



EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR RESEARCH & INNOVATION

Open Innovation and Open Science
Research infrastructure



GRANT AGREEMENT

NUMBER — 730884 — JUMPING JIVE

This **Agreement** ('the Agreement') is **between** the following parties:

on the one part,

the **European Union** ('the EU'), represented by the European Commission ('the Commission'),

represented for the purposes of signature of this Agreement by Head of Unit, DIRECTORATE-GENERAL FOR RESEARCH & INNOVATION, Open Innovation and Open Science, Administration and finance, Pascale CID,

and

on the other part,

1. 'the coordinator':

JOINT INSTITUTE FOR VERY LONG BASELINE INTERFEROMETRY AS A EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (JIV-ERIC) (JIV-ERIC), 62827278, established in OUDE HOOGEVEENSEDIJK 4, DWINGELOO 7991 PD, Netherlands, VAT number NL854973527B01, represented for the purposes of signing the Agreement by Director, Huib VAN LANGEVELDE

and the following other beneficiaries, if they sign their 'Accession Form' (see Annex 3 and Article 56):

2. **CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS (CNRS)**, 180089013, established in RUE MICHEL ANGE 3, PARIS 75794, France, VAT number FR40180089013,

3. **CHALMERS TEKNISKA HOEGSKOLA AB (CHALMERS) AB**, 5564795598, established in -, GOETEBORG 41296, Sweden, VAT number SE556479559801,

4. **DEPARTMENT OF SCIENCE AND TECHNOLOGY (DST)**, established in Meiring Naude Road 53 CSIR Campus, BRUMMERIA 0001, South Africa,

5. **ISTITUTO NAZIONALE DI ASTROFISICA (INAF)**, 97220210583, established in Viale del Parco Mellini 84, ROMA 00136, Italy, VAT number IT06895721006,

6. **MINISTERIO DE FOMENTO (MFOM-E)**, established in PASEO DE LA CASTELLANA 67, MADRID 28071, Spain,

7. **SKA ORGANISATION (SKAO) GB5**, 07881918, established in JODRELL BANK OBSERVATORY LOWER WITHINGTON, MACCLESFIELD SK11 9DL, United Kingdom,

8. **STICHTING ASTRON, NETHERLANDS INSTITUTE FOR RADIO ASTRONOMY (ASTRON)** NL6, 41166026, established in Oude Hoogeveensedijk 4, DWINGELOO 7991PD, Netherlands, VAT number NL003447741B01,

9. **STICHTING INTERNATIONAL LOFAR TELESCOPE (ILT)** NL6, 51272059, established in OUDE HOOGEVEENSEDIJK 4, Dwingeloo 7991 PD, Netherlands, VAT number NL n/a,

10. **TECHNISCHE UNIVERSITAET MUENCHEN (TUM)**, Bay. Hochschulgesetz, established in Arcisstrasse 21, MUENCHEN 80333, Germany, VAT number DE811193231,

11. **UNIVERSITY OF LEEDS (UNIVLEEDS)** GB22, RC000658, established in WOODHOUSE LANE, LEEDS LS2 9JT, United Kingdom, VAT number GB613451470,

12. **THE UNIVERSITY OF MANCHESTER (UMAN)** GB22, RC000797, established in OXFORD ROAD UNIVERSITY OF MANCHESTER OFFICE OF DIRECTOR OF FINANCE, MANCHESTER M13 9PL, United Kingdom, VAT number GB849738956,

Unless otherwise specified, references to ‘beneficiary’ or ‘beneficiaries’ include the coordinator.

The parties referred to above have agreed to enter into the Agreement under the terms and conditions below.

By signing the Agreement or the Accession Form, the beneficiaries accept the grant and agree to implement it under their own responsibility and in accordance with the Agreement, with all the obligations and conditions it sets out.

The Agreement is composed of:

Terms and Conditions

Annex 1	Description of the action
Annex 2	Estimated budget for the action
	2a Additional information on the estimated budget
Annex 3	Accession Forms
Annex 4	Model for the financial statements
Annex 5	Model for the certificate on the financial statements
Annex 6	Model for the certificate on the methodology

TERMS AND CONDITIONS

TABLE OF CONTENTS

CHAPTER 1 GENERAL	11
ARTICLE 1 — SUBJECT OF THE AGREEMENT	11
CHAPTER 2 ACTION	11
ARTICLE 2 — ACTION TO BE IMPLEMENTED.....	11
ARTICLE 3 — DURATION AND STARTING DATE OF THE ACTION	11
ARTICLE 4 — ESTIMATED BUDGET AND BUDGET TRANSFERS	11
4.1 Estimated budget	11
4.2 Budget transfers	11
CHAPTER 3 GRANT	11
ARTICLE 5 — GRANT AMOUNT, FORM OF GRANT, REIMBURSEMENT RATES AND FORMS OF COSTS	11
5.1 Maximum grant amount	11
5.2 Form of grant, reimbursement rates and forms of costs	12
5.3 Final grant amount — Calculation	12
5.4 Revised final grant amount — Calculation	14
ARTICLE 6 — ELIGIBLE AND INELIGIBLE COSTS	14
6.1 General conditions for costs to be eligible	14
6.2 Specific conditions for costs to be eligible	15
6.3 Conditions for costs of linked third parties to be eligible	20
6.4 Conditions for in-kind contributions provided by third parties free of charge to be eligible	20
6.5 Ineligible costs	20
6.6 Consequences of declaration of ineligible costs	21
CHAPTER 4 RIGHTS AND OBLIGATIONS OF THE PARTIES	21
SECTION 1 RIGHTS AND OBLIGATIONS RELATED TO IMPLEMENTING THE ACTION	21
ARTICLE 7 — GENERAL OBLIGATION TO PROPERLY IMPLEMENT THE ACTION	21
7.1 General obligation to properly implement the action	21
7.2 Consequences of non-compliance	21
ARTICLE 8 — RESOURCES TO IMPLEMENT THE ACTION — THIRD PARTIES INVOLVED IN THE ACTION	22
ARTICLE 9 — IMPLEMENTATION OF ACTION TASKS BY BENEFICIARIES NOT RECEIVING EU FUNDING	22
ARTICLE 10 — PURCHASE OF GOODS, WORKS OR SERVICES	22

10.1 Rules for purchasing goods, works or services	22
10.2 Consequences of non-compliance	23
ARTICLE 11 — USE OF IN-KIND CONTRIBUTIONS PROVIDED BY THIRD PARTIES AGAINST PAYMENT	23
11.1 Rules for the use of in-kind contributions against payment	23
11.2 Consequences of non-compliance	23
ARTICLE 12 — USE OF IN-KIND CONTRIBUTIONS PROVIDED BY THIRD PARTIES FREE OF CHARGE	23
12.1 Rules for the use of in-kind contributions free of charge	23
12.2 Consequences of non-compliance	24
ARTICLE 13 — IMPLEMENTATION OF ACTION TASKS BY SUBCONTRACTORS	24
13.1 Rules for subcontracting action tasks	24
13.2 Consequences of non-compliance	25
ARTICLE 14 — IMPLEMENTATION OF ACTION TASKS BY LINKED THIRD PARTIES	25
ARTICLE 15 — FINANCIAL SUPPORT TO THIRD PARTIES	25
15.1 Rules for providing financial support to third parties	25
15.2 Financial support in the form of prizes	25
15.3 Consequences of non-compliance	25
ARTICLE 16 — PROVISION OF TRANS-NATIONAL OR VIRTUAL ACCESS TO RESEARCH INFRASTRUCTURE	25
16.1 Rules for providing trans-national access to research infrastructure	25
16.2 Rules for providing virtual access to research infrastructure	25
16.3 Consequences of non-compliance	25
SECTION 2 RIGHTS AND OBLIGATIONS RELATED TO THE GRANT ADMINISTRATION	25
ARTICLE 17 – GENERAL OBLIGATION TO INFORM	25
17.1 General obligation to provide information upon request	25
17.2 Obligation to keep information up to date and to inform about events and circumstances likely to affect the Agreement	26
17.3 Consequences of non-compliance	26
ARTICLE 18 — KEEPING RECORDS — SUPPORTING DOCUMENTATION	26
18.1 Obligation to keep records and other supporting documentation	26
18.2 Consequences of non-compliance	27
ARTICLE 19 — SUBMISSION OF DELIVERABLES	28
19.1 Obligation to submit deliverables	28
19.2 Consequences of non-compliance	28
ARTICLE 20 — REPORTING — PAYMENT REQUESTS	28
20.1 Obligation to submit reports	28

20.2 Reporting periods	28
20.3 Periodic reports — Requests for interim payments	28
20.4 Final report — Request for payment of the balance	29
20.5 Information on cumulative expenditure incurred	30
20.6 Currency for financial statements and conversion into euro	30
20.7 Language of reports	30
20.8 Consequences of non-compliance	30
ARTICLE 21 — PAYMENTS AND PAYMENT ARRANGEMENTS	30
21.1 Payments to be made	30
21.2 Pre-financing payment — Amount — Amount retained for the Guarantee Fund	31
21.3 Interim payments — Amount — Calculation	31
21.4 Payment of the balance — Amount — Calculation — Release of the amount retained for the Guarantee Fund	32
21.5 Notification of amounts due	32
21.6 Currency for payments	33
21.7 Payments to the coordinator — Distribution to the beneficiaries	33
21.8 Bank account for payments	33
21.9 Costs of payment transfers	33
21.10 Date of payment	33
21.11 Consequences of non-compliance	33
ARTICLE 22 — CHECKS, REVIEWS, AUDITS AND INVESTIGATIONS — EXTENSION OF FINDINGS	34
22.1 Checks, reviews and audits by the Commission	34
22.2 Investigations by the European Anti-Fraud Office (OLAF)	36
22.3 Checks and audits by the European Court of Auditors (ECA)	36
22.4 Checks, reviews, audits and investigations for international organisations	36
22.5 Consequences of findings in checks, reviews, audits and investigations — Extension of findings	36
22.6 Consequences of non-compliance	38
ARTICLE 23 — EVALUATION OF THE IMPACT OF THE ACTION	38
23.1 Right to evaluate the impact of the action	38
23.2 Consequences of non-compliance	39
SECTION 3 RIGHTS AND OBLIGATIONS RELATED TO BACKGROUND AND RESULTS	39
SUBSECTION 1 GENERAL	39
ARTICLE 23a — MANAGEMENT OF INTELLECTUAL PROPERTY	39
23a.1 Obligation to take measures to implement the Commission Recommendation on the management of intellectual property in knowledge transfer activities	39

23a.2 Consequences of non-compliance	39
SUBSECTION 2 RIGHTS AND OBLIGATIONS RELATED TO BACKGROUND	39
ARTICLE 24 — AGREEMENT ON BACKGROUND	39
24.1 Agreement on background	39
24.2 Consequences of non-compliance	40
ARTICLE 25 — ACCESS RIGHTS TO BACKGROUND	40
25.1 Exercise of access rights — Waiving of access rights — No sub-licensing	40
25.2 Access rights for other beneficiaries, for implementing their own tasks under the action	40
25.3 Access rights for other beneficiaries, for exploiting their own results	40
25.4 Access rights for affiliated entities	40
25.5 Access rights for third parties	41
25.6 Consequences of non-compliance	41
SUBSECTION 3 RIGHTS AND OBLIGATIONS RELATED TO RESULTS	41
ARTICLE 26 — OWNERSHIP OF RESULTS	41
26.1 Ownership by the beneficiary that generates the results	41
26.2 Joint ownership by several beneficiaries	41
26.3 Rights of third parties (including personnel)	42
26.4 EU ownership, to protect results	42
26.5 Consequences of non-compliance	43
ARTICLE 27 — PROTECTION OF RESULTS — VISIBILITY OF EU FUNDING	43
27.1 Obligation to protect the results	43
27.2 EU ownership, to protect the results	43
27.3 Information on EU funding	44
27.4 Consequences of non-compliance	44
ARTICLE 28 — EXPLOITATION OF RESULTS	44
28.1 Obligation to exploit the results	44
28.2 Results that could contribute to European or international standards — Information on EU funding	44
28.3 Consequences of non-compliance	44
ARTICLE 29 — DISSEMINATION OF RESULTS — OPEN ACCESS — VISIBILITY OF EU FUNDING	45
29.1 Obligation to disseminate results	45
29.2 Open access to scientific publications	45
29.3 Open access to research data	46
29.4 Information on EU funding — Obligation and right to use the EU emblem	46
29.5 Disclaimer excluding Commission responsibility	46

29.6 Consequences of non-compliance	46
ARTICLE 30 — TRANSFER AND LICENSING OF RESULTS	46
30.1 Transfer of ownership	46
30.2 Granting licenses	47
30.3 Commission right to object to transfers or licensing	47
30.4 Consequences of non-compliance	47
ARTICLE 31 — ACCESS RIGHTS TO RESULTS	47
31.1 Exercise of access rights — Waiving of access rights — No sub-licensing	47
31.2 Access rights for other beneficiaries, for implementing their own tasks under the action	47
31.3 Access rights for other beneficiaries, for exploiting their own results	48
31.4 Access rights of affiliated entities	48
31.5 Access rights for the EU institutions, bodies, offices or agencies and EU Member States	48
31.6 Access rights for third parties	48
31.7 Consequences of non-compliance	48
SECTION 4 OTHER RIGHTS AND OBLIGATIONS	48
ARTICLE 32 — RECRUITMENT AND WORKING CONDITIONS FOR RESEARCHERS	49
32.1 Obligation to take measures to implement the European Charter for Researchers and Code of Conduct for the Recruitment of Researchers	49
32.2 Consequences of non-compliance	49
ARTICLE 33 — GENDER EQUALITY	49
33.1 Obligation to aim for gender equality	49
33.2 Consequences of non-compliance	49
ARTICLE 34 — ETHICS AND RESEARCH INTEGRITY	49
34.1 Obligation to comply with ethical and research integrity principles	49
34.2 Activities raising ethical issues	51
34.3 Activities involving human embryos or human embryonic stem cells	51
34.4 Consequences of non-compliance	51
ARTICLE 35 — CONFLICT OF INTERESTS	51
35.1 Obligation to avoid a conflict of interests	51
35.2 Consequences of non-compliance	52
ARTICLE 36 — CONFIDENTIALITY	52
36.1 General obligation to maintain confidentiality	52
36.2 Consequences of non-compliance	53
ARTICLE 37 — SECURITY-RELATED OBLIGATIONS	53
37.1 Results with a security recommendation	53
37.2 Classified results	53

37.3 Activities involving dual-use goods or dangerous materials and substances	53
37.4 Consequences of non-compliance	53
ARTICLE 38 — PROMOTING THE ACTION — VISIBILITY OF EU FUNDING	53
38.1 Communication activities by beneficiaries	53
38.2 Communication activities by the Commission	54
38.3 Consequences of non-compliance	55
ARTICLE 39 — PROCESSING OF PERSONAL DATA	55
39.1 Processing of personal data by the Commission	55
39.2 Processing of personal data by the beneficiaries	56
39.3 Consequences of non-compliance	56
ARTICLE 40 — ASSIGNMENTS OF CLAIMS FOR PAYMENT AGAINST THE COMMISSION.....	56
CHAPTER 5 DIVISION OF BENEFICIARIES' ROLES AND RESPONSIBILITIES — RELATIONSHIP WITH COMPLEMENTARY BENEFICIARIES — RELATIONSHIP WITH PARTNERS OF A JOINT ACTION	56
ARTICLE 41 — DIVISION OF BENEFICIARIES' ROLES AND RESPONSIBILITIES — RELATIONSHIP WITH COMPLEMENTARY BENEFICIARIES — RELATIONSHIP WITH PARTNERS OF A JOINT ACTION	56
41.1 Roles and responsibilities towards the Commission.....	56
41.2 Internal division of roles and responsibilities	57
41.3 Internal arrangements between beneficiaries — Consortium agreement	58
41.4 Relationship with complementary beneficiaries — Collaboration agreement	58
41.5 Relationship with partners of a joint action — Coordination agreement	58
CHAPTER 6 REJECTION OF COSTS — REDUCTION OF THE GRANT — RECOVERY — SANCTIONS — DAMAGES — SUSPENSION — TERMINATION — FORCE MAJEURE	58
SECTION 1 REJECTION OF COSTS — REDUCTION OF THE GRANT — RECOVERY — SANCTIONS	58
ARTICLE 42 — REJECTION OF INELIGIBLE COSTS	58
42.1 Conditions	58
42.2 Ineligible costs to be rejected — Calculation — Procedure	58
42.3 Effects	59
ARTICLE 43 — REDUCTION OF THE GRANT	59
43.1 Conditions	59
43.2 Amount to be reduced — Calculation — Procedure	60
43.3 Effects	60
ARTICLE 44 — RECOVERY OF UNDUE AMOUNTS	60
44.1 Amount to be recovered — Calculation — Procedure	60
ARTICLE 45 — ADMINISTRATIVE SANCTIONS	64
SECTION 2 LIABILITY FOR DAMAGES	64

ARTICLE 46 — LIABILITY FOR DAMAGES	64
46.1 Liability of the Commission.....	64
46.2 Liability of the beneficiaries	64
SECTION 3 SUSPENSION AND TERMINATION	64
ARTICLE 47 — SUSPENSION OF PAYMENT DEADLINE	65
47.1 Conditions	65
47.2 Procedure	65
ARTICLE 48 — SUSPENSION OF PAYMENTS	65
48.1 Conditions	65
48.2 Procedure	66
ARTICLE 49 — SUSPENSION OF THE ACTION IMPLEMENTATION	66
49.1 Suspension of the action implementation, by the beneficiaries	66
49.2 Suspension of the action implementation, by the Commission.....	67
ARTICLE 50 — TERMINATION OF THE AGREEMENT OR OF THE PARTICIPATION OF ONE OR MORE BENEFICIARIES	68
50.1 Termination of the Agreement, by the beneficiaries	68
50.2 Termination of the participation of one or more beneficiaries, by the beneficiaries	69
50.3 Termination of the Agreement or the participation of one or more beneficiaries, by the Commission.....	71
SECTION 4 FORCE MAJEURE	75
ARTICLE 51 — FORCE MAJEURE	75
CHAPTER 7 FINAL PROVISIONS	76
ARTICLE 52 — COMMUNICATIONS BETWEEN THE PARTIES	76
52.1 Form and means of communication	76
52.2 Date of communication	76
52.3 Addresses for communication	77
ARTICLE 53 — INTERPRETATION OF THE AGREEMENT	77
53.1 Precedence of the Terms and Conditions over the Annexes	77
53.2 Privileges and immunities	77
ARTICLE 54 — CALCULATION OF PERIODS, DATES AND DEADLINES	77
ARTICLE 55 — AMENDMENTS TO THE AGREEMENT	77
55.1 Conditions	77
55.2 Procedure	78
ARTICLE 56 — ACCESSION TO THE AGREEMENT	78
56.1 Accession of the beneficiaries mentioned in the Preamble	78
56.2 Addition of new beneficiaries	78

ARTICLE 57 — APPLICABLE LAW AND SETTLEMENT OF DISPUTES	79
57.1 Applicable law	79
57.2 Dispute settlement	79
ARTICLE 58 — ENTRY INTO FORCE OF THE AGREEMENT	79

CHAPTER 1 GENERAL

ARTICLE 1 — SUBJECT OF THE AGREEMENT

This Agreement sets out the rights and obligations and the terms and conditions applicable to the grant awarded to the beneficiaries for implementing the action set out in Chapter 2.

CHAPTER 2 ACTION

ARTICLE 2 — ACTION TO BE IMPLEMENTED

The grant is awarded for the action entitled ‘**Joining up Users for Maximising the Profile, the Innovation and the Necessary Globalisation of JIVE — JUMPING JIVE**’ (‘action’), as described in Annex 1.

ARTICLE 3 — DURATION AND STARTING DATE OF THE ACTION

The duration of the action will be **50 months** as of 1 December 2016 (‘**starting date of the action**’).

ARTICLE 4 — ESTIMATED BUDGET AND BUDGET TRANSFERS

4.1 Estimated budget

The ‘**estimated budget**’ for the action is set out in Annex 2.

It contains the estimated eligible costs and the forms of costs, broken down by beneficiary and budget category (see Articles 5, 6).

4.2 Budget transfers

The estimated budget breakdown indicated in Annex 2 may be adjusted — without an amendment (see Article 55) — by transfers of amounts between beneficiaries, budget categories and/or forms of costs set out in Annex 2, if the action is implemented as described in Annex 1.

However, the beneficiaries may not add costs relating to subcontracts not provided for in Annex 1, unless such additional subcontracts are approved by an amendment or in accordance with Article 13.

CHAPTER 3 GRANT

ARTICLE 5 — GRANT AMOUNT, FORM OF GRANT, REIMBURSEMENT RATES AND FORMS OF COSTS

5.1 Maximum grant amount

The ‘**maximum grant amount**’ is **EUR 2,983,682.50** (two million nine hundred and eighty three thousand six hundred and eighty two EURO and fifty eurocents).

5.2 Form of grant, reimbursement rates and forms of costs

The grant reimburses **100% of the action's eligible costs** (see Article 6) (**'reimbursement of eligible costs grant'**) (see Annex 2).

The estimated eligible costs of the action are EUR **3,312,308.59** (three million three hundred and twelve thousand three hundred and eight EURO and fifty nine eurocents).

Eligible costs (see Article 6) must be declared under the following forms (**'forms of costs'**):

(a) for **direct personnel costs**:

- as actually incurred costs (**'actual costs'**) or
- on the basis of an amount per unit calculated by the beneficiary in accordance with its usual cost accounting practices (**'unit costs'**).

Personnel **costs for SME owners or beneficiaries that are natural persons** not receiving a salary (see Article 6.2, Points A.4 and A.5) must be declared on the basis of the amount per unit set out in Annex 2a (**unit costs**);

(b) for **direct costs for subcontracting**: as actually incurred costs (**actual costs**);

(c) for **direct costs of providing financial support to third parties**: not applicable;

(d) for **other direct costs**: as actually incurred costs (**actual costs**);

(e) for **indirect costs**: on the basis of a flat-rate applied as set out in Article 6.2, Point E (**'flat-rate costs'**);

(f) **specific cost category(ies)**: not applicable.

5.3 Final grant amount — Calculation

The **'final grant amount'** depends on the actual extent to which the action is implemented in accordance with the Agreement's terms and conditions.

This amount is calculated by the Commission — when the payment of the balance is made (see Article 21.4) — in the following steps:

Step 1 – Application of the reimbursement rates to the eligible costs

Step 2 – Limit to the maximum grant amount

Step 3 – Reduction due to the no-profit rule

Step 4 – Reduction due to substantial errors, irregularities or fraud or serious breach of obligations

5.3.1 Step 1 — Application of the reimbursement rates to the eligible costs

The reimbursement rate(s) (see Article 5.2) are applied to the eligible costs (actual costs, unit costs and flat-rate costs; see Article 6) declared by the beneficiaries (see Article 20) and approved by the Commission (see Article 21).

5.3.2 Step 2 — Limit to the maximum grant amount

If the amount obtained following Step 1 is higher than the maximum grant amount set out in Article 5.1, it will be limited to the latter.

5.3.3 Step 3 — Reduction due to the no-profit rule

The grant must not produce a profit.

‘**Profit**’ means the surplus of the amount obtained following Steps 1 and 2 plus the action’s total receipts, over the action’s total eligible costs.

The ‘**action’s total eligible costs**’ are the consolidated total eligible costs approved by the Commission.

The ‘**action’s total receipts**’ are the consolidated total receipts generated during its duration (see Article 3).

The following are considered **receipts**:

- (a) income generated by the action; if the income is generated from selling equipment or other assets purchased under the Agreement, the receipt is up to the amount declared as eligible under the Agreement;
- (b) financial contributions given by third parties to the beneficiary specifically to be used for the action, and
- (c) in-kind contributions provided by third parties free of charge and specifically to be used for the action, if they have been declared as eligible costs.

The following are however not considered receipts:

- (a) income generated by exploiting the action’s results (see Article 28);
- (b) financial contributions by third parties, if they may be used to cover costs other than the eligible costs (see Article 6);
- (c) financial contributions by third parties with no obligation to repay any amount unused at the end of the period set out in Article 3.

If there is a profit, it will be deducted from the amount obtained following Steps 1 and 2.

5.3.4 Step 4 — Reduction due to substantial errors, irregularities or fraud or serious breach of obligations — Reduced grant amount — Calculation

If the grant is reduced (see Article 43), the Commission will calculate the reduced grant amount by deducting the amount of the reduction (calculated in proportion to the seriousness of the errors, irregularities or fraud or breach of obligations, in accordance with Article 43.2) from the maximum grant amount set out in Article 5.1.

The final grant amount will be the lower of the following two:

- the amount obtained following Steps 1 to 3 or

- the reduced grant amount following Step 4.

5.4 Revised final grant amount — Calculation

If — after the payment of the balance (in particular, after checks, reviews, audits or investigations; see Article 22) — the Commission rejects costs (see Article 42) or reduces the grant (see Article 43), it will calculate the ‘**revised final grant amount**’ for the beneficiary concerned by the findings.

This amount is calculated by the Commission on the basis of the findings, as follows:

- in case of **rejection of costs**: by applying the reimbursement rate to the revised eligible costs approved by the Commission for the beneficiary concerned;
- in case of **reduction of the grant**: by calculating the concerned beneficiary’s share in the grant amount reduced in proportion to the seriousness of the errors, irregularities or fraud or breach of obligations (see Article 43.2).

In case of **rejection of costs and reduction of the grant**, the revised final grant amount for the beneficiary concerned will be the lower of the two amounts above.

ARTICLE 6 — ELIGIBLE AND INELIGIBLE COSTS

6.1 General conditions for costs to be eligible

‘**Eligible costs**’ are costs that meet the following criteria:

(a) for **actual costs**:

- (i) they must be actually incurred by the beneficiary;
- (ii) they must be incurred in the period set out in Article 3, with the exception of costs relating to the submission of the periodic report for the last reporting period and the final report (see Article 20);
- (iii) they must be indicated in the estimated budget set out in Annex 2;
- (iv) they must be incurred in connection with the action as described in Annex 1 and necessary for its implementation;
- (v) they must be identifiable and verifiable, in particular recorded in the beneficiary’s accounts in accordance with the accounting standards applicable in the country where the beneficiary is established and with the beneficiary’s usual cost accounting practices;
- (vi) they must comply with the applicable national law on taxes, labour and social security, and
- (vii) they must be reasonable, justified and must comply with the principle of sound financial management, in particular regarding economy and efficiency;

(b) for **unit costs**:

- (i) they must be calculated as follows:

{amounts per unit set out in Annex 2a or calculated by the beneficiary in accordance with its usual cost accounting practices (see Article 6.2, Point A)}

multiplied by

the number of actual units};

(ii) the number of actual units must comply with the following conditions:

- the units must be actually used or produced in the period set out in Article 3;
- the units must be necessary for implementing the action or produced by it, and
- the number of units must be identifiable and verifiable, in particular supported by records and documentation (see Article 18);

(c) for **flat-rate costs**:

(i) they must be calculated by applying the flat-rate set out in Annex 2, and

(ii) the costs (actual costs or unit costs) to which the flat-rate is applied must comply with the conditions for eligibility set out in this Article.

6.2 Specific conditions for costs to be eligible

Costs are eligible if they comply with the general conditions (see above) and the specific conditions set out below for each of the following budget categories:

- A. direct personnel costs;
- B. direct costs of subcontracting;
- C. not applicable;
- D. other direct costs;
- E. indirect costs;
- F. not applicable.

‘Direct costs’ are costs that are directly linked to the action implementation and can therefore be attributed to it directly. They must not include any indirect costs (see Point E below).

‘Indirect costs’ are costs that are not directly linked to the action implementation and therefore cannot be attributed directly to it.

A. Direct personnel costs

Types of eligible personnel costs

A.1 Personnel costs are eligible, if they are related to personnel working for the beneficiary under an employment contract (or equivalent appointing act) and assigned to the action (**‘costs for employees (or equivalent)’**). They must be limited to salaries (including during parental leave), social security contributions, taxes and other costs included in the **remuneration**, if they arise from national law or the employment contract (or equivalent appointing act).

Beneficiaries that are non-profit legal entities¹ may also declare as personnel costs **additional remuneration** for personnel assigned to the action (including payments on the basis of supplementary contracts regardless of their nature), if:

- (a) it is part of the beneficiary’s usual remuneration practices and is paid in a consistent manner whenever the same kind of work or expertise is required;

- (b) the criteria used to calculate the supplementary payments are objective and generally applied by the beneficiary, regardless of the source of funding used.

Additional remuneration for personnel assigned to the action is eligible up to the following amount:

- (a) if the person works full time and exclusively on the action during the full year: up to EUR 8 000;
- (b) if the person works exclusively on the action but not full-time or not for the full year: up to the corresponding pro-rata amount of EUR 8 000, or
- (c) if the person does not work exclusively on the action: up to a pro-rata amount calculated as follows:
- {{EUR 8 000
divided by
the number of annual productive hours (see below)},
multiplied by
the number of hours that the person has worked on the action during the year}.

A.2 The **costs for natural persons working under a direct contract** with the beneficiary other than an employment contract are eligible personnel costs, if:

- (a) the person works under the beneficiary's instructions and, unless otherwise agreed with the beneficiary, on the beneficiary's premises;
- (b) the result of the work carried out belongs to the beneficiary, and
- (c) the costs are not significantly different from those for personnel performing similar tasks under an employment contract with the beneficiary.

A.3 The **costs of personnel seconded by a third party against payment** are eligible personnel costs, if the conditions in Article 11.1 are met.

A.4 **Costs of owners** of beneficiaries that are small and medium-sized enterprises ('**SME owners**') who are working on the action and who do not receive a salary are eligible personnel costs, if they correspond to the amount per unit set out in Annex 2a multiplied by the number of actual hours worked on the action.

A.5 **Costs of 'beneficiaries that are natural persons'** not receiving a salary are eligible personnel costs, if they correspond to the amount per unit set out in Annex 2a multiplied by the number of actual hours worked on the action.

Calculation

Personnel costs must be calculated by the beneficiaries as follows:

¹ For the definition, see Article 2.1(14) of the Rules for Participation Regulation No 1290/2013: '**non-profit legal entity**' means a legal entity which by its legal form is non-profit-making or which has a legal or statutory obligation not to distribute profits to its shareholders or individual members.

{hourly rate
 multiplied by
 the number of actual hours worked on the action},
 plus
 for non-profit legal entities: additional remuneration to personnel assigned to the action under the
 conditions set out above (Point A.1)}.

The number of actual hours declared for a person must be identifiable and verifiable (see Article 18).

The total number of hours declared in EU or Euratom grants, for a person for a year, cannot be higher than the annual productive hours used for the calculations of the hourly rate. Therefore, the maximum number of hours that can be declared for the grant is:

{the number of annual productive hours for the year (see below)
 minus
 total number of hours declared by the beneficiary for that person in that year for other EU or Euratom
 grants}.

The ‘**hourly rate**’ is one of the following:

- (a) for personnel costs declared as **actual costs**: the hourly rate is calculated *per full financial year*, as follows:

{actual annual personnel costs (excluding additional remuneration) for the person
 divided by
 number of annual productive hours}.

using the personnel costs and the number of productive hours for each full financial year covered by the reporting period concerned. If a financial year is not closed at the end of the reporting period, the beneficiaries must use the hourly rate of the last closed financial year available.

For the ‘number of annual productive hours’, the beneficiaries may choose one of the following:

- (i) ‘fixed number of hours’: 1 720 hours for persons working full time (or corresponding pro-rata for persons not working full time);
 (ii) ‘individual annual productive hours’: the total number of hours worked by the person in the year for the beneficiary, calculated as follows:

{annual workable hours of the person (according to the employment contract, applicable collective labour agreement or national law)
 plus
 overtime worked
 minus
 absences (such as sick leave and special leave)}.

‘Annual workable hours’ means the period during which the personnel must be working, at the employer’s disposal and carrying out his/her activity or duties under the employment contract, applicable collective labour agreement or national working time legislation.

If the contract (or applicable collective labour agreement or national working time legislation) does not allow to determine the annual workable hours, this option cannot be used;

- (iii) ‘standard annual productive hours’: the ‘standard number of annual hours’ generally applied by the beneficiary for its personnel in accordance with its usual cost accounting practices. This number must be at least 90% of the ‘standard annual workable hours’.

If there is no applicable reference for the standard annual workable hours, this option cannot be used.

For all options, the actual time spent on **parental leave** by a person assigned to the action may be deducted from the number of annual productive hours.

As an alternative, beneficiaries may calculate the hourly rate *per month*, as follows:

{actual monthly personnel cost (excluding additional remuneration) for the person

divided by

{number of annual productive hours / 12}}

using the personnel costs for each month and (one twelfth of) the annual productive hours calculated according to either option (i) or (iii) above, i.e.:

- fixed number of hours or
- standard annual productive hours.

Time spent on **parental leave** may not be deducted when calculating the hourly rate per month. However, beneficiaries may declare personnel costs incurred in periods of parental leave in proportion to the time the person worked on the action in that financial year.

If parts of a basic remuneration are generated over a period longer than a month, the beneficiaries may include only the share which is generated in the month (irrespective of the amount actually paid for that month).

Each beneficiary must use only one option (per full financial year or per month) for each full financial year;

(b) for personnel costs declared on the basis of **unit costs**: the hourly rate is one of the following:

- (i) for SME owners or beneficiaries that are natural persons: the hourly rate set out in Annex 2a (see Points A.4 and A.5 above), or
- (ii) for personnel costs declared on the basis of the beneficiary’s usual cost accounting practices: the hourly rate calculated by the beneficiary in accordance with its usual cost accounting practices, if:

- the cost accounting practices used are applied in a consistent manner, based on objective criteria, regardless of the source of funding;
- the hourly rate is calculated using the actual personnel costs recorded in the beneficiary's accounts, excluding any ineligible cost or costs included in other budget categories.

The actual personnel costs may be adjusted by the beneficiary on the basis of budgeted or estimated elements. Those elements must be relevant for calculating the personnel costs, reasonable and correspond to objective and verifiable information;

and

- the hourly rate is calculated using the number of annual productive hours (see above).

B. Direct costs of subcontracting (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible if the conditions in Article 13.1.1 are met.

C. Direct costs of providing financial support to third parties

Not applicable

D. Other direct costs

D.1 Travel costs and related subsistence allowances (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible if they are in line with the beneficiary's usual practices on travel.

D.2 The depreciation costs of equipment, infrastructure or other assets (new or second-hand) as recorded in the beneficiary's accounts are eligible, if they were purchased in accordance with Article 10.1.1 and written off in accordance with international accounting standards and the beneficiary's usual accounting practices.

The **costs of renting or leasing** equipment, infrastructure or other assets (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are also eligible, if they do not exceed the depreciation costs of similar equipment, infrastructure or assets and do not include any financing fees.

The costs of equipment, infrastructure or other assets **contributed in-kind against payment** are eligible, if they do not exceed the depreciation costs of similar equipment, infrastructure or assets, do not include any financing fees and if the conditions in Article 11.1 are met.

The only portion of the costs that will be taken into account is that which corresponds to the duration of the action and rate of actual use for the purposes of the action.

D.3 Costs of other goods and services (including related duties, taxes and charges such as non-deductible value added tax (VAT) paid by the beneficiary) are eligible, if they are:

- (a) purchased specifically for the action and in accordance with Article 10.1.1 or
- (b) contributed in kind against payment and in accordance with Article 11.1.

Such goods and services include, for instance, consumables and supplies, dissemination (including open access), protection of results, certificates on the financial statements (if they are required by the Agreement), certificates on the methodology, translations and publications.

D.4 Capitalised and operating costs of ‘large research infrastructure’²: Not applicable

E. Indirect costs

Indirect costs are eligible if they are declared on the basis of the flat-rate of 25% of the eligible direct costs (see Article 5.2 and Points A to D above), from which are excluded:

- (a) costs of subcontracting and
- (b) costs of in-kind contributions provided by third parties which are not used on the beneficiary’s premises;
- (c) not applicable;
- (d) not applicable.

Beneficiaries receiving an operating grant⁴ financed by the EU or Euratom budget cannot declare indirect costs for the period covered by the operating grant.

F. Specific cost category(ies)

Not applicable

6.3 Conditions for costs of linked third parties to be eligible

Not applicable

6.4 Conditions for in-kind contributions provided by third parties free of charge to be eligible

In-kind contributions provided free of charge are eligible direct costs (for the beneficiary), if the costs incurred by the third party fulfil — *mutatis mutandis* — the general and specific conditions for eligibility set out in this Article (Article 6.1 and 6.2) and Article 12.1.

6.5 Ineligible costs

‘**Ineligible costs**’ are:

- (a) costs that do not comply with the conditions set out above (Article 6.1 to 6.4), in particular:

² ‘**Large research infrastructure**’ means research infrastructure of a total value of at least EUR 20 million, for a beneficiary, calculated as the sum of historical asset values of each individual research infrastructure of that beneficiary, as they appear in its last closed balance sheet before the date of the signature of the Agreement or as determined on the basis of the rental and leasing costs of the research infrastructure.

⁴ For the definition, see Article 121(1)(b) of Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002 (‘**Financial Regulation No 966/2012**’)(OJ L 218, 26.10.2012, p.1): ‘**operating grant**’ means direct financial contribution, by way of donation, from the budget in order to finance the functioning of a body which pursues an aim of general EU interest or has an objective forming part of and supporting an EU policy.

- (i) costs related to return on capital;
 - (ii) debt and debt service charges;
 - (iii) provisions for future losses or debts;
 - (iv) interest owed;
 - (v) doubtful debts;
 - (vi) currency exchange losses;
 - (vii) bank costs charged by the beneficiary's bank for transfers from the Commission;
 - (viii) excessive or reckless expenditure;
 - (ix) deductible VAT;
 - (x) costs incurred during suspension of the implementation of the action (see Article 49);
- (b) costs declared under another EU or Euratom grant (including grants awarded by a Member State and financed by the EU or Euratom budget and grants awarded by bodies other than the Commission for the purpose of implementing the EU or Euratom budget); in particular, indirect costs if the beneficiary is already receiving an operating grant financed by the EU or Euratom budget in the same period.

6.6 Consequences of declaration of ineligible costs

Declared costs that are ineligible will be rejected (see Article 42).

This may also lead to any of the other measures described in Chapter 6.

CHAPTER 4 RIGHTS AND OBLIGATIONS OF THE PARTIES

SECTION 1 RIGHTS AND OBLIGATIONS RELATED TO IMPLEMENTING THE ACTION

ARTICLE 7 — GENERAL OBLIGATION TO PROPERLY IMPLEMENT THE ACTION

7.1 General obligation to properly implement the action

The beneficiaries must implement the action as described in Annex 1 and in compliance with the provisions of the Agreement and all legal obligations under applicable EU, international and national law.

7.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 8 — RESOURCES TO IMPLEMENT THE ACTION — THIRD PARTIES INVOLVED IN THE ACTION

The beneficiaries must have the appropriate resources to implement the action.

If it is necessary to implement the action, the beneficiaries may:

- purchase goods, works and services (see Article 10);
- use in-kind contributions provided by third parties against payment (see Article 11);
- use in-kind contributions provided by third parties free of charge (see Article 12);
- call upon subcontractors to implement action tasks described in Annex 1 (see Article 13);
- call upon linked third parties to implement action tasks described in Annex 1 (see Article 14).

In these cases, the beneficiaries retain sole responsibility towards the Commission and the other beneficiaries for implementing the action.

ARTICLE 9 — IMPLEMENTATION OF ACTION TASKS BY BENEFICIARIES NOT RECEIVING EU FUNDING

Not applicable

ARTICLE 10 — PURCHASE OF GOODS, WORKS OR SERVICES

10.1 Rules for purchasing goods, works or services

10.1.1 If necessary to implement the action, the beneficiaries may purchase goods, works or services.

The beneficiaries must make such purchases ensuring the best value for money or, if appropriate, the lowest price. In doing so, they must avoid any conflict of interests (see Article 35).

The beneficiaries must ensure that the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards their contractors.

10.1.2 Beneficiaries that are ‘contracting authorities’ within the meaning of Directives 2004/18/EC⁵ (or 2014/24/EC⁶) or ‘contracting entities’ within the meaning of Directive 2004/17/EC⁷ (or 2014/25/EC⁸) must comply with the applicable national law on public procurement.

⁵ Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public work contracts, public supply contracts and public service contracts (OJ L 134, 30.04.2004, p. 114).

⁶ Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC. (OJ L 94, 28.03.2014, p. 65).

⁷ Directive 2004/17/EC of the European Parliament and of the Council of 31 March 2004 coordinating the procurement procedures of entities operating in the water, energy, transport and postal services sectors (OJ L 134, 30.04.2004, p. 1)

⁸ Directive 2014/25/EU of the European Parliament and of the Council of 26 February 2014 on procurement by entities operating in the water, energy, transport and postal services sectors and repealing Directive 2004/17/EC (OJ L 94, 28.03.2014, p. 243).

10.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Article 10.1.1, the costs related to the contract concerned will be ineligible (see Article 6) and will be rejected (see Article 42).

If a beneficiary breaches any of its obligations under Article 10.1.2, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 11 — USE OF IN-KIND CONTRIBUTIONS PROVIDED BY THIRD PARTIES AGAINST PAYMENT

11.1 Rules for the use of in-kind contributions against payment

If necessary to implement the action, the beneficiaries may use in-kind contributions provided by third parties against payment.

The beneficiaries may declare costs related to the payment of in-kind contributions as eligible (see Article 6.1 and 6.2), up to the third parties' costs for the seconded persons, contributed equipment, infrastructure or other assets or other contributed goods and services.

The third parties and their contributions must be set out in Annex 1. The Commission may however approve in-kind contributions not set out in Annex 1 without amendment (see Article 55), if:

- they are specifically justified in the periodic technical report and
- their use does not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiaries must ensure that the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards the third parties.

11.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the costs related to the payment of the in-kind contribution will be ineligible (see Article 6) and will be rejected (see Article 42).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 12 — USE OF IN-KIND CONTRIBUTIONS PROVIDED BY THIRD PARTIES FREE OF CHARGE

12.1 Rules for the use of in-kind contributions free of charge

If necessary to implement the action, the beneficiaries may use in-kind contributions provided by third parties free of charge.

The beneficiaries may declare costs incurred by the third parties for the seconded persons, contributed equipment, infrastructure or other assets or other contributed goods and services as eligible in accordance with Article 6.4.

The third parties and their contributions must be set out in Annex 1. The Commission may however approve in-kind contributions not set out in Annex 1 without amendment (see Article 55), if:

- they are specifically justified in the periodic technical report and
- their use does not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiaries must ensure that the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards the third parties.

12.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the costs incurred by the third parties related to the in-kind contribution will be ineligible (see Article 6) and will be rejected (see Article 42).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 13 — IMPLEMENTATION OF ACTION TASKS BY SUBCONTRACTORS

13.1 Rules for subcontracting action tasks

13.1.1 If necessary to implement the action, the beneficiaries may award subcontracts covering the implementation of certain action tasks described in Annex 1.

Subcontracting may cover only a limited part of the action.

The beneficiaries must award the subcontracts ensuring the best value for money or, if appropriate, the lowest price. In doing so, they must avoid any conflict of interests (see Article 35).

The tasks to be implemented and the estimated cost for each subcontract must be set out in Annex 1 and the total estimated costs of subcontracting per beneficiary must be set out in Annex 2. The Commission may however approve subcontracts not set out in Annex 1 and 2 without amendment (see Article 55), if:

- they are specifically justified in the periodic technical report and
- they do not entail changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

The beneficiaries must ensure that the Commission, the European Court of Auditors (ECA) and the European Anti-Fraud Office (OLAF) can exercise their rights under Articles 22 and 23 also towards their subcontractors.

13.1.2 The beneficiaries must ensure that their obligations under Articles 35, 36, 38 and 46 also apply to the subcontractors.

Beneficiaries that are ‘contracting authorities’ within the meaning of Directive 2004/18/EC (or 2014/24/EU) or ‘contracting entities’ within the meaning of Directive 2004/17/EC (or 2014/25/EU) must comply with the applicable national law on public procurement.

13.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Article 13.1.1, the costs related to the subcontract concerned will be ineligible (see Article 6) and will be rejected (see Article 42).

If a beneficiary breaches any of its obligations under Article 13.1.2, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 14 — IMPLEMENTATION OF ACTION TASKS BY LINKED THIRD PARTIES

Not applicable

ARTICLE 15 — FINANCIAL SUPPORT TO THIRD PARTIES

15.1 Rules for providing financial support to third parties

Not applicable

15.2 Financial support in the form of prizes

Not applicable

15.3 Consequences of non-compliance

Not applicable

ARTICLE 16 — PROVISION OF TRANS-NATIONAL OR VIRTUAL ACCESS TO RESEARCH INFRASTRUCTURE

16.1 Rules for providing trans-national access to research infrastructure

Not applicable

16.2 Rules for providing virtual access to research infrastructure

Not applicable

16.3 Consequences of non-compliance

Not applicable

SECTION 2 RIGHTS AND OBLIGATIONS RELATED TO THE GRANT ADMINISTRATION

ARTICLE 17 — GENERAL OBLIGATION TO INFORM

17.1 General obligation to provide information upon request

The beneficiaries must provide — during implementation of the action or afterwards and in accordance with Article 41.2 — any information requested in order to verify eligibility of the costs, proper implementation of the action and compliance with any other obligation under the Agreement.

17.2 Obligation to keep information up to date and to inform about events and circumstances likely to affect the Agreement

Each beneficiary must keep information stored in the Participant Portal Beneficiary Register (via the electronic exchange system; see Article 52) up to date, in particular, its name, address, legal representatives, legal form and organisation type.

Each beneficiary must immediately inform the coordinator — which must immediately inform the Commission and the other beneficiaries — of any of the following:

- (a) **events** which are likely to affect significantly or delay the implementation of the action or the EU's financial interests, in particular:
 - (i) changes in its legal, financial, technical, organisational or ownership situation
- (b) **circumstances** affecting:
 - (i) the decision to award the grant or
 - (ii) compliance with requirements under the Agreement.

17.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 18 — KEEPING RECORDS — SUPPORTING DOCUMENTATION

18.1 Obligation to keep records and other supporting documentation

The beneficiaries must — for a period of five years after the payment of the balance — keep records and other supporting documentation in order to prove the proper implementation of the action and the costs they declare as eligible.

They must make them available upon request (see Article 17) or in the context of checks, reviews, audits or investigations (see Article 22).

If there are on-going checks, reviews, audits, investigations, litigation or other pursuits of claims under the Agreement (including the extension of findings; see Articles 22), the beneficiaries must keep the records and other supporting documentation until the end of these procedures.

The beneficiaries must keep the original documents. Digital and digitalised documents are considered originals if they are authorised by the applicable national law. The Commission may accept non-original documents if it considers that they offer a comparable level of assurance.

18.1.1 Records and other supporting documentation on the scientific and technical implementation

The beneficiaries must keep records and other supporting documentation on scientific and technical implementation of the action in line with the accepted standards in the respective field.

18.1.2 Records and other documentation to support the costs declared

The beneficiaries must keep the records and documentation supporting the costs declared, in particular the following:

- (a) for **actual costs**: adequate records and other supporting documentation to prove the costs declared, such as contracts, subcontracts, invoices and accounting records. In addition, the beneficiaries' usual cost accounting practices and internal control procedures must enable direct reconciliation between the amounts declared, the amounts recorded in their accounts and the amounts stated in the supporting documentation;
- (b) for **unit costs**: adequate records and other supporting documentation to prove the number of units declared. Beneficiaries do not need to identify the actual eligible costs covered or to keep or provide supporting documentation (such as accounting statements) to prove the amount per unit.

In addition, for **direct personnel costs declared as unit costs calculated in accordance with the beneficiary's usual cost accounting practices**, the beneficiaries must keep adequate records and documentation to prove that the cost accounting practices used comply with the conditions set out in Article 6.2, Point A.

The beneficiaries may submit to the Commission, for approval, a certificate (drawn up in accordance with Annex 6) stating that their usual cost accounting practices comply with these conditions ('**certificate on the methodology**'). If the certificate is approved, costs declared in line with this methodology will not be challenged subsequently, unless the beneficiaries have concealed information for the purpose of the approval.

- (c) for **flat-rate costs**: adequate records and other supporting documentation to prove the eligibility of the costs to which the flat-rate is applied. The beneficiaries do not need to identify the costs covered or provide supporting documentation (such as accounting statements) to prove the amount declared at a flat-rate.

In addition, for **personnel costs** (declared as actual costs or on the basis of unit costs), the beneficiaries must keep **time records** for the number of hours declared. The time records must be in writing and approved by the persons working on the action and their supervisors, at least monthly. In the absence of reliable time records of the hours worked on the action, the Commission may accept alternative evidence supporting the number of hours declared, if it considers that it offers an adequate level of assurance.

As an exception, for **persons working exclusively on the action**, there is no need to keep time records, if the beneficiary signs a **declaration** confirming that the persons concerned have worked exclusively on the action.

18.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, costs insufficiently substantiated will be ineligible (see Article 6) and will be rejected (see Article 42), and the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 19 — SUBMISSION OF DELIVERABLES

19.1 Obligation to submit deliverables

The coordinator must submit the ‘**deliverables**’ identified in Annex 1, in accordance with the timing and conditions set out in it.

19.2 Consequences of non-compliance

If the coordinator breaches any of its obligations under this Article, the Commission may apply any of the measures described in Chapter 6.

ARTICLE 20 — REPORTING — PAYMENT REQUESTS

20.1 Obligation to submit reports

The coordinator must submit to the Commission (see Article 52) the technical and financial reports set out in this Article. These reports include requests for payment and must be drawn up using the forms and templates provided in the electronic exchange system (see Article 52).

20.2 Reporting periods

The action is divided into the following ‘**reporting periods**’:

- RP1: from month 1 to month 20
- RP2: from month 21 to month 38
- RP3: from month 39 to month 50

20.3 Periodic reports — Requests for interim payments

The coordinator must submit a periodic report within 60 days following the end of each reporting period.

The **periodic report** must include the following:

(a) a ‘**periodic technical report**’ containing:

- (i) an **explanation of the work carried out** by the beneficiaries;
- (ii) an **overview of the progress** towards the objectives of the action, including milestones and deliverables identified in Annex 1.

This report must include explanations justifying the differences between work expected to be carried out in accordance with Annex 1 and that actually carried out.

The report must detail the exploitation and dissemination of the results and — if required in Annex 1 — an updated ‘**plan for the exploitation and dissemination of the results**’.

The report must indicate the communication activities;

- (iii) a **summary** for publication by the Commission;
- (iv) the answers to the ‘**questionnaire**’, covering issues related to the action implementation and the economic and societal impact, notably in the context of the Horizon 2020 key performance indicators and the Horizon 2020 monitoring requirements;

(b) a ‘**periodic financial report**’ containing:

- (i) an ‘**individual financial statement**’ (see Annex 4) from each beneficiary, for the reporting period concerned.

The individual financial statement must detail the eligible costs (actual costs, unit costs and flat-rate costs; see Article 6) for each budget category (see Annex 2).

The beneficiaries must declare all eligible costs, even if — for actual costs, unit costs and flat-rate costs — they exceed the amounts indicated in the estimated budget (see Annex 2). Amounts which are not declared in the individual financial statement will not be taken into account by the Commission.

If an individual financial statement is not submitted for a reporting period, it may be included in the periodic financial report for the next reporting period.

The individual financial statements of the last reporting period must also detail the **receipts of the action** (see Article 5.3.3).

Each beneficiary must **certify** that:

- the information provided is full, reliable and true;
- the costs declared are eligible (see Article 6);
- the costs can be substantiated by adequate records and supporting documentation (see Article 18) that will be produced upon request (see Article 17) or in the context of checks, reviews, audits and investigations (see Article 22), and
- for the last reporting period: that all the receipts have been declared (see Article 5.3.3);

- (ii) an **explanation of the use of resources** and the information on subcontracting (see Article 13) and in-kind contributions provided by third parties (see Articles 11 and 12) from each beneficiary, for the reporting period concerned;

(iii) not applicable;

- (iv) a ‘**periodic summary financial statement**’, created automatically by the electronic exchange system, consolidating the individual financial statements for the reporting period concerned and including — except for the last reporting period — the **request for interim payment**.

20.4 Final report — Request for payment of the balance

In addition to the periodic report for the last reporting period, the coordinator must submit the final report within 60 days following the end of the last reporting period.

The **final report** must include the following:

(a) a ‘**final technical report**’ with a **summary** for publication containing:

- (i) an overview of the results and their exploitation and dissemination;

- (ii) the conclusions on the action, and
 - (iii) the socio-economic impact of the action;
- (b) a **‘final financial report’** containing:
- (i) a **‘final summary financial statement’**, created automatically by the electronic exchange system, consolidating the individual financial statements for all reporting periods and including the **request for payment of the balance** and
 - (ii) a **‘certificate on the financial statements’** (drawn up in accordance with Annex 5) for each beneficiary, if it requests a total contribution of EUR 325 000 or more, as reimbursement of actual costs and unit costs calculated on the basis of its usual cost accounting practices (see Article 5.2 and Article 6.2, Point A).

20.5 Information on cumulative expenditure incurred

Not applicable

20.6 Currency for financial statements and conversion into euro

Financial statements must be drafted in euro.

Beneficiaries with accounting established in a currency other than the euro must convert the costs recorded in their accounts into euro, at the average of the daily exchange rates published in the C series of the *Official Journal of the European Union*, calculated over the corresponding reporting period.

If no daily euro exchange rate is published in the *Official Journal of the European Union* for the currency in question, they must be converted at the average of the monthly accounting rates published on the Commission’s website, calculated over the corresponding reporting period.

Beneficiaries with accounting established in euro must convert costs incurred in another currency into euro according to their usual accounting practices.

20.7 Language of reports

All reports (technical and financial reports, including financial statements) must be submitted in the language of the Agreement.

20.8 Consequences of non-compliance

If the reports submitted do not comply with this Article, the Commission may suspend the payment deadline (see Article 47) and apply any of the other measures described in Chapter 6.

If the coordinator breaches its obligation to submit the reports and if it fails to comply with this obligation within 30 days following a written reminder, the Commission may terminate the Agreement (see Article 50) or apply any of the other measures described in Chapter 6.

ARTICLE 21 — PAYMENTS AND PAYMENT ARRANGEMENTS

21.1 Payments to be made

The following payments will be made to the coordinator:

- one **pre-financing payment**;
- one or more **interim payments**, on the basis of the request(s) for interim payment (see Article 20), and
- one **payment of the balance**, on the basis of the request for payment of the balance (see Article 20).

21.2 Pre-financing payment — Amount — Amount retained for the Guarantee Fund

The aim of the pre-financing is to provide the beneficiaries with a float.

It remains the property of the EU until the payment of the balance.

The amount of the pre-financing payment will be EUR **1,591,297.33** (one million five hundred and ninety one thousand two hundred and ninety seven EURO and thirty three eurocents).

The Commission will — except if Article 48 applies — make the pre-financing payment to the coordinator within 30 days, either from the entry into force of the Agreement (see Article 58) or from 10 days before the starting date of the action (see Article 3), whichever is the latest.

An amount of EUR **149,184.13** (one hundred and forty nine thousand one hundred and eighty four EURO and thirteen eurocents), corresponding to 5% of the maximum grant amount (see Article 5.1), is retained by the Commission from the pre-financing payment and transferred into the ‘**Guarantee Fund**’.

21.3 Interim payments — Amount — Calculation

Interim payments reimburse the eligible costs incurred for the implementation of the action during the corresponding reporting periods.

The Commission will pay to the coordinator the amount due as interim payment within 90 days from receiving the periodic report (see Article 20.3), except if Articles 47 or 48 apply.

Payment is subject to the approval of the periodic report. Its approval does not imply recognition of the compliance, authenticity, completeness or correctness of its content.

The **amount due as interim payment** is calculated by the Commission in the following steps:

Step 1 – Application of the reimbursement rates

Step 2 – Limit to 90% of the maximum grant amount

21.3.1 Step 1 — Application of the reimbursement rates

The reimbursement rate(s) (see Article 5.2) are applied to the eligible costs (actual costs, unit costs and flat-rate costs ; see Article 6) declared by the beneficiaries (see Article 20) and approved by the Commission (see above) for the concerned reporting period.

21.3.2 Step 2 — Limit to 90% of the maximum grant amount

The total amount of pre-financing and interim payments must not exceed 90% of the maximum grant amount set out in Article 5.1. The maximum amount for the interim payment will be calculated as follows:

{90% of the maximum grant amount (see Article 5.1)

minus

{pre-financing and previous interim payments}}.

21.4 Payment of the balance — Amount — Calculation — Release of the amount retained for the Guarantee Fund

The payment of the balance reimburses the remaining part of the eligible costs incurred by the beneficiaries for the implementation of the action.

If the total amount of earlier payments is greater than the final grant amount (see Article 5.3), the payment of the balance takes the form of a recovery (see Article 44).

If the total amount of earlier payments is lower than the final grant amount, the Commission will pay the balance within 90 days from receiving the final report (see Article 20.4), except if Articles 47 or 48 apply.

Payment is subject to the approval of the final report. Its approval does not imply recognition of the compliance, authenticity, completeness or correctness of its content.

The **amount due as the balance** is calculated by the Commission by deducting the total amount of pre-financing and interim payments (if any) already made, from the final grant amount determined in accordance with Article 5.3:

{final grant amount (see Article 5.3)

minus

{pre-financing and interim payments (if any) made}}.

At the payment of the balance, the amount retained for the Guarantee Fund (see above) will be released and:

- if the balance is positive: the amount released will be paid in full to the coordinator together with the amount due as the balance;
- if the balance is negative (payment of the balance taking the form of recovery): it will be deducted from the amount released (see Article 44.1.2). If the resulting amount:
 - is positive, it will be paid to the coordinator
 - is negative, it will be recovered.

The amount to be paid may however be offset — without the beneficiaries' consent — against any other amount owed by a beneficiary to the Commission or an executive agency (under the EU or Euratom budget), up to the maximum EU contribution indicated, for that beneficiary, in the estimated budget (see Annex 2).

21.5 Notification of amounts due

When making payments, the Commission will formally notify to the coordinator the amount due, specifying whether it concerns an interim payment or the payment of the balance.

For the payment of the balance, the notification will also specify the final grant amount.

In the case of reduction of the grant or recovery of undue amounts, the notification will be preceded by the contradictory procedure set out in Articles 43 and 44.

21.6 Currency for payments

The Commission will make all payments in euro.

21.7 Payments to the coordinator — Distribution to the beneficiaries

Payments will be made to the coordinator.

Payments to the coordinator will discharge the Commission from its payment obligation.

The coordinator must distribute the payments between the beneficiaries without unjustified delay.

Pre-financing may however be distributed only:

- (a) if the minimum number of beneficiaries set out in the call for proposals has acceded to the Agreement (see Article 56) and
- (b) to beneficiaries that have acceded to the Agreement (see Article 56).

21.8 Bank account for payments

All payments will be made to the following bank account:

Name of bank: ABN AMRO BANK N.V.
Full name of the account holder: JIV ERIC
Full account number (including bank codes): ()
IBAN code: NL92ABNA0630499292

21.9 Costs of payment transfers

The cost of the payment transfers is borne as follows:

- the Commission bears the cost of transfers charged by its bank;
- the beneficiary bears the cost of transfers charged by its bank;
- the party causing a repetition of a transfer bears all costs of the repeated transfer.

21.10 Date of payment

Payments by the Commission are considered to have been carried out on the date when they are debited to its account.

21.11 Consequences of non-compliance

21.11.1 If the Commission does not pay within the payment deadlines (see above), the beneficiaries are entitled to **late-payment interest** at the rate applied by the European Central Bank (ECB) for its main refinancing operations in euros ('reference rate'), plus three and a half points. The reference rate is the rate in force on the first day of the month in which the payment deadline expires, as published in the C series of the *Official Journal of the European Union*.

If the late-payment interest is lower than or equal to EUR 200, it will be paid to the coordinator only upon request submitted within two months of receiving the late payment.

Late-payment interest is not due if all beneficiaries are EU Member States (including regional and local government authorities or other public bodies acting on behalf of a Member State for the purpose of this Agreement).

Suspension of the payment deadline or payments (see Articles 47 and 48) will not be considered as late payment.

Late-payment interest covers the period running from the day following the due date for payment (see above), up to and including the date of payment.

Late-payment interest is not considered for the purposes of calculating the final grant amount.

21.11.2 If the coordinator breaches any of its obligations under this Article, the grant may be reduced (see Article 43) and the Agreement or the participation of the coordinator may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 22 — CHECKS, REVIEWS, AUDITS AND INVESTIGATIONS — EXTENSION OF FINDINGS

22.1 Checks, reviews and audits by the Commission

22.1.1 Right to carry out checks

The Commission will — during the implementation of the action or afterwards — check the proper implementation of the action and compliance with the obligations under the Agreement, including assessing deliverables and reports.

For this purpose the Commission may be assisted by external persons or bodies.

The Commission may also request additional information in accordance with Article 17. The Commission may request beneficiaries to provide such information to it directly.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

22.1.2 Right to carry out reviews

The Commission may — during the implementation of the action or afterwards — carry out reviews on the proper implementation of the action (including assessment of deliverables and reports), compliance with the obligations under the Agreement and continued scientific or technological relevance of the action.

Reviews may be started **up to two years after the payment of the balance**. They will be formally notified to the coordinator or beneficiary concerned and will be considered to have started on the date of the formal notification.

If the review is carried out on a third party (see Articles 10 to 16), the beneficiary concerned must inform the third party.

The Commission may carry out reviews directly (using its own staff) or indirectly (using external persons or bodies appointed to do so). It will inform the coordinator or beneficiary concerned of the identity of the external persons or bodies. They have the right to object to the appointment on grounds of commercial confidentiality.

The coordinator or beneficiary concerned must provide — within the deadline requested — any information and data in addition to deliverables and reports already submitted (including information on the use of resources). The Commission may request beneficiaries to provide such information to it directly.

The coordinator or beneficiary concerned may be requested to participate in meetings, including with external experts.

For **on-the-spot** reviews, the beneficiaries must allow access to their sites and premises, including to external persons or bodies, and must ensure that information requested is readily available.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

On the basis of the review findings, a '**review report**' will be drawn up.

The Commission will formally notify the review report to the coordinator or beneficiary concerned, which has 30 days to formally notify observations ('**contradictory review procedure**').

Reviews (including review reports) are in the language of the Agreement.

22.1.3 Right to carry out audits

The Commission may — during the implementation of the action or afterwards — carry out audits on the proper implementation of the action and compliance with the obligations under the Agreement.

Audits may be started **up to two years after the payment of the balance**. They will be formally notified to the coordinator or beneficiary concerned and will be considered to have started on the date of the formal notification.

If the audit is carried out on a third party (see Articles 10 to 16), the beneficiary concerned must inform the third party.

The Commission may carry out audits directly (using its own staff) or indirectly (using external persons or bodies appointed to do so). It will inform the coordinator or beneficiary concerned of the identity of the external persons or bodies. They have the right to object to the appointment on grounds of commercial confidentiality.

The coordinator or beneficiary concerned must provide — within the deadline requested — any information (including complete accounts, individual salary statements or other personal data) to verify compliance with the Agreement. The Commission may request beneficiaries to provide such information to it directly.

For **on-the-spot** audits, the beneficiaries must allow access to their sites and premises, including to external persons or bodies, and must ensure that information requested is readily available.

Information provided must be accurate, precise and complete and in the format requested, including electronic format.

On the basis of the audit findings, a ‘**draft audit report**’ will be drawn up.

The Commission will formally notify the draft audit report to the coordinator or beneficiary concerned, which has 30 days to formally notify observations (‘**contradictory audit procedure**’). This period may be extended by the Commission in justified cases.

The ‘**final audit report**’ will take into account observations by the coordinator or beneficiary concerned. The report will be formally notified to it.

Audits (including audit reports) are in the language of the Agreement.

The Commission may also access the beneficiaries’ statutory records for the periodical assessment of unit costs or flat-rate amounts.

22.2 Investigations by the European Anti-Fraud Office (OLAF)

Under Regulations No 883/2013¹⁴ and No 2185/96¹⁵ (and in accordance with their provisions and procedures), the European Anti-Fraud Office (OLAF) may — at any moment during implementation of the action or afterwards — carry out investigations, including on-the-spot checks and inspections, to establish whether there has been fraud, corruption or any other illegal activity affecting the financial interests of the EU.

22.3 Checks and audits by the European Court of Auditors (ECA)

Under Article 287 of the Treaty on the Functioning of the European Union (TFEU) and Article 161 of the Financial Regulation No 966/2012¹⁶, the European Court of Auditors (ECA) may — at any moment during implementation of the action or afterwards — carry out audits.

The ECA has the right of access for the purpose of checks and audits.

22.4 Checks, reviews, audits and investigations for international organisations

Not applicable

22.5 Consequences of findings in checks, reviews, audits and investigations — Extension of findings

22.5.1 Findings in this grant

Findings in checks, reviews, audits or investigations carried out in the context of this grant may lead to the rejection of ineligible costs (see Article 42), reduction of the grant (see Article 43), recovery of undue amounts (see Article 44) or to any of the other measures described in Chapter 6.

¹⁴ Regulation (EU, Euratom) No 883/2013 of the European Parliament and of the Council of 11 September 2013 concerning investigations conducted by the European Anti-Fraud Office (OLAF) and repealing Regulation (EC) No 1073/1999 of the European Parliament and of the Council and Council Regulation (Euratom) No 1074/1999 (OJ L 248, 18.09.2013, p. 1).

¹⁵ Council Regulation (Euratom, EC) No 2185/1996 of 11 November 1996 concerning on-the-spot checks and inspections carried out by the Commission in order to protect the European Communities' financial interests against fraud and other irregularities (OJ L 292, 15.11.1996, p. 2).

¹⁶ Regulation (EU, Euratom) No 966/2012 of the European Parliament and of the Council of 25 October 2012 on the financial rules applicable to the general budget of the Union and repealing Council Regulation (EC, Euratom) No 1605/2002 (OJ L 298, 26.10.2012, p. 1).

Rejection of costs or reduction of the grant after the payment of the balance will lead to a revised final grant amount (see Article 5.4).

Findings in checks, reviews, audits or investigations may lead to a request for amendment for the modification of Annex 1 (see Article 55).

Checks, reviews, audits or investigations that find systemic or recurrent errors, irregularities, fraud or breach of obligations may also lead to consequences in other EU or Euratom grants awarded under similar conditions (**‘extension of findings from this grant to other grants’**).

Moreover, findings arising from an OLAF investigation may lead to criminal prosecution under national law.

22.5.2 Findings in other grants

The Commission may extend findings from other grants to this grant (**‘extension of findings from other grants to this grant’**), if:

- (a) the beneficiary concerned is found, in other EU or Euratom grants awarded under similar conditions, to have committed systemic or recurrent errors, irregularities, fraud or breach of obligations that have a material impact on this grant and
- (b) those findings are formally notified to the beneficiary concerned — together with the list of grants affected by the findings — no later than two years after the payment of the balance of this grant.

The extension of findings may lead to the rejection of costs (see Article 42), reduction of the grant (see Article 43), recovery of undue amounts (see Article 44), suspension of payments (see Article 48), suspension of the action implementation (see Article 49) or termination (see Article 50).

22.5.3 Procedure

The Commission will formally notify the beneficiary concerned the systemic or recurrent errors and its intention to extend these audit findings, together with the list of grants affected.

22.5.3.1 If the findings concern **eligibility of costs**: the formal notification will include:

- (a) an invitation to submit observations on the list of grants affected by the findings;
- (b) the request to submit **revised financial statements** for all grants affected;
- (c) the **correction rate for extrapolation** established by the Commission on the basis of the systemic or recurrent errors, to calculate the amounts to be rejected if the beneficiary concerned:
 - (i) considers that the submission of revised financial statements is not possible or practicable
or
 - (ii) does not submit revised financial statements.

The beneficiary concerned has 90 days from receiving notification to submit observations, revised financial statements or to propose a duly substantiated **alternative correction method**. This period may be extended by the Commission in justified cases.

The Commission may then start a rejection procedure in accordance with Article 42, on the basis of:

- the revised financial statements, if approved;
- the proposed alternative correction method, if accepted

or

- the initially notified correction rate for extrapolation, if it does not receive any observations or revised financial statements, does not accept the observations or the proposed alternative correction method or does not approve the revised financial statements.

22.5.3.2 If the findings concern **substantial errors, irregularities or fraud or serious breach of obligations**: the formal notification will include:

- (a) an invitation to submit observations on the list of grants affected by the findings and
- (b) the flat-rate the Commission intends to apply according to the principle of proportionality.

The beneficiary concerned has 90 days from receiving notification to submit observations or to propose a duly substantiated alternative flat-rate.

The Commission may then start a reduction procedure in accordance with Article 43, on the basis of:

- the proposed alternative flat-rate, if accepted

or

- the initially notified flat-rate, if it does not receive any observations or does not accept the observations or the proposed alternative flat-rate.

22.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, any insufficiently substantiated costs will be ineligible (see Article 6) and will be rejected (see Article 42).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 23 — EVALUATION OF THE IMPACT OF THE ACTION

23.1 Right to evaluate the impact of the action

The Commission may carry out interim and final evaluations of the impact of the action measured against the objective of the EU programme.

Evaluations may be started during implementation of the action and up to five years after the payment of the balance. The evaluation is considered to start on the date of the formal notification to the coordinator or beneficiaries.

The Commission may make these evaluations directly (using its own staff) or indirectly (using external bodies or persons it has authorised to do so).

The coordinator or beneficiaries must provide any information relevant to evaluate the impact of the action, including information in electronic format.

23.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the Commission may apply the measures described in Chapter 6.

SECTION 3 RIGHTS AND OBLIGATIONS RELATED TO BACKGROUND AND RESULTS

SUBSECTION 1 GENERAL

ARTICLE 23a — MANAGEMENT OF INTELLECTUAL PROPERTY

23a.1 Obligation to take measures to implement the Commission Recommendation on the management of intellectual property in knowledge transfer activities

Beneficiaries that are universities or other public research organisations must take measures to implement the principles set out in Points 1 and 2 of the Code of Practice annexed to the Commission Recommendation on the management of intellectual property in knowledge transfer activities¹⁷.

This does not change the obligations set out in Subsections 2 and 3 of this Section.

The beneficiaries must ensure that researchers and third parties involved in the action are aware of them.

23a.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the Commission may apply any of the measures described in Chapter 6.

SUBSECTION 2 RIGHTS AND OBLIGATIONS RELATED TO BACKGROUND

ARTICLE 24 — AGREEMENT ON BACKGROUND

24.1 Agreement on background

The beneficiaries must identify and agree (in writing) on the background for the action (**‘agreement on background’**).

‘Background’ means any data, know-how or information — whatever its form or nature (tangible or intangible), including any rights such as intellectual property rights — that:

- (a) is held by the beneficiaries before they acceded to the Agreement, and
- (b) is needed to implement the action or exploit the results.

¹⁷ Commission Recommendation C(2008) 1329 of 10.4.2008 on the management of intellectual property in knowledge transfer activities and the Code of Practice for universities and other public research institutions attached to this recommendation.

24.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 25 — ACCESS RIGHTS TO BACKGROUND

25.1 Exercise of access rights — Waiving of access rights — No sub-licensing

To exercise access rights, this must first be requested in writing (**‘request for access’**).

‘Access rights’ means rights to use results or background under the terms and conditions laid down in this Agreement.

Waivers of access rights are not valid unless in writing.

Unless agreed otherwise, access rights do not include the right to sub-license.

25.2 Access rights for other beneficiaries, for implementing their own tasks under the action

The beneficiaries must give each other access — on a royalty-free basis — to background needed to implement their own tasks under the action, unless the beneficiary that holds the background has — before acceding to the Agreement —:

- (a) informed the other beneficiaries that access to its background is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel), or
- (b) agreed with the other beneficiaries that access would not be on a royalty-free basis.

25.3 Access rights for other beneficiaries, for exploiting their own results

The beneficiaries must give each other access — under fair and reasonable conditions — to background needed for exploiting their own results, unless the beneficiary that holds the background has — before acceding to the Agreement — informed the other beneficiaries that access to its background is subject to legal restrictions or limits, including those imposed by the rights of third parties (including personnel).

‘Fair and reasonable conditions’ means appropriate conditions, including possible financial terms or royalty-free conditions, taking into account the specific circumstances of the request for access, for example the actual or potential value of the results or background to which access is requested and/or the scope, duration or other characteristics of the exploitation envisaged.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

25.4 Access rights for affiliated entities

Unless otherwise agreed in the consortium agreement, access to background must also be given — under fair and reasonable conditions (see above; Article 25.3) and unless it is subject to legal

restrictions or limits, including those imposed by the rights of third parties (including personnel) — to affiliated entities¹⁸ established in an EU Member State or ‘**associated country**’¹⁹, if this is needed to exploit the results generated by the beneficiaries to which they are affiliated.

Unless agreed otherwise (see above; Article 25.1), the affiliated entity concerned must make the request directly to the beneficiary that holds the background.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

25.5 Access rights for third parties

Not applicable

25.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

SUBSECTION 3 RIGHTS AND OBLIGATIONS RELATED TO RESULTS

ARTICLE 26 — OWNERSHIP OF RESULTS

26.1 Ownership by the beneficiary that generates the results

Results are owned by the beneficiary that generates them.

‘**Results**’ means any (tangible or intangible) output of the action such as data, knowledge or information — whatever its form or nature, whether it can be protected or not — that is generated in the action, as well as any rights attached to it, including intellectual property rights.

26.2 Joint ownership by several beneficiaries

Two or more beneficiaries own results jointly if:

¹⁸ For the definition, see Article 2.1(2) of the Rules for Participation Regulation No 1290/2013: ‘**affiliated entity**’ means any legal entity that is under the direct or indirect control of a participant, or under the same direct or indirect control as the participant, or that is directly or indirectly controlling a participant.

‘Control’ may take any of the following forms:

- (a) the direct or indirect holding of more than 50% of the nominal value of the issued share capital in the legal entity concerned, or of a majority of the voting rights of the shareholders or associates of that entity;
- (b) the direct or indirect holding, in fact or in law, of decision-making powers in the legal entity concerned.

However the following relationships between legal entities shall not in themselves be deemed to constitute controlling relationships:

- (a) the same public investment corporation, institutional investor or venture-capital company has a direct or indirect holding of more than 50% of the nominal value of the issued share capital or a majority of voting rights of the shareholders or associates;
- (b) the legal entities concerned are owned or supervised by the same public body.

¹⁹ For the definition, see Article 2.1(3) of the Rules for Participation Regulation No 1290/2013: ‘**associated country**’ means a third country which is party to an international agreement with the Union, as identified in Article 7 of Horizon 2020 Framework Programme Regulation No 1291/2013. Article 7 sets out the conditions for association of non-EU countries to Horizon 2020.

- (a) they have jointly generated them and
- (b) it is not possible to:
 - (i) establish the respective contribution of each beneficiary, or
 - (ii) separate them for the purpose of applying for, obtaining or maintaining their protection (see Article 27).

The joint owners must agree (in writing) on the allocation and terms of exercise of their joint ownership (**‘joint ownership agreement’**), to ensure compliance with their obligations under this Agreement.

Unless otherwise agreed in the joint ownership agreement, each joint owner may grant non-exclusive licences to third parties to exploit jointly-owned results (without any right to sub-license), if the other joint owners are given:

- (a) at least 45 days advance notice and
- (b) fair and reasonable compensation.

Once the results have been generated, joint owners may agree (in writing) to apply another regime than joint ownership (such as, for instance, transfer to a single owner (see Article 30) with access rights for the others).

26.3 Rights of third parties (including personnel)

If third parties (including personnel) may claim rights to the results, the beneficiary concerned must ensure that it complies with its obligations under the Agreement.

If a third party generates results, the beneficiary concerned must obtain all necessary rights (transfer, licences or other) from the third party, in order to be able to respect its obligations as if those results were generated by the beneficiary itself.

If obtaining the rights is impossible, the beneficiary must refrain from using the third party to generate the results.

26.4 EU ownership, to protect results

26.4.1 The EU may — with the consent of the beneficiary concerned — assume ownership of results to protect them, if a beneficiary intends — up to four years after the period set out in Article 3 — to disseminate its results without protecting them, except in any of the following cases:

- (a) the lack of protection is because protecting the results is not possible, reasonable or justified (given the circumstances);
- (b) the lack of protection is because there is a lack of potential for commercial or industrial exploitation, or
- (c) the beneficiary intends to transfer the results to another beneficiary or third party established in an EU Member State or associated country, which will protect them.

Before the results are disseminated and unless any of the cases above under Points (a), (b) or (c) applies, the beneficiary must formally notify the Commission and at the same time inform it of any

reasons for refusing consent. The beneficiary may refuse consent only if it can show that its legitimate interests would suffer significant harm.

If the Commission decides to assume ownership, it will formally notify the beneficiary concerned within 45 days of receiving notification.

No dissemination relating to these results may take place before the end of this period or, if the Commission takes a positive decision, until it has taken the necessary steps to protect the results.

26.4.2 The EU may — with the consent of the beneficiary concerned — assume ownership of results to protect them, if a beneficiary intends — up to four years after the period set out in Article 3 — to stop protecting them or not to seek an extension of protection, except in any of the following cases:

- (a) the protection is stopped because of a lack of potential for commercial or industrial exploitation;
- (b) an extension would not be justified given the circumstances.

A beneficiary that intends to stop protecting results or not seek an extension must — unless any of the cases above under Points (a) or (b) applies — formally notify the Commission at least 60 days before the protection lapses or its extension is no longer possible and at the same time inform it of any reasons for refusing consent. The beneficiary may refuse consent only if it can show that its legitimate interests would suffer significant harm.

If the Commission decides to assume ownership, it will formally notify the beneficiary concerned within 45 days of receiving notification.

26.5 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to the any of the other measures described in Chapter 6.

ARTICLE 27 — PROTECTION OF RESULTS — VISIBILITY OF EU FUNDING

27.1 Obligation to protect the results

Each beneficiary must examine the possibility of protecting its results and must adequately protect them — for an appropriate period and with appropriate territorial coverage — if:

- (a) the results can reasonably be expected to be commercially or industrially exploited and
- (b) protecting them is possible, reasonable and justified (given the circumstances).

When deciding on protection, the beneficiary must consider its own legitimate interests and the legitimate interests (especially commercial) of the other beneficiaries.

27.2 EU ownership, to protect the results

If a beneficiary intends not to protect its results, to stop protecting them or not seek an extension of protection, the EU may — under certain conditions (see Article 26.4) — assume ownership to ensure their (continued) protection.

27.3 Information on EU funding

Applications for protection of results (including patent applications) filed by or on behalf of a beneficiary must — unless the Commission requests or agrees otherwise or unless it is impossible — include the following:

“The project leading to this application has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 730884”.

27.4 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 28 — EXPLOITATION OF RESULTS

28.1 Obligation to exploit the results

Each beneficiary must — up to four years after the period set out in Article 3 — take measures aiming to ensure ‘**exploitation**’ of its results (either directly or indirectly, in particular through transfer or licensing; see Article 30) by:

- (a) using them in further research activities (outside the action);
- (b) developing, creating or marketing a product or process;
- (c) creating and providing a service, or
- (d) using them in standardisation activities.

This does not change the security obligations in Article 37, which still apply.

28.2 Results that could contribute to European or international standards — Information on EU funding

If results are incorporated in a standard, the beneficiary concerned must — unless the Commission requests or agrees otherwise or unless it is impossible — ask the standardisation body to include the following statement in (information related to) the standard:

“Results incorporated in this standard received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 730884”.

28.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced in accordance with Article 43.

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 29 — DISSEMINATION OF RESULTS — OPEN ACCESS — VISIBILITY OF EU FUNDING

29.1 Obligation to disseminate results

Unless it goes against their legitimate interests, each beneficiary must — as soon as possible — ‘**disseminate**’ its results by disclosing them to the public by appropriate means (other than those resulting from protecting or exploiting the results), including in scientific publications (in any medium).

This does not change the obligation to protect results in Article 27, the confidentiality obligations in Article 36, the security obligations in Article 37 or the obligations to protect personal data in Article 39, all of which still apply.

A beneficiary that intends to disseminate its results must give advance notice to the other beneficiaries of — unless agreed otherwise — at least 45 days, together with sufficient information on the results it will disseminate.

Any other beneficiary may object within — unless agreed otherwise — 30 days of receiving notification, if it can show that its legitimate interests in relation to the results or background would be significantly harmed. In such cases, the dissemination may not take place unless appropriate steps are taken to safeguard these legitimate interests.

If a beneficiary intends not to protect its results, it may — under certain conditions (see Article 26.4.1) — need to formally notify the Commission before dissemination takes place.

29.2 Open access to scientific publications

Each beneficiary must ensure open access (free of charge online access for any user) to all peer-reviewed scientific publications relating to its results.

In particular, it must:

- (a) as soon as possible and at the latest on publication, deposit a machine-readable electronic copy of the published version or final peer-reviewed manuscript accepted for publication in a repository for scientific publications;

Moreover, the beneficiary must aim to deposit at the same time the research data needed to validate the results presented in the deposited scientific publications.

- (b) ensure open access to the deposited publication — via the repository — at the latest:
 - (i) on publication, if an electronic version is available for free via the publisher, or
 - (ii) within six months of publication (twelve months for publications in the social sciences and humanities) in any other case.
- (c) ensure open access — via the repository — to the bibliographic metadata that identify the deposited publication.

The bibliographic metadata must be in a standard format and must include all of the following:

- the terms “European Union (EU)” and “Horizon 2020”;

- the name of the action, acronym and grant number;
- the publication date, and length of embargo period if applicable, and
- a persistent identifier.

29.3 Open access to research data

Not applicable

29.4 Information on EU funding — Obligation and right to use the EU emblem

Unless the Commission requests or agrees otherwise or unless it is impossible, any dissemination of results (in any form, including electronic) must:

- (a) display the EU emblem and
- (b) include the following text:

“This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 730884”.

When displayed together with another logo, the EU emblem must have appropriate prominence.

For the purposes of their obligations under this Article, the beneficiaries may use the EU emblem without first obtaining approval from the Commission.

This does not however give them the right to exclusive use.

Moreover, they may not appropriate the EU emblem or any similar trademark or logo, either by registration or by any other means.

29.5 Disclaimer excluding Commission responsibility

Any dissemination of results must indicate that it reflects only the author's view and that the Commission is not responsible for any use that may be made of the information it contains.

29.6 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 30 — TRANSFER AND LICENSING OF RESULTS

30.1 Transfer of ownership

Each beneficiary may transfer ownership of its results.

It must however ensure that its obligations under Articles 26.2, 26.4, 27, 28, 29, 30 and 31 also apply to the new owner and that this owner has the obligation to pass them on in any subsequent transfer.

This does not change the security obligations in Article 37, which still apply.

Unless agreed otherwise (in writing) for specifically-identified third parties or unless impossible under applicable EU and national laws on mergers and acquisitions, a beneficiary that intends to transfer ownership of results must give at least 45 days advance notice (or less if agreed in writing) to the other beneficiaries that still have (or still may request) access rights to the results. This notification must include sufficient information on the new owner to enable any beneficiary concerned to assess the effects on its access rights.

Unless agreed otherwise (in writing) for specifically-identified third parties, any other beneficiary may object within 30 days of receiving notification (or less if agreed in writing), if it can show that the transfer would adversely affect its access rights. In this case, the transfer may not take place until agreement has been reached between the beneficiaries concerned.

30.2 Granting licenses

Each beneficiary may grant licences to its results (or otherwise give the right to exploit them), if:

- (a) this does not impede the rights under Article 31 and
- (b) not applicable.

In addition to Points (a) and (b), exclusive licences for results may be granted only if all the other beneficiaries concerned have waived their access rights (see Article 31.1).

This does not change the dissemination obligations in Article 29 or security obligations in Article 37, which still apply.

30.3 Commission right to object to transfers or licensing

Not applicable

30.4 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such a breach may also lead to any of the other measures described in Chapter 6.

ARTICLE 31 — ACCESS RIGHTS TO RESULTS

31.1 Exercise of access rights — Waiving of access rights — No sub-licensing

The conditions set out in Article 25.1 apply.

The obligations set out in this Article do not change the security obligations in Article 37, which still apply.

31.2 Access rights for other beneficiaries, for implementing their own tasks under the action

The beneficiaries must give each other access — on a royalty-free basis — to results needed for implementing their own tasks under the action.

31.3 Access rights for other beneficiaries, for exploiting their own results

The beneficiaries must give each other — under fair and reasonable conditions (see Article 25.3) — access to results needed for exploiting their own results.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

31.4 Access rights of affiliated entities

Unless agreed otherwise in the consortium agreement, access to results must also be given — under fair and reasonable conditions (Article 25.3) — to affiliated entities established in an EU Member State or associated country, if this is needed for those entities to exploit the results generated by the beneficiaries to which they are affiliated.

Unless agreed otherwise (see above; Article 31.1), the affiliated entity concerned must make any such request directly to the beneficiary that owns the results.

Requests for access may be made — unless agreed otherwise — up to one year after the period set out in Article 3.

31.5 Access rights for the EU institutions, bodies, offices or agencies and EU Member States

The beneficiaries must give access to their results — on a royalty-free basis — to EU institutions, bodies, offices or agencies, for developing, implementing or monitoring EU policies or programmes.

Such access rights are limited to non-commercial and non-competitive use.

This does not change the right to use any material, document or information received from the beneficiaries for communication and publicising activities (see Article 38.2).

31.6 Access rights for third parties

Not applicable

31.7 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

SECTION 4 OTHER RIGHTS AND OBLIGATIONS

²¹ Commission Recommendation 2005/251/EC of 11 March 2005 on the European Charter for Researchers and on a Code of Conduct for the Recruitment of Researchers (OJ L 75, 22.3.2005, p. 67).

ARTICLE 32 — RECRUITMENT AND WORKING CONDITIONS FOR RESEARCHERS

32.1 Obligation to take measures to implement the European Charter for Researchers and Code of Conduct for the Recruitment of Researchers

The beneficiaries must take all measures to implement the principles set out in the Commission Recommendation on the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers²¹, in particular regarding:

- working conditions;
- transparent recruitment processes based on merit, and
- career development.

The beneficiaries must ensure that researchers and third parties involved in the action are aware of them.

32.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the Commission may apply any of the measures described in Chapter 6.

ARTICLE 33 — GENDER EQUALITY

33.1 Obligation to aim for gender equality

The beneficiaries must take all measures to promote equal opportunities between men and women in the implementation of the action. They must aim, to the extent possible, for a gender balance at all levels of personnel assigned to the action, including at supervisory and managerial level.

33.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the Commission may apply any of the measures described in Chapter 6.

ARTICLE 34 — ETHICS AND RESEARCH INTEGRITY

34.1 Obligation to comply with ethical principles and research integrity

The beneficiaries must carry out the action in compliance with:

- (a) ethical principles (including the highest standards of research integrity)
- and
- (b) applicable international, EU and national law.

Funding will not be granted for activities carried out outside the EU if they are prohibited in all Member States or for activities which destroy human embryos (for example, for obtaining stem cells).

The beneficiaries must ensure that the activities under the action have an exclusive focus on civil applications.

The beneficiaries must ensure that the activities under the action do not:

- (a) aim at human cloning for reproductive purposes;
- (b) intend to modify the genetic heritage of human beings which could make such changes heritable (with the exception of research relating to cancer treatment of the gonads, which may be financed), or
- (c) intend to create human embryos solely for the purpose of research or for the purpose of stem cell procurement, including by means of somatic cell nuclear transfer.

The beneficiaries must respect the highest standards of research integrity — as set out, for instance, in the European Code of Conduct for Research Integrity²².

This implies notably compliance with the following essential principles:

- honesty;
- reliability;
- objectivity;
- impartiality;
- open communication;
- duty of care;
- fairness and
- responsibility for future science generations.

This means that beneficiaries must ensure that persons carrying out research tasks:

- present their research goals and intentions in an honest and transparent manner;
- design their research carefully and conduct it in a reliable fashion, taking its impact on society into account;
- use techniques and methodologies (including for data collection and management) that are appropriate for the field(s) concerned;
- exercise due care for the subjects of research — be they human beings, animals, the environment or cultural objects;
- ensure objectivity, accuracy and impartiality when disseminating the results;
- allow — as much as possible and taking into account the legitimate interest of the beneficiaries — access to research data, in order to enable research to be reproduced;
- make the necessary references to their work and that of other researchers;

²² European Code of Conduct for Research Integrity of ALLEA (All European Academies) and ESF (European Science Foundation) of March 2011.

http://www.esf.org/fileadmin/Public_documents/Publications/Code_Conduct_ResearchIntegrity.pdf

- refrain from practicing any form of plagiarism, data falsification or fabrication;
- avoid double funding, conflicts of interest and misrepresentation of credentials or other research misconduct.

34.2 Activities raising ethical issues

Activities raising ethical issues must comply with the ‘**ethics requirements**’ set out as deliverables in Annex 1.

Before the beginning of an activity raising an ethical issue, each beneficiary must have obtained:

- (a) any ethics committee opinion required under national law and
- (b) any notification or authorisation for activities raising ethical issues required under national and/or European law

needed for implementing the action tasks in question.

The documents must be kept on file and be submitted upon request by the coordinator to the Commission (see Article 52). If they are not in English, they must be submitted together with an English summary, which shows that the action tasks in question are covered and includes the conclusions of the committee or authority concerned (if available).

34.3 Activities involving human embryos or human embryonic stem cells

Activities involving research on human embryos or human embryonic stem cells may be carried out, in addition to Article 34.1, only if:

- they are set out in Annex 1 or
- the coordinator has obtained explicit approval (in writing) from the Commission (see Article 52).

34.4 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43) and the Agreement or participation of the beneficiary may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 35 — CONFLICT OF INTERESTS

35.1 Obligation to avoid a conflict of interests

The beneficiaries must take all measures to prevent any situation where the impartial and objective implementation of the action is compromised for reasons involving economic interest, political or national affinity, family or emotional ties or any other shared interest (‘**conflict of interests**’).

They must formally notify to the Commission without delay any situation constituting or likely to lead to a conflict of interests and immediately take all the necessary steps to rectify this situation.

The Commission may verify that the measures taken are appropriate and may require additional measures to be taken by a specified deadline.

35.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43) and the Agreement or participation of the beneficiary may be terminated (see Article 50).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 36 — CONFIDENTIALITY

36.1 General obligation to maintain confidentiality

During implementation of the action and for four years after the period set out in Article 3, the parties must keep confidential any data, documents or other material (in any form) that is identified as confidential at the time it is disclosed (**‘confidential information’**).

If a beneficiary requests, the Commission may agree to keep such information confidential for an additional period beyond the initial four years.

If information has been identified as confidential only orally, it will be considered to be confidential only if this is confirmed in writing within 15 days of the oral disclosure.

Unless otherwise agreed between the parties, they may use confidential information only to implement the Agreement.

The beneficiaries may disclose confidential information to their personnel or third parties involved in the action only if they:

- (a) need to know to implement the Agreement and
- (b) are bound by an obligation of confidentiality.

This does not change the security obligations in Article 37, which still apply.

The Commission may disclose confidential information to its staff, other EU institutions and bodies. It may disclose confidential information to third parties, if:

- (a) this is necessary to implement the Agreement or safeguard the EU's financial interests and
- (b) the recipients of the information are bound by an obligation of confidentiality.

Under the conditions set out in Article 4 of the Rules for Participation Regulation No 1290/2013²³, the Commission must moreover make available information on the results to other EU institutions, bodies, offices or agencies as well as Member States or associated countries.

The confidentiality obligations no longer apply if:

- (a) the disclosing party agrees to release the other party;
- (b) the information was already known by the recipient or is given to him without obligation of confidentiality by a third party that was not bound by any obligation of confidentiality;

²³ Regulation (EU) No 1290/2013 of the European Parliament and of the Council of 11 December 2013 laying down the rules for participation and dissemination in "Horizon 2020 - the Framework Programme for Research and Innovation (2014-2020)" (OJ L 347, 20.12.2013 p.81).

- (c) the recipient proves that the information was developed without the use of confidential information;
- (d) the information becomes generally and publicly available, without breaching any confidentiality obligation, or
- (e) the disclosure of the information is required by EU or national law.

36.2 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 37 — SECURITY-RELATED OBLIGATIONS

37.1 Results with a security recommendation

Not applicable

37.2 Classified information

Not applicable

37.3 Activities involving dual-use goods or dangerous materials and substances

Not applicable

37.4 Consequences of non-compliance

Not applicable

ARTICLE 38 — PROMOTING THE ACTION — VISIBILITY OF EU FUNDING

38.1 Communication activities by beneficiaries

38.1.1 Obligation to promote the action and its results

The beneficiaries must promote the action and its results, by providing targeted information to multiple audiences (including the media and the public) in a strategic and effective manner.

This does not change the dissemination obligations in Article 29, the confidentiality obligations in Article 36 or the security obligations in Article 37, all of which still apply.

Before engaging in a communication activity expected to have a major media impact, the beneficiaries must inform the Commission (see Article 52).

38.1.2 Information on EU funding — Obligation and right to use the EU emblem

Unless the Commission requests or agrees otherwise or unless it is impossible, any communication activity related to the action (including in electronic form, via social media, etc.) and any infrastructure, equipment and major results funded by the grant must:

- (a) display the EU emblem and
- (b) include the following text:

For communication activities: *“This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 730884”.*

For infrastructure, equipment and major results: *“This [infrastructure][equipment][insert type of result] is part of a project that has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 730884”.*

When displayed together with another logo, the EU emblem must have appropriate prominence.

For the purposes of their obligations under this Article, the beneficiaries may use the EU emblem without first obtaining approval from the Commission.

This does not, however, give them the right to exclusive use.

Moreover, they may not appropriate the EU emblem or any similar trademark or logo, either by registration or by any other means.

38.1.3 Disclaimer excluding Commission responsibility

Any communication activity related to the action must indicate that it reflects only the author's view and that the Commission is not responsible for any use that may be made of the information it contains.

38.2 Communication activities by the Commission

38.2.1 Right to use beneficiaries’ materials, documents or information

The Commission may use, for its communication and publicising activities, information relating to the action, documents notably summaries for publication and public deliverables as well as any other material, such as pictures or audio-visual material received from any beneficiary (including in electronic form).

This does not change the confidentiality obligations in Article 36 and the security obligations in Article 37, all of which still apply.

If the Commission’s use of these materials, documents or information would risk compromising legitimate interests, the beneficiary concerned may request the Commission not to use it (see Article 52).

The right to use a beneficiary’s materials, documents and information includes:

- (a) **use for its own purposes** (in particular, making them available to persons working for the Commission or any other EU institution, body, office or agency or body or institutions in EU Member States; and copying or reproducing them in whole or in part, in unlimited numbers);
- (b) **distribution to the public** (in particular, publication as hard copies and in electronic or digital format, publication on the internet, as a downloadable or non-downloadable file, broadcasting by any channel, public display or presentation, communicating through press information services, or inclusion in widely accessible databases or indexes);
- (c) **editing or redrafting** for communication and publicising activities (including shortening, summarising, inserting other elements (such as meta-data, legends, other graphic, visual, audio

or text elements), extracting parts (e.g. audio or video files), dividing into parts, use in a compilation);

(d) **translation**;

(e) giving **access in response to individual requests** under Regulation No 1049/2001²⁵, without the right to reproduce or exploit;

(f) **storage** in paper, electronic or other form;

(g) **archiving**, in line with applicable document-management rules, and

(h) the right to authorise third parties to act on its behalf or sub-license the modes of use set out in Points (b), (c), (d) and (f) to third parties if needed for the communication and publicising activities of the Commission.

If the right of use is subject to rights of a third party (including personnel of the beneficiary), the beneficiary must ensure that it complies with its obligations under this Agreement (in particular, by obtaining the necessary approval from the third parties concerned).

Where applicable (and if provided by the beneficiaries), the Commission will insert the following information:

“© – [year] – [name of the copyright owner]. All rights reserved. Licensed to the European Union (EU) under conditions.”

38.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under this Article, the grant may be reduced (see Article 43).

Such breaches may also lead to any of the other measures described in Chapter 6.

ARTICLE 39 — PROCESSING OF PERSONAL DATA

39.1 Processing of personal data by the Commission

Any personal data under the Agreement will be processed by the Commission under Regulation No 45/2001²⁶ and according to the ‘notifications of the processing operations’ to the Data Protection Officer (DPO) of the Commission (publicly accessible in the DPO register).

Such data will be processed by the ‘**data controller**’ of the Commission for the purposes of implementing, managing and monitoring the Agreement or protecting the financial interests of the EU or Euratom (including checks, reviews, audits and investigations; see Article 22).

The persons whose personal data are processed have the right to access and correct their own personal data. For this purpose, they must send any queries about the processing of their personal data to the

²⁵ Regulation (EC) No 1049/2001 of the European Parliament and of the Council of 30 May 2001 regarding public access to European Parliament, Council and Commission documents, OJ L 145, 31.5.2001, p. 43.

²⁶ Regulation (EC) No 45/2001 of the European Parliament and of the Council of 18 December 2000 on the protection of individuals with regard to the processing of personal data by the Community institutions and bodies and on the free movement of such data (OJ L 8, 12.01.2001, p. 1).

data controller, via the contact point indicated in the privacy statement(s) that are published on the Commission websites.

They also have the right to have recourse at any time to the European Data Protection Supervisor (EDPS).

39.2 Processing of personal data by the beneficiaries

The beneficiaries must process personal data under the Agreement in compliance with applicable EU and national law on data protection (including authorisations or notification requirements).

The beneficiaries may grant their personnel access only to data that is strictly necessary for implementing, managing and monitoring the Agreement.

The beneficiaries must inform the personnel whose personal data are collected and processed by the Commission. For this purpose, they must provide them with the privacy statement(s) (see above), before transmitting their data to the Commission.

39.3 Consequences of non-compliance

If a beneficiary breaches any of its obligations under Article 39.2, the Commission may apply any of the measures described in Chapter 6.

ARTICLE 40 — ASSIGNMENTS OF CLAIMS FOR PAYMENT AGAINST THE COMMISSION

The beneficiaries may not assign any of their claims for payment against the Commission to any third party, except if approved by the Commission on the basis of a reasoned, written request by the coordinator (on behalf of the beneficiary concerned).

If the Commission has not accepted the assignment or the terms of it are not observed, the assignment will have no effect on it.

In no circumstances will an assignment release the beneficiaries from their obligations towards the Commission.

CHAPTER 5 DIVISION OF BENEFICIARIES' ROLES AND RESPONSIBILITIES **— RELATIONSHIP WITH COMPLEMENTARY BENEFICIARIES —** **RELATIONSHIP WITH PARTNERS OF A JOINT ACTION**

ARTICLE 41 — DIVISION OF BENEFICIARIES' ROLES AND RESPONSIBILITIES **— RELATIONSHIP WITH COMPLEMENTARY BENEFICIARIES —** **RELATIONSHIP WITH PARTNERS OF A JOINT ACTION**

41.1 Roles and responsibilities towards the Commission

The beneficiaries have full responsibility for implementing the action and complying with the Agreement.

The beneficiaries are jointly and severally liable for the **technical implementation** of the action as described in Annex 1. If a beneficiary fails to implement its part of the action, the other beneficiaries

become responsible for implementing this part (without being entitled to any additional EU funding for doing so), unless the Commission expressly relieves them of this obligation.

The **financial responsibility** of each beneficiary is governed by Articles 44, 45 and 46.

41.2 Internal division of roles and responsibilities

The internal roles and responsibilities of the beneficiaries are divided as follows:

(a) Each **beneficiary** must:

- (i) keep information stored in the Participant Portal Beneficiary Register (via the electronic exchange system) up to date (see Article 17);
- (ii) inform the coordinator immediately of any events or circumstances likely to affect significantly or delay the implementation of the action (see Article 17);
- (iii) submit to the coordinator in good time:
 - individual financial statements for itself and, if required, certificates on the financial statements (see Article 20);
 - the data needed to draw up the technical reports (see Article 20);
 - ethics committee opinions and notifications or authorisations for activities raising ethical issues (see Article 34);
 - any other documents or information required by the Commission under the Agreement, unless the Agreement requires the beneficiary to submit this information directly to the Commission.

(b) The **coordinator** must:

- (i) monitor that the action is implemented properly (see Article 7);
- (ii) act as the intermediary for all communications between the beneficiaries and the Commission (in particular, providing the Commission with the information described in Article 17), unless the Agreement specifies otherwise;
- (iii) request and review any documents or information required by the Commission and verify their completeness and correctness before passing them on to the Commission;
- (iv) submit the deliverables and reports to the Commission (see Articles 19 and 20);
- (v) ensure that all payments are made to the other beneficiaries without unjustified delay (see Article 21);
- (vi) inform the Commission of the amounts paid to each beneficiary, when required under the Agreement (see Articles 44 and 50) or requested by the Commission.

The coordinator may not delegate or subcontract the above-mentioned tasks to any other beneficiary or third party (including linked third parties).

41.3 Internal arrangements between beneficiaries — Consortium agreement

The beneficiaries must have internal arrangements regarding their operation and co-ordination to ensure that the action is implemented properly. These internal arrangements must be set out in a written ‘**consortium agreement**’ between the beneficiaries, which may cover:

- internal organisation of the consortium;
- management of access to the electronic exchange system;
- distribution of EU funding;
- additional rules on rights and obligations related to background and results (including whether access rights remain or not, if a beneficiary is in breach of its obligations) (see Section 3 of Chapter 4);
- settlement of internal disputes;
- liability, indemnification and confidentiality arrangements between the beneficiaries.

The consortium agreement must not contain any provision contrary to the Agreement.

41.4 Relationship with complementary beneficiaries — Collaboration agreement

Not applicable

41.5 Relationship with partners of a joint action — Coordination agreement

Not applicable

CHAPTER 6 REJECTION OF COSTS — REDUCTION OF THE GRANT — RECOVERY — SANCTIONS — DAMAGES — SUSPENSION — TERMINATION — FORCE MAJEURE

SECTION 1 REJECTION OF COSTS — REDUCTION OF THE GRANT — RECOVERY — SANCTIONS

ARTICLE 42 — REJECTION OF INELIGIBLE COSTS

42.1 Conditions

The Commission will — at the time of an **interim payment**, after **termination of the participation of a beneficiary**, at the time of an **interim payment**, **at the payment of the balance** or **afterwards** — reject any costs which are ineligible (see Article 6), in particular following checks, reviews, audits or investigations (see Article 22).

The rejection may also be based on the **extension of findings from other grants to this grant** (see Article 22.5.2).

42.2 Ineligible costs to be rejected — Calculation — Procedure

Ineligible costs will be rejected in full.

If the rejection of costs does not lead to a recovery (see Article 44), the Commission will formally notify the coordinator or beneficiary concerned of the rejection of costs, the amounts and the reasons why (if applicable, together with the notification of amounts due; see Article 21.5). The coordinator or beneficiary concerned may — within 30 days of receiving notification — formally notify the Commission of its disagreement and the reasons why.

If the rejection of costs leads to a recovery, the Commission will follow the contradictory procedure with pre-information letter set out in Article 44.

42.3 Effects

If the Commission rejects costs at the time of an **interim payment or the payment of the balance**, it will deduct them from the total eligible costs declared, for the action, in the periodic or final summary financial statement (see Articles 20.3 and 20.4). It will then calculate the interim payment or payment of the balance as set out in Articles 21.3 or 21.4.

If the Commission rejects costs **after termination of the participation of a beneficiary**, it will deduct them from the costs declared by the beneficiary in the termination report and include the rejection in the calculation after termination (see Article 50.2 and 50.3).

If the Commission — **after an interim payment but before the payment of the balance** — rejects costs declared in a periodic summary financial statement, it will deduct them from the total eligible costs declared, for the action, in the next periodic summary financial statement or in the final summary financial statement. It will then calculate the interim payment or payment of the balance as set out in Articles 21.3 or 21.4.

If the Commission rejects costs **after the payment of the balance**, it will deduct the amount rejected from the total eligible costs declared, by the beneficiary, in the final summary financial statement. It will then calculate the revised final grant amount as set out in Article 5.4.

ARTICLE 43 — REDUCTION OF THE GRANT

43.1 Conditions

The Commission may — **after termination of the participation of a beneficiary, at the payment of the balance or afterwards** — reduce the grant amount (see Article 5.1), if :

- (a) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed:
 - (i) substantial errors, irregularities or fraud or
 - (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles) or
- (b) a beneficiary (or a natural person who has the power to represent or take decision on its behalf) has committed — in other EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2).

43.2 Amount to be reduced — Calculation — Procedure

The amount of the reduction will be proportionate to the seriousness of the errors, irregularities or fraud or breach of obligations.

Before reduction of the grant, the Commission will formally notify a '**pre-information letter**' to the coordinator or beneficiary concerned:

- informing it of its intention to reduce the grant, the amount it intends to reduce and the reasons why and
- inviting it to submit observations within 30 days of receiving notification

If the Commission does not receive any observations or decides to pursue reduction despite the observations it has received, it will formally notify **confirmation** of the reduction (if applicable, together with the notification of amounts due; see Article 21).

43.3 Effects

If the Commission reduces the grant **after termination of the participation of a beneficiary**, it will calculate the reduced grant amount for that beneficiary and then determine the amount due to that beneficiary (see Article 50.2 and 50.3).

If the Commission reduces the grant **at the payment of the balance**, it will calculate the reduced grant amount for the action and then determine the amount due as payment of the balance (see Articles 5.3.4 and 21.4).

If the Commission reduces the grant **after the payment of the balance**, it will calculate the revised final grant amount for the beneficiary concerned (see Article 5.4). If the revised final grant amount for the beneficiary concerned is lower than its share of the final grant amount, the Commission will recover the difference (see Article 44).

ARTICLE 44 — RECOVERY OF UNDUE AMOUNTS

44.1 Amount to be recovered — Calculation — Procedure

The Commission will — after **termination of the participation of a beneficiary, at the payment of the balance** or **afterwards** — claim back any amount that was paid but is not due under the Agreement.

Each beneficiary's financial responsibility in case of recovery is limited to its own debt, except for the amount retained for the Guarantee Fund (see Article 21.4).

44.1.1 Recovery after termination of a beneficiary's participation

If recovery takes place after termination of a beneficiary's participation (including the coordinator), the Commission will claim back the undue amount from the beneficiary concerned, by formally notifying it a debit note (see Article 50.2 and 50.3). This note will specify the amount to be recovered, the terms and the date for payment.

If payment is not made by the date specified in the debit note, the Commission will **recover** the amount:

- (a) by ‘**offsetting**’ it — without the beneficiary’s consent — against any amounts owed to the beneficiary concerned by the Commission or an executive agency (from the EU or Euratom budget).

In exceptional circumstances, to safeguard the EU’s financial interests, the Commission may offset before the payment date specified in the debit note;

- (b) not applicable;

- (c) by **taking legal action** (see Article 57) or by **adopting an enforceable decision** under Article 299 of the Treaty on the Functioning of the EU (TFEU) and Article 79(2) of the Financial regulation No 966/2012.

If payment is not made by the date specified in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the payment date in the debit note, up to and including the date the Commission receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC²⁷ applies.

44.1.2 Recovery at payment of the balance

If the payment of the balance takes the form of a recovery (see Article 21.4), the Commission will formally notify a ‘**pre-information letter**’ to the coordinator:

- informing it of its intention to recover, the amount due as the balance and the reasons why;
- specifying that it intends to deduct the amount to be recovered from the amount retained for the Guarantee Fund;
- requesting the coordinator to submit a report on the distribution of payments to the beneficiaries within 30 days of receiving notification, and
- inviting the coordinator to submit observations within 30 days of receiving notification.

If no observations are submitted or the Commission decides to pursue recovery despite the observations it has received, it will **confirm recovery** (together with the notification of amounts due; see Article 21.5) and:

- pay the difference between the amount to be recovered and the amount retained for the Guarantee Fund, **if the difference is positive** or
- formally notify to the coordinator a **debit note** for the difference between the amount to be recovered and the amount retained for the Guarantee Fund, **if the difference is negative**. This note will also specify the terms and the date for payment.

²⁷ Directive 2007/64/EC of the European Parliament and of the Council of 13 November 2007 on payment services in the internal market amending Directives 97/7/EC, 2002/65/EC, 2005/60/EC and 2006/48/EC and repealing Directive 97/5/EC (OJ L 319, 05.12.2007, p. 1).

If the coordinator does not repay the Commission by the date in the debit note and has not submitted the report on the distribution of payments: the Commission will **recover** the amount set out in the debit note from the coordinator (see below).

If the coordinator does not repay the Commission by the date in the debit note, but has submitted the report on the distribution of payments: the Commission will:

- (a) identify the beneficiaries for which the amount calculated as follows is negative:

$\{ \{ \{ \text{beneficiary's costs declared in the final summary financial statement and approved by the Commission multiplied by the reimbursement rate set out in Article 5.2 for the beneficiary concerned} \}$

divided by

the EU contribution for the action calculated according to Article 5.3.1 }

multiplied by

the final grant amount (see Article 5.3) } ,

minus

{pre-financing and interim payments received by the beneficiary} } .

- (b) formally notify to each beneficiary identified according to point (a) a **debit note** specifying the terms and date for payment. The amount of the debit note is calculated as follows:

{ {amount calculated according to point (a) for the beneficiary concerned

divided by

the sum of the amounts calculated according to point (a) for all the beneficiaries identified according to point (a) }

multiplied by

the amount set out in the debit note formally notified to the coordinator} .

If payment is not made by the date specified in the debit note, the Commission will **recover** the amount:

- (a) by ‘**offsetting**’ it — without the beneficiary’s consent — against any amounts owed to the beneficiary concerned by the Commission or an executive agency (from the EU or Euratom budget).

In exceptional circumstances, to safeguard the EU’s financial interests, the Commission may offset before the payment date specified in the debit note;

- (b) by **drawing on the Guarantee Fund**. The Commission will formally notify the beneficiary concerned the debit note on behalf of the Guarantee Fund and recover the amount:

- (i) not applicable;

- (ii) by **taking legal action** (see Article 57) or by **adopting an enforceable decision** under Article 299 of the Treaty on the Functioning of the EU (TFEU) and Article 79(2) of the Financial Regulation No 966/2012.

If payment is not made by the date in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the payment date in the debit note, up to and including the date the Commission receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC applies.

44.1.3 Recovery of amounts after payment of the balance

If, for a beneficiary, the revised final grant amount (see Article 5.4) is lower than its share of the final grant amount, it must repay the difference to the Commission.

The beneficiary's share of the final grant amount is calculated as follows:

$\left\{ \left\{ \text{beneficiary's costs declared in the final summary financial statement and approved by the Commission multiplied by the reimbursement rate set out in Article 5.2 for the beneficiary concerned} \right\} \right\}$

divided by

$\left\{ \text{the EU contribution for the action calculated according to Article 5.3.1} \right\}$

multiplied by

$\left\{ \text{the final grant amount (see Article 5.3)} \right\}$.

If the coordinator has not distributed amounts received (see Article 21.7), the Commission will also recover these amounts.

The Commission will formally notify a **pre-information letter** to the beneficiary concerned:

- informing it of its intention to recover, the due amount and the reasons why and
- inviting it to submit observations within 30 days of receiving notification.

If no observations are submitted or the Commission decides to pursue recovery despite the observations it has received, it will **confirm** the amount to be recovered and formally notify to the beneficiary concerned a **debit note**. This note will also specify the terms and the date for payment.

If payment is not made by the date specified in the debit note, the Commission will **recover** the amount:

- (a) by '**offsetting**' it — without the beneficiary's consent — against any amounts owed to the beneficiary concerned by the Commission or an executive agency (from the EU or Euratom budget).

In exceptional circumstances, to safeguard the EU's financial interests, the Commission may offset before the payment date specified in the debit note;

(b) by **drawing on the Guarantee Fund**. The Commission will formally notify the beneficiary concerned the debit note on behalf of the Guarantee Fund and recover the amount:

(i) not applicable;

(ii) by **taking legal action** (see Article 57) or by **adopting an enforceable decision** under Article 299 of the Treaty on the Functioning of the EU (TFEU) and Article 79(2) of the Financial Regulation No 966/2012.

If payment is not made by the date in the debit note, the amount to be recovered (see above) will be increased by **late-payment interest** at the rate set out in Article 21.11, from the day following the date for payment in the debit note, up to and including the date the Commission receives full payment of the amount.

Partial payments will be first credited against expenses, charges and late-payment interest and then against the principal.

Bank charges incurred in the recovery process will be borne by the beneficiary, unless Directive 2007/64/EC applies.

ARTICLE 45 — ADMINISTRATIVE SANCTIONS

In addition to contractual measures, the Commission may also adopt administrative sanctions under Articles 106 and 131(4) of the Financial Regulation No 966/2012 (i.e. exclusion from future procurement contracts, grants and expert contracts and/or financial penalties).

SECTION 2 LIABILITY FOR DAMAGES

ARTICLE 46 — LIABILITY FOR DAMAGES

46.1 Liability of the Commission

The Commission cannot be held liable for any damage caused to the beneficiaries or to third parties as a consequence of implementing the Agreement, including for gross negligence.

The Commission cannot be held liable for any damage caused by any of the beneficiaries or third parties involved in the action, as a consequence of implementing the Agreement.

46.2 Liability of the beneficiaries

Except in case of force majeure (see Article 51), the beneficiaries must compensate the Commission for any damage it sustains as a result of the implementation of the action or because the action was not implemented in full compliance with the Agreement.

SECTION 3 SUSPENSION AND TERMINATION

ARTICLE 47 — SUSPENSION OF PAYMENT DEADLINE

47.1 Conditions

The Commission may — at any moment — suspend the payment deadline (see Article 21.2 to 21.4) if a request for payment (see Article 20) cannot be approved because:

- (a) it does not comply with the provisions of the Agreement (see Article 20);
- (b) the technical or financial reports have not been submitted or are not complete or additional information is needed, or
- (c) there is doubt about the eligibility of the costs declared in the financial statements and additional checks, reviews, audits or investigations are necessary.

47.2 Procedure

The Commission will formally notify the coordinator of the suspension and the reasons why.

The suspension will **take effect** the day notification is sent by the Commission (see Article 52).

If the conditions for suspending the payment deadline are no longer met, the suspension will be **lifted** — and the remaining period will resume.

If the suspension exceeds two months, the coordinator may request the Commission if the suspension will continue.

If the payment deadline has been suspended due to the non-compliance of the technical or financial reports (see Article 20) and the revised report or statement is not submitted or was submitted but is also rejected, the Commission may also terminate the Agreement or the participation of the beneficiary (see Article 50.3.1(l)).

ARTICLE 48 — SUSPENSION OF PAYMENTS

48.1 Conditions

The Commission may — at any moment — suspend payments, in whole or in part and interim payments or the payment of the balance for one or more beneficiaries, if:

- (a) a beneficiary (or a natural person who has the power to represent or take decision on its behalf) has committed or is suspected of having committed:
 - (i) substantial errors, irregularities or fraud or
 - (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles) or
- (b) a beneficiary (or a natural person who has the power to represent or take decision on its behalf) has committed — in other EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2).

If payments are suspended for one or more beneficiaries, the Commission will make partial payment(s) for the part(s) not suspended. If suspension concerns the payment of the balance, — once suspension is lifted — the payment or the recovery of the amount(s) concerned will be considered the payment of the balance that closes the action.

48.2 Procedure

Before suspending payments, the Commission will formally notify the coordinator or beneficiary concerned:

- informing it of its intention to suspend payments and the reasons why and
- inviting it to submit observations within 30 days of receiving notification.

If the Commission does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify **confirmation** of the suspension. Otherwise, it will formally notify that the suspension procedure is not continued.

The suspension will **take effect** the day the confirmation notification is sent by the Commission.

If the conditions for resuming payments are met, the suspension will be **lifted**. The Commission will formally notify the coordinator or beneficiary concerned.

During the suspension, the periodic report(s) for all reporting periods except the last one (see Article 20.3), must not contain any individual financial statements from the beneficiary concerned. The coordinator must include them in the next periodic report after the suspension is lifted or — if suspension is not lifted before the end of the action — in the last periodic report.

The beneficiaries may suspend implementation of the action (see Article 49.1) or terminate the Agreement or the participation of the beneficiary concerned (see Article 50.1 and 50.2).

ARTICLE 49 — SUSPENSION OF THE ACTION IMPLEMENTATION

49.1 Suspension of the action implementation, by the beneficiaries

49.1.1 Conditions

The beneficiaries may suspend implementation of the action or any part of it, if exceptional circumstances — in particular *force majeure* (see Article 51) — make implementation impossible or excessively difficult.

49.1.2 Procedure

The coordinator must immediately formally notify to the Commission the suspension (see Article 52), stating:

- the reasons why and
- the expected date of resumption.

The suspension will **take effect** the day this notification is received by the Commission.

Once circumstances allow for implementation to resume, the coordinator must immediately formally notify the Commission and request an **amendment** of the Agreement to set the date on which the

action will be resumed, extend the duration of the action and make other changes necessary to adapt the action to the new situation (see Article 55) — unless the Agreement or the participation of a beneficiary has been terminated (see Article 50).

The suspension will be **lifted** with effect from the resumption date set out in the amendment. This date may be before the date on which the amendment enters into force.

Costs incurred during suspension of the action implementation are not eligible (see Article 6).

49.2 Suspension of the action implementation, by the Commission

49.2.1 Conditions

The Commission may suspend implementation of the action or any part of it, if:

- (a) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed or is suspected of having committed:
 - (i) substantial errors, irregularities or fraud or
 - (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false declaration, failure to provide required information, breach of ethical principles);
- (b) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed — in other EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2), or
- (c) the action is suspected of having lost its scientific or technological relevance.

49.2.2 Procedure

Before suspending implementation of the action, the Commission will formally notify the coordinator or beneficiary concerned:

- informing it of its intention to suspend the implementation and the reasons why and
- inviting it to submit observations within 30 days of receiving notification.

If the Commission does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify **confirmation** of the suspension. Otherwise, it will formally notify that the procedure is not continued.

The suspension will **take effect** five days after confirmation notification is received (or on a later date specified in the notification).

It will be **lifted** if the conditions for resuming implementation of the action are met.

The coordinator or beneficiary concerned will be formally notified of the lifting and the Agreement will be **amended** to set the date on which the action will be resumed, extend the duration of the action

and make other changes necessary to adapt the action to the new situation (see Article 55) — unless the Agreement has already been terminated (see Article 50).

The suspension will be lifted with effect from the resumption date set out in the amendment. This date may be before the date on which the amendment enters into force.

Costs incurred during suspension are not eligible (see Article 6).

The beneficiaries may not claim damages due to suspension by the Commission (see Article 46).

Suspension of the action implementation does not affect the Commission's right to terminate the Agreement or participation of a beneficiary (see Article 50), reduce the grant or recover amounts unduly paid (see Articles 43 and 44).

ARTICLE 50 — TERMINATION OF THE AGREEMENT OR OF THE PARTICIPATION OF ONE OR MORE BENEFICIARIES

50.1 Termination of the Agreement, by the beneficiaries

50.1.1 Conditions and procedure

The beneficiaries may terminate the Agreement.

The coordinator must formally notify termination to the Commission (see Article 52), stating:

- the reasons why and
- the date the termination will take effect. This date must be after the notification.

If no reasons are given or if the Commission considers the reasons do not justify termination, the Agreement will be considered to have been '**terminated improperly**'.

The termination will **take effect** on the day specified in the notification.

50.1.2 Effects

The coordinator must — within 60 days from when termination takes effect — submit:

- (i) a periodic report (for the open reporting period until termination; see Article 20.3) and
- (ii) the final report (see Article 20.4).

If the Commission does not receive the reports within the deadline (see above), only costs which are included in an approved periodic report will be taken into account.

The Commission will **calculate** the final grant amount (see Article 5.3) and the balance (see Article 21.4) on the basis of the reports submitted. Only costs incurred until termination are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

Improper termination may lead to a reduction of the grant (see Article 43).

After termination, the beneficiaries' obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

50.2 Termination of the participation of one or more beneficiaries, by the beneficiaries

50.2.1 Conditions and procedure

The participation of one or more beneficiaries may be terminated by the coordinator, on request of the beneficiary concerned or on behalf of the other beneficiaries.

The coordinator must formally notify termination to the Commission (see Article 52) and inform the beneficiary concerned.

If the coordinator's participation is terminated without its agreement, the formal notification must be done by another beneficiary (acting on behalf of the other beneficiaries).

The notification must include:

- the reasons why;
- the opinion of the beneficiary concerned (or proof that this opinion has been requested in writing);
- the date the termination takes effect. This date must be after the notification, and
- a request for amendment (see Article 55), with a proposal for reallocation of the tasks and the estimated budget of the beneficiary concerned (see Annexes 1 and 2) and, if necessary, the addition of one or more new beneficiaries (see Article 56). If termination takes effect after the period set out in Article 3, no request for amendment must be included unless the beneficiary concerned is the coordinator. In this case, the request for amendment must propose a new coordinator.

If this information is not given or if the Commission considers that the reasons do not justify termination, the participation will be considered to have been **terminated improperly**.

The termination will **take effect** on the day specified in the notification.

50.2.2 Effects

The coordinator must — within 30 days from when termination takes effect — submit:

- (i) a report on the distribution of payments to the beneficiary concerned and
- (ii) if termination takes effect during the period set out in Article 3, a '**termination report**' from the beneficiary concerned, for the open reporting period until termination, containing an overview of the progress of the work, an overview of the use of resources, the individual financial statement and, if applicable, the certificate on the financial statement (see Articles 20.3 and 20.4).

The information in the termination report must also be included in the periodic report for the next reporting period (see Article 20.3).

If the request for amendment is rejected by the Commission, (because it calls into question the decision awarding the grant or breaches the principle of equal treatment of applicants), the Agreement may be terminated according to Article 50.3.1(c).

If the request for amendment is accepted by the Commission, the Agreement is **amended** to introduce the necessary changes (see Article 55).

The Commission will — on the basis of the periodic reports, the termination report and the report on the distribution of payments — **calculate** the amount which is due to the beneficiary and if the (pre-financing and interim) payments received by the beneficiary exceed this amount.

The **amount which is due** is calculated in the following steps:

Step 1 — Application of the reimbursement rate to the eligible costs

The grant amount for the beneficiary is calculated by applying the reimbursement rate(s) to the total eligible costs declared by the beneficiary in the termination report and approved by the Commission.

Only costs incurred by the beneficiary concerned until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

Step 2 — Reduction due to substantial errors, irregularities or fraud or serious breach of obligations

In case of a reduction (see Article 43), the Commission will calculate the reduced grant amount for the beneficiary by deducting the amount of the reduction (calculated in proportion to the seriousness of the errors, irregularities or fraud or breach of obligations, in accordance with Article 43.2) from the grant amount for the beneficiary.

If the payments received **exceed the amounts due**:

- if termination takes effect during the period set out in Article 3 and the request for amendment is accepted, the beneficiary concerned must repay to the coordinator the amount unduly received. The Commission will formally notify the amount unduly received and request the beneficiary concerned to repay it to the coordinator within 30 days of receiving notification. If it does not repay the coordinator, the Commission will draw upon the Guarantee Fund to pay the coordinator and then notify a **debit note** on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);
- in all other cases, in particular if termination takes effect after the period set out in Article 3, the Commission will formally notify a **debit note** to the beneficiary concerned. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the Commission the amount due and the Commission will notify a debit note on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);
- if the beneficiary concerned is the former coordinator, it must repay the new coordinator according to the procedure above, unless:
 - termination takes effect after an interim payment and
 - the former coordinator has not distributed amounts received as pre-financing or interim payments (see Article 21.7).

In this case, the Commission will formally notify a **debit note** to the former coordinator. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the Commission the amount due. The Commission will then pay the new coordinator and notify a debit note on behalf of the Guarantee Fund to the former coordinator (see Article 44).

If the payments received **do not exceed the amounts due**: amounts owed to the beneficiary concerned will be included in the next interim or final payment.

If the Commission does not receive the termination report within the deadline (see above), only costs included in an approved periodic report will be taken into account.

If the Commission does not receive the report on the distribution of payments within the deadline (see above), it will consider that:

- the coordinator did not distribute any payment to the beneficiary concerned and that
- the beneficiary concerned must not repay any amount to the coordinator.

Improper termination may lead to a reduction of the grant (see Article 43) or termination of the Agreement (see Article 50).

After termination, the concerned beneficiary's obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

50.3 Termination of the Agreement or the participation of one or more beneficiaries, by the Commission

50.3.1 Conditions

The Commission may terminate the Agreement or the participation of one or more beneficiaries, if:

- (a) one or more beneficiaries do not accede to the Agreement (see Article 56);
- (b) a change to their legal, financial, technical, organisational or ownership situation is likely to substantially affect or delay the implementation of the action or calls into question the decision to award the grant;
- (c) following termination of participation for one or more beneficiaries (see above), the necessary changes to the Agreement would call into question the decision awarding the grant or breach the principle of equal treatment of applicants (see Article 55);
- (d) implementation of the action is prevented by force majeure (see Article 51) or suspended by the coordinator (see Article 49.1) and either:
 - (i) resumption is impossible, or
 - (ii) the necessary changes to the Agreement would call into question the decision awarding the grant or breach the principle of equal treatment of applicants;
- (e) a beneficiary is declared bankrupt, being wound up, having its affairs administered by the courts, has entered into an arrangement with creditors, has suspended business activities, or is subject to any other similar proceedings or procedures under national law;

- (f) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has been found guilty of professional misconduct, proven by any means;
- (g) a beneficiary does not comply with the applicable national law on taxes and social security;
- (h) the action has lost scientific or technological relevance;
- (i) not applicable;
- (j) not applicable;
- (k) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed fraud, corruption, or is involved in a criminal organisation, money laundering or any other illegal activity;
- (l) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has committed:
 - (i) substantial errors, irregularities or fraud or
 - (ii) serious breach of obligations under the Agreement or during the award procedure (including improper implementation of the action, submission of false information, failure to provide required information, breach of ethical principles);
- (m) a beneficiary has committed — in other EU or Euratom grants awarded to it under similar conditions — systemic or recurrent errors, irregularities, fraud or serious breach of obligations that have a material impact on this grant (**extension of findings from other grants to this grant**; see Article 22.5.2).
- (n) despite a specific request by the Commission, a beneficiary does not request — through the coordinator — an amendment to the Agreement to end the participation of one of its linked third parties that is in one of the situations under points (e), (f), (g), (k), (l) or (m) and to reallocate its tasks.

50.3.2 Procedure

Before terminating the Agreement or participation of one or more beneficiaries, the Commission will formally notify the coordinator or beneficiary concerned:

- informing it of its intention to terminate and the reasons why and
- inviting it, within 30 days of receiving notification, to submit observations and — in case of Point (l.ii) above — to inform the Commission of the measures to ensure compliance with the obligations under the Agreement.

If the Commission does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify to the coordinator or beneficiary concerned **confirmation** of the termination and the date it will take effect. Otherwise, it will formally notify that the procedure is not continued.

The termination will **take effect**:

- for terminations under Points (b), (c), (e), (g), (h), (j), (l.ii) and (n) above: on the day specified in the notification of the confirmation (see above);

- for terminations under Points (a), (d), (f), (i), (k), (l.i) and (m) above: on the day after the notification of the confirmation is received.

50.3.3 Effects

(a) for **termination of the Agreement**:

The coordinator must — within 60 days from when termination takes effect — submit:

- (i) a periodic report (for the last open reporting period until termination; see Article 20.3) and
- (ii) a final report (see Article 20.4).

If the Agreement is terminated for breach of the obligation to submit reports (see Articles 20.8 and 50.3.1(l)), the coordinator may not submit any reports after termination.

If the Commission does not receive the reports within the deadline (see above), only costs which are included in an approved periodic report will be taken into account.

The Commission will **calculate** the final grant amount (see Article 5.3) and the balance (see Article 21.4) on the basis of the reports submitted. Only costs incurred until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

This does not affect the Commission's right to reduce the grant (see Article 43) or to impose administrative sanctions (Article 45).

The beneficiaries may not claim damages due to termination by the Commission (see Article 46).

After termination, the beneficiaries' obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

(b) for **termination of the participation of one or more beneficiaries**:

The coordinator must — within 60 days from when termination takes effect — submit:

- (i) a report on the distribution of payments to the beneficiary concerned;
- (ii) a request for amendment (see Article 55), with a proposal for reallocation of the tasks and estimated budget of the beneficiary concerned (see Annexes 1 and 2) and, if necessary, the addition of one or more new beneficiaries (see Article 56). If termination is notified after the period set out in Article 3, no request for amendment must be submitted unless the beneficiary concerned is the coordinator. In this case the request for amendment must propose a new coordinator, and
- (iii) if termination takes effect during the period set out in Article 3, a **termination report** from the beneficiary concerned, for the open reporting period until termination, containing an overview of the progress of the work, an overview of the use of resources, the individual financial statement and, if applicable, the certificate on the financial statement (see Article 20).

The information in the termination report must also be included in the periodic report for the next reporting period (see Article 20.3).

If the request for amendment is rejected by the Commission, (because it calls into question the decision awarding the grant or breaches the principle of equal treatment of applicants), the Agreement may be terminated according to Article 50.3.1(c).

If the request for amendment is accepted by the Commission, the Agreement is **amended** to introduce the necessary changes (see Article 55).

The Commission will — on the basis of the periodic reports, the termination report and the report on the distribution of payments — **calculate** the amount which is due to the beneficiary and if the (pre-financing and interim) payments received by the beneficiary exceed this amount.

The **amount which is due** is calculated in the following steps:

Step 1 — Application of the reimbursement rate to the eligible costs

The grant amount for the beneficiary is calculated by applying the reimbursement rate(s) to the total eligible costs declared by the beneficiary in the termination report and approved by the Commission.

Only costs incurred by the beneficiary concerned until termination takes effect are eligible (see Article 6). Costs relating to contracts due for execution only after termination are not eligible.

Step 2 — Reduction due to substantial errors, irregularities or fraud or serious breach of obligations

In case of a reduction (see Article 43), the Commission will calculate the reduced grant amount for the beneficiary by deducting the amount of the reduction (calculated in proportion to the seriousness of the errors, irregularities or fraud or breach of obligations, in accordance with Article 43.2) from the grant amount for the beneficiary.

If the payments received **exceed the amounts due**:

- if termination takes effect during the period set out in Article 3 and the request for amendment is accepted, the beneficiary concerned must repay to the coordinator the amount unduly received. The Commission will formally notify the amount unduly received and request the beneficiary concerned to repay it to the coordinator within 30 days of receiving notification. If it does not repay the coordinator, the Commission will draw upon the Guarantee Fund to pay the coordinator and then notify a **debit note** on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);
- in all other cases, in particular if termination takes effect after the period set out in Article 3, the Commission will formally notify a **debit note** to the beneficiary concerned. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the Commission the amount due and the Commission will notify a debit note on behalf of the Guarantee Fund to the beneficiary concerned (see Article 44);
- if the beneficiary concerned is the former coordinator, it must repay the new coordinator according to the procedure above, unless:
 - termination takes effect after an interim payment and

- the former coordinator has not distributed amounts received as pre-financing or interim payments (see Article 21.7).

In this case, the Commission will formally notify a **debit note** to the former coordinator. If payment is not made by the date in the debit note, the Guarantee Fund will pay to the Commission the amount due. The Commission will then pay the new coordinator and notify a debit note on behalf of the Guarantee Fund to the former coordinator (see Article 44).

If the payments received **do not exceed the amounts due**: amounts owed to the beneficiary concerned will be included in the next interim or final payment.

If the Commission does not receive the termination report within the deadline (see above), only costs included in an approved periodic report will be taken into account.

If the Commission does not receive the report on the distribution of payments within the deadline (see above), it will consider that:

- the coordinator did not distribute any payment to the beneficiary concerned and that
- the beneficiary concerned must not repay any amount to the coordinator.

After termination, the concerned beneficiary's obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38, 40, 42, 43 and 44) continue to apply.

SECTION 4 FORCE MAJEURE

ARTICLE 51 — FORCE MAJEURE

'Force majeure' means any situation or event that:

- prevents either party from fulfilling their obligations under the Agreement,
- was unforeseeable, exceptional situation and beyond the parties' control,
- was not due to error or negligence on their part (or on the part of third parties involved in the action), and
- proves to be inevitable in spite of exercising all due diligence.

The following cannot be invoked as force majeure:

- any default of a service, defect in equipment or material or delays in making them available, unless they stem directly from a relevant case of force majeure,
- labour disputes or strikes, or
- financial difficulties.

Any situation constituting force majeure must be formally notified to the other party without delay, stating the nature, likely duration and foreseeable effects.

The parties must immediately take all the necessary steps to limit any damage due to force majeure and do their best to resume implementation of the action as soon as possible.

The party prevented by force majeure from fulfilling its obligations under the Agreement cannot be considered in breach of them.

CHAPTER 7 FINAL PROVISIONS

ARTICLE 52 — COMMUNICATION BETWEEN THE PARTIES

52.1 Form and means of communication

Communication under the Agreement (information, requests, submissions, ‘formal notifications’, etc.) must:

- be made in writing and
- bear the number of the Agreement.

Until the payment of the balance: all communication must be made through the electronic exchange system and using the forms and templates provided there.

After the payment of the balance: formal notifications must be made by registered post with proof of delivery (‘formal notification on paper’).

Communications in the electronic exchange system must be made by persons authorised according to the Participant Portal Terms & Conditions. For naming the authorised persons, each beneficiary must have designated — before the signature of this Agreement — a ‘legal entity appointed representative (LEAR)’. The role and tasks of the LEAR are stipulated in his/her appointment letter (see Participant Portal Terms & Conditions).

If the electronic exchange system is temporarily unavailable, instructions will be given on the Commission websites.

52.2 Date of communication

Communications are considered to have been made when they are sent by the sending party (i.e. on the date and time they are sent through the electronic exchange system).

Formal notifications through the **electronic** exchange system are considered to have been made when they are received by the receiving party (i.e. on the date and time of acceptance by the receiving party, as indicated by the time stamp). A formal notification that has not been accepted within 10 days after sending is considered to have been accepted.

Formal notifications **on paper** sent by **registered post** with proof of delivery (only after the payment of the balance) are considered to have been made on either:

- the delivery date registered by the postal service or
- the deadline for collection at the post office.

If the electronic exchange system is temporarily unavailable, the sending party cannot be considered in breach of its obligation to send a communication within a specified deadline.

52.3 Addresses for communication

The **electronic** exchange system must be accessed via the following URL:

<https://ec.europa.eu/research/participants/portal/desktop/en/projects/>

The Commission will formally notify the coordinator and beneficiaries in advance any changes to this URL.

Formal notifications on paper (only after the payment of the balance) addressed **to the Commission** must be sent to the following address:

European Commission
DIRECTORATE-GENERAL FOR RESEARCH & INNOVATION
Research infrastructure
ORBN 04/108
B-1049 Brussels Belgium

Formal notifications on paper (only after the payment of the balance) addressed **to the beneficiaries** must be sent to their legal address as specified in the Participant Portal Beneficiary Register.

ARTICLE 53 — INTERPRETATION OF THE AGREEMENT

53.1 Precedence of the Terms and Conditions over the Annexes

The provisions in the Terms and Conditions of the Agreement take precedence over its Annexes.

Annex 2 takes precedence over Annex 1.

53.2 Privileges and immunities

Not applicable

ARTICLE 54 — CALCULATION OF PERIODS, DATES AND DEADLINES

In accordance with Regulation No 1182/71²⁸, periods expressed in days, months or years are calculated from the moment the triggering event occurs.

The day during which that event occurs is not considered as falling within the period.

ARTICLE 55 — AMENDMENTS TO THE AGREEMENT

55.1 Conditions

The Agreement may be amended, unless the amendment entails changes to the Agreement which would call into question the decision awarding the grant or breach the principle of equal treatment of applicants.

²⁸ Regulation (EEC, Euratom) No 1182/71 of the Council of 3 June 1971 determining the rules applicable to periods, dates and time-limits (OJ L 124, 8.6.1971, p. 1).

Amendments may be requested by any of the parties.

55.2 Procedure

The party requesting an amendment must submit a request for amendment signed in the electronic exchange system (see Article 52).

The coordinator submits and receives requests for amendment on behalf of the beneficiaries (see Annex 3).

If a change of coordinator is requested without its agreement, the submission must be done by another beneficiary (acting on behalf of the other beneficiaries).

The request for amendment must include:

- the reasons why;
- the appropriate supporting documents;
- for a change of coordinator without its agreement: the opinion of the coordinator (or proof that this opinion has been requested in writing).

The Commission may request additional information.

If the party receiving the request agrees, it must sign the amendment in the electronic exchange system within 45 days of receiving notification (or any additional information the Commission has requested). If it does not agree, it must formally notify its disagreement within the same deadline. The deadline may be extended, if necessary for the assessment of the request. If no notification is received within the deadline, the request is considered to have been rejected.

An amendment **enters into force** on the day of the signature of the receiving party.

An amendment **takes effect** on the date agreed by the parties or, in the absence of such an agreement, on the date on which the amendment enters into force.

ARTICLE 56 — ACCESSION TO THE AGREEMENT

56.1 Accession of the beneficiaries mentioned in the Preamble

The other beneficiaries must accede to the Agreement by signing the Accession Form (see Annex 3) in the electronic exchange system (see Article 52) within 30 days after its entry into force (see Article 58).

They will assume the rights and obligations under the Agreement with effect from the date of its entry into force (see Article 58).

If a beneficiary does not accede to the Agreement within the above deadline, the coordinator must — within 30 days — request an amendment to make any changes necessary to ensure proper implementation of the action. This does not affect the Commission's right to terminate the Agreement (see Article 50).

56.2 Addition of new beneficiaries

In justified cases, the beneficiaries may request the addition of a new beneficiary.

For this purpose, the coordinator must submit a request for amendment in accordance with Article 55. It must include an Accession Form (see Annex 3) signed by the new beneficiary in the electronic exchange system (see Article 52).

New beneficiaries must assume the rights and obligations under the Agreement with effect from the date of their accession specified in the Accession Form (see Annex 3).

ARTICLE 57 — APPLICABLE LAW AND SETTLEMENT OF DISPUTES

57.1 Applicable law

The Agreement is governed by the applicable EU law, supplemented if necessary by the law of Belgium.

57.2 Dispute settlement

If a dispute concerning the interpretation, application or validity of the Agreement cannot be settled amicably, the General Court — or, on appeal, the Court of Justice of the European Union — has sole jurisdiction. Such actions must be brought under Article 272 of the Treaty on the Functioning of the EU (TFEU).

As an exception, if such a dispute is between the Commission and DEPARTMENT OF SCIENCE AND TECHNOLOGY, the competent Belgian courts have sole jurisdiction.

If a dispute concerns administrative sanctions, offsetting or an enforceable decision under Article 299 TFEU (see Articles 44, 45 and 46), the beneficiaries must bring action before the General Court — or, on appeal, the Court of Justice of the European Union — under Article 263 TFEU.

ARTICLE 58 — ENTRY INTO FORCE OF THE AGREEMENT

The Agreement will enter into force on the day of signature by the Commission or the coordinator, depending on which is later.

SIGNATURES

For the coordinator

For the Commission



EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR RESEARCH & INNOVATION
Research infrastructure



ANNEX 1 (part A)

Coordination and support action

NUMBER — 730884 — JUMPING JIVE

Table of Contents

1.1. The project summary.....	3
1.2. The list of beneficiaries.....	4
1.3. Workplan Tables - Detailed implementation.....	5
1.3.1. WT1 List of work packages.....	5
1.3.2. WT2 List of deliverables.....	6
1.3.3. WT3 Work package descriptions.....	8
Work package 1.....	8
Work package 2.....	10
Work package 3.....	12
Work package 4.....	15
Work package 5.....	17
Work package 6.....	20
Work package 7.....	23
Work package 8.....	26
Work package 9.....	29
Work package 10.....	32
1.3.4. WT4 List of milestones.....	35
1.3.5. WT5 Critical Implementation risks and mitigation actions.....	38
1.3.6. WT6 Summary of project effort in person-months.....	40
1.3.7. WT7 Tentative schedule of project reviews.....	41

1.1. The project summary

Project Number ¹	730884	Project Acronym ²	JUMPING JIVE
-----------------------------	--------	------------------------------	--------------

One form per project

General information

Project title ³	Joining up Users for Maximising the Profile, the Innovation and the Necessary Globalisation of JIVE
Starting date ⁴	01/12/2016
Duration in months ⁵	50
Call (part) identifier ⁶	H2020-INFRADEV-2016-1
Topic	INFRADEV-03-2016-2017 Individual support to ESFRI and other world-class research infrastructures
Fixed EC Keywords	Knowledge infrastructure
Free keywords	

Abstract ⁷

“Joining up Users for Maximising the Profile, the Innovation and the Necessary Globalisation of JIVE” (JUMPING JIVE) aims to prepare and position European Very Long Baseline Interferometry (VLBI) for the SKA era, and to secure the role of JIV-ERIC in the European and global landscape of Research Infrastructures.

On a European scale, the proposed activities will raise the profile of JIVE among scientists and operators of radio-astronomical facilities, by widely advocating its science capabilities and its role as research infrastructure provider within the international radio astronomy community. These activities will focus on outreach and on reinforcing science cases for the next decade. New partnerships will be pursued, and in addition JIVE will expand its potential user base by offering geodetic and enhanced astrometric processing. Finally, the possibility of the International LOFAR Telescope using the same ERIC governance structure in the future will be investigated.

With respect to global VLBI, the aim is to place JIV-ERIC in a leading role in the definition of scientific and technical standards in the SKA era. JIVE will take charge of a number of operational interfaces that will be essential for truly global VLBI, and establish close connections with the African VLBI Network and the SKA as the main strategic partners for the next decade.

1.2. List of Beneficiaries

Project Number ¹	730884	Project Acronym ²	JUMPING JIVE
-----------------------------	--------	------------------------------	--------------

List of Beneficiaries

No	Name	Short name	Country	Project entry month ⁸	Project exit month
1	JOINT INSTITUTE FOR VERY LONG BASELINE INTERFEROMETRY AS A EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (JIV-ERIC)	JIV-ERIC	Netherlands	1	50
2	CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS	CNRS	France	1	50
3	CHALMERS TEKNISKA HOEGSKOLA AB	CHALMERS	Sweden	1	50
4	DEPARTMENT OF SCIENCE AND TECHNOLOGY	DST	South Africa	1	50
5	ISTITUTO NAZIONALE DI ASTROFISICA	INAF	Italy	1	50
6	MINISTERIO DE FOMENTO	MFOM-E	Spain	1	50
7	SKA ORGANISATION	SKAO	United Kingdom	1	50
8	STICHTING ASTRON, NETHERLANDS INSTITUTE FOR RADIO ASTRONOMY	ASTRON	Netherlands	1	50
9	STICHTING INTERNATIONAL LOFAR TELESCOPE	ILT	Netherlands	1	50
10	TECHNISCHE UNIVERSITAET MUENCHEN	TUM	Germany	1	50
11	UNIVERSITY OF LEEDS	UNIVLEEDS	United Kingdom	1	50
12	THE UNIVERSITY OF MANCHESTER	UMAN	United Kingdom	1	50

1.3. Workplan Tables - Detailed implementation

1.3.1. WT1 List of work packages

WP Number ⁹	WP Title	Lead beneficiary ¹⁰	Person-months ¹¹	Start month ¹²	End month ¹³
WP1	Management	1 - JIV-ERIC	19.00	1	48
WP2	Outreach and Advocacy	1 - JIV-ERIC	42.00	1	48
WP3	Building new Partnerships	1 - JIV-ERIC	11.80	1	48
WP4	ERIC scope: The International LOFAR Telescope	8 - ASTRON	10.60	1	36
WP5	Integrating new elements	6 - MFOM-E	50.40	1	48
WP6	Geodetic capabilities	2 - CNRS	36.00	1	42
WP7	The VLBI future	5 - INAF	15.60	6	48
WP8	Global VLBI interfaces	1 - JIV-ERIC	64.00	3	45
WP9	Capacity for VLBI in Africa	12 - UMAN	22.60	1	48
WP10	VLBI with the SKA	1 - JIV-ERIC	24.00	1	48
Total			296.00		

1.3.2. WT2 list of deliverables

Deliverable Number ¹⁴	Deliverable Title	WP number ⁹	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D1.1	First Periodic Report	WP1	1 - JIV-ERIC	Report	Public	18
D1.2	Second Periodic Report	WP1	1 - JIV-ERIC	Report	Public	36
D1.3	Final Periodic Report	WP1	1 - JIV-ERIC	Report	Public	48
D2.1	Brochure	WP2	1 - JIV-ERIC	Websites, patents filling, etc.	Public	14
D2.2	Display	WP2	1 - JIV-ERIC	Websites, patents filling, etc.	Public	24
D2.3	Report on advocating the EVN	WP2	1 - JIV-ERIC	Report	Public	18
D2.4	Final report on attracting new users for EVN	WP2	1 - JIV-ERIC	Report	Public	47
D3.1	Inventory of state of VLBI involvement	WP3	1 - JIV-ERIC	Report	Public	8
D3.2	Progress report on working with national representatives	WP3	1 - JIV-ERIC	Report	Public	24
D3.3	Final report on JIV-ERIC memberships	WP3	1 - JIV-ERIC	Report	Public	46
D4.1	Workshops boards discussing position papers	WP4	9 - ILT	Report	Confidential, only for members of the consortium (including the Commission Services)	16
D4.2	Workshops with external experts	WP4	9 - ILT	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D4.3	Final documents	WP4	9 - ILT	Report	Public	35
D5.1	reports to TOG	WP5	1 - JIV-ERIC	Report	Public	18
D5.2	Changes in pipeline & EVN archive interface	WP5	1 - JIV-ERIC	Other	Public	42
D5.3	Final report on integrating new elements	WP5	6 - MFOM-E	Report	Public	46
D6.1	New correlator data products	WP6	1 - JIV-ERIC	Other	Public	12

Deliverable Number¹⁴	Deliverable Title	WP number⁹	Lead beneficiary	Type¹⁵	Dissemination level¹⁶	Due Date (in months)¹⁷
D6.2	Software to deal with geodetic observing schedules	WP6	1 - JIV-ERIC	Other	Public	18
D6.3	Analysis of EVN station positions	WP6	2 - CNRS	Report	Public	40
D7.1	Minutes of Kick-off meeting	WP7	1 - JIV-ERIC	Report	Public	7
D7.2	Minutes of meeting 2	WP7	5 - INAF	Report	Public	15
D7.3	Minutes of meeting 3	WP7	5 - INAF	Report	Public	30
D7.4	White paper	WP7	5 - INAF	Report	Public	45
D8.1	Setting up of SCHED re-factoring forum	WP8	1 - JIV-ERIC	Other	Public	3
D8.2	Document of SCHED	WP8	1 - JIV-ERIC	Report	Public	8
D8.3	Re-factored SCHED	WP8	1 - JIV-ERIC	Other	Public	36
D8.4	Evaluation software packages	WP8	10 - TUM	Report	Public	4
D8.5	Integration existing software into central infrastructure	WP8	10 - TUM	Other	Public	12
D8.6	Completed monitoring schedule	WP8	10 - TUM	Other	Public	24
D9.1	Minutes of telecom 1	WP9	12 - UMAN	Report	Public	2
D9.2	Mid-term report on training visits to African countries	WP9	12 - UMAN	Report	Public	23
D9.3	Final report on exchange visits to be hosted in Europe	WP9	12 - UMAN	Report	Public	47
D10.1	Details on VLBI interfaces to SKA consortia	WP10	7 - SKAO	Report	Public	24
D10.2	Operational plan for inclusion of SKA in Global VLBI	WP10	7 - SKAO	Report	Public	36
D10.3	Portfolio of SKA-VLBI Science cases	WP10	1 - JIV-ERIC	Report	Public	30
D10.4	Report on SKA-VLBI Key Science Projects	WP10	1 - JIV-ERIC	Report	Public	42

1.3.3. WT3 Work package descriptions

Work package number ⁹	WP1	Lead beneficiary ¹⁰	1 - JIV-ERIC
Work package title	Management		
Start month	1	End month	48

Objectives

The management of JUMPING JIVE will be located at JIVE. The objective is to transparently facilitate the range of activities and monitor the progress. JIVE will distribute the funds associated with 3rd party travel. This management WP will coordinate all reporting of the project to the EC.

Description of work and role of partners

WP1 - Management [Months: 1-48]

JIV-ERIC

For this programme JIVE proposes to work with a limited number of partners, mostly institutes already closely involved in the JIVE and EVN governance. This reflects the distributed nature of the VLBI research infrastructure and makes sure that an optimal use is made of existing expertise. As a result, it will be necessary to agree on a consortium agreement that institutes a project board, but in many practical cases this can be aligned with the JIV-ERIC council. The consortium agreement will be

based on the DESCAs template augmented through our experiences in RadioNet, ASTERICS and (N)EXPREs.

The main objective of the management is to make sure that the project stays on track by providing the coordinator and the work package leaders regular metrics for monitoring progress. This involves tracking time sheets, spending and deliverables. The choice of JIVE as the location of the management team follows naturally from the fact that JIVE is the main and coordinating partner of the consortium. The management will facilitate communication by maintaining distribution lists and calling meetings. An internal website (wiki) will give all partners access to the project information. Because most partners are JIVE partners, we know we can accomplish these tasks with a modest team effort.

In past projects JIVE has acquired extensive experience with administering travel funds for 3rd party travel. It is proposed that JIVE will hold all the resources for travel associated with events organised by the other Work Packages, when it involves non-partner participation. This includes funds for workshops and training activities.

Finally the management will take responsibility for delivering the reports for the programme, where we anticipate that there will be 2 reports over the 4 year period.

WP leader: JIVE (Huib van Langevelde).

Participation per Partner

Partner number and short name	WP1 effort
1 - JIV-ERIC	19.00
Total	19.00

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D1.1	First Periodic Report	1 - JIV-ERIC	Report	Public	18
D1.2	Second Periodic Report	1 - JIV-ERIC	Report	Public	36

List of deliverables

Deliverable Number¹⁴	Deliverable Title	Lead beneficiary	Type¹⁵	Dissemination level¹⁶	Due Date (in months)¹⁷
D1.3	Final Periodic Report	1 - JIV-ERIC	Report	Public	48

Description of deliverables

D1.1 : First Periodic Report [18]
 First Periodic Report
 D1.2 : Second Periodic Report [36]
 Second Periodic Report
 D1.3 : Final Periodic Report [48]
 Final Periodic Report

Schedule of relevant Milestones

Milestone number¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS1	First periodic report	1 - JIV-ERIC	18	First periodic report, approved by board
MS2	Second periodic report	1 - JIV-ERIC	36	Second periodic report, approved by board
MS3	Final periodic report	1 - JIV-ERIC	48	Final periodic report, approved by board

Work package number ⁹	WP2	Lead beneficiary ¹⁰	1 - JIV-ERIC
Work package title	Outreach and Advocacy		
Start month	1	End month	48

Objectives

Support the sustainability of JIV-ERIC and the EVN in the coming decade through profiling the scientific impact of high-resolution radio astronomy amongst the general public, policy makers and peers in the scientific community.

Description of work and role of partners

WP2 - Outreach and Advocacy [Months: 1-48]
JIV-ERIC
 Background. JIVE has been in existence for over 20 years, serving the EVN and its users. As the mission of JIVE has focused on an operational role to facilitate EVN usage, any outreach targeting the general public, the European policy makers and prospective users was limited to activities by JIVE management and individual scientists. The only exception occurred during the EC-funded (N)EXPREs projects, where a dedicated outreach effort created far more visibility in the general European scientific and industrial arena.

One can argue that without such a small (5%) but dedicated outreach effort, organisations like JIVE/EVN are not making effective use of the output they are generating. Nevertheless, the JIVE partners have always given priority to operational aspects and user interfaces, as they consider outreach to be a national matter. With JIVE now being a European entity it is crucial that the excitement of VLBI is communicated at a super-national level, notably so as the strategy is to involve more countries and advocate global VLBI.

It is of key importance that JIVE communicates with potential users across Europe. We have learned in past RadioNet (FP7) efforts that this is a delicate process; it requires the authority of a scientist to attract new users to the facility. The EVN and JIVE have been making slow but steady progress in this area, helped by the efforts of the support scientists at JIVE, who have consistently forged close collaborations with new users.

Task 1. Outreach for non-experts.
 We propose to employ a half-time communication expert who will help us to profile JIVE among nonexperts. This will involve shaping a number of communication tools, such as a web page and annual reports. Most importantly, we require new communication materials now that JIVE has become a new legal entity. The outreach person will also become point of contact for EVN-wide press releases. The EVN recently adopted a guideline on how to relay press material in all partner countries, after it was realised that some exciting results had not reached all communities that contribute to European VLBI.

This plan calls for central resources at JIVE. With the press officer in place the EVN will also be more visible at conferences and events. This effort will make use of the existing expertise amongst the partners, notably at IGN Spain and the SKA Organisation.

Task 2. Advocacy of EVN capabilities to scientists.
 It is equally important to communicate the exciting capabilities of EVN/JIVE to the scientific community. For this an active scientist (actively pursuing a scientific career) is required. This person will raise the visibility of EVN observing opportunities, targeting the communities that are not (yet involved in VLBI. Important goals will be to attend (regional) science meetings of astrophysicists and other potential VLBI users (space applications and geodesy). Considering the close links to WP6 (geodesy) and WP9 (Africa), one suitable person might combine the position of project scientist with that of policy officer in WP3 (new partnerships) and WP4 (ERIC scope).

WP leader: JIVE (Huib van Langevelde)

Participation per Partner

Partner number and short name	WP2 effort
1 - JIV-ERIC	42.00

Partner number and short name	WP2 effort
Total	42.00

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D2.1	Brochure	1 - JIV-ERIC	Websites, patents filling, etc.	Public	14
D2.2	Display	1 - JIV-ERIC	Websites, patents filling, etc.	Public	24
D2.3	Report on advocating the EVN	1 - JIV-ERIC	Report	Public	18
D2.4	Final report on attracting new users for EVN	1 - JIV-ERIC	Report	Public	47

Description of deliverables

D2.1 : Brochure [14]
 Brochure explaining the principles and practices of VLBI

D2.2 : Display [24]
 Project display to be used at conferences

D2.3 : Report on advocating the EVN [18]
 Report on advocating the EVN outside regular circles

D2.4 : Final report on attracting new users for EVN [47]
 Final report on attracting new users for the EVN

Schedule of relevant Milestones

Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS4	Brochure	1 - JIV-ERIC	14	Brochure explaining the principles and practices of VLBI, approved by exec.
MS5	Display	1 - JIV-ERIC	24	Display to be used at conferences, approved by exec
MS6	Report on advocating the EVN	1 - JIV-ERIC	18	Report on advocating the EVN outside regular circles, approved by board
MS7	Final report on attracting new users for the EVN	1 - JIV-ERIC	47	Final report on attracting new users for the EVN, shared with EVN-CBD

Work package number ⁹	WP3	Lead beneficiary ¹⁰	1 - JIV-ERIC
Work package title	Building new Partnerships		
Start month	1	End month	48

Objectives

In order for JIV-ERIC to be an efficient and sustainable European entity, it must attract more partners in its first 5-year cycle. A number of opportunities exist to target new countries, involved or interested in VLBI. This WP implements support for the JIVE director and management in this process.

Description of work and role of partners

WP3 - Building new Partnerships [Months: 1-48]
JIV-ERIC

Background. VLBI is collaborative and international by its very nature. The EVN was established by combining the efforts of European institutes and observatories, established primarily for activities other than VLBI. After exploring the scientific needs of astrophysical, astrometric and geodetic research for more than four decades, we think that the science case for VLBI necessitates true globalisation. On a European scale, it means involving new partners and connecting them to top-level science by integrating them with EVN and JIVE activities. As member of a VLBI network that one day will include the SKA, local, medium-size European facilities can participate in the on-going revolution in radio astronomy.

The aim will be to communicate the incentives to contribute to JIVE to national policy makers:

- Involvement in cutting-edge science research with links to global teams and organizations;
- Direct access to the intellectual property of the European VLBI collaboration and involvement in interdisciplinary innovation efforts;
- Joint exploitation of the science potential of VLBI for capacity building through exchanges, training events, schools and science meetings;
- Joint exploitation of the educational and public outreach potential of EVN and JIVE.

Task: Generate interest among potential new member countries to participate in JIVE. This WP has only a single task, but we adapt our strategy to the current level of involvement in the EVN and JIVE. We define three tiers:

Tier 1: countries and organisations already involved in one way or another in the EVN, JIVE, and/or JIVE-related FP7 or other joint activities. These are

- a) Finland: Aalto University, Metsähovi Radio Astronomy Observatory;
- b) Latvia: Ventspils International Radio Astronomy Center, Ventspils University College;
- c) Poland: Torun University, Center for Astrophysics.

Tier 1 countries are fairly close to attaining the status of full members of JIV-ERIC; all three are either full members of the EVN or are in the process of establishing a full EVN membership.

The main activity will be preparatory work for admission of the Tier 1 countries into JIV-ERIC. This may involve consultation on local policy roadmaps and funding proposals, as well as drafting collaborative agreements. In specific cases it may entail the implementation of joint science, educational, R&D and PO activities in these countries in close collaboration with the EVN.

Tier 2: countries/organisations that deploy VLBI activities consistent with the JIVE mission but not yet involved in JIV-ERIC:

- a) Hungary: FOMI Satellite Geodetic Observatory, with one of the leading VLBI users groups in Europe;
- b) Ireland: Cork University College, another one of the leading VLBI users groups in Europe;
- c) Russia: Institute of Applied Astronomy, a full member of the EVN, but with a disproportionately small users community.
- d) Ukraine: Radio Astronomy Institute, a well-established school of low-frequency radio astronomy with experience in VLBI technology and geodesy, but also with a disproportionately small users community.

We will start with establishing mechanisms to involve scientists, engineers and students from Tier 2 countries in JIVE activities. Note that this is related to WP2 activities, but also WP7.

Tier 3: countries/organisations with declared interest in radio astronomy and VLBI, but without established facilities and/or sizable user groups:

- a) Israel: Weizmann Institute and Tel-Aviv University – radio astronomy groups being established, strong tradition in theoretical astrophysics;

b) Jordan: National Meteorology and Geography Authority – a declared interest in pursuing radio astronomy research;
 c) Norway: active involvement in geodetic VLBI (Ny Ålesund, Svalbard), but with a virtually nonexistent user community;

d) Portugal: Institute of Telecommunications, Santiago University (Aveiro) – strong tradition and interest in radio astronomy related technology (including SKA), VLBI antennas on Azores.

Specific activities in this category include assisting local contacts with creating a case to the respective national authorities for radio astronomy and VLBI activities. We also envision involvement in educational and nationally oriented PR actions, again in line with the activities in WP2.

The activities listed will start from collaborations along existing partnerships (Tier 1 and 2) and establishing new partnerships (Tier 3). These activities will range from preparing documents on science cases and legal frameworks (Tier 1) to preparing the initial input documents for initiating JIV-ERIC admission process (Tier 2) to assessing science potential of establishing national VLBI “seedgroups” (Tier 3).

The WP3 activity will be implemented by a policy officer, who will prepare engagement of national representatives with JIVE management and/or council members. Where applicable the work-package should be able to invoke legal expertise.

WP Leader: JIVE (Leonid Gurvits)

Participation per Partner

Partner number and short name	WP3 effort
1 - JIV-ERIC	11.80
Total	11.80

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D3.1	Inventory of state of VLBI involvement	1 - JIV-ERIC	Report	Public	8
D3.2	Progress report on working with national representatives	1 - JIV-ERIC	Report	Public	24
D3.3	Final report on JIV-ERIC memberships	1 - JIV-ERIC	Report	Public	46

Description of deliverables

As it is impossible to predict when and which country will make progress in this complex process, the deliverables will be limited to a number of evaluations:

D3.1 : Inventory of state of VLBI involvement [8]

Inventory of state of VLBI involvement

D3.2 : Progress report on working with national representatives [24]

Progress report on working with national representatives

D3.3 : Final report on JIV-ERIC memberships [46]

Final report on JIV-ERIC memberships

Schedule of relevant Milestones

Milestone number¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS8	Inventory of state of VLBI involvement	1 - JIV-ERIC	8	Inventory of state of VLBI involvement, shared with JIV-ERIC council
MS9	Progress report on working with national representatives	1 - JIV-ERIC	24	Progress report on working with national representatives, shared with the JIV-ERIC council
MS10	Final report on JIV-ERIC memberships	1 - JIV-ERIC	46	Final report on JIV-ERIC memberships, shared with JIV-ERIC council

Work package number ⁹	WP4	Lead beneficiary ¹⁰	8 - ASTRON
Work package title	ERIC scope: The International LOFAR Telescope		
Start month	1	End month	36

Objectives

Carry out an assessment, to be presented in a discussion document for the JIVE and ILT governing bodies and stakeholders, of the possible merits and pitfalls of a closer operational alignment of these two facilities, and possibly their merging into one ERIC.

Description of work and role of partners

WP4 - ERIC scope: The International LOFAR Telescope [Months: 1-36]
ASTRON, JIV-ERIC

Background. Scientifically and organisationally there are a number of similarities between the European VLBI Network and the International LOFAR telescope. Both run a distributed international telescope network and both rely on a central facility for correlation, data curation, quality control and user interfaces. With the aim of optimising the governance for long-term sustainability, we propose to research if there are advantages in lining up the organisations more closely.

Task 1. Assessment studies. There will be a single task to carry out two assessment studies, with documents to be made public at the end of the project, to evaluate the overlaps/similarities as well as differences between JIVE and ILT. Each document will start from a description of the current status and then assess how changing internal and external circumstances (national, European, and international) may alter the respective positions of JIVE and ILT in the next decade; the associated opportunities, challenges, and risks will be discussed. Each document will conclude with a study of the possible advantages and risks that specific collaborations between JIVE and the ILT would entail, including a full merger of the two entities into a combined ERIC.

1. The first document will focus on the operational model and core technologies employed by the respective facilities. It will first describe the current modus operandi. The document will then proceed to explore the likely evolution and enhancement paths of the respective facilities. These will be required in order to stay abreast of expanding technological capabilities as well as growing scientific end-user needs, particularly within the European landscape. The document will conclude with an analysis of the advantages and risks in bringing the JIVE and ILT operational models and technological efforts more closely into alignment.
2. The second document will focus on institutional partnerships, financing, and governance models. It will first clearly describe the current governance and partnerships of the respective facilities. The document will then explore plausible national, European, and international developments in the next decade with regard to funding and collaboration on operating large-scale research facilities in radio astronomy, keeping the ESFRI priorities in mind. The document will assess the possible places and roles of our facilities against the evolution of research infrastructures. Taking into account in particular the substantially overlapping membership of JIVE and the ILT and the ambitions of both organisations to grow (in part) by acquiring new partners in Europe, the document will conclude with an analysis of possible advantages, risks, and challenges, of aligning the JIVE and ILT governance and financing models, including the discussion of a full merger scenario.

Several intensive meeting sessions or workshops will be required to carry out the studies and the development of the documents described above. The workshops will initially involve relevant operational and general management staff from the respective organisations, followed by a meeting with representation from governing bodies; experts from similar European or international (prospective) partner facilities will also be invited. It is to be expected that external technical and legal/financial experts will be called upon as needed to ensure thorough assessments. One or more of the meetings will probably be held in Brussels, where relevant experts from the EC will be invited to share their insight based on specific prior communication with them.

Finally, the documents will be presented and discussed in the JIVE Council, and in the ILT Board and the national LOFAR consortia. This will be the culmination and conclusion of this work package. It will be up to these governing entities to decide whether to take any further actions, and if so, what, when, and how. A possible follow-up is outside the scope of this work package

WP Leader: ILT/ASTRON (René Vermeulen)

Participation per Partner

Partner number and short name	WP4 effort
1 - JIV-ERIC	4.60
8 - ASTRON	6.00
Total	10.60

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D4.1	Workshops boards discussing position papers	9 - ILT	Report	Confidential, only for members of the consortium (including the Commission Services)	16
D4.2	Workshops with external experts	9 - ILT	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D4.3	Final documents	9 - ILT	Report	Public	35

Description of deliverables

<p>D4.1 : Workshops boards discussing position papers [16] Workshops with board representatives discussing position papers</p> <p>D4.2 : Workshops with external experts [30] Broader-scoped workshops with external experts</p> <p>D4.3 : Final documents [35] Final documents presented and discussed in JIVE council and ILT board</p>

Schedule of relevant Milestones

Milestone number ¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS11	Workshop board discussing position papers	9 - ILT	16	Workshop board discussing position papers, noted by JIV-ERIC council and ILT board
MS12	Workshop with external experts	9 - ILT	30	Workshop with external experts, noted by JIV-ERIC council and ILT board
MS13	Final documents	9 - ILT	35	Final documents, approved by JIV-ERIC council and ILT board

Work package number ⁹	WP5	Lead beneficiary ¹⁰	6 - MFOM-E
Work package title	Integrating new elements		
Start month	1	End month	48

Objectives

This work package will test and verify the performance of new telescopes in the EVN. This is important both for the new consortium members, as well as the EVN user community. A special focus will be on quality control and calibration

Description of work and role of partners

WP5 - Integrating new elements [Months: 1-48]
MFOM-E, JIV-ERIC

Background. From its birth as a consortium of five European radio astronomy observatories, the growth of the EVN has been a principal factor in being able to offer astronomers an ever more capable instrument. Additional telescopes provide improved imaging fidelity and sensitivity to fainter sources. Developments in digital back-end technology over the past few years, and, more recently, in the distribution of clock and frequency standards, are lowering the barrier for aspiring telescopes to participate in the EVN. Examples of such network enlargements in the new millennium are the - element KVAZAR network in Russia and the 3-element KVN in Korea, the latter operating at the higher frequencies covered by the EVN. In addition, new telescopes with significantly enhanced capabilities at existing EVN institutes have come on line (the 40m telescope at Yebes, Spain; the 65m telescope at Tianma, near Shanghai, China), as well as new or refurbished telescopes at institutes not previously associated with the EVN (the new 65m telescope in Sardinia; the 32m telescope in Irbene, Latvia). Characterising and monitoring the performance of these telescopes is a considerable effort.

Task 1. Significant enhancements at existing EVN and affiliated stations. Some of the new EVN telescopes are upgrading their receivers to better match the EVN observing frequencies. For example, the Kunming 40m telescope in south-west China has participated in very few EVN observations, as currently only one frequency band overlaps with the frequency coverage of the EVN. Recently, multifrequency front-end equipment has been purchased, but has yet to be tested with the EVN. The inclusion of this telescope at more frequency bands will provide an enhanced coverage in the eastern reaches of the EVN, improved image fidelity and the capability to track sources for longer periods of time, especially when conducting joint observations with the Australian LBA. JIVE's support team will need to verify the data quality and work with the station staff to determine a reliable calibration of such observations. We also point out the exciting possibility of using the enormous FAST telescope in China for VLBI. We will also work towards incorporating the short baselines formed by the individual eMERLIN telescopes in the UK. It is obvious that this will significantly improve the EVN's sensitivity to extended structure. As the signals from these telescopes go through the eMERLIN correlator before they can be processed for EVN correlation we can expect some subtle problems. With the implementation of this eMerlin mode recently completed, we will focus on verifying the data quality and calibration effects in detail. Similar work is anticipated for the Westerbork array as a VLBI element, after the deployment of the phased-array feed APERTIF system. APERTIF provides a multi-beam, wide-field capability for 18-21cm observations. The EVN could benefit from the full Westerbork array sensitivity at these frequencies with the new wider-field feature for projects conducting deep surveys. Similar work would be needed for the SKA precursor telescope MeerKAT in South Africa.

In this task a dedicated support scientist at JIVE will serve as a contact person for the stations that use new receivers or data interfaces. He/she will make a plan for testing new capabilities and discuss the requirements for delivering calibration. When progress is deemed satisfactory, the new modes can be incorporated in the standard Network Monitoring Experiments. The support scientist's findings will be discussed with the stations in the EVN Technical and Operations Group (TOG). We note that the support scientist will also be an active scientist, pursuing a career in astrophysics.

Task 2. Supporting new telescopes. Several 30-m class telescopes are found throughout Europe that could greatly improve the EVN's image fidelity by providing baselines currently not available. The first step would be to conduct a census of such telescopes, their institutional situation and technical needs for a conversion to an EVN-ready radio telescope. We have had expressions of interest from the UK, Portugal, Finland, and Ireland. In addition there are a number of geodetic stations in European countries that have not participated (for a long time) in EVN observations. Besides dedicated support at the correlator, we propose to make provisions to support tiger teams comprising technical experts from EVN stations, that could accelerate the progress towards EVN participation. Note that the same expertise

will be used in WP9 to facilitate African VLBI telescopes. This however we view as a special category, as an exchange programme on all levels is required.

The support scientist dedicated to this task will make an inventory of the telescopes that could benefit from this programme. For these a technical assessment will be made of potential bottlenecks that stand in the way of EVN participation. Where needed, special tiger team visits will be arranged to facilitate test observations. These efforts will be coordinated and reported at the EVN TOG (the Technical Operations Group). The support scientist will also be responsible for scheduling and data inspection.

Task 3. Station feedback from pipeline and archive. An asset of the central JIVE organisation at the heart of the EVN is a very complete, interactive and public archive. Through a pipeline, which runs after correlation, the archive is populated not only with the correlated raw data, but also with calibration data and preliminary images. We propose to make changes to this system that will allow telescope operators to query the archive for information on telescope performance. The focus will be on calibrator observations, which will allow a direct assessment of a specific telescope's performance.

Offering this capability will require re-engineering of the existing data flows and a careful evaluation by the experts in the JIVE telescope support team.

WP Leaders: IGN/MFOM-E (Pablo de Vicente), JIVE (Bob Campbell)

Participation per Partner

Partner number and short name	WP5 effort
1 - JIV-ERIC	50.40
Total	50.40

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D5.1	reports to TOG	1 - JIV-ERIC	Report	Public	18
D5.2	Changes in pipeline & EVN archive interface	1 - JIV-ERIC	Other	Public	42
D5.3	Final report on integrating new elements	6 - MFOM-E	Report	Public	46

Description of deliverables

D5.1 : reports to TOG [18]
 Bundle of reports to the TOG on Task 1 and 2 activities

D5.2 : Changes in pipeline & EVN archive interface [42]
 Pipeline and the EVN archive interfaces for monitoring station performance

D5.3 : Final report on integrating new elements [46]
 Final report on integrating new elements

Schedule of relevant Milestones

Milestone number¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS14	Reports to TOG	1 - JIV-ERIC	18	Reports to the TOG, minuted by EVN TOG
MS15	Changes in pipeline & EVN archive interface	1 - JIV-ERIC	42	Changes in pipeline & EVN archive interface, published to community
MS16	Final report on integrating new elements	6 - MFOM-E	46	Final report on integrating new elements, minuted by EVN TOG

Work package number ⁹	WP6	Lead beneficiary ¹⁰	2 - CNRS
Work package title	Geodetic capabilities		
Start month	1	End month	42

Objectives

This work package will enable geodetic use of the JIVE data processor. When validated, this mode will allow the use of the JIV-ERIC infrastructure for high accuracy (global) astrometric and geodetic applications. In addition it will provide means to verify the data quality on a more fundamental level and improve the accuracy with which EVN station positions are known.

Astronomers typically use the EVN for self-calibration or phase-referencing imaging, or for phase-referencing relative astrometry in which the positions of a target are determined relative to a nearby reference source. The data produced by the EVN software correlator at JIVE (SFXC) contains visibility phases calculated on the basis of an a-priori correlator model that accounts for the earth/sky geometry, relativistic effects and propagation effects at the time of the observations. This correlator model, although it can be linked to the output data, is not yet included in the files that the astronomer receives.

If the data files contained this correlator model, scientists could use this for:

- Absolute astrometry to determine source positions directly in the ICRF, which would provide the means to find new reference sources in targeted areas of the sky, which in turn could improve the astrometry derived from the current phase-referencing practice.
- Geodesy, which can determine the position of the participating telescopes by observing sources of known positions spread over the whole sky. This would be especially useful to the EVN for new telescopes or those that do not have the specific receivers necessary to participate in IVS observations.
- Accounting for changes in the correlator model that may arise between epochs of multi-epoch programmes, or from the use of different correlators. This will give the users more flexibility and will allow the JIVE staff to do detailed quality checks.

A preliminary assessment of the astrometric quality of the SFXC was done at JIVE in 2015, with a re-correlation of four stations from an IVS 24-hour geodetic observation. A member of the geodetic VLBI community compared the standard output files from this re-correlation, plus the correlator model used for the original IVS geodetic correlation. The preliminary conclusion was that a fairly straightforward engineering effort would be sufficient to make SFXC ready for precise absolute astrometry. In fact, the exercise illustrated that in some cases a sensitivity improvement could result from the use of the SFXC correlation algorithm.

This demonstration of the astrometric quality and favourable sensitivity of the SFXC was a first step towards being able to deploy geodetic capabilities. Using standard data-analysis methods these will be directly accessible to both astronomy and geodesy.

Description of work and role of partners

WP6 - Geodetic capabilities [Months: 1-42]
CNRS, JIV-ERIC

Task1. Data interface. The first task is to attach the correlator model to the data product following international standards. This is a straightforward task for the experts at JIVE who understand the time series description of the correlator model. However, careful comparison of the model delay computed at arbitrary times using the correlator algorithm with the resulting data correction files will be needed to validate this transformation.

Task 2. Experiment definition. Because they cannot rely on tracking a nearby calibrator, the scheduling strategies for geodetic and absolute astrometry observations differ from those used in more typical EVN observations. In particular, the need to obtain atmospheric calibration over the whole sky often requires forming sub-arrays within the overall set of participating telescopes ("sub-netting"). Because of these different strategies, these observations often use a different scheduling program, that makes schedule files in a format which is different from the usual EVN schedules. The ability to handle sub-netting (different sets of telescopes/sources at the same time) and to read in the different schedule format needs to be developed for the local SFXC environment.

One or more test observations would be conducted and analysed to validate the newly implemented SFXC features and correlator-model information in the AIPS tables.

Task 3. Application: Station Positions. We propose to carry out (at least) one full-scale geodetic-style observation to determine the positions of EVN telescopes that do not participate in standard IVS observations. A similar observation at 6cm wavelength was done in 2000 by Bordeaux experts to determine the positions of the telescopes at Jodrell Bank (UK), Westerbork (NL), and Torun (PL). These positions, along with a plate-motion model, have formed the basis of the location used for these telescopes in subsequent EVN observations. A separate 1.3cm geodetic-style observation in 2006 determined the position of the Jodrell Bank Mark2 telescope, consistent with the earlier determination when accounting for the modelled tectonic plate motion. A new 1.3cm observation would thus enable a new determination of the position (and the motion) of the Mark2 telescope, as well as of the Torun telescope which has obtained a 1.3cm receiver since the previous observations, with a long enough time-baseline to measure the site velocity empirically rather than through a plate-motion model. A new 6cm observation would extend these advantages to Westerbork, which cannot observe at 1.3cm. The advantage of shorter-wavelength observations is that they reduce ionospheric effects and thereby yield better precision.

Such observations will also provide improved accuracy for several new telescopes, notably Irbene (LV) and the Sardina Radio Telescope (IT). As such the proposed programme is connected to the work on integrating new antennas (WP5) and future observing with antennas in Africa (WP9). It is worth noting that many of the telescopes we are serving have a keen interest to participate in large scale geodetic programmes, for which this work will be a starting point.

WP leaders: CNRS (Patrick Charlot, Bordeaux) and JIVE (Bob Campbell)

Participation per Partner

Partner number and short name	WP6 effort
1 - JIV-ERIC	12.00
2 - CNRS	24.00
Total	36.00

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D6.1	New correlator data products	1 - JIV-ERIC	Other	Public	12
D6.2	Software to deal with geodetic observing schedules	1 - JIV-ERIC	Other	Public	18
D6.3	Analysis of EVN station positions	2 - CNRS	Report	Public	40

Description of deliverables

D6.1 : New correlator data products [12]
 New correlator data products, verified for use with geodatic software

D6.2 : Software to deal with geodetic observing schedules [18]
 Software to deal with geodetic observing schedules, verified by tests observations

D6.3 : Analysis of EVN station positions [40]
 Document with analysis of EVN station position determination

Schedule of relevant Milestones

Milestone number¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS17	New correlator data products	1 - JIV-ERIC	12	New correlator data products, available to user community
MS18	Software to deal with geodetic observing schedules	1 - JIV-ERIC	18	Software to deal with geodetic observing schedules, available to user community
MS19	Analysis of EVN station positions	2 - CNRS	40	Analysis of EVN station positions, presentation to EVN TOG

Work package number ⁹	WP7	Lead beneficiary ¹⁰	5 - INAF
Work package title	The VLBI future		
Start month	6	End month	48

Objectives

Because of the progress in the field of astrophysics and the changes in the radio astronomy landscape it is timely to revisit the EVN science case. In consultation with the user community and global partners we will define the most important science areas for future VLBI arrays.

Description of work and role of partners

WP7 - The VLBI future [Months: 6-48]
INAF, JIV-ERIC, CHALMERS

Background. Very Long Baseline Interferometry (VLBI) arrays are the only instruments that reach angular resolutions of the order of a milli-arcsecond and less, allowing unique studies of the central black holes of active galactic nuclei and their evolution, star formation and stellar evolution, gamma-ray bursts, searches for extra-solar planets, and ultra precision astrometry, to name just some of the many research areas and applications. The European VLBI Network is one of the world’s most sensitive VLBI arrays over a broad range of frequencies. This has been achieved by the close collaboration and communication between the scientific and technological/engineering staff, and by long-term coordinated investment and development programme among all partners. Science and technology need to progress hand in hand to ensure the most outstanding scientific output. Moreover, the continued effort of JIVE, particularly in providing user support at many stages, has ensured a considerable growth of the VLBI scientific community, making the intrinsic complex observational technique and data analysis broadly accessible to all.

Radio-astronomical facilities are currently undergoing a rapid evolution, which in many cases involves VLBI as a key ingredient. Beyond the ALMA-VLBI connection, most relevant to the current proposal are the potential developments in Africa (African VLBI Network, AVN, addressed in WP9) and the construction phase of the SKA (addressed in WP10). In particular, the establishment of a 30m class of radio telescopes throughout Africa would ensure an almost continuous distribution of radio telescopes from Northern Europe to South Africa, with a resulting substantial increase in that portion of the sky accessible for high-fidelity milli-arcsecond resolution imaging. In addition, the possibility of a phased SKA for VLBI observations would provide a step change in sensitivity, and hence in the scientific potential of VLBI.

Many (European) partners realise the potential of radio astronomy and are joining up with the VLBI community (WP3, 5) or are joining complementary SKA pathfinders (WP4). In this rapidly evolving framework it is essential that the tight synergy between science and development is continued, and that a scientific roadmap is defined, to fully exploit the forthcoming generation of VLBI arrays. The prospect of this project is timely as the SKA is being designed and the establishment of an AVN has started. Defining a new roadmap for VLBI is urgent.

Task 1. VLBI science case. The main deliverable will be a document, in the form of a White Paper, that will address and explore several relevant points in setting the future priorities of VLBI science capabilities. Besides the global developments it is also important to take technical capabilities into consideration. One example is the question how to implement a “large-survey mode” for VLBI in order to address the wishes of the scientific community and thus ensure the best scientific returns. Another is the feasibility of transient surveys. Deep surveys of individual targets, or somewhat shallower surveys with a large field of view, are scientifically profitable, but the question is in which case the EVN resources are best used. The first would benefit from the large telescopes in the EVN and the traditional observing mode (limited to the EVN sessions), while the latter would be better implemented by adding smaller dishes to the array. Those would provide large field of view, would be available most of the year and would better complement the SKA. Other technical aspects that need to be considered are the frequency coverage and bandwidth available, but also the capabilities of the central data processor, the correlator, which forms the final science products. Maybe in the future it will become possible to do VLBI observations with array feeds, providing multiple beams per station.

The synergy with the new astrophysical frontiers which will become accessible with future space missions and ground facilities (some remarkable examples include LSST, GAIA, XIPE) will play a major role in shaping the White Paper. Beyond the challenges raised above, we should keep in mind that astronomy is undergoing a major revolution at another level: namely the massive increase in the data volumes which are becoming prevalent in the new state-of-the-art facilities. This is the case in many wave bands, but particularly in radio astronomy, requiring the development of

data archiving and data mining tools. In this rapidly evolving framework it is important to propose future directions for the development of the EVN data archive at JIVE.

We expect the VLBI community to be aware of the future challenges. So it is our task to engage the user base in an efficient feedback process and involve them actively in the discussion. However, it is essential that the needs of the next generation of radio astronomers are also identified, in terms of the development of software tools, user-support, and data analysis. How this should be implemented at JIVE to enhance and improve its invaluable role in supporting user access to the EVN to maximize the scientific return will be part of the process and discussion.

To achieve the goal of the White Paper, and ensure that at least all the above points are properly addressed we propose to set up a team which includes both members from the partners in the project, and external experts in other fields of astronomy as well as from the technology and engineering community. To keep the feedback process with the VLBI community alive, some members of the WP may attend key science meetings and workshops, such as for instance the EVN Symposia, whose scientific discussions and results will be relevant for our purpose. This WP will work in synergy with WP6 - to include astrometry and geodesy in the VLBI revised science case - WP9 (to link up with the science developments in Africa) and will provide input to WP10 (that aims to define an operational SKA-VLBI and to develop global VLBI science for it).

WP leader: INAF (Tiziana Venturi) with support from JIVE and in coordination with the EVN PC chair (Michael Lindqvist, CHALMERS-OSO)

Participation per Partner

Partner number and short name	WP7 effort
1 - JIV-ERIC	3.60
3 - CHALMERS	3.00
5 - INAF	9.00
Total	15.60

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D7.1	Minutes of Kick-off meeting	1 - JIV-ERIC	Report	Public	7
D7.2	Minutes of meeting 2	5 - INAF	Report	Public	15
D7.3	Minutes of meeting 3	5 - INAF	Report	Public	30
D7.4	White paper	5 - INAF	Report	Public	45

Description of deliverables

D7.1 : Minutes of Kick-off meeting [7]

Meeting 1, kick-off meeting among the WP members

D7.2 : Minutes of meeting 2 [15]

Meeting 2, here we will invite external experts to take part in the discussion

D7.3 : Minutes of meeting 3 [30]

Meeting 3, the available draft of the white paper will be discussed and improved

D7.4 : White paper [45]

White paper delivered

Schedule of relevant Milestones

Milestone number¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS20	Minutes of Kick-off meeting	1 - JIV-ERIC	7	Minutes of Kick-off meeting, noted by EVN CBD
MS21	Minutes of meeting 2	5 - INAF	15	Minutes of meeting 2, noted by EVN CBD
MS22	Minutes of meeting 3	5 - INAF	30	Minutes of meeting 3, noted by EVN CBD
MS23	White paper	5 - INAF	45	White paper, approved by EVN CBD

Work package number ⁹	WP8	Lead beneficiary ¹⁰	1 - JIV-ERIC
Work package title	Global VLBI interfaces		
Start month	3	End month	45

Objectives

In order to support the globalisation of VLBI it will be necessary to update tools and methods that allow the telescopes to be addressed in a uniform way. This work package will take charge of scheduling and monitoring tools, adapting and modernising them as needed, while taking care to continue to adhere to international standards and requirements.

Description of work and role of partners

WP8 - Global VLBI interfaces [Months: 3-45]
JIV-ERIC, CHALMERS, TUM

Background. VLBI, by its very nature, depends on the seamless interaction of many elements spread around the globe. Over many years, various mechanisms and tools have been put in place to make this possible. Some of these tools, although still functional, have now become very hard to maintain, let alone upgrade to new functionality. With new telescopes coming online and being added to VLBI networks, and observing modes and standards rapidly evolving, it has become essential to address these issues. Moreover, the VLBI user experience is seriously affected by the scheduling experience; new tools to involve scientists at various stages with a modern interface can currently not be implemented.

This work package will deal with two most outstanding problems. The first is scheduling of observations, which today is (mostly) handled through a programme called SCHED, dating from the early eighties and entirely written in FORTRAN. The second is the continuous monitoring of the status of stations participating in VLBI sessions. This is not only important for the early detection of technical problems, thus preventing the waste of valuable observing time, but also could prove very useful during the commissioning phase of new VLBI telescopes, for example in Africa. Resolving these issues will help to enable truly global operations, and prepare VLBI for the inclusion of the large instruments of the future, notably the phased up MeerKat and SKA arrays.

Task 8.1: Re-factoring of legacy scheduling software. The program SCHED was written in the early eighties in order to provide a common, generalised user interface for scheduling VLBI observations. It does so by combining observing parameters, source catalogues and frequency setup catalogues, which describe the detailed settings at all different stations. This is by no means trivial, considering that all telescopes are different, in terms of location, architecture, hardware limitations, equipment and frequency coverage. The resulting schedule comes in the form of a so-called VEX file, for which an international standard was defined, a plain-text human-readable equivalent of a database. This file is sent to the stations, where the control computer parses the schedule and translates it into a series of commands to the telescope control system and the recording/transmitting equipment. The decades-old code base makes the program extremely hard to modify in order to adapt it to the modern-day demands of VLBI networks. And in spite of the fact that several VLBI networks around the world depend on it, there is no formal support for SCHED in place.

The aim of this task will be to re-factor the existing code, rather than re-writing all from scratch. This will be done by separating out well-defined bits of functionality and re-writing these as individual modules in a modern language, most likely Python. In this way a “gold standard” will remain available throughout the process, enabling an incremental replacement of the original code base. Static parts of the code that do not need frequent modifications will be kept as they are. The end product will be a modernised version of SCHED that will be far easier to adapt, written in a widely used and well-known programming language. It will be usable for all aspects of the proposal-observational cycle, which means during the proposal phase, the programming by the PI and finally the actual generation of an observing schedule by the JIVE staff. This functionality will be essential for VLBI users in the SKA era. As an aside, we will set up a forum of SCHED experts and users, to ensure that the engineering effort will keep the different needs of different VLBI networks in mind.

Task 8.2: Remote access and monitoring In the past, monitoring of the elements of a VLBI array during observations used to be virtually impossible. Equipment failures, human mistakes or other mishaps would often only be noted during or even after correlation by inspecting the data, which might take place months after the actual observations. The advent of e-VLBI, transferring data in real time to the correlator, brought with it a considerable improvement in the communications between stations and correlator. However, VLBI observations are still mostly done using recorders, during sessions that hardly have any central overview of the network as a whole. This will be unavoidably the case for the proposed global VLBI, involving remote stations all over the world.

During the EC-funded NEXPReS project, a remote control and monitoring system was developed and deployed at a number of geodetic stations. This task will evaluate this product and other existing monitoring systems to find a common ground in order to ensure interoperability. It will adapt existing software for integration into a central infrastructure and set up web-based access techniques. The final product will be a central, web-based monitoring system, usable for both astronomical and geodetic VLBI. This system will be accessible to all involved, correlator and stations, and will serve to continuously monitor and assess the status of the VLBI network, enabling automated warnings in case of failures and providing the information needed to continuously improve the performance of the network. Such a system will also be of great value when helping with the commissioning of new VLBI telescopes, in particular in areas of the world where radio astronomy is not well-established yet.

Work on these tasks will be carried out at JIVE and TUM, while CHALMERS-OSO will provide hardware and personnel for testing the results in the field.

WP leader: JIVE (Arpad Szomoru)

Participation per Partner

Partner number and short name	WP8 effort
1 - JIV-ERIC	36.00
3 - CHALMERS	4.00
10 - TUM	24.00
Total	64.00

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D8.1	Setting up of SCHED re-factoring forum	1 - JIV-ERIC	Other	Public	3
D8.2	Document of SCHED	1 - JIV-ERIC	Report	Public	8
D8.3	Re-factored SCHED	1 - JIV-ERIC	Other	Public	36
D8.4	Evaluation software packages	10 - TUM	Report	Public	4
D8.5	Integration existing software into central infrastructure	10 - TUM	Other	Public	12
D8.6	Completed monitoring schedule	10 - TUM	Other	Public	24

Description of deliverables

D8.1 : Setting up of SCHED re-factoring forum [3]

Setting up of SCHED re-factoring forum

D8.2 : Document of SCHED [8]

document detailing what functionality of SCHED will be re-written, and method to be followed, based partly on input from SRFF

D8.3 : Re-factored SCHED [36]

re-factored SCHED

D8.4 : Evaluation software packages [4]
 Evaluation of different monitoring software packages

D8.5 : Integration existing software into central infrastructure [12]
 Integration of existing software into central infrastructure

D8.6 : Completed monitoring schedule [24]
 Completed monitoring system, deployed at JIVE and Geodetic obs. Wettzell

Schedule of relevant Milestones

Milestone number¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS24	Setting up of SCHED re-factoring forum	1 - JIV-ERIC	3	Setting up of SCHED re-factoring forum, noted by exec.
MS25	Document on SCHED	1 - JIV-ERIC	8	Document on SCHED, published to global community
MS26	Re-factored SCHED	1 - JIV-ERIC	36	Re-factored SCHED, available to user community
MS27	Evaluation software packages	10 - TUM	4	Evaluation software packages, noted by exec.
MS28	Integration existing software into central infrastructure	10 - TUM	12	Integration existing software into central infrastructure, noted by exec.
MS29	Completed monitoring schedule	10 - TUM	24	Completed monitoring schedule, available to telescope operators

Work package number ⁹	WP9	Lead beneficiary ¹⁰	12 - UMAN
Work package title	Capacity for VLBI in Africa		
Start month	1	End month	48

Objectives

The SKA is a transformational project with the aim to build up to 3000 dishes to extend current capabilities in radio astronomy by orders of magnitude. It is being constructed in a phased way with the 64 dish MeerKAT SKA-precursor following on from the KAT-7 prototype in the Karoo desert in the Northern Cape district. These will be integrated in the Phase 1 of the SKA mid-frequency array with the addition of 250 dishes in South Africa to be built over the 2018-2023 period with maximum 150km baselines. To provide the high angular resolution on the sky of the full SKA some of the remaining dishes will be spread over 1000s of kilometres, as well as work in tandem with existing VLBI arrays, in a ‘VLBI-mode’ (see WP10). So, although the core of the telescope will be in South Africa, the outlying stations will be located in 8 partner countries across Africa, namely: Botswana, Ghana, Kenya, Madagascar, Mauritius, Mozambique, Namibia and Zambia. Given that the stations in these countries will not be built until Phase 2 of the SKA project during 2023-30, and that there is virtually no research astronomy activity in the partner countries at present, the South African SKA project (SKA-SA) initiated the African VLBI Network project or AVN.

The AVN aims to establish a 30 m class radio telescope in each of the partner countries and link these together in a Very Long Baseline Interferometry (VLBI) network. This will operate in tandem with the European VLBI Network (EVN). This will be achieved through a combination of converting ex-telecommunications dishes, a programme that is mainly funded and driven by SKA-SA, and newly built antennas. These dishes will provide a focus for the development of radio astronomy in each partner country so that a skilled local team is ready to install, maintain and operate the SKA outstations when they arrive. Moreover, the aim is to establish astrophysics education and research communities in these countries as a springboard for wider technical and economic development.

This is a very ambitious objective since in most partner countries astrophysics and associated technologies are starting from scratch and so a significant amount of training is required. To this end a number of initiatives investing in the development of the AVN and training of scientists and engineers in partner countries are underway. Notably these include investments, initially through the period 2015-2017, via the Newton fund from South Africa and the UK’s Royal Society to provide basic training and experience. These initiatives, along with the efforts of SKA-SA, have already established a network of contacts within a number of African countries. Available resources have limited these efforts to only a few countries (Kenya, Zambia, Namibia & Ghana) so far. This WP will provide an expansion of these existing initiatives to include other AVN partner countries (initially Botswana, Madagascar, Mauritius and Mozambique). Working in tandem and building upon these existing activities, this WP will bring the wealth of technical, operational and scientific expertise residing in Europe into this effort. It will provide a tangible platform for the future success of the AVN and provide an early link with the EVN, paving the path for early AVN and eventually SKA science delivery. This will be done in a sustainable manner by providing skills and training for communities in AVN countries to enable their future success.

Description of work and role of partners

WP9 - Capacity for VLBI in Africa [Months: 1-48]
 UMAN, JIV-ERIC, UNIVLEEDS

To succeed in this goal this WP will provide the resources to expand and support on-going scientific and technical training initiatives. This will be broken down into 4 key objectives each of which will increase the links between European based VLBI expertise by providing a network of bi-directional training visits, and setting up a sustainable framework for future developments. The WP will target a number of AVN countries which are not currently supported by other initiatives (such as Newton) as well as provide added value and expertise to on-going activities, thus providing cost effective training delivery outcomes.

This WP will enable:

- European radio astronomers to participate as expert trainers in existing funded training activities in Africa thus broadening the base of European involvement in EU-Africa collaboration. This will build upon the existing UK’s Newton project by mobilizing additional VLBI expertise from partner institutes to extend and enhance this effort. These VLBI partners will provide enhanced training opportunities, via technical and scientific expertise which will organise and contribute to annual network training meetings. Currently these Newton training initiatives are underway in Kenya,

Zambia, Namibia & Ghana and are capacity limited. This WP will aid and expand the capacity of these schemes, including extending them to a number of new participating countries, such as Botswana, Madagascar and Mozambique.

- European radio astronomers to travel to AVN and prospective AVN institutions to give seminars or short lecture series to major physics departments in countries with an interest in developing radio astronomy. This will provide a flexible resource to broaden the base of African radio astronomy. Initial self-funded activities by this group have provided seminars (>2000 attendees, Jan 2016) in major Universities in Nigeria highlighting the scope of potential expansion and the significant interest in prospective AVN countries.
- The funding of a limited number of short term placements of African personnel with an interest in developing their radio astronomy expertise, in both scientific and technical/operational areas, with European institutes. The scientific, technical and operational experience of the partners in this proposal will provide an invaluable training opportunity for the burgeoning AVN community. Trips will provide critical operational training in how a VLBI station is run, hands-on training at European telescopes, exposure to radio astronomy research and attendance at meetings and training schools within Europe. This will also help to initiate and facilitate communication between AVN technical staff and the pool of expertise in Europe, opening up future collaborative opportunities.
- The setting up of an AVN technical & support personnel forum network to remotely connect technical and operational staff within AVN countries allowing the dissemination of knowledge throughout the continent and channel communication of technical issues with EU partners. This forum would provide an AVN equivalent to the highly successful EVN Technical and Operations Group and a self-coordinating technical body for future AVN activities, helping to provide longterm technical sustainability of the AVN.

Implementation and Deliverables:

Staff effort from UMAN, UNIVLEEDS and JIVE will be utilised, along with significant in-kind contributions from all partners, to deliver these training opportunities, host exchanges and manage this WP (UMAN). Relevant partners are assigned against individual objectives above. All partners will provide in-kind contributions to training trips in Africa and host exchanges within Europe. EVN institute (JIVE, UMAN, INAF, CHALMERS-OSO) partners will provide exposure to hands-on VLBI observing during EVN sessions. In conjunction with UMAN and SKA-SA, UNIVLEEDS who lead the existing Newton programme will dedicate 5 months of effort over the project duration to manage the interface between

these initiatives. This will be vital to maximise the impact and return of both programmes. The budget request for this WP is 120 kEuro for travel and subsistence expenditure to cover objectives 1-3. This will comprise of 10-15 trips per year over the 4yr duration of the WP at an average cost of ~2-3 kEuro per trip (note that cost of exchange trips, which will be of longer duration and based in Europe, will have a higher average cost). Travel will comprise of a mixture of EU experts travelling to Africa to deliver training and lectures, and AVN trainees undertaking short (~1-3 week) placements in Europe, or within Africa, for example to SKA-SA to utilize their expertise.

WP Lead UMAN (Rob Beswick) liaising with the existing NEWTON project at University of Leeds (Melvin Hoare) and DST South Africa (Antia Loots).

Participation per Partner

Partner number and short name	WP9 effort
1 - JIV-ERIC	9.60
11 - UNIVLEEDS	4.00
12 - UMAN	9.00
Total	22.60

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D9.1	Minutes of telecom 1	12 - UMAN	Report	Public	2

List of deliverables

Deliverable Number¹⁴	Deliverable Title	Lead beneficiary	Type¹⁵	Dissemination level¹⁶	Due Date (in months)¹⁷
D9.2	Mid-term report on training visits to African countries	12 - UMAN	Report	Public	23
D9.3	Final report on exchange visits to be hosted in Europe	12 - UMAN	Report	Public	47

Description of deliverables

D9.1 : Minutes of telecom 1 [2]
 Minutes of Telecom 1, kick-off meeting amongst WP partners

D9.2 : Mid-term report on training visits to African countries [23]
 Mid-term report on training visits to African countries

D9.3 : Final report on exchange visits to be hosted in Europe [47]
 Final report on exchange visits to be hosted in Europe

Schedule of relevant Milestones

Milestone number¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS30	Minutes of telecom 1	12 - UMAN	2	Minutes of telecom 1, noted by exec
MS31	Mid-term report on training visits to African countries	12 - UMAN	23	Mid-term report on training visits to African countries, noted by exec.
MS32	Final report on exchange visits hosted in Europe	12 - UMAN	47	Final report on exchange visits hosted in Europe, approved by board

Work package number ⁹	WP10	Lead beneficiary ¹⁰	1 - JIV-ERIC
Work package title	VLBI with the SKA		
Start month	1	End month	48

Objectives

The driver for this Work Package is to pursue the globalisation of VLBI in the advent of SKA, to dramatically enhance VLBI observations by providing significantly increased sensitivity and access to a broad range of spatial resolutions. With this Work Package, we will support this unique opportunity to explore the synergies between VLBI and the SKA.

Description of work and role of partners

WP10 - VLBI with the SKA [Months: 1-48]
JIV-ERIC, SKAO

Background. SKA1-MID, phase 1 of the mid-frequency telescope of the Square Kilometre Array (SKA), will be built in South Africa (with the low-frequency counterpart to be constructed in Australia). SKA1-MID is capable of providing very long and ultra-sensitive North-South baselines to the European VLBI Network (EVN), enabling exciting VLBI science to be achieved with this unique, global array. The SKA Organisation has initiated a number of international science working groups in order to inform and constrain the detailed design with high profile science cases. The SKA-VLBI Working Group was initiated in the summer of 2015 and has strong representation from JIVE/EVN, with the goal of identifying key science areas where SKA-VLBI will deliver breakthrough astrophysics.

Through the cooperation and coordination of work with the SKA, new and exciting opportunities will arise for global VLBI and JIVE. This Work Package is designed to achieve this through two well-defined tasks: to develop the operational model and the global science cases for SKA-VLBI.

Task 1. SKA-VLBI Operational Model. It is recognised that the development of SKA-VLBI requires a person with VLBI expertise to work closely with the SKA. This person will need to be located in the SKA office to ensure smooth communication channels between all stakeholders, namely, the SKA Office, the construction consortia, and JIVE. We identify a number of key outcomes to emerge from this task.

- Operational model for SKA-VLBI: Given that SKA construction is due to commence in 2018, it is important to ensure that science case developments are in line with existing SKA-VLBI requirements. Investigating this through a series of use cases and operational scenarios would ensure conformity with the SKA design. Commensal observing will be a common operational mode for the SKA. However, it is not clear whether this is also true for SKA-VLBI, and so it will be important to identify whether any technical or operational limitations exist to implementing this operational mode for SKA-VLBI and to increasing the observing efficiency and scientific throughput of VLBI.
- Interfaces: The interfaces between the VLBI and SKA require that there is someone identified to act as a liaison, or point-of-contact, between the SKA office, the construction teams and the global VLBI centres. This will occur at different levels of interaction, for example with the consortia responsible for the correlator or telescope managers. It will deal with data transport, and ensuring that the beam-formed data is in the correct format before being sent for correlation at the VLBI correlation centres. In addition, this work includes laying the foundations for establishing agreements between the SKA and the VLBI networks on issues such as proposal handling, time allocation, data rights and observation management. For instance, the SKA will expect to receive schedule blocks that conform with their telescope and observation management systems.
- Commissioning, test procedures and calibration strategy: Recognising that there is limited scope for SKA support of VLBI during the telescopes construction phase, there is a need to develop a commissioning and test plan for integrating the SKA into the VLBI network. This necessarily includes developing a calibration strategy.

In addition, in the course of much of this work it will be important to consider an upgrade path for SKA-VLBI commensurate with the development path of the SKA. The justification for this, and the requirements that would flow from there, will need to be documented and reviewed.

Task 2. Developing global VLBI science cases. The SKA1-MID will be a phased array with the capability of providing multiple beams over the field of view of individual dishes to observe multiple sources, and at the same time aid precision astrometry. The local interferometer data will complement the high-resolution VLBI results, providing simultaneous images of the sky at a broad range of angular resolutions. The unique combination of high-sensitivity and high-resolution capabilities have not been possible with traditional VLBI arrays. As such VLBI with the SKA is a fundamental tool providing for a wide range of SKA key science including maser astrometry, proto-planetary disks, Galactic and

extragalactic structure, mapping stellar magnetic fields, pulsar astrometry and the localisation of transients on all timescales. SKA1-MID will also be capable of providing triggers to the EVN for following-up transient phenomena.

Our aim is to bring together VLBI experts to work on new research projects in the field of precision astrometry, large field-of-view VLBI, VLBI surveys and transients, in order to prepare for scientific exploration of SKA-VLBI. This will result in custom-designed use cases and possible science projects, as well as surveys with traditional VLBI, or other (pathfinder) facilities in preparation for possible SKA-VLBI Key Science Programmes. Involvement of experts as well as promising young scientists is important at this stage.

The aim of this task is to bring together VLBI experts to work on new science cases under the umbrella of the high precision astrometry provided by SKA-VLBI. This will allow the optimal preparation for the full scientific exploration of the science that will be enabled by SKA-VLBI, resulting in custom-designed use cases and science projects in the many VLBI-related science areas identified in the SKA Science Book (2015), as well as surveys with traditional VLBI, SKA pathfinder facilities in preparation for possible SKA-VLBI Key Science Programmes. Involvement of established experts, as well as talented young scientists, is vital at this stage. This task will support the SKA Science and Operations Teams, the SKA VLBI Working Group (core and associated members), as well as other VLBI experts. Besides workshops, we propose to support a number of working visits.

WP Lead: JIVE (Zsolt Paragi) and SKAO (Antonio Chrysostomou)

Participation per Partner

Partner number and short name	WP10 effort
7 - SKAO	24.00
Total	24.00

List of deliverables

Deliverable Number ¹⁴	Deliverable Title	Lead beneficiary	Type ¹⁵	Dissemination level ¹⁶	Due Date (in months) ¹⁷
D10.1	Details on VLBI interfaces to SKA consortia	7 - SKAO	Report	Public	24
D10.2	Operational plan for inclusion of SKA in Global VLBI	7 - SKAO	Report	Public	36
D10.3	Portfolio of SKA-VLBI Science cases	1 - JIV-ERIC	Report	Public	30
D10.4	Report on SKA-VLBI Key Science Projects	1 - JIV-ERIC	Report	Public	42

Description of deliverables

D10.1 : Details on VLBI interfaces to SKA consortia [24]
 Details on VLBI interfaces to SKA consortia

D10.2 : Operational plan for inclusion of SKA in Global VLBI [36]
 Detailed operational plan for inclusion of SKA in Global VLBI

D10.3 : Portfolio of SKA-VLBI Science cases [30]
 Portfolio of SKA-VLBI Science cases with details on science requirements

D10.4 : Report on SKA-VLBI Key Science Projects [42]

Report on SKA-VLBI Key Science Projects

Schedule of relevant Milestones

Milestone number¹⁸	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS33	Details on VLBI interfaces to SKA consortia	7 - SKAO	24	Details on VLBI interfaces to SKA consortia, noted by SKA VLBI working group
MS34	Operational plan for inclusion of SKA in Global VLBI	7 - SKAO	36	Operational plan for inclusion of SKA in Global VLBI, noted by SKA VLBI working group
MS35	Portfolio of SKA-VLBI Science cases	1 - JIV-ERIC	30	Portfolio of SKA-VLBI Science cases, approved by SKA VLBI working group
MS36	Report on SKA-VLBI key science projects	1 - JIV-ERIC	42	Report on SKA-VLBI key science projects, noted by SKA VLBI working group

1.3.4. WT4 List of milestones

Milestone number ¹⁸	Milestone title	WP number ⁹	Lead beneficiary	Due Date (in months) ¹⁷	Means of verification
MS1	First periodic report	WP1	1 - JIV-ERIC	18	First periodic report, approved by board
MS2	Second periodic report	WP1	1 - JIV-ERIC	36	Second periodic report, approved by board
MS3	Final periodic report	WP1	1 - JIV-ERIC	48	Final periodic report, approved by board
MS4	Brochure	WP2	1 - JIV-ERIC	14	Brochure explaining the principles and practices of VLBI, approved by exec.
MS5	Display	WP2	1 - JIV-ERIC	24	Display to be used at conferences, approved by exec
MS6	Report on advocating the EVN	WP2	1 - JIV-ERIC	18	Report on advocating the EVN outside regular circles, approved by board
MS7	Final report on attracting new users for the EVN	WP2	1 - JIV-ERIC	47	Final report on attracting new users for the EVN, shared with EVN-CBD
MS8	Inventory of state of VLBI involvement	WP3	1 - JIV-ERIC	8	Inventory of state of VLBI involvement, shared with JIV-ERIC council
MS9	Progress report on working with national representatives	WP3	1 - JIV-ERIC	24	Progress report on working with national representatives, shared with the JIV-ERIC council
MS10	Final report on JIV-ERIC memberships	WP3	1 - JIV-ERIC	46	Final report on JIV-ERIC memberships, shared with JIV-ERIC council
MS11	Workshop board discussing position papers	WP4	9 - ILT	16	Workshop board discussing position papers, noted by JIV-ERIC council and ILT board
MS12	Workshop with external experts	WP4	9 - ILT	30	Workshop with external experts, noted by JIV-ERIC council and ILT board
MS13	Final documents	WP4	9 - ILT	35	Final documents, approved by JIV-ERIC council and ILT board
MS14	Reports to TOG	WP5	1 - JIV-ERIC	18	Reports to the TOG, minuted by EVN TOG
MS15	Changes in pipeline & EVN archive interface	WP5	1 - JIV-ERIC	42	Changes in pipeline & EVN archive interface, published to community

Milestone number¹⁸	Milestone title	WP number⁹	Lead beneficiary	Due Date (in months)¹⁷	Means of verification
MS16	Final report on integrating new elements	WP5	6 - MFOM-E	46	Final report on integrating new elements, minuted by EVN TOG
MS17	New correlator data products	WP6	1 - JIV-ERIC	12	New correlator data products, available to user community
MS18	Software to deal with geodetic observing schedules	WP6	1 - JIV-ERIC	18	Software to deal with geodetic observing schedules, available to user community
MS19	Analysis of EVN station positions	WP6	2 - CNRS	40	Analysis of EVN station positions, presentation to EVN TOG
MS20	Minutes of Kick-off meeting	WP7	1 - JIV-ERIC	7	Minutes of Kick-off meeting, noted by EVN CBD
MS21	Minutes of meeting 2	WP7	5 - INAF	15	Minutes of meeting 2, noted by EVN CBD
MS22	Minutes of meeting 3	WP7	5 - INAF	30	Minutes of meeting 3, noted by EVN CBD
MS23	White paper	WP7	5 - INAF	45	White paper, approved by EVN CBD
MS24	Setting up of SCHED re-factoring forum	WP8	1 - JIV-ERIC	3	Setting up of SCHED re-factoring forum, noted by exec.
MS25	Document on SCHED	WP8	1 - JIV-ERIC	8	Document on SCHED, published to global community
MS26	Re-factored SCHED	WP8	1 - JIV-ERIC	36	Re-factored SCHED, available to user community
MS27	Evaluation software packages	WP8	10 - TUM	4	Evaluation software packages, noted by exec.
MS28	Integration existing software into central infrastructure	WP8	10 - TUM	12	Integration existing software into central infrastructure, noted by exec.
MS29	Completed monitoring schedule	WP8	10 - TUM	24	Completed monitoring schedule, available to telescope operators
MS30	Minutes of telecom 1	WP9	12 - UMAN	2	Minutes of telecom 1, noted by exec
MS31	Mid-term report on training visits to African countries	WP9	12 - UMAN	23	Mid-term report on training visits to African countries, noted by exec.
MS32	Final report on exchange visits hosted in Europe	WP9	12 - UMAN	47	Final report on exchange visits hosted in Europe, approved by board

Milestone number¹⁸	Milestone title	WP number⁹	Lead beneficiary	Due Date (in months)¹⁷	Means of verification
MS33	Details on VLBI interfaces to SKA consortia	WP10	7 - SKAO	24	Details on VLBI interfaces to SKA consortia, noted by SKA VLBI working group
MS34	Operational plan for inclusion of SKA in Global VLBI	WP10	7 - SKAO	36	Operational plan for inclusion of SKA in Global VLBI, noted by SKA VLBI working group
MS35	Portfolio of SKA-VLBI Science cases	WP10	1 - JIV-ERIC	30	Portfolio of SKA-VLBI Science cases, approved by SKA VLBI working group
MS36	Report on SKA-VLBI key science projects	WP10	1 - JIV-ERIC	42	Report on SKA-VLBI key science projects, noted by SKA VLBI working group

1.3.5. WT5 Critical Implementation risks and mitigation actions

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
1	There is a risk of not being able to find suitable candidates for new staff positions. This risk is medium for a number of tasks that depend on new staff.	WP10, WP2, WP5, WP6	Advertise jobs widely, start acquisition early, consider internal candidates
2	Other tasks have a lower risk that we cannot make hires in time, as the work depends less on new staff.	WP3, WP4, WP7, WP8, WP9	Advertise jobs widely, start acquisition early, consider internal candidates
3	It could prove hard in WP2 to interest astrophysicists to consider VLBI for their science projects, as they must make their own decisions. Medium.	WP2	We will set-up a steering committee that will give advise on an optimal strategy.
4	The risk associated with WP3, “Building new Partnerships”, is that no new partnerships materialise. This is inherent to the type of activity, with many factors contributing to its success, many of which are not controlled by the project. Considering this WP involves several institutes that have already made the first steps towards a closer collaboration with JIVE and the EVN, we think this risk is low. The risk to the work itself and the deliverables is very low, as the work will be done one way or the other.	WP3	No risk-mitigating measures available, formally not a risk.
5	There is a low risk in WP4 that the board/council of the existing JIV-ERIC and ILT are not interested to discuss joint governance.	WP4	Already announced in both bodies that we are proposing this activity.
6	Part of WP5, “Integrating new Elements”, has a risk similar to that of WP3, namely that no new elements become available. Also in this case, the risk is low as there is a stated interest from many potential new participants. As a large part	WP5	No risk-mitigating measures available, formally not a risk.

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
	of the work will focus on existing partners anyway, this poses only a minor risk. The proposed deliverable will be reported anyway.		
7	The risk in re-factoring SCHED is not so much the engineering challenge, as well as the acceptance by the general VLBI community. This risk is low, as the drive for a modernised SCHED is broadly supported	WP8	Set up a world-wide forum of experts, for advice and consultation, to ensure that the end result will be useful for and usable by different VLBI networks
8	“Capacity for VLBI in Africa” could be affected by changes in priorities in African countries. The risk is low, as the WP targets many different countries. We can still do the training aspects if the telescopes are delayed.	WP9	No risk-mitigating measures available
9	There is low risk that the SKA project gets delayed or diverted in such way that the discussion on VLBI operations becomes irrelevant.	WP10	We will monitor and support SKA-VLBI at all levels and continue to push for global VLBI with SKA pathfinders in any case.

1.3.6. WT6 Summary of project effort in person-months

	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	WP10	Total Person/Months per Participant
1 - JIV-ERIC	19	42	11.80	4.60	50.40	12	3.60	36	9.60	0	189.00
2 - CNRS	0	0	0	0	0	24	0	0	0	0	24
3 - CHALMERS	0	0	0	0	0	0	3	4	0	0	7
4 - DST	0	0	0	0	0	0	0	0	0	0	0
5 - INAF	0	0	0	0	0	0	9	0	0	0	9
6 - MFOM-E	0	0	0	0	0	0	0	0	0	0	0
7 - SKAO	0	0	0	0	0	0	0	0	0	24	24
8 - ASTRON	0	0	0	6	0	0	0	0	0	0	6
9 - ILT	0	0	0	0	0	0	0	0	0	0	0
10 - TUM	0	0	0	0	0	0	0	24	0	0	24
11 - UNIVLEEDS	0	0	0	0	0	0	0	0	4	0	4
12 - UMAN	0	0	0	0	0	0	0	0	9	0	9
Total Person/Months	19	42	11.80	10.60	50.40	36	15.60	64	22.60	24	296

1.3.7. WT7 Tentative schedule of project reviews

Review number ¹⁹	Tentative timing	Planned venue of review	Comments, if any
RV1	21	Brussels	
RV2	50	Brussels	

1. Project number

The project number has been assigned by the Commission as the unique identifier for your project. It cannot be changed. The project number **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

2. Project acronym

Use the project acronym as given in the submitted proposal. It can generally not be changed. The same acronym **should appear on each page of the grant agreement preparation documents (part A and part B)** to prevent errors during its handling.

3. Project title

Use the title (preferably no longer than 200 characters) as indicated in the submitted proposal. Minor corrections are possible if agreed during the preparation of the grant agreement.

4. Starting date

Unless a specific (fixed) starting date is duly justified and agreed upon during the preparation of the Grant Agreement, the project will start on the first day of the month following the entry into force of the Grant Agreement (NB : entry into force = signature by the Commission). Please note that if a fixed starting date is used, you will be required to provide a written justification.

5. Duration

Insert the duration of the project in full months.

6. Call (part) identifier

The Call (part) identifier is the reference number given in the call or part of the call you were addressing, as indicated in the publication of the call in the Official Journal of the European Union. You have to use the identifier given by the Commission in the letter inviting to prepare the grant agreement.

7. Abstract

8. Project Entry Month

The month at which the participant joined the consortium, month 1 marking the start date of the project, and all other start dates being relative to this start date.

9. Work Package number

Work package number: WP1, WP2, WP3, ..., WPn

10. Lead beneficiary

This must be one of the beneficiaries in the grant (not a third party) - Number of the beneficiary leading the work in this work package

11. Person-months per work package

The total number of person-months allocated to each work package.

12. Start month

Relative start date for the work in the specific work packages, month 1 marking the start date of the project, and all other start dates being relative to this start date.

13. End month

Relative end date, month 1 marking the start date of the project, and all end dates being relative to this start date.

14. Deliverable number

Deliverable numbers: D1 - Dn

15. Type

Please indicate the type of the deliverable using one of the following codes:

R	Document, report
DEM	Demonstrator, pilot, prototype
DEC	Websites, patent filings, videos, etc.
OTHER	
ETHICS	Ethics requirement

16. Dissemination level

Please indicate the dissemination level using one of the following codes:

PU Public
CO Confidential, only for members of the consortium (including the Commission Services)
EU-RES Classified Information: RESTREINT UE (Commission Decision 2005/444/EC)
EU-CON Classified Information: CONFIDENTIEL UE (Commission Decision 2005/444/EC)
EU-SEC Classified Information: SECRET UE (Commission Decision 2005/444/EC)

17. Delivery date for Deliverable

Month in which the deliverables will be available, month 1 marking the start date of the project, and all delivery dates being relative to this start date.

18. Milestone number

Milestone number: MS1, MS2, ..., MSn

19. Review number

Review number: RV1, RV2, ..., RVn

20. Installation Number

Number progressively the installations of a same infrastructure. An installation is a part of an infrastructure that could be used independently from the rest.

21. Installation country

Code of the country where the installation is located or IO if the access provider (the beneficiary or linked third party) is an international organization, an ERIC or a similar legal entity.

22. Type of access

VA if virtual access,
TA-uc if trans-national access with access costs declared on the basis of unit cost,
TA-ac if trans-national access with access costs declared as actual costs, and
TA-cb if trans-national access with access costs declared as a combination of actual costs and costs on the basis of unit cost.

23. Access costs

Cost of the access provided under the project. For virtual access fill only the second column. For trans-national access fill one of the two columns or both according to the way access costs are declared. Trans-national access costs on the basis of unit cost will result from the unit cost by the quantity of access to be provided.

HISTORY OF CHANGES

Deliverable 1.2 added (D1.2 second periodic report)
Small changes to description Participant 6
Addressed Ethics issues category NEC
Affiliations added to all staff mentioned in document

TABLE OF CONTENTS

1 Excellence	3
1.1 Objectives	4
1.2 Relation to the work programme	6
1.3 Concept and methodology, quality of the coordination and support measures	8
2 Impact	10
2.1 Expected progress	10
2.2 Measures to maximise impact	11
2.2.1 <i>Dissemination and exploitation of results</i>	11
2.2.2 <i>Communication activities</i>	12
3 Implementation	14
3.1 Work plan – Work Packages and deliverables	14
3.2 Management structure and procedures	15
3.3 Consortium as a whole	16
3.4 Resources to be committed	17
4 Members of the consortium	45
4.1 Participants	45
4.2 Third parties involved in the project (including use of third party resources)	64
5 Ethics and security	64
5.1 Ethics	64
5.2 Security	64

1 Excellence

The way VLBI has developed can be seen as an excellent example of how European research infrastructures could be organised. Starting three decades ago as a bottom-up collaboration, the European VLBI Network (EVN) pioneered the use of this technique, obtaining the very first scientific results and forging the collaborations that would lay the foundations for future radio-astronomical networks. Twenty years ago, the Joint Institute for VLBI in Europe (JIVE) was founded, to host the central processor of the EVN, provide user support and promote the use of VLBI in all its aspects. In 2015, the continuous growth and evolution of both EVN and JIVE culminated in the transformation of JIVE from a foundation under Dutch law to a European Research Infrastructure Consortium, the Joint Institute for VLBI ERIC.



Highlights of the opening ceremony of the JIVE ERIC.

Throughout, the EVN has maintained its character as an open collaboration, attracting new partners from all over the world. Supported by national agencies and often catalysed by EC programmes (RadioNet, (N)EXPreS), the EVN/JIVE research infrastructure has been able to effectively use advances in digital technology to become a world-leader in the field.

The establishment of a new legal entity at the heart of the EVN was timely as the landscape in radio astronomy is changing rapidly, with global partners making a concerted effort to build the Square Kilometer Array, now an ESFRI Landmark. This development will offer new opportunities for the VLBI partners to join forces in establishing global services, that will make optimal use of the SKA, its technology and its anticipated scientific output.

Through JIVE, Europe is very well positioned to take a leading role in this process. This will benefit the European scientists who will have direct access to the enhanced infrastructure, but it also ensures that the nationally operated telescopes continue to participate in cutting edge science. Moreover, it provides an excellent way for the European radio astronomy community

at large to engage in radio astronomy with the SKA, as only few European countries are currently connected directly to its development.

There are many strong points in the JIVE/EVN collaboration that we can build on when shaping the Global VLBI Facility of the future. Scientifically, the EVN has a head start with its large, sensitive dishes and its strong tradition of technological innovation. Organisationally, it has established an international entity at its centre, while maintaining a low threshold for new members, attracting partners from all over the world. Additionally, the EVN has been able to build up a strongly committed, distributed user community, including user groups in countries without radio astronomy facilities. The EVN has a user model in which the astronomers are fully engaged in the organisation of their observations, albeit with dedicated support available at all stages. Furthermore the EVN/JIVE has innovated a number of the operational aspects of VLBI that will set implicit and explicit standards for global VLBI.



Map of current VLBI telescopes that carry out joint observations with JIVE/EVN; lights indicate which telescopes were being processed at the time of the picture.

Through the proposed work programme, “JUMPING JIVE”, we can start addressing many of the critical strategic issues that JIVE is facing in this process. On the one hand, we must attract more partners in Europe and communicate the value of the new European entity. In the process we aim to reach a larger user base by expanding the range of scientific services. On the other hand, on a global scale, we want to advocate the standards established in the EVN as best practices for organising global VLBI experiments, including the SKA as an element. We identify a number of opportunities to become the de-facto world leader, by taking responsibility for some crucial operational interfaces. In some cases this will require us to take charge of software maintenance and overhaul activities.

1.1 Objectives

We identify a number of excellent opportunities to strengthen JIVE, advocate its services and enlarge its partnerships, in preparation for global VLBI in the SKA era:

- The first objective is to solidify JIVE’s presence in Europe’s radio astronomy community. It is of vital importance to establish an efficient outreach process for the VLBI research infrastructure. Too often exciting results reach the general public only in the countries where the leading scientists reside, while the potential to highlight the use of the

distributed astronomical facility is missed. The principles for structuring this have been established within the EVN, but the required dedicated manpower at JIVE is not part of its current operational budget.

- Raising the public awareness of JIVE and the EVN is also necessary for expanding partnerships in the ERIC. Some countries contribute telescope time to the EVN, but not to the central resources for correlation and user support. In addition, initiatives have been proposed in several countries to join the EVN with new or existing antennas. Facilitating such initiatives requires an advocacy effort aimed at both policy makers and potential scientific users. In cases where a more advanced stage is reached, some support by legal experts will be needed to work out collaborative agreements.
- We propose to use the same expertise to investigate whether it is feasible to expand the scope of the ERIC that was established for JIVE. The International LOFAR Telescope (ILT) is currently a foundation like JIVE was before 2014. There is significant overlap in the nations and the technical facilities now involved, and in the ambitions for expansion across Europe. We propose to engage the board/council members of JIVE and the EVN, and the board/management of the International LOFAR Telescope with its affiliated national LOFAR consortia, in a discussion to explore advantages and pitfalls of forging either a close collaboration or an eventual full merger between JIVE and ILT; this will take into account both governance, financing, and operational topics.
- Another issue that is important for the European base of JIVE/EVN is the further integration of new telescopes. We identify a number of efforts to establish new operational elements or new integration of existing elements. In order to channel these efforts effectively towards more science use we want to facilitate technical support for these efforts by providing funds for direct visits by EVN experts or travel of prospective telescope staff to operational sites. In particular we propose to dedicate effort at the correlator for verifying calibration data, this being one of the main hurdle between new telescope (modes) and the scientific user community.
- We recognize that the motivation of many of our existing and new partners comes not just from an interest in astrophysics, but also in geodesy. For JIVE to be a more attractive partner we propose to verify the geodetic properties of the JIVE data path. Being able to advertise the geodetic and astrometric capabilities of JIVE/EVN will be an asset, as currently astrometric processing can only be done in relative (phase referencing) mode. It is also highly relevant for the space applications that JIVE and its partners wish to develop.
- Our development path will be guided through a user consultation on long-term scientific priorities. We argue that aiming for a global VLBI facility is important for JIVE, considering the prospect of new opportunities that SKA will bring in the next decade. We propose to bring together European and global experts, authorities in their fields, to work out these priorities.
- In line with the ambition to work towards a Global VLBI Facility, we identify a number of operational interface issues that should be addressed. Some of these interfaces have used the same software for several decades, and developing new standards and tools will be of key importance for organizing global VLBI in the future. We think the VLBI scheduling software should be addressed most urgently, especially as it is still used directly by the science community to drive VLBI experiments. Although progress has been made by JIVE engineers to define new standards for observing schedules, these are not useful for the international community without proper software tools. In consultation with global partners we wish to overhaul the existing tool to a modern platform, for a much better user

experience and operational efficiency. In the context of efficiency, and with potential new telescopes in mind, we wish to greatly improve the coherence of the VLBI network by deploying remote monitoring and control mechanisms at all telescopes.



The first cohort of Kenyan trainees in front of the 30m dish at Longonot during training undertaken by the team from UMAN.

- Important for the success of VLBI with the SKA is the establishment of an operational African VLBI Network (AVN), currently under development. Based on a South-African initiative to refurbish existing communication dishes, this is an important means to increase the capacity for astronomy in African countries. JIVE has recognized the strategic importance of this effort for doing joint observations with the EVN, reaching for longer and more Southern baselines. We propose to make the support for this effort more tangible by implementing a large-scale exchange programme for researchers and technicians, based on our expertise in engaging new communities. It will also be important to support the processing and data quality control of African VLBI data at the JIVE facility.
- We see a great challenge to work with international partners to organise a Global VLBI Infrastructure. We argue that such a collaboration is needed to effectively organise observing time for VLBI with the SKA, providing user access, establish global standards and interfaces and designate regional correlator centres for processing and user support. A key factor in this process is the support we propose for the SKA VLBI Working Group, which is engaged with the SKA organisation in the definition of high resolution science programmes and their technical requirements. We will support that effort by organising workshops and enabling attendance by its international workgroup members, but also by the funding of longer visits to develop quantitative science cases. Furthermore we will appoint a VLBI liaison officer at the SKA organisation. We think this is very important, as the SKA project is divided into a number of technical areas addressing specific functionalities, with VLBI scattered over many of these areas.

1.2 Relation to the work programme

By virtue of its foundation in 2014, the JIV-ERIC qualifies as an excellent European Research Infrastructure. It should be noted that operating the total astronomical facility for the scientific users is a responsibility shared with the EVN, a consortium of telescope operators that contribute the essential distributed resources. Key organisations from this consortium are therefore partners in this proposal.

The establishment of JIV-ERIC, central to the EVN operations, provides solid footing for a sustainable organisation. However, as the national resources contributed to JIVE are almost exclusively aimed at an operational role, we see the proposed programme as a critical step towards becoming a recognized authority amongst European radio astronomy operators and scientists. With more European partners it will become possible to maintain a VLBI facility that includes proper outreach, communication and a strong innovation programme. The project will initially address these issues through coordination measures for outreach and advocacy of the science capabilities. In a more advanced stage, it will support the legal processes involved in new memberships.

Moreover, there is some urgency to establish more collaboration on a global scale. We see a fantastic opportunity for our European research infrastructure to play a defining role in the establishment of the Global VLBI Facility. Through earlier programmes we have a lead in innovating the standards and practices of VLBI, for example by pioneering e-VLBI. Since the successful NEXPREs programme, the EVN has continued to offer and enhance the e-VLBI standard for rapid return science. Introducing e-VLBI has considerably changed the way VLBI science is pursued, on the one hand increasing reliability by providing immediate feedback for telescope operations, on the other hand allowing researchers to do their science more interactively. The operational and technical expertise acquired are excellent starting points to define global standards and optimise VLBI for the SKA era; this way we will be able to offer exciting, complementary scientific capabilities and support the community with high quality and readily usable data products.



*Participants of the European Radio Interferometry School
in front of the Westerbork Telescope (2013)*

Considering capacity building, there is a well-established practice of exchanging post-doctoral research fellows in radio astronomy, where truly international careers are the norm. This is valuable for spreading expertise around the world. We realise that this practice is however limited to scientists involved in astronomy. In this project we wish to create similar opportunities for engineers and geodesy experts. Moreover, we want to engage more African scientists in this practice, taking full advantage of the opportunity to join forces with burgeoning radio astronomy institutes in African countries.

The revolutionary progress in radio astronomy over the last decade, and in VLBI in particular, stems from advances in digital equipment. During this process we have worked with industry, and with national research network providers in order to establish new protocols and new applications. Although no R&D is proposed in this programme, we are building on these collaborations to implement and overhaul existing practices. In this regard the proposed programme will allow an operational implementation of previous R&D results.

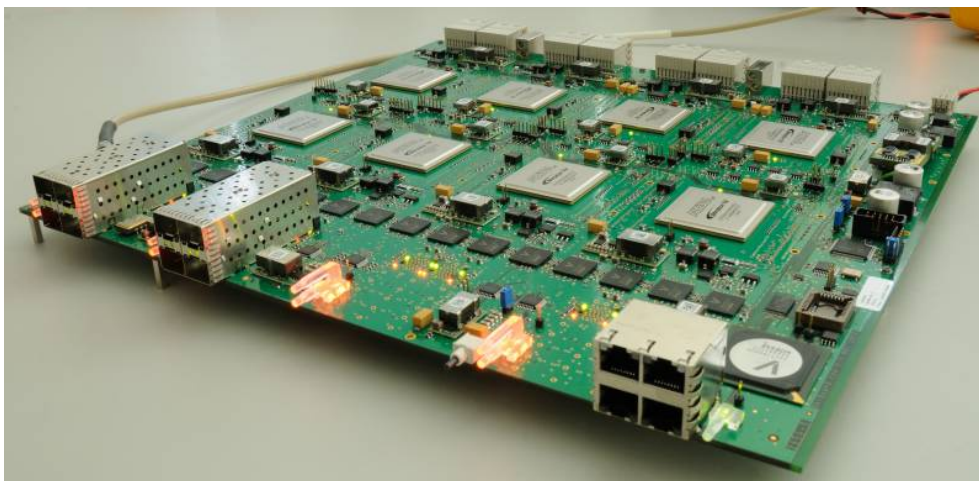
Besides this link to industrial development, the societal value of astronomy is to engage (young) people in science and make them wonder about our place in the cosmos. The proposed effort in WP2 addresses a missed opportunity to share the excitement of VLBI astronomy.

1.3 Concept and methodology, quality of the coordination and support measures

The strategy behind this proposal is to strengthen the identity of JIVE-ERIC in Europe and to promote the establishment of a Global VLBI Facility for the next decade.

JIVE has a fantastic track record in providing user access to EVN data. Over the years we have consistently worked on providing the best possible data products, including calibration and preliminary images where possible. This full transparency on the data quality is complemented by a programme of extensive user support in all steps of the VLBI process. It should be noted that we provide open access to all data after a proprietary period of one year for the original proposers of a specific observation. This operational practice has been implemented with the support of the EVN TNA programme in a number of consecutive RadioNet projects and has resulted in a steadily growing user base across Europe.

On a technological level, JIVE and its partners have conducted a number of exciting innovation programmes. One highlight has been the introduction of real-time VLBI, connecting telescopes to the JIVE correlator by high-speed fibre links. This has allowed a revolution in radio astronomy studies of transient phenomena. These developments are currently being carried forward to other (ESFRI-listed) astronomy facilities through the Horizon2020 ASTERICS project, in which JIVE and partners are working, among others, on time standard protocols. These developments also have implications for space science applications; observations of spacecraft with VLBI allow very accurate trajectory determinations, relevant for planetary science and fundamental physics. Finally, in order to match the increasing bandwidth of future VLBI observations, JIVE has continued the development of correlator platforms, for example by deploying an FPGA-based correlator developed through the RadioNet UniBoard project.

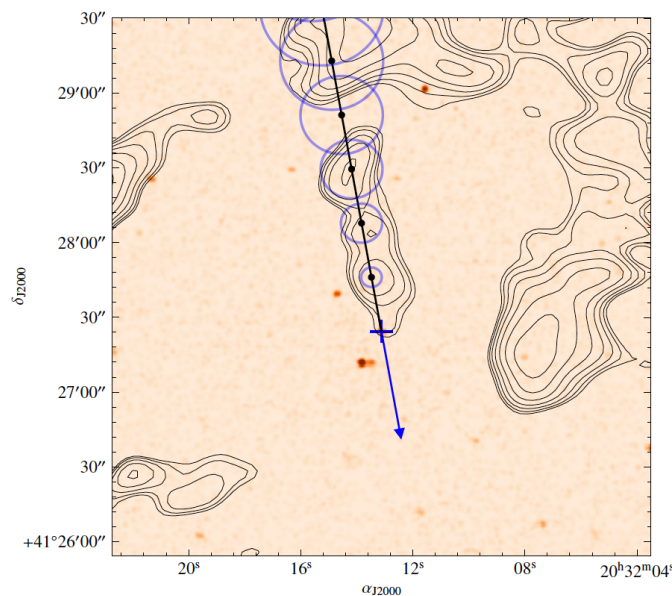


The FPGA-based correlator – UniBoard

However, despite a vibrant R&D programme and excellent science operations, we are clearly lacking capacity for outreach, resources to advertise our science and involving new partners in JIVE. There is little room for this available in the budget of JIVE, which is mainly aimed at science operations, nor are these resources applied for in the RadioNet proposal currently being prepared, which is mostly aimed at access support and new analysis software methods for the EVN. We propose to gather a small team at JIVE to shape our outreach and policy development efforts. Moreover, we see various opportunities to support community efforts by this team in order to develop operational scenarios and science cases for the VLBI of the future and to extend the scope of JIVE.

In addition, we propose in this programme to implement a number of interfaces that will allow us to broaden and strengthen our capacity to serve the user community. Taking control of some operational tools for the facility is not only important for serving the science users, but also an opportunity to assume leadership in the global arena. By providing access tools that adhere to established standards the commitment to these standards will increase. The proposed work is limited to relatively straightforward, but important implementation work, based on principles derived during previous R&D efforts.

JIVE and partners have a solid track record collaborating in EC projects, as JIVE was the coordinator in the (N)EXPREs projects, which received an excellent evaluation. JIVE management has recently completed the transition from a Dutch foundation into an ERIC and we intend to use the built-up expertise and momentum to extend our partner base in the next 4 years. Based on our experiences we think we can implement this programme with a relatively modest, but effective management structure, which in places overlaps with the ERIC management.



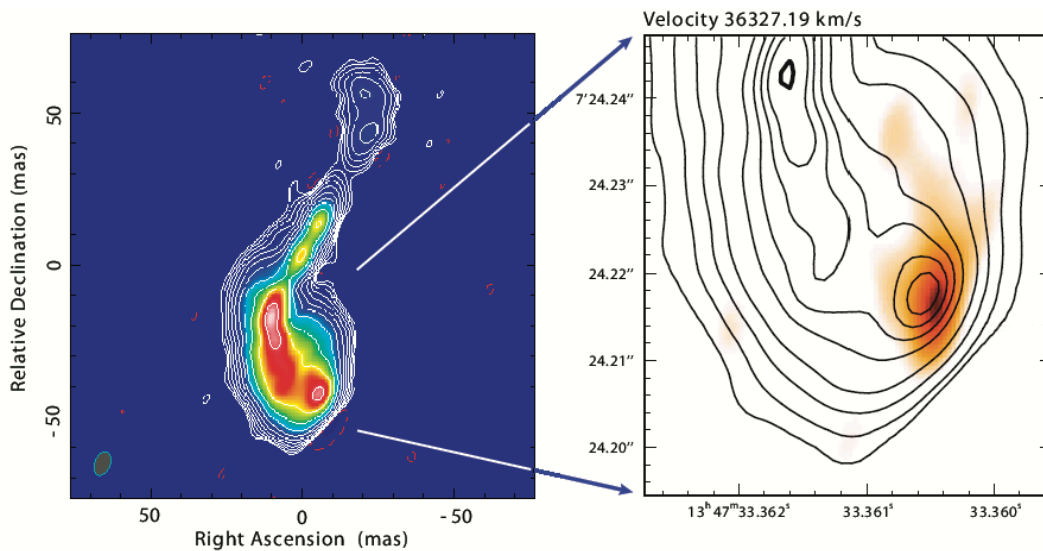
The power of VLBI astrometry is demonstrated by this study that relates structures in the interstellar medium to the trajectory of a pulsar (Moldon et al, 2016 in prep.).

2 Impact

The transformation of JIVE in 2014 from a foundation into an ERIC has not resulted in a larger budget. JIVE has the resources for its operational role and some capacity to take R&D initiatives. However, the capacity to profile its role in the European research arena is clearly lacking. This proposed programme should bring more partners to JIVE, extend its scope and make it more viable in the long run. The ambition to become a global leader in the field is complementary to this, as it will make JIVE a more attractive organisation to join.

2.1 Expected progress

Promoting JIVE as a European research entity is expected to be an important step towards a sustainable situation in which a flexible VLBI network is available for European researchers. The resources for this European facility must be contributed by countries, mainly those that host radio telescope facilities. In a time that the plans for the SKA are becoming concrete, it will be essential to communicate that JIVE is an attractive partner for many European astronomy initiatives. We will do this by putting more emphasis on the science results that the VLBI facility is producing, as well as the potential of technical innovations that are on-going. But we will also implement strategic efforts that potentially broaden the scope of JIVE, attracting more partners.



Global VLBI image of a young, restarting active galactic nucleus (AGN). The right panel shows absorption by atomic Hydrogen at the terminating point of the jet, as a result of the strong interaction between the relativistic jet and the interstellar medium (Morganti et al. 2013, Science, 341, 1082).

Moreover, through the policy work, but certainly also through the proposed re-engineering effort, we will establish or enforce standards for VLBI operations and intermediate data products. This is mostly relevant on a global scale where intercontinental VLBI will grow in importance during the next decade. This global VLBI effort will also be an important stepping-stone, both in defining the science applications and operational model, for the SKA Phase 2, which will provide many more long baselines.

Importantly, these efforts will contribute to a healthy radio astronomy community in Europe and thus help building the necessary capacity in Europe to take full advantage of the SKA, also

in countries that are not partners in its development. This also holds for the technical expertise that is needed to maintain and improve the radio astronomy facilities. In various programmes these efforts have tight links with local industry.

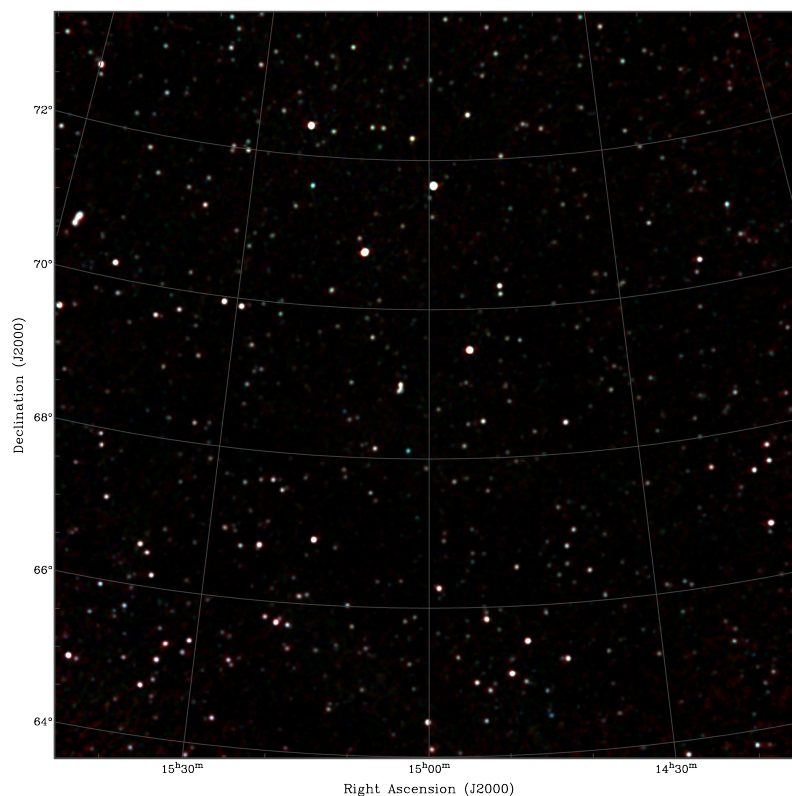
Ultimately, through its role of operating a large-scale infrastructure (EVN) and with the unique expertise in real-time e-VLBI, a JIV-ERIC with firm partner commitments and a strong network of collaborations across the globe, will be ready when the SKA Phase 2 will deploy new telescope dishes spread over several thousands of kilometres

2.2 Measures to maximise impact

2.2.1 Dissemination and exploitation of results

The team at JIVE, consisting of the outreach and policy officers, will carry out the dissemination efforts of this project. They will use the science output of the EVN, as well as any results obtained in the course of the project. Together with the coordinator and the JIVE management they will bundle scientific results with policy arguments and target new potential partners. It will be important to establish and maintain contacts in countries that have shown an interest in joining the VLBI network. In this process we will publish various materials, including a brochure on science results and organisation.

At the same time we will engage in discussions with other radio astronomy collaborations to investigate whether the JIV-ERIC can be useful to serve other communities. In the case of the International LOFAR Telescope this will involve a discussion at the council/board level concerning the merits of a close collaboration or even a merger into a single ERIC. We propose to prepare a document, to be made public eventually, that describes the potential impact on the ERIC statutes and procedures, and possible changes in governance for the various national LOFAR partners.



Results of the LOFAR sky survey; thousands of new targets for future study

The proposed 4-year programme will be a success if the number of partners of JIVE has grown by the next evaluation of the ERIC (2019). We will target several new countries that could be involved in VLBI, some in Europe, but also globally. JIVE will attract more users by expanding its scope to other radio astronomy facilities and offering astrometric and geodetic products. Our aim will be the establishment of a Global VLBI Facility in the next decade.

As noted, there is only little potential to use our facility beyond fundamental science. But the technical work that focuses on streamlining operations is important for future applications that include spacecraft observations for accurate position determination in the solar system. Indirectly radio astronomy has been important to push the envelope of the capabilities of various digital developments including Internet techniques.

For technical efforts to enhance the scientific capacity of the VLBI research infrastructure, the guiding principle is always that these (software) efforts become public. This is in many cases also a requirement originating from the software tools that are in use by our engineers. In radio astronomy and geodesy there is a strong tradition of global collaboration and it is expected that the proposed work will lead to new standards that will be discussed in a global forum.

The activity to support the development of an African radio astronomy community will be shaped according to the normal standards of international scientific collaboration, implying that full accounts of all the presentations will be on-line and available for future use. In addition, we intend to organise a number of workshops to engage our user community in working out in detail the science case and technology roadmap for the VLBI facility in the SKA era. Following normal practices, all relevant documents will become publicly available already during the preparatory phase of these workshops.

It should be noted that the project cannot control whether individual users of the VLBI research infrastructure publish their results in open access journals. However, radio astronomy has a long tradition of publishing all results in green open access on-line repositories. The team at JIVE will endeavour to further promote this practice.

This dissemination plan will be updated in the course of the project if needed.

2.2.2 Communication activities

Communication is at the heart of the proposed work programme. We must in particular target the policy makers across Europe to advocate JIVE as an attractive partner. This requires us to compile a package of material that advertises the science output of the research facility in an attractive way, combined with background material on the organisation of the legal entity. We have personal contacts in most countries that we can engage in bilateral discussions on these matters, but EC forums also offer a starting point for profiling JIVE. With the proposed resources we will have an opportunity to attend more of such events in the future.

There are several opportunities to raise the profile to the potential user community. In synergy with previous RadioNet efforts we will create a bigger impact at science workshops and training activities. Key scientists in the user community will be involved in the science case and roadmap exercise and in thinking about the use of SKA for VLBI.



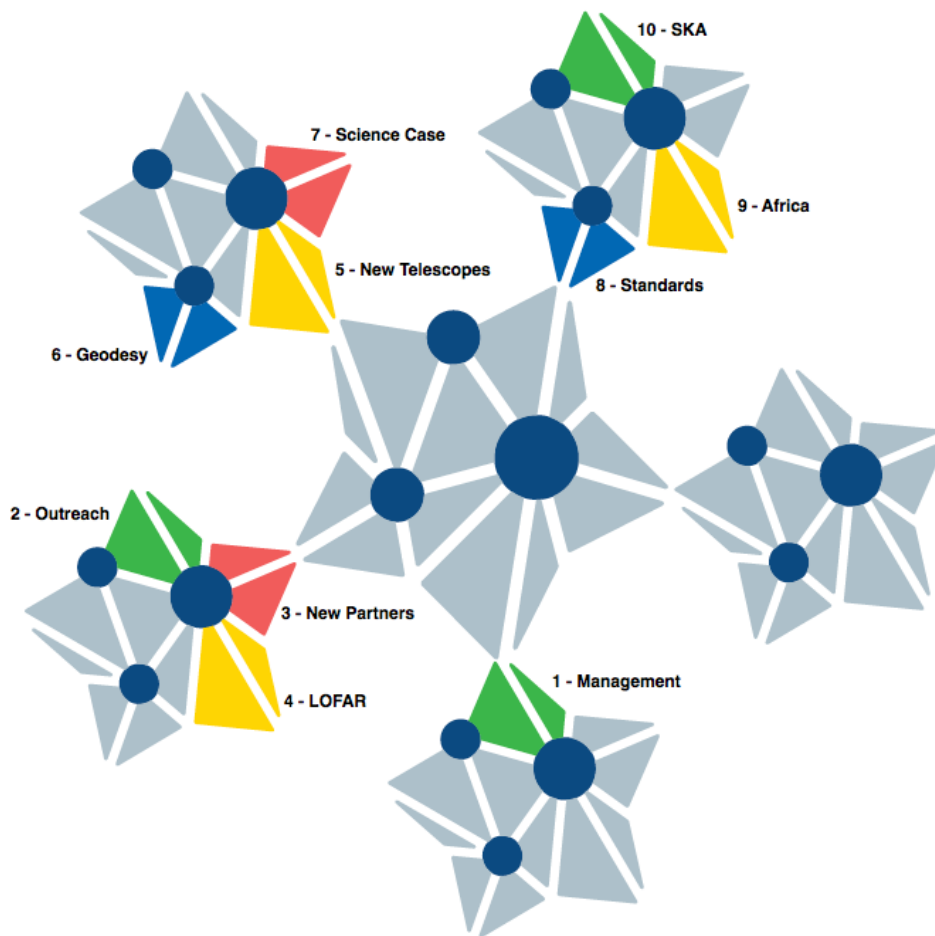
Open day at JIVE in 2015

Similarly, we have a huge communication challenge to promote a concerted effort to redefine Global VLBI. This will require our team to make an impact at a number of international events that are important for the development of a Global VLBI Facility. At such events the critical goal will be to present convincing science cases for global scale VLBI. JIVE will be visible at these events with scientific presentation and, if appropriate, an appealing display and hand-out materials.

3 Implementation

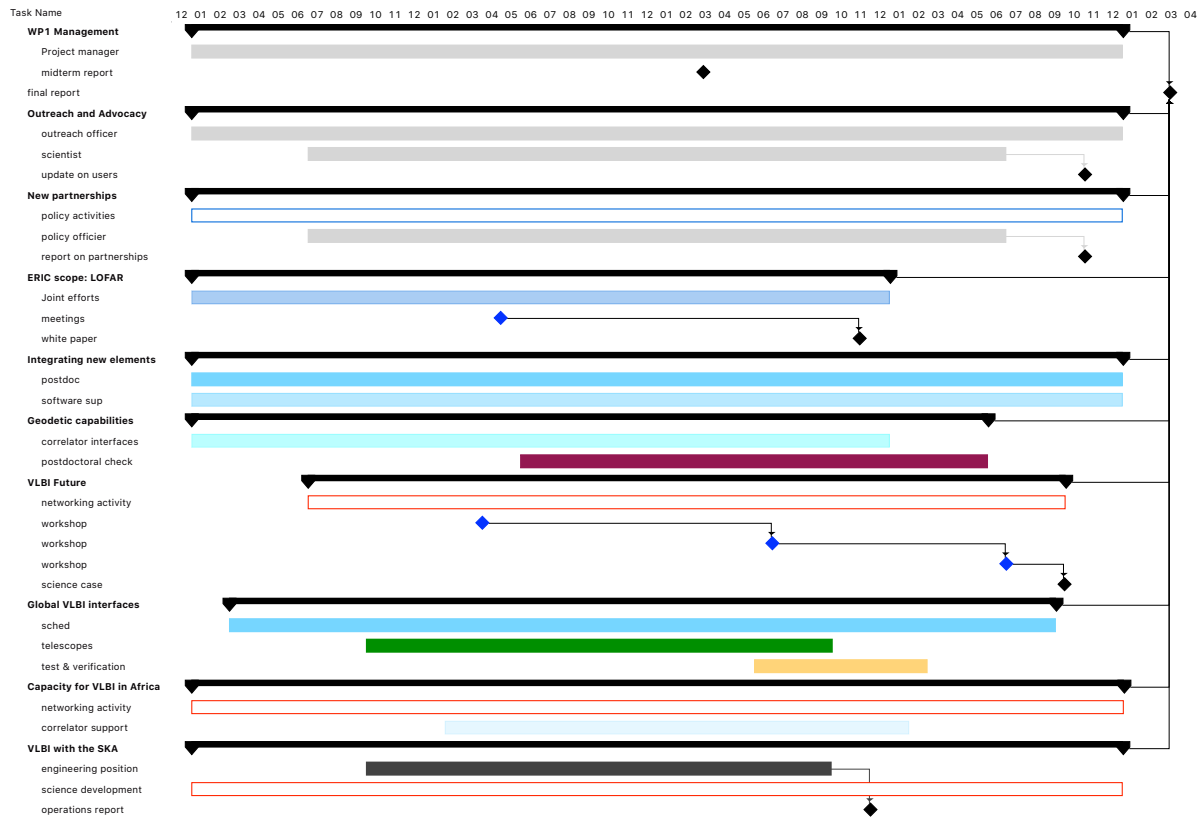
3.1 Work plan – Work Packages and deliverables

Besides Management (WP1), there are nine more Work Packages in this programme. Work Packages 2, 3, 4, 5 and 7 work towards a sustainable ERIC in the European context, with a focus on outreach and new partnerships. Through Work Package 5 we will also be able to directly impact the user experience by integrating new telescope elements in the Network. Both Work Packages 6 and 8 have a more technical character and aim at improving the user capabilities of the Research Infrastructure. Strategically they offer a unique option to promote new standards for operating VLBI. In Work Packages 8, 9 and 10 we propose important steps towards establishing a Global VLBI Facility. Some of these relations are illustrated below.



Impression of the relations between the proposed Work Packages

The ten Work Packages are mostly independent, which has the advantage that they will not affect each other adversely if delays would occur. Moreover, they typically involve different people from the community, leading to clear work plans for all involved. Nevertheless, there are important feedback processes between the Work Packages when it comes to content, for example when the development of a the science case in WP7 feeds into the negotiations with new JIVE partners in WP3, or when new operational standards established in WP8 influence the plans developed for VLBI with the SKA in WP10. For all of these work-flows JIVE is the central point of interaction, so we can expect these communications to be smooth (see section 3.2.)



Gantt chart of the Work Packages and the most important deliverables in JUMPING JIVE.

Most of the Work Packages run over the entire duration of the programme because most of them contain networking activities for the community that we want to be able to offer at any time. Where the Work Packages start late it is usually related to the need to hire new staff.

There are 35 tangible deliverables in the programme, but it should be noted that some of the desired outcomes like new JIVE partnerships, depend on national priorities that we can influence but not control. Often we associate milestones with deliverables, because further actions usually depend on the content of the deliverable.

The direct output of the project, like roadmaps and use cases will be made available through open access. Our partners typically produce software under the GNU GPL open license or similar, allowing free use and distribution of the new standards we aim to produce. Concerning Open Science, the proposed work does not include any direct scientific research and it should be noted that we can encourage external users, but not force them, to publish following golden open access rules. However, in astronomy the norm is always to offer green open access to all results through arXiv.org.

Because this project will not generate experimental data by itself we choose not to participate in the Open Research Data Pilot

3.2 Management structure and procedures

This project focuses on activities related to strengthening JIVE and the EVN. It brings together expertise from JIVE, from the telescope partners and some collaborators from other institutes. As a consequence this Project, although specifically targeted at strengthening the role of the existing European Research Infrastructure Consortium, will need to adopt a consortium agreement that establishes a management structure. We will be using the DESCA template for this (<http://www.desca-2020.eu/>).

There will be a consortium board, which will have considerable overlap with the JIVE council. The role of this consortium board is to oversee the activities and the coordinator. It will be the deciding body of the Project. Because it will have many members from the JIVE Council, it is straightforward to organise a face-to-face consortium board once per year.

An executive committee will be formed by the WP leaders, which will include the coordinator as leader of the management (WP1) and outreach Work Packages (WP2). This team will meet every 6 weeks by telecom and once per year in a face-to-face meeting. Its role is to implement the work programme and monitor progress. It may propose changes to the original work programme to the board in order to address specific problems. It should be noted that all members of the standing JIVE Management Team are among the WP leaders, so that again communication will be easily established.

The coordinator will be the point of interaction with the EC. JIVE will run a small project office using the experienced project assistance available at JIVE. Here the reporting of the work packages will be maintained and the financial transactions monitored. These processes map largely directly onto JIVE's standard processes. As was done before, JIVE will hold all the travel money for external users centrally, implementing a uniform and robust claiming practice. Because of the extensive experience at JIVE with running EC projects and the embedding of most of the WPs in the well-established JIVE management procedures, we are confident that tracking of the progress of JUMPING JIVE can be done very effectively.

We note that the proposed work includes some technical and software efforts, but that there is no room for risky innovation R&D under this call.

We list some of the risks we identified below. Because of the nature of the work, drafting documents, mobilising the community and re-engineering of existing techniques, we identify that the risks associated with reaching the actual milestones is often limited to timely hiring of new staff. We have left some of the risks associated with external factors (progress with new partner countries, progress with telescope projects, progress with the SKA) outside of our deliverables by proposing reports that can be produced in any case.

3.3 Consortium as a whole

The EVN is a distributed facility of radio telescopes with JIVE taking a central role for data processing, user support and technical development. Consequently in this JUMPING JIVE proposal we have chosen to involve both JIVE staff, as well as experts among the JIVE partners. In a number of cases we collaborate with other institutes that we know to have explicit expertise for specific tasks.

The result is a small and focused collaboration with all JIVE partners involved in areas where they excel. At JIVE we have expertise for the proposed technical work through a number of existing initiatives and technical responsibilities; we have maintained most of the EVN user interfaces for over two decades and have been instrumental in defining new standards for VLBI operations. Our correlator team has in-depth understanding of the principles of geodetic VLBI, which will be needed in WP6. The JIVE-based leader of WP10 is chairing the international SKA Working Group on VLBI. The senior management of JIVE has extensive experience in dealing with policy issues and negotiations with new partner countries as can be substantiated by 20 years of JIVE collaboration and the recent ERIC transition.

Moreover, experts like the EVN TOG (at MFOM-E) and PC (at CHALMERS) chairs have been tasked to work on the integration of new telescopes and developing the science case. The work packages on the future of the EVN and Africa will be run by scientists from UMAN and INAF who have extensive experience with these subjects. CNRS will be involved through the

Bordeaux group where there is extensive experience in astrometric and geodetic VLBI. The management of the International LOFAR Telescope at ASTRON will be directly involved in WP4. The Technische Universität München provides expertise for remote telescope control and the partners at Leeds University and –obviously– our South African partner NRF, have a head-start on working with the aspiring VLBI telescopes in Africa.

The proposed activities will also aim to mobilise a number of external scientists to involve them in outreach activities towards new partners, the definition of the future of VLBI, the use of SKA for VLBI or in training events for African colleagues, amongst other things. The EVN as a distributed network, as well as our collaborations in, for example, RadioNet provide a pool of specialists that we can interest in these activities.

In this context we note that the experts at MFOM-E have chosen to contribute at zero costs, as their staff are not able to receive EC funding for their work.

There are no ‘other countries’ involved in the programme. We understand that the SKA organisation is currently not yet an international organisation.

3.4 Resources to be committed

Table 3.4 b ‘Other direct cost’ items (travel, equipment, infrastructure, goods and services)

1. JIVE	Cost (€)	Justification
Travel & subsistence for trans-national access (if applicable)		
Other Travel	367.700	124.500 JIVE travel, 243.200 overall travel
Equipment		
Other goods and services	37.500	
Total	403.200	

3.CHALMERS	Cost (€)	Justification
Travel & subsistence for trans-national access (if applicable)		
Other Travel	9.000	Travel
Equipment		
Other goods and services		
Total	9.000	

5. INAF	Cost (€)	Justification
Travel & subsistence for trans-national access (if applicable)		
Other Travel	8.000	Travel
Equipment		
Other goods and services	8.000	Materials
Total	16.000	

8. ASTRON	Cost (€)	Justification
Travel & subsistence for trans-national access (if applicable)		
Other Travel	12.000	Travel
Equipment		
Other goods and services		
Total	12.000	

11. UnivLeeds	Cost (€)	Justification
Travel & subsistence for trans-national access (if applicable)		
Other Travel	4.000	Travel
Equipment		
Other goods and services	4.000	Materials
Total	8.000	

12. UMAN	Cost (€)	Justification
Travel & subsistence for trans-national access (if applicable)		
Other Travel	8.000	Travel
Equipment		
Other goods and services	8.000	Materials
Total	16.000	

4 Members of the consortium

4.1 Participants

Participant No 1: JIV-ERIC (EU/NL)

The Joint Institute for VLBI ERIC (JIVE) is the central node of the European VLBI Network (EVN, <http://www.evlbi.org/>), a distributed array of radio telescopes, in and outside of Europe, offering astronomers the highest resolution view of radio sources. JIVE provides the scientific data product as well as support for the astrophysicists using the instrument, including training. In close collaboration with the EVN telescope staff, JIVE monitors the quality and calibration of the EVN.



Besides user and telescope services, JIVE excels in research and development to innovate VLBI and related radio astronomy techniques. The institute pioneered e-VLBI by connecting the telescopes through optical fibre networks and enabling real-time science, leading to the development of a unique correlation platform as well. This correlator can also process VLBI observations of spacecraft and determine their precise position in the Solar system. With RadioNet partners, JIVE has developed the UniBoard platform, which is a low-power solution for future beam forming and correlation applications. Through past programmes and the current ERC BlackHoleCam project, the JIVE experts are addressing the data processing needs of current and future VLBI users. In particular, JIVE has been advocating the science case for involving the SKA elements and precursor telescopes in VLBI.

After 21 years as a foundation based on international funding, JIVE became an ERIC in the last month of 2014. As the only European legal entity in centimetre astronomy, JIVE remains actively engaged in discussions on the governance of European radio astronomy.

Prof. dr. Huib van Langevelde (male) is the director of JIVE and a professor in Galactic Radio Astronomy at Leiden University. He is an active astrophysicist, studying the formation, distribution and life cycle of stars, mostly through observations of molecular emission, often using the special properties of astrophysical masers. He is involved in several international consortia that carry out astrometric VLBI studies, measuring stellar motions and distances. In addition, he has contributed to various data processing tools and has been the lead on various past work packages that address user software and correlation platforms. As the director of JIVE he was the coordinator of (N)EXPreS and more recently he has completed the transition of JIVE from an internationally funded foundation into an ERIC. In RadioNet3, Huib van Langevelde was the WP leader of the outreach and governance work package. He is a member of the EVN board and involved in a number of other relevant projects (ASTERICS, ALMA, SKA). He is the coordinator of this JUMPING JIVE proposal.

Prof. dr. Leonid Gurvits (male) is the head of Space science and innovative applications group at JIVE and an adjunct professor in Planetary and Space Science at Delft University of Technology. He is a member of the International Academy of Astronautics. Leonid Gurvits is combining an active interest in radio astronomy studies of extremely distant radio sources as cosmological probes and applications of VLBI techniques in planetary and space science. For more than three decades he was involved in various leading roles in space VLBI missions, such as VSOP/HALCA and RadioAstron. He has been also PI of the VLBI tracking experiment with the ESA's Huygens Probe of Titan and is now a PI of one of the science experiments of ESA's Jupiter Icy Satellite

Explorer (JUICE) mission. Leonid Gurvits has fulfilled leading and coordinating functions in bilateral and multilateral international collaborations, including roles of programme manager and project scientist of EC FP4-FP7 projects RadioNet, EuroPlaNet, ESPaCE and others. He also teaches master courses in radio astronomy and astrophysics and supervises PhD projects in the Netherlands as well as in Latvia, Hungary, Russia and China.

Dr. Bob Campbell (male) is the head of the Science Operations Group at JIVE since 2003. His research interests lie in the areas of VLBI astrometry, pulsars, and gravitational lensing. He has been a member of the EVN Programme Committee since 2006, has served on the scientific organizing committee of the biennial European Radio Interferometry Schools since 2011, and was a member of the IAU Division I working group on the 2nd Realization of the International Celestial Reference Frame. As the head of operations he has overseen the support of user programmes on the EVN, as well as the quality monitoring of all EVN data. Bob Campbell has been the WP leader of EVN trans-national access programs for the previous three EC RadioNet programmes, since 2004.

Dr. Arpad Szomoru (male) is the head of technical operations and R&D at JIVE. As work package leader in several EC and NWO-funded projects he was instrumental in the development of global real-time electronic VLBI. He also led the development of an FPGA-based computing platform as the basis of a next generation VLBI correlator. His group is currently working on expanding the capabilities of the SFXC software correlator, which was developed at JIVE, the upgrade to higher observing bandwidths throughout the EVN, and the research into high precision time and frequency transfer over public networks.

Dr. Zsolt Paragi (male) is the Head of User Support at JIVE. He has a broad scientific interest in VLBI astrophysics, ranging from the study of supermassive black holes in the centres of galaxies to binary systems containing a stellar-mass black hole, as well as finding and localizing various types of transient phenomena using the real-time e-VLBI technique. He is the co-chair of the SKA-VLBI Working Group that aims to support VLBI observations with the Square Kilometre Array.

Role in JUMPING JIVE:

JIVE will host the management team. Huib van Langevelde leads WP1, 2 and is closely involved in WP4. Leonid Gurvits will lead WP3. Bob Campbell is one of the leaders in WP6 and involved in WP5. Arpad Szomoru is leading WP8. Zsolt Paragi is one of the leaders of WP10 and closely involved in WP7. JIVE will support the project as a whole through the appointment of a support scientist, an outreach and a policy officer. JIVE will also provide engineering effort to several work packages.

JIVE Publications

1. Keimpema, A.; Kettenis, M. M.; Pogrebenko, S. V.; **Campbell, R. M.**; Cimó, G.; Duev, D. A.; Eldering, B.; Kruithof, N.; **van Langevelde, H. J.**; Marchal, D.; Molera Calvés, G.; Ozdemir, H.; **Paragi, Z.**; Pidopryhora, Y.; **Szomoru, A.**; Yang, J., “*The SFXC software correlator for very long baseline interferometry: algorithms and implementation*”, 2015 Experimental Astronomy, Volume 39, Issue 2, pp.259-279
2. Morganti, R.; Fogasy, J.; **Paragi, Z.**; Oosterloo, T.; Orienti, M., “*Radio Jets Clearing the Way Through a Galaxy: Watching Feedback in Action*”, 2013, Science, 341, 1082
3. Duev, D.A.; Molera Calves, G.; Pogrebenko, S.V.; **Gurvits, L.I.**; Cimo, G.; Bocanegra Bahamon, T., “*Spacecraft VLBI and Doppler Tracking: Algorithms and Implementation*”, 2012, A&A 541, A43

4. Kirsten, F., Vlemmings, W., **Campbell, R.M.**, Kramer, M., & Chatterjee, S., “*Revisiting the Birth Locations of Pulsars B1929+10, B2020+28, B2021+51*”, 2015, A&A 577, A111
5. **Paragi, Z.**; Godfrey, L.; Reynolds, C. et al., including **Gurvits, L.**; **Szomoru, A.**; Charlot, P.; Garrett, M. A.; **van Langevelde, H. J.**; Zensus, A. J.; Beswick, R.; **Campbell, B.**; Cimo, G.; Colomer, F.; Conway, J. E.; Lindqvist, M.; , Venturi, T.; Vermeulen, R.; “*Very Long Baseline Interferometry with the SKA*”, 2015, Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14). 9 -13 June, 2014. Giardini Naxos, Italy.

JIVE projects

- NEXPRES (<http://www.nexpres.eu/>) was the project to enhance the operational practices and scientific capabilities after EXPRES (<http://www.expres-eu.org/>) in which e-VLBI was introduced as an operational facility. Both were close collaborations between radio astronomical research institutes and research network providers.
- Within the RadioNet collaboration (<http://www.radionet-eu.org/>) JIVE took on management responsibilities for the overall network programme, the EVN Trans National Access, the UniBoard2 project, as well as some of the communication programmes with peers, the public and policy makers.
- JIVE is also a member of EuroPlaNet (<http://www.europlanet-eu.org/>) and related initiatives. The technique of measuring the accurate position of spacecraft is planned to be used in current and future space missions.
- The ASTERICS (<https://www.asterics2020.eu/>) project aims to establish common methods for the (ESFRI-listed,) European astronomy facilities. JIVE leads projects that build on the data transport expertise, for example to coordinate rapid response science.

Participant No 2: CNRS (FR)

The French National Centre for Scientific Research (CNRS) is a public scientific and technological organization operating under the authority of the French Ministry of National Education, Higher Education and Research. CNRS is one of the main research organization in Europe and is largely involved in national, European, and international projects. It covers all scientific disciplines. CNRS employs nearly 33000 researchers, engineers and technicians and has a budget of approximately €3.3 billion. Its 1100 research and service units, including some 95% in partnership with universities, higher education institutions and other research organizations, are present throughout France and abroad.



The *Laboratoire d'Astrophysique de Bordeaux* (LAB) is a joint research unit of the University of Bordeaux and CNRS. It is involved in extragalactic, galactic, stellar and planetary research. The major topics comprise reference systems, active galactic nuclei, stars and Galactic structure, chemistry of the interstellar medium, star formation, circumstellar discs, planetary formation, exoplanets, planetary atmospheres and surfaces, as well as studies about the origin of life on Earth and in the Universe. Additionally, the LAB has long been developing instrumentation (including electronics and mechanics) for space and ground-based (radio) telescopes (Herschel, ALMA, SKA) and Martian rover programs (MSL, Exomars, Mars2020). The LAB cooperates with ESO, ESA and various European institutes or local industry on such technological developments. It is further engaged in a number of national, European and international scientific collaborations

among which the Gaia space mission and the International VLBI Service for geodesy and astrometry. The LAB hosts three ERC Starting Grants (E₃ARTHS, 3DICE, WHIPLASH²) and coordinates the COST Origins. It was a partner in several other EU-funded projects such as RadioNet-FP7, RadioNet3 and the Marie Curie Initial Training Network GREAT. CNRS (through the French Ministry) is a partner in JIV-ERIC.

Dr. Patrick Charlot (male) (CNRS) has worked in the field of geodetic, astrometric and astrophysical VLBI for more than two decades. His major research interests include reference frames and active galactic nuclei. He currently leads the international collaboration in charge of building the 3rd realization of the International Celestial Reference Frame (organized under the responsibility of the International Astronomical Union). He is also a member of the IVS (International VLBI Service for geodesy and astrometry) Directing Board. Additionally, Patrick Charlot has long been closely connected to the EVN, e.g. as chair of the EVN Program Committee from 2003 to 2008, and more generally to European radio astronomy, notably through the successive RadioNet collaborations. He is the current chair of the JIV-ERIC council and was chair of the RadioNet Board during 2014-2015. His interest also extends to the ESA Gaia space mission, as a member of the Gaia Data Processing and Analysis Consortium. Patrick Charlot was the Director of the LAB from 2008 to 2015.

Role in JUMPING JIVE:

CNRS/LAB will work with JIVE on implementing geodetic and astrometric capabilities in WP6 for which Patrick Charlot (CNRS) is one of the Work Package leaders. In particular, CNRS/LAB will lead the task 3 aimed at determining the EVN station positions, as an application of the JIVE correlator new capabilities.

CNRS/LAB publications:

1. **Charlot, P.**, Campbell, R. M., Alef, W., Borkowski, K. J., Conway, et al., “Improved positions of non-geodetic EVN telescopes”, 2002, Proceedings of the 6th European VLBI Network Symposium, Max-Planck Institut für Radioastronomie, Bonn, Germany, p. 9
2. Pradel, N., **Charlot, P.**, Lestrade, J.-F., “Astrometric accuracy of phase-referenced observations with the VLBA and EVN”, 2006, *Astron. Astrophys.*, 452, 1099
3. Petrachenko, W. T., Niell, A. E. E., Behrend, D., Corey, B., Bôhm, J., **Charlot, P.**, Collioud, A., et al., “Design aspects of the VLBI2010 system”, 2009, Progress Report of the IVS VLBI2010 Committee, NASA/TM-2009-214180 (62 pages)
4. Lanyi, G. E., Boboltz, D. A., **Charlot, P.**, Fey, A. L., Fomalont, E. B., “The Celestial Reference Frame at 24 and 43 GHz: I. Astrometry”, 2010, *Astron. J.*, 139, 1695
5. Paragi, Z., Godfrey, L., Reynolds, C., Rioja, M., Deller, A., **Charlot, P.**, et al., “Very Long Baseline Interferometry with the SKA”, 2014, Proceedings of the conference “Advancing astrophysics with the SKA”, PoS(AASKA14)143

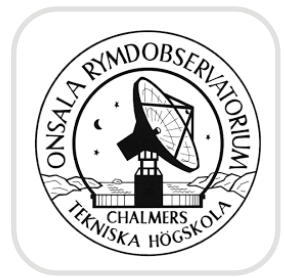
CNRS/LAB projects:

- CNRS/LAB is a partner in the International VLBI Service for geodesy and astrometry (IVS). It contributes to the service as an analysis centre. CNRS/LAB has also been involved in the design of the next generation VLBI system of the IVS (also known as VGOS).
- CNRS/LAB was a member of the RadioNet-FP7 and RadioNet3 collaborations. It was involved in three Joint Research Activities (ALBiUS, Uniboard and Uniboard2), all three led by JIVE, within these two successive collaborations.

- CNRS/LAB is part of the ICRF3 collaboration, which is aimed at building the next realization of the International Celestial Reference Frame by 2018. The collaboration was organized as a Working Group of the IAU, which is currently chaired by a member of CNRS/LAB.
- CNRS/LAB is currently involved in three SKA consortiums with the charge of developing wide-band digitizers within these collaborations. It is also involved in the ALMA development plan along similar lines.
- CNRS/LAB is a partner in the Data Processing and Analysis Consortium of the Gaia space mission. One of the charges within this consortium is the identification of the proper quasars for aligning the Gaia reference frame with the International Celestial Reference Frame.

Participant No 3: Chalmers (SE)

Onsala Space Observatory (OSO) is the Swedish National Facility for Radio Astronomy. OSO is hosted by Department of Earth and Space Sciences at Chalmers University of Technology in Göteborg, and is operated on behalf of the Swedish Research Council (VR). VR's present contract with OSO defines its mission as providing equipment and expertise in radio astronomy and associated geoscience to the Swedish scientific community to ensure that Swedish research in these areas is world leading. OSO is involved in both cm-wavelength VLBI, through our participation in the EVN and in mm-wavelength VLBI, via the Global Millimetre VLBI Array (GMVA). OSO was among the pioneers in developing the VLBI technique and was one of the founding members of the EVN as well as the GMVA and has for a long time contributed not just with its antennae but also with scientific and technical expertise. OSO has since its establishment funded (on agreement with VR) the operations of JIVE by an annual contribution from its operating budget. The operation of JIVE as an ERIC is supported directly through VR. OSO operates three telescopes at Onsala, a 25 m diameter cm-wave telescope, a 20 m diameter mm-wave telescope, and a LOFAR station. OSO hosts the Nordic ALMA regional centre (ARC) node, which is part of the European ARC. It provides support services to astronomers in the Nordic region and develops tools for advanced data reduction and analysis. OSO is one of three partners in the Atacama Pathfinder EXperiment (APEX) project. It is a 12 m diameter single dish sub-millimetre wavelength telescope located in the Atacama desert in Chile at an altitude of 5100 m. OSO has a strong receiver development programme for mm and sub-mm wavelengths, as well as pursues developments of other radio astronomical instruments (radiometers, feeds, etc.). In addition, OSO provides the channel through which Sweden is involved in large international radio astronomy projects, such as the EVN, JIVE, LOFAR, ALMA and SKA.



Dr. Michael Lindqvist (male) is the Head of Telescope Operations at CHALMERS-OSO and has been the Chairman of the EVN Technical and Operations Group (TOG) between 2012-2014. Since 2015 he is the Chairman of the EVN Programme Committee (PC). He was the vice-Chairman of the EVN TOG between 2007-2011 and has been an observatory member of the EVN PC since 2005. His research interests lie in the areas of asymptotic giant branch stars.

Role in JUMPING JIVE:

CHALMERS-OSO staff will participate in the writing of the White Paper in WP7 and will assist in the knowledge transfer of VLBI, both technically and scientifically, in WP9. They will also provide a WP8 design and testing team.

Chalmers publications:

1. Kocz J., Bourke S., et al., “*Digital Signal Processing Using Stream High Performance Computing*”, 2015, JAI, 4, id. 1550003
2. **Lindqvist M.**, Szomoru A., “*Present status and technical directions of the EVN*”, 2014, Proceedings of the 12th European VLBI Network Symposium and Users Meeting (EVN 2014). Online at: http://pos.sissa.it/archive/conferences/230/031/EVN%202014_031.pdf
3. Marti-Vidal I., Vlemmings W.H.T., Muller S., Casey S., “*UVMULTIFIT: A versatile tool for fitting astronomical radio interferometric data*”, 2014, A&A 564, A136
4. Szomoru A., **Lindqvist M.**, “*From tape reel to intercontinental lightpaths: Technical developments in the EVN*”, 2013, IEEE AFRICON Conference. Online at: <http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6757823>
5. Tuccari G., Alef W., Bertarini A., Buttaccio S., Casey S., Felke A., **Lindqvist M.**, Platania P.R., Wunderlich M., “*DBBC3 Development*”, 2014, Proceedings of the 12th European VLBI Network Symposium and Users Meeting (EVN 2014). Online at: http://pos.sissa.it/archive/conferences/230/032/EVN_2014_032.pdf

Chalmers projects:

- CHALMERS-OSO has been involved in the RadioNet collaboration (<http://www.radionet-eu.org/>) from the start, including work within several TNA:s, JRA:s and NA:s. OSO was involved in the JRAs DIVA and AETHER in RadioNet3 (which ended 2015) and APEX (for Swedish observing time) was one of the TNA sites.
- CHALMERS-OSO was a partner in the EVN-wide EC-funded R&D projects, EXPReS in the FP6 programme, followed by NEXPReS in FP7, both coordinated by JIVE. The main aim of the projects was to introduce an e-VLBI component to every experiment and thus improving the robustness and flexibility of the array.
- CHALMERS-OSO is part of the ALMA Band 5 Full Production project aimed at equipping all ALMA antennas with a Band 5 receiver. The ALMA Band 5 receiver covers the frequency range 163–211 GHz and is centred on the para-H₂O (313–220) line at 183 GHz; one of the few H₂O lines that can be observed from the Earth’s surface.
- CHALMERS-OSO has a strong involvement in the Square Kilometre Array (SKA), an international project aiming to build a new astronomical facility serving the radio waveband at metre and centimetre wavelengths. In June 2013 contracts were awarded to 11 multi-national design consortia that will accomplish the final detailed engineering design of SKA Phase 1. Sweden, represented by OSO is part of two such design consortia, the Dish and the Wide Band Single Pixel Feed consortia, one of which OSO is leading.
- CHALMERS-OSO was involved in the Odin satellite (launched February 20, 2001) – an observatory for sub-millimetre wave spectroscopy. Odin was designed for research in both astronomy and aeronomy. Odin was built by the Swedish Space Corporation, on behalf of the Swedish National Space Board and the space agencies of Canada (CSA), Finland (TEKES) and France (CNES). The microwave radiometer system was integrated, tested and optimised by OSO engineers.

Participant No 6: DST (SA)

The DST is the South-African national government authority responsible for science, technology and innovation policy in South Africa (SA). The DST includes among its key activities the development of strategic partnerships / collaborations with the international science and technology (S&T) community; the internationalising/branding of SA's S&T capabilities, and improving the quality and depth of information to support development and investment decision-making and driving improvements in the quality of S&T activities against the backdrop of internationally recognized benchmarks. The DST has been responsible over the past decade, in partnership with the European Union (EC) Directorate-General Research, for the coordination, monitoring and promotion of cooperation under the SA-EU Agreement - this includes SA participation in FP4, FP5, FP6, FP7 and now the Horizon 2020 programme.



To maintain and strengthen the SA-EU strategic partnership in Science and Technology research, development and innovation, the DST has several policy dialogues with the European Commission Directorate-General for Research and Innovation where the two parties discuss policy direction and implement joint activities to strengthen the partnership. In particular it has taken the initiative for many collaborations in the field of radio astronomy (AERAP) recognizing that not only South Africa, but also African partner countries will be hosting the SKA. Astronomy is a flagship project receiving the single largest investment in the budget of the Department of Science and Technology. The Astronomy portfolio includes the development of radio astronomy through the MeerKAT, SKA and HartRAO, but also other wavelength initiatives and the protection of the Karoo SKA site.

Takalani Nemaungani (male) is currently the Acting Chief Director for the Astronomy portfolio at the Dept of Science and Technology. Mr Nemaungani played a pivotal role in bringing the SKA project to Africa in his role as the central lobbying campaign coordinator. Prior to joining the Astronomy division, he was the Director of Global Projects unit within the International Cooperation and Resources division of the Department, where he was the Project Coordinator of the Promoting Africa-Europe Research Infrastructure Project (PAERIP), an EU FP7 funded project which involved four partners from Europe and four others from Africa.

Mamohlodig Tlhagale (female) is the Director for Strategic Partnerships at the Department of Science and Technology in South Africa where her role is to promote strategic international partnerships. The portfolio includes: leveraging the EU funding instruments and network to support SA S&T research development and innovation (RDI) and capacity building, promoting African participation and dialogue between the EU and South Africa. Mrs. Tlhagale has also coordinated an FP7 project Strengthening the European-South African Science and Technology Advancement Programme (ESASTAP 2). Mrs Tlhagale is also the lead DST official responsible for the Department's contribution in FP7 and H2020 Coordination and Support Actions and ERA-NET projects. Prior to joining the International Resources, Mrs. Tlhagale worked with a team also in the Department of Science and Technology responsible for promoting biosciences and astronomy research in South Africa. Mrs. Tlhagale has also worked as a Medical Scientist and a lecturer of molecular biology and microbiology at the Medical University of Southern Africa

Role in JUMPING JIVE:

DST has taken the initiative to retrofit telescopes in a number of countries in order to establish the African VLBI Network. It is therefore a key partner in Work Package 9, building capacity for

radio astronomy in Africa. In addition, members of the South-African astronomy community, who are already part of the JIVE partnership, are expected to be involved in a number of other Work Packages, for example on the future science case and global standards for VLBI. There is also a keen interest in geodetic applications.

DST publications:

1. Gaylard, M. J.; Bietenholz, M. F.; Combrinck, L.; Booth, R. S.; Buchner, S. J.; Fanaroff, B. L.; MacLeod, G. C.; Nicolson, G. D.; Quick, J. F. H.; Stronkhorst, P.; Venkatasubramani, T. L.; "An African VLBI Network of radio telescopes", 2011, in Proceedings of SAIP2011, the 56th Annual Conference of the South African Institute of Physics,. Edited by I. Basson and A.E. Botha, p. 473
2. Barbosa, D.; Paulo, C.; Ribeiro, V. A. R. M.; Loots, A.; Thondikulam, V. L.; Gaylard, M.; van Ardenne, A.; Colafrancesco, S.; Bergano, M.; Amador, J. C.; Maia, R.; Melo, R.; "Design, Environmental and Sustainability Constraints of new African Observatories: The example of the Mozambique Radio Astronomy Observatory", 2013, arXiv1311.4464
3. de Witt, A.; Gaylard, M.; Quick, J.; Combrinck, L.; "An Overview of Geodetic and Astrometric VLBI at the Hartebeesthoek Radio Astronomy Observatory", in 21st Meeting of the European VLBI Group for Geodesy and Astronomy, held in Espoo, Finland, March 5-8, 2013, Eds: N. Zubko and M. Poutanen, Reports of the Finnish Geodetic Institute, p. 45,
4. Paragi, Z.; Godfrey, L.; Reynolds, C. et al., including Beswick, R.; Deane, R.; Gaylard, M.; Smirnov, O.; "Very Long Baseline Interferometry with the SKA", 2015, Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14). 9 -13 June, 2014. Giardini Naxos, Italy

DST projects:

- AERAP: The African-European Radio Astronomy Platform (AERAP, <http://www.aerap.org>) is a stakeholder forum convened to define priorities for radio astronomy cooperation between Africa and Europe. It provides a framework for stakeholders from industry and academia to define research action plans across the wide range of technological areas that will be essential for the future of radio astronomy. This framework will enable major research and technological advances that will drive socioeconomic development and competitiveness in both, Africa and Europe.
- ESASTAP is the Strengthening the European-South African Science and Technology Advancement Programme (<http://www.esastap.org.za/about/index.php>) that has been operational in a number of framework programmes and continues in Horizon 2020. It aims to enrich the science, technology and innovation policy dialogue and facilitates the participation of South Africa in EC programmes.
- PAERIP (Promoting African – European Research Infrastructure Partnerships, <http://www.paerip.org>) is a project funded under FP7. The project is a dedicated initiative to promote research infrastructure partnerships between Europe and Africa and address capacity building by undertaking a series of relevant studies, which will inform the organisation of policy dialogue and cooperation promotion events.

Participant No 5: INAF (IT)

The Italian National Institute for Astrophysics, INAF, is a governmental research organization with 19 research centers geographically distributed over the national territory, plus the "Galileo" observing facility located in La



Palma, Canary Islands. INAF promotes, realizes and coordinates, also within programs of the European Union and international organisms, research activities in many astronomical fields, such as optical/infrared astronomy, radio astronomy, X and γ ray astronomy, particle astrophysics and cosmic physics, both in collaboration with Universities and with other public and private, national and international agencies. INAF is a major partner of the astrophysics related ESFRI projects (CTA, SKA and E-ELT), having actively participated in their definition since the initial phases; it has furthermore important participations in several other world class projects, both ground-based (e.g. ALMA, LBT, MAGIC) and space-borne (e.g. Planck, Gaia, Euclid). INAF is also active in the field of infrastructures for research, and in particular distributed computing technologies (deployment of infrastructure and integration of domain specific applications, leadership of the A&A Heavy Users Community in the FP7 EGI-Inspire project), distributed archives of astronomical data (both from ground-based and space-borne facilities) and the astronomical Virtual Observatory (Euro-VO and IVOA). Participation in the ESFRI projects allows INAF to focus on their real needs in terms of infrastructure, and the experience from previous and current projects increases the feasibility of the planned facilities. INAF is participating in JUMPING JIVE via the Osservatorio di Radio Astronomia (ORA), which operates the three major national radio astronomical infrastructures, i.e. the Medicina and Noto 32m radio telescopes and the 64m Sardinia Radio Telescope. INAF is part of the European and Global VLBI Networks and of the International VLBI Service for Astrometry and Geodesy (IVS). ORA hosts the Italian ALMA Regional Centre on behalf of INAF.

Dr. Tiziana Venturi (female) is a senior staff astronomer at the Italian National Institute for Astrophysics (INAF), Osservatorio di Radio Astronomia (ORA). She is an active astrophysicist, with internationally recognised expertise in the field of galaxy clusters and active galactic nuclei. Her research is carried out with the main radio astronomical interferometers (including VLBI), and she is actively involved in a number of science projects with the new SKA pathfinders (LOFAR, MeerKAT, ASKAP and MWA). She has long been responsible for the VLBI operations in Italy, has been responsible for the catalogue of the EVN observations for many years and has contributed to the link between the latter and the data archive at JIVE. She has chaired the EVN Programme Committee. She has been WP leader of the Science Working Groups in RadioNet (FP6), RadioNet2 and RadioNet3 (FP7), and has been involved in other EC projects (FP7-IRSES-PEOPLE).

Role in JUMPING JIVE:

ORA-Istituto di Radioastronomia will coordinate WP7, The Future of VLBI, under the responsibility of Dr. Tiziana Venturi.

INAF publications:

1. Koyama, S.; Kino, M.; Giroletti, M.; Doi, A.; Giovannini, G.; Orienti, M.; Hada, K.; Ros, E.; Niinuma, K.; Nagai, H.; et al., “Discovery of off-axis jet structure of TeV blazar Mrk 501 with mm-VLBI”, 2016, A&A 586, 113
2. Mantovani, F., Bondi, M., Mack, K.-H., Alef, W., Ros, E., & Zensus, J. A., “A sample of weak blazars at milli-arcsecond resolution”, 2015, A&A, 577, A36
3. Aleksić, J., Ansoldi, S., Antonelli, L. A., et al., “Black hole lightning due to particle acceleration at subhorizon scales”, 2014, Sci, 346, 1080
4. Moscadelli, L., & Goddi, C.A., “A multiple system of high-mass YSOs surrounded by disks in NGC 7538 IRS1. Gas dynamics on scales of 10-700 AU from CH₃OH maser and NH₃ thermal lines”, 2014, A&A, 566, 150

5. Orienti, M., D'Ammando, F., Giroletti, M., Finke, J., Ajello, M., Dallacasa, D., & **Venturi, T.**, “Exploring the multiband emission of TXS 0536+145: the most distant γ -ray flaring blazar”, 2014, MNRAS, 444, 3040

INAF projects:

- RadioNet FP6 and FP7, leading a number of work packages on technological developments of receivers for VLBI and single dish observations, and of a new generation of multipurpose digital backends for radio astronomy.
- Cherenkov Telescope Array: the INAF contribution to this project spans a wide number of activities from the realization of a prototype to the participation to the data analysis and archiving chain.
- Euclid is a space mission of the ESA Cosmic Vision program aimed at understanding the nature of dark energy and gravity. Within the Euclid Consortium, INAF staff coordinates several Science Working Groups, and works on the two instruments, the Euclid pipeline, and the overall coordination of the Science Ground Segment.
- Grid and Distributed Computing projects: INAF has played an active role in a number of projects dedicated to distributed computing infrastructures, both in Italy (Grid.it, DRACO) and on a European level (EGEE-II, EGEE-III, EGI-Inspire).
- ER-flow, funded by FP7, aims at building a European Research Community to promote workflow sharing and to investigate interoperability of the scientific data in workflow sharing. In this project INAF is a major developer and represents and provides support to the astronomical community.

Participant No 6: MFOM-E (ES)

The Spanish “Ministerio de Fomento” (Ministry of Development) hosts the Instituto Geográfico Nacional (IGN) which operates a national Singular Scientific and Technological Infrastructure (ICTS) at Yebes Observatory, including two radio telescopes: a 40m dish operating from cm to mm wavelengths, which is integrated in the EVN, GMVA and IVS networks, and a 13.2 m telescope operating between 2 and 30 GHz which is currently integrated in the IVS network. Yebes Observatory also hosts world-class laboratories for the RF-technology development including quasi-optics.



MFOM-E takes part in the JUMPING JIVE project through IGN, hereafter indicated as IGN/MFOM-E.

Dr. Pablo de Vicente (male) is the TOG chair since 2015. He is an astronomer at the Observatory of Yebes (IGN/MFOM-E) and the manager of the 40m radiotelescope located there. His research interests have been in star formation regions, and lately in the circumstellar environment of evolved stars. Together with his team he has developed the control system for the 40 and 13.2m telescopes at Yebes. This includes low and high level system programming, interfacing it with the FS and the complete pipeline for single dish observations. He has been part of the IRAM scientific committee between 2007 and 2014 and member of the Technical and Operations Group of the EVN since 1992. He is also member of the IAU, Division H.

Dr. Francisco Colomer (male) (IGN/MFOM-E) is an active astronomer in the field of high-resolution studies of the circumstellar environments in late-type stars, which has produced 96 scientific publications and more than 1000 citations. He is scientific-technical coordinator for astronomy, geophysics and space applications at IGN, and project manager of the participation of IGN/MFOM-E in national and European projects. Colomer has also an active profile in outreach activities, giving seminars, coordinating the presence of IGN/MFOM-E in social networks (web, Facebook, twitter) and chairing a local association for the promotion of science.

Role in JUMPING JIVE:

The IGN/MFOM-E is a founding member of the JIV-ERIC. Among its responsibilities in JUMPING JIVE are the participation in WP5 (Integrating New Elements). Dr Pablo de Vicente is the IGN technical coordinator of VLBI activities and responsible for the 40-m radio telescope. He is also the current chair of the EVN Technical Operation Group (TOG) where the WP5-T2 developments will be discussed. IGN/MFOM-E will also be involved in the coordination of outreach activities described in WP2 as Dr Francisco Colomer has large experience, being responsible for the web and presence of IGN/MFOM-E in social networks. He also has been a member of the RadioNet3 Quesera and Astronet Task 5 for astronomy and education.

Pablo de Vicente (IGN/MFOM-E), as TOG chair, will be a leader for WP5, working together with the support scientist on the coordination of tests of new telescopes to be integrated in the EVN. He will also take part in the organization of visits to the new telescopes by a team of EVN experts when required.

IGN publications:

1. **P. de Vicente**, V. Bujarrabal, A. Díaz-Pulido, C. Albo, J. Alcolea, A. Barcia, L. Barbas, R. Bolaño, **F. Colomer**, M.C. Diez, J.D. Gallego, J. Gómez-González, I. López-Fernández, J.A. López-Fernández, J.A. López-Pérez, I. Malo, A. Moreno, M. Patino, J.M. Serna, F. Tercero, B. Vaquero. "*28 SiO $v=0$ $J=1-0$ emission from evolved stars*", 2016, *Astronomy & Astrophysics* (in press)
2. R.I. Amils, J.D. Gallego, J.L. Sebastián, S. Muñoz, A. Martín, A. Leuther, "*Thermal conductivity of silver loaded conductive epoxy from cryogenic to ambient temperature and its application for precision cryogenic noise measurements*", *Cryogenics* (Accepted 02/03/2016)
3. B. Aja Abelan, M. Seelmann-Eggebert, D. Bruch, A. Leuther, H. Massler, B. Baldischweiler, M. Schlechtweg, J.D. Gallego-Puyol, I. Lopez-Fernandez, C. Diez-Gonzalez, I. Malo-Gomez, E. Villa, E. Artal, "*4–12- and 25–34-GHz Cryogenic mHEMT MMIC Low-Noise Amplifiers*", 2012, *IEEE Trans. Microw. Theory Techn.*, vol.60, no.12, pp. 4080-4088
4. **P. de Vicente**, "*Checking the phase stability of the DBBC at the telescope*", 2014, Technical report CDT
5. **P. de Vicente**, J. González, L. Barbas, B. Córdoba, "*Preliminary results from the 13.2m Yebes antenna after the VGOS update*", 2016. Technical report CDT

IGN/MFOM-E projects:

- EC Synergy grant "Nanocosmos": granted 15 M€ in 2014-2020 to study the formation of nanoparticles and dust in the circumstellar envelopes of late-type stars. PI is CSIC (ES) and CNRS (FR); IGN participates in the construction of state-of-the-art receivers for the 40m radio telescope and the vacuum chambers where the nanoparticles are created.

- EC FP7 Radionet3: a 9.5 M€ programme in 2012-2015 to develop high-performance technologies for radio astronomy, and provide access to large-scale facilities in Europe. IGN participates in task AETHER, and the EVN TNA.
- National project FIS2012-32096: granted 300 k€ in 2013-2016 to complete the instrumentation needed for a full participation of the Yebes 40m radio telescope in VLBI and single-dish observations.
- RAEGE: granted 4 M€ of ERDF funds to establish a geodetic VGOS station at Yebes Observatory for the International VLBI Service (IVS) for Geodesy and Astrometry. Three more stations (in Canary and Azores Islands) are also under construction.

Participant No 7: SKAO (UK)

The Square Kilometre Array (SKA) Organisation is a private UK company limited by guarantee. The company does not have a share capital, but has Members who are guarantors (with limited liability) instead of shareholders. It was formed in December 2011 to formalise relationships between the international partners and to centralise the leadership of the project; formally its mission is to complete the detailed design of the SKA and prepare for construction; a subsequent evolution of the Organisation to another form is planned to enact the construction phase. Formal negotiations on this new legal structure began in 2015, with the ambition of creating an SKA International Organisation.



The current Members of the SKA Organisation are funding bodies and government departments with an interest in realising the construction and operation of the SKA, and delivering science for their respective communities. Presently, there are ten member countries – Australia, Canada, China, India, Italy, New Zealand, South Africa, Sweden, The Netherlands, United Kingdom.

The Office of the SKA Organisation is responsible for coordinating the global activities of the SKA project, including in the design and development phase, engineering, science, policy, outreach and planning for the future operation of the telescope. SKA Organisation staff have been involved in previous EC-funded instruments in the past; the FP6-funded SKA Design Study (SKADS) project, the Preparatory Phase programme PrepSKA in the technical/policy domain, and more recently in supporting the FP7 policy instrument GO-SKA.

Dr. Antonio Chrysostomou (male) is the Head of Scientific Operations Planning at the Square Kilometre Array Organisation. He was previously Associate Director of the James Clerk Maxwell Telescope, (on leave of absence from the University of Hertfordshire) from 2007-2012 where he was responsible for the operations, staffing and budget of the James Clerk Maxwell Telescope, as well as managing the JCMT Legacy Survey. He has served on many review panels and committees for the UK's Science and Technology Facilities Council and for other observatories, facilities and research councils.

Role in JUMPING JIVE:

SKAO will lead WP10, working on an operational model and the scientific exploitation of SKA-VLBI.

SKAO publications:

1. "Advancing Astrophysics with the Square Kilometre Array", editor: SKA Organisation, 2015: <https://www.skatelescope.org/wp-content/uploads/2011/03/SKA-Astrophysics-Vol1.pdf>, <https://www.skatelescope.org/wp-content/uploads/2011/03/SKA-Astrophysics-Vol2.pdf>
2. "Science with the Square Kilometre Array", eds: C. Carilli, S. Rawlings: <http://arxiv.org/abs/astro-ph/0409274>
3. "The SKA: an engineering perspective", P.Hall, Springer, 2005 – reprinted from Experimental astronomy, Vol 17, Nos 1-3, 2004
4. Dempsey, Jessica T.; Bell, Graham S.; Chrysostomou, Antonio; Coulson, Iain M.; Davis, Gary R.; et al. "Setting the standard: 25 years of operating the JCMT", 2014, SPIE, 9149
5. Holland, W. S.; Bintley, D.; Chapin, E. L.; Chrysostomou, A.; Davis, G. R.; Dempsey, J. T.; Duncan, W. D.; Fich, M.; Friberg, P.; Halpern, M, et al. "SCUBA-2: the 10 000 pixel bolometer camera on the James Clerk Maxwell Telescope", 2013, MNRAS, 430, 251

SKAO projects:

- PrepSKA: SKA Organisation and particularly its predecessor, the SKA Programme Development Office (SPDO) were centrally involved in the PrepSKA project (2007-2012). PrepSKA, funded under FP7, was an initiative associated with the SKA's Preparatory Phase, to develop both high-level technical and policy aspects of the project. It marked the transformation of SKA into a project with significant backing from funding agencies and governments.
- GO-SKA: SKA Organisation was centrally involved in the FP7 GO-SKA project, which supported workpackages aimed at developing the 'globalisation' of the SKA. Building on the work of PrepSKA, SKA Organisation supported work towards an appropriate globally-appropriate legal structure and financial model for the construction and operation phase. The programme also considered the development of a procurement policy for SKA construction activities, and how to formulate and construct an overall 'business case' for the project.
- IN-SKA: Following the recommendation by ESFRI that SKA would benefit from specific enabling funding to assist with transition to the implementation phase, SKA Organisation developed and now coordinates the IN-SKA project. In IN-SKA, SKA Organisation leads teams in Australia and South Africa to finalise the detailed design of the most critical infrastructure components for the telescopes, necessary to move to the construction of the facility on schedule in late 2018.

Participant No 8: ASTRON (NL)

ASTRON is the Netherlands Institute for Radio Astronomy, and is part of the Netherlands Organisation for Scientific Research (NWO). It provides front-line observing capabilities for Dutch and international astronomers across a broad range of frequencies and techniques. It operates the WSRT and is the central operational organisation for LOFAR within the ILT. ASTRON plays a leading role in the design consortia for the Square Kilometre Array. It has a strong technology development programme, encompassing both innovative instrumentation for existing telescopes and the new technologies needed for future facilities. ASTRON also conducts a vigorous programme of fundamental astronomical research. ASTRON is



involved in large-scale software and system development. ASTRON enjoys extensive collaborative contacts with Dutch Universities and Radio Astronomy institutes all over the world.

Dr. René C. Vermeulen (male) is the director of the ASTRON Radio Observatory. He is responsible for the operation of both the International LOFAR Telescope (ILT) and the WSRT/APERTIF telescopes and the science production on the archives for LOFAR, WSRT and APERTIF. The observatory operates the VLBI capability and René is the director of the central operating organisation for the ILT.

Role in JUMPING JIVE:

ASTRON observatory director and director of the ILT, René Vermeulen will be leading Work Package 4.

ASTRON publications:

1. Moldón, J., Deller, A. T., Wucknitz, O., Jackson, N., Drabent, A., Carozzi, T. et.al. *"The LOFAR long baseline snapshot calibrator survey"*, 2015, *Astronomy and Astrophysics*, 574, A73
2. Heald G. H., Pizzo R. F., Orru E., et al., *"The LOFAR Multifrequency Snapshot Sky Survey (MSSS). Survey description and first results"*, 2015, *Astronomy and Astrophysics*, 582, A123
3. Van Haarlem, M. P., Wise, M. W., Gunst, A. W., Heald, G., McKean, J. P., Hessels, J. W. T., et al., *"LOFAR: The low-frequency array"*, 2013, *Astronomy & Astrophysics*, 556, A2
4. de Vaate, J. G. B., Pantaleev, M., Ivashina, M., Yang, J., Lindqvist, M., Schäfer, F., Keller, R., Alef, W., *"Wide Bandwidth Integrated 1-4 GHz Feed Development for VLBI and SKA"*, 11th European VLBI Network Symposium & Users Meeting, October 9-12, 2012, Bordeaux, France
5. Oosterloo, T., Verheijen, M., van Cappellen, W., Bakker, L., Heald, G., & Ivashina, M., *"Apertif-the focal-plane array system for the WSRT"*, 2009, *Proceedings of Wide Field Astronomy & Technology for the Square Kilometre Array (SKADS 2009)*. 4-6 November 2009. Chateau de Limelette, Belgium.

ASTRON projects:

- ASTRON is leading the SKA design consortia Low Frequency Aperture Array (LFAA) and the Mid Frequency Aperture Array (MFAA). It plays a major role in the consortia Science Data Processor (SDP) and the Central Signal Processor (SDP).
- ASTRON has coordinated several projects in FP6 and FP7 (SKADS, RadioNet-FP7) and participated in other EC projects (RadioNet FP6, EXPreS FP6, NEXPreS FP7, PrepSKA FP7, Radionet3 FP7), and is now the project coordinator of the ASTERICS INFRADEV-4 project.
- ASTRON has a research collaboration DOME with IBM on Exascale Technology for Radio Astronomy.
- 'Building on Advanced LOFAR Technology for innovation, collaboration and sustainability-BALTICS' EU-funded Twinning programme between VIRAC (Latvia), UMAN and ASTRON to develop VIRCA in Latvia as a hub for radio astronomy in the Baltic region.

Participant No 9: ILT (NL)

The International LOFAR Telescope (ILT) is the foundation, established under Netherlands law in November 2010 and seated in Dwingeloo, The Netherlands, in which ASTRON and national LOFAR astronomy consortia in France, Germany, The Netherlands, Sweden, the United Kingdom and Poland collaborate on the exploitation of all LOFAR facilities for astronomy in their countries. The ILT offers these facilities in a common-user environment to all interested parties. The ILT employs no personnel. ASTRON, seated in Dwingeloo, the Netherlands, is the coordinating operational entity within the ILT; it employs the ILT Director, and commits the bulk of the annual operational resources. The ILT formally started its full functions on 1 January 2011.

International LOFAR Telescope

Dr. René C. Vermeulen (male) is the director of both the International LOFAR Telescope (ILT) and of the ASTRON Radio Observatory. He is responsible for the operation of both the ILT and the WSRT/APERTIF telescopes and the science production on the archives for LOFAR, WSRT and APERTIF.

Role in JUMPING JIVE:

ILT will investigate, together with JIVE, the possibility to model the ILT as an ERIC, and maybe even to merge both entities into one research infrastructure. The ILT director will be leading this effort in Work Package 4.

ILT publications:

1. Van Haarlem, M. P., Wise, M. W., Gunst, A. W., Heald, G., McKean, J. P., Hessels, J. W. T., et al., "LOFAR: The low-frequency array", 2013, *Astronomy & Astrophysics*, 556, A2
2. Buitink S, Corstanje A., Falcke H. et al, "A large light-mass component of cosmic rays at 10E17-1017.5 electronvolts from radio observations", 2016, *Nature*, 531, 70.
3. Falcke H. Apel W.D. et al, "Detection and imaging of atmospheric radio flashes from cosmic ray air showers", 2015, *Nature*, 435, 313-316
4. Hermsen W., Hessels J. W. T., Kuiper L. et al, "Synchronous X-ray and Radio Mode Switches: A Rapid Global Transformation of the Pulsar Magnetosphere", 2013, *Science*, 339, 436
5. Heald G. H., Pizzo R. F., Orru E., et al., "The LOFAR Multifrequency Snapshot Sky Survey (MSSS). I. Survey description and first results", 2015, *A&A*, 582, A123

ILT projects:

- The ILT participated in the EC-funded Radionet3 project.

Participant No 10: TUM (DE)

The Forschungseinrichtung Satellitengeodäsie (FESG; Research Facility for Satellite Geodesy) of the Technical University of Munich operates the Geodetic Observatory Wettzell together with the Federal Agency for Cartography and Geodesy (Bundesamt für Kartographie und Geodäsie, BKG). It is mainly involved in the operation of the 20m radio telescope and contributes to the development of the TWIN radio telescopes for IVS VGOS



sessions. The Wettzell 20-m radio telescope is one of the most used geodetic telescopes. The institute participates in developments of control software for Laser Ranging Systems and for remote control of VLBI radio telescopes for space geodetic techniques at Wettzell. It cooperates together with the BKG in all relevant international IAG services, such as IVS, ILRS, IGS. Software developed at Wettzell is used by other sites, such as AuScope in Australia, O'Higgins in Antarctica, Ny Alesund in Spitzbergen, Hartebeesthoek in South Africa. Members of the institute contribute to the GGOS Bureau of Networks and Observations in the internal working group for communication, coordination and automation.

Dr. Alexander Neidhardt (male) is the head of the group for microwave techniques, research scientist and software engineer at the Forschungseinrichtung Satellitengeodäsie (FESG), Geodetic Observatory Wettzell, TUM. His fields of research are applied computer science for space geodesy and the development of modern, remotely controllable and autonomous control systems for the instruments of geodetic space techniques. He has been the vice-chair of the IVS Working Group on the Observation of satellites using VLBI since October 2014, the chair of the IVS Task Force on Seamless Auxiliary Data Archives since March 2014 and the chair of the internal Working Group for Coordination, Communication and Automation in the Global Geodetic Observing System (GGOS) Bureau for Networks and Observations since 2012.

Role in JUMPING JIVE:

TUM will work on remote monitoring in the EVN and the IVS, integrating JIVE as a center for monitoring and control data in the EVN. The main goal will be interoperability between the currently existing systems in order to set up an infrastructure which can be offered to all partners.

TUM publications:

1. **Neidhardt, Alexander:** *"Applied Computer Science for GGOS observatories. Communication, coordination and automation of future geodetic infrastructures"*. Springer Int., 2016 (in preparation)
2. Schüler, T.; Kronschnabl, G.; Plötz, Ch.; **Neidhardt, A.**; Bertarini, A; Bernhart, S; la Porta, L; Halsig, S.; Nothnagel, A.: *"Initial Results Obtained with the First TWIN VLBI Radio Telescope at the Geodetic Observatory Wettzell"*; Sensors — Open Access Journal, MDPI AG, ISSN (Online) 1424-8220, 2015
3. **Neidhardt, A.**; Collioud, A.: *"Real-time data streams from "e-RemoteCtrl" to central VLBI network status monitoring services like "IVS Live"*; in: Behrend, D.; Baver, K.; Armstrong, K. (eds.) IVS 2014 General Meeting Proceedings - "VGOS: The New VLBI Network", pp 262-266, Science Press, ISBN (Print) 978-7-03-042974-2, ISBN (Online) 978-7-03-042974-2, 2014.
4. **Neidhardt, A.**; Schönberger, M.; Plötz, C.; Kronschnabl, G.: *"Developments for the automation and remote control of radio telescopes of the Geodetic Observatory Wettzell"*; in: Behrend, D.; Baver, K.; Armstrong, K. (eds.) IVS 2014 General Meeting Proceedings - "VGOS: The New VLBI Network", pp 48-52, Science Press, ISBN (Print) 978-7-03-042974-2, ISBN (Online) 978-7-03-042974-2, 2014.
5. **Neidhardt, A.**; Ettl, M.; Mühlbauer, M.; Kronschnabl, G.; Alef, W.; Himwich, E.; Beaudoin, C.; Plötz, C.; Lovell, J.: *"Safe and secure remote control for the Twin Radio Telescope Wettzell"*; in: Zubko, N.; Poutanen, M. (eds.) Proceedings of the 21st meeting of the European VLBI Group for Geodesy and Astrometry, pp 25-28, Finnish Geodetic Institute, 2013.

TUM projects:

- NEXPREs (<http://www.nexpres.eu/>) was the project to enhance the operational practices and scientific capabilities after EXPRES (<http://www.expres-eu.org/>) in which e-VLBI was introduced as an operational facility. Both were close collaborations between radio astronomical research institutes and research network providers.
- IVS MCI, Wettzell System Monitoring SysMon. This project started as a cooperation between Haystack and Wettzell observatories within the IVS MCI group. The goal was a white paper defining a system to collect monitoring data with MCI nodes. The project resulted in an MCI implementation at Haystack and the extension of the Wettzell SysMon system. <ftp://ivscg.gsfc.nasa.gov/pub/TOW/tow2015/notebook/Neidhardt.Sem2.pdf>
- IVS Seamless Auxiliary Data Archives. The main products of the IVS rely on auxiliary data such as meteorology and time corrections between local clocks and UTC. If these data were to be continuously available this would have a positive effect on the accuracy of IVS data products. A proof-of-concept is being implemented that will collect data from a limited number of observatories using a centralized data repository. http://www.oan.es/raege/evga2015/EVGA2015_proceedings.pdf
- e-RemoteCtrl developments, software development for the TWIN Radio Telescope project at Wettzell. During e-VLBI sessions, live monitoring of the status of the system and control access can increase the efficiency of observations. At the Geodetic Observatory Wettzell, a software extension to the NASA Field System was developed for remote telescope control, in collaboration with the Max-Planck-Institute for Radio Astronomy in Bonn. <http://www.econtrol-software.de/>

Participant No 11: UnivLeeds (UK)

Leeds is one of the largest universities in the UK. In 2014/15 it had an annual income in excess of 907M€ and over 30,000 students from 141 countries and approximately 6,740 staff of 99 different nationalities, attached to 560 different undergraduate and 300 postgraduate degree programmes. In 2014/15 its annual research income exceeded 215M€ of which 11.7% was derived from EU awards. Under Horizon 2020 Leeds is currently coordinating 33 projects and is a partner in a further 26 successful projects. Leeds' research income from the Horizon 2020 programme is currently over 29.5M€. The School of Physics and Astronomy has 34 academic staff of which 8 are in the Astrophysics group. The group has a strong research programme in star and planet formation. Radio astronomy studies form a big part of this with members of the group leading large survey programmes with the VLA and e-MERLIN. Leeds also chairs the consortium of universities that is working with the SME GES Ltd that is converting the 30 m class ex-telecommunication dishes at Goonhilly in Cornwall, UK for use as radio telescopes with the aim of incorporating these into e-MERLIN and EVN. Members of the group are also leading the way in the development and implementation of programmes of radio astronomy training in Africa.



Prof. Melvin Hoare (male) is a senior academic at the University of Leeds. He has over 30 years of experience in astrophysics, much of this in radio astronomy. His area of expertise is in high resolution studies of massive star formation and he has published 124 refereed papers. Prof. Hoare has led major surveys with the VLA, ATCA and e-Merlin and has served on the EVN Program Committee. He is also chairing the consortium of universities that is working with the

SME GES Ltd to convert 30 m ex-telecommunication dishes at Goonhilly in to radio dishes with the intention that these will join the e-Merlin and EVN arrays. He was until recently chair of the SKA Science Working Group on the Cradle of Life team. Prof. Hoare is leading the Human Capital Development programmes on radio astronomy in Africa. He is the PI of a Royal Society Africa Award that together with SKA-SA is training radio astronomers in Ghana. Recently he has led major bids to the new UK Newton Fund to expand this programme to Kenya, Zambia and Namibia together with other partners including UMAN and SKA-SA.

Role in JUMPING JIVE:

UnivLeeds, who leads the existing Newton programme, will manage the interface between the various initiatives in WP9, working with JIVE and UMAN.

UnivLeeds publications:

1. Purcell, C. R.; **Hoare, M. G.**; Cotton, W. D.; Lumsden, S. L.; Urquhart, J. S.; et al. *“The Coordinated Radio and Infrared Survey for High-mass Star Formation. II”*, 2013, Source Catalog, ApJS, 205, 1
2. **Hoare, M. G.**; Purcell, C. R.; Churchwell, E. B.; Diamond, P.; Cotton, W. D.; et al, *“The Coordinated Radio and Infrared Survey for High-Mass Star Formation (The CORNISH Survey)”*, 2012, I. Survey Design, PASP, 124 939
3. **Hoare, M. G.**; Kurtz, S. E.; Lizano, S.; Keto, E.; Hofner, P., *“Ultracompact HII Regions and the Early Lives of Massive Stars”*, 2007, Protostars and Planets V, B. Reipurth, D. Jewitt, and K. Keil (eds.), University of Arizona Press, Tucson, 951 pp., p.181-196
4. **Hoare, M. G.**, *“An Equatorial Wind from the Massive Young Stellar Object S140 IRS 1”*, 2006, ApJ, 649, 856
5. Urquhart, J. S.; **Hoare, M. G.**; Purcell, C. R.; Lumsden, S. L.; Oudmaijer, R. D.; et al., *“The RMS survey. 6 cm continuum VLA observations towards candidate massive YSOs in the northern hemisphere”*, 2009, A&A, 501, 539

UnivLeeds projects:

- The joint UK-SA project Development in Africa with Radio Astronomy is funded by the UK’s Newton Fund. With 12 partners including UMAN and SKA-SA they are rolling out a programme of training in radio astronomy to Kenya, Zambia, Namibia and Botswana with the aim of expanding this to cover all 8 African VLBI Network partners.
- The Royal Society Africa Award project provides radio astronomy training in Ghana where the first of the AVN dish is being converted from its previous telecommunications role by SKA-SA.
- The Consortium of Universities for Goonhilly Astronomy has invested £0.5M into the conversion of telecommunications dishes at Goonhilly for use as radio astronomy dishes.

Participant No 12: UMAN (UK)

The University of Manchester is the largest single-site university in the UK with more than 28,000 undergraduates and 11,000 postgraduates, drawn from 180 countries worldwide. The School of Physics and Astronomy, of which JBCA is part, is one of the largest and most active in the UK with staff and students drawn from across the world. A tradition of excellence has been established by many eminent teachers and research workers,



including eleven Nobel Prize winners, the most recent of which are Andre Geim and Kostya Novoselov who were awarded the honour in 2010.

Jodrell Bank Observatory is an integral part of the University of Manchester's Jodrell Bank Centre for Astrophysics (JBCA) which has over 180 staff and postgraduate students working on all areas of astronomy and astrophysics. JBCA staff work across two sites, Jodrell Bank itself and the University of Manchester central campus. The group is highly respected for the quality of its research programme.

Several significant radio astronomy research facilities are operated from Jodrell Bank:

Lovell Telescope and Pulsar Research: The 76-m Lovell Telescope is the most productive telescope in Europe for precision pulsar timing, with an unparalleled pulsar-timing database which stretches back for more than 40 years. It is equipped with state-of-the-art (single-beam) receivers and digital backends. It is a key member of the European Pulsar Timing Array.

e-MERLIN and VLBI : Jodrell Bank is the hub of e-MERLIN, a 217-km baseline array of 7 telescopes, designed for high resolution radio imaging, spectroscopy, polarimetry and astrometry. e-MERLIN is a pathfinder instrument for the SKA and is now the world's largest dedicated fully-connected array. e-MERLIN is carrying out a broad programme of research, including the formation of planets, young stellar objects, supernovae, the evolution of galaxies and the black holes at their centres and cosmology using weak lensing. Jodrell Bank was a founding member of the European VLBI network (EVN) and remains a vital part of the network. The planned integration of e-MERLIN and EVN into a real-time array will create a telescope with baselines from 10km to 10,000km to complement the SKA.

Technical R&D: Jodrell Bank has always been self-sufficient in developing and manufacturing all the sub-systems which make up radio telescope arrays, from mechanical structures, control systems, telescope optics, receivers, analogue and digital back-ends.

Dr. Rob Beswick (male) is a University of Manchester academic and the project scientist for the e-MERLIN project, head of e-MERLIN science and user support, and a UK's ALMA Regional Support Centre scientist. He has over 15 years of experience in radio astronomy and interferometry. He is chair of the internationally appointed SKA Science Working group dedicated to extragalactic Spectral line astronomy. He is a co-investigator and active member in the UK/SA funded Newton project 'Radio Astronomy for Development in Africa' which is sustainably aiding the development of radio astronomy in sub-Saharan Africa through education programmes, and steering committee member for the EU-funded BALTICS programme which is helping to strengthen the training of radio interferometry in Latvia and the Baltic region. Dr. Beswick is an active research scientist with over 150 papers on a wide range of topics from Supernovae and star-formation through to high redshift galaxies and weak lensing.

Role in JUMPING JIVE:

UMAN will lead WP9, working closely with JIVE and UnivLeeds.

UMAN publications:

1. Pérez-Torres, M. A.; Lundqvist, P.; **Beswick, R. J.** et al, "Constraints on the Progenitor System and the Environs of SN 2014J from Deep Radio Observations", 2014, The Astrophysical Journal, Volume 792, Issue 1, article id. 38, 10
2. Argo, M., "e-MERLIN data reduction pipeline", 2014, Journal of Open Research Software 3(1):e2, published 29 January 2015; doi:10.5334/jors.bp

3. Kloeckner, H.-R.; Rawlings, S.; Heywood, I.; **Beswick, R.**; et al, “*Goonhilly: a new site for e-MERLIN and the EVN*”, 2011, Proceedings of the 10th European VLBI Network Symposium and EVN Users Meeting: VLBI and the new generation of radio arrays. September 20-24, 2010. Manchester, UK
4. **Beswick, R.**; Brinks, E.; Perez-Torres, M.; et al., “*SKA studies of nearby galaxies: star-formation, accretion processes and molecular gas across all environments*”, 2015, Proceedings of Advancing Astrophysics with the Square Kilometre Array (AASKA14). 9 -13 June, 2014. Giardini Naxos, Italy
5. Radcliffe, J. F.; Garrett, M. A.; **Beswick, R. J.**; et al., “*Multi-source self-calibration: Unveiling the microJy population of compact radio sources*”, 2016, Astronomy & Astrophysics, Volume 587, id.A85, 7

UMAN projects:

- ‘Radio Astronomy for Development in Africa – A Newton funded project’ – UK funded project, in collaboration with South Africa, to aid in the development of radio astronomy in Africa through education and the inspiration of young people.
- ‘Building on Advanced LOFAR Technology for innovation, collaboration and sustainability-BALTICS’ EU-funded Twinning programme between VIRAC (Latvia), UMAN and ASTRON to develop VIRAC in Latvia as a hub for radio astronomy in the Baltic region.
- E-MERLIN. UMAN runs and operates on behalf of the UK’s Science and Technology Facility the e-MERLIN and VLBI national facility which is the UK’s dedicated radio interferometry facility.
- RadioNet1-3: UMAN has been a key member of all of the EU-funded RadioNet projects.
- EVN: UMAN was a founder member of the European VLBI network and remains a key member of the network. Currently UMAN contribute staff effort directly to the EVN in the role of Network scheduler, and membership to the EVN programme committee.

4.2 Third parties involved in the project (including use of third party resources)

No third parties involved

5 Ethics and security

5.1 Ethics

No specific gender issues are included in this project. However all partners are committed to keeping equal opportunities for both female and male researchers.

The ethical standards and guidelines of Horizon2020 will be rigorously applied, regardless of the country in which the research is carried out.

5.2 Security

Please indicate if your project will involve:

- activities or results raising security issues: NO
- ‘EU-classified information’ as background or results: NO

ESTIMATED BUDGET FOR THE ACTION (page 1 of 2)

Estimated eligible ¹ costs (per budget category)										EU contribution			Additional information		
A. Direct personnel costs		B. Direct costs of subcontracting	C. Direct costs of fin. support	D. Other direct costs	E. Indirect costs ²	F. Special unit costs	Total costs	Reimbursement rate %	Maximum EU contribution ³	Maximum grant amount ⁴	Information for indirect costs	Information for auditors	Other information:		
A.1 Employees (or equivalent) A.2 Natural persons under direct contract A.3 Seconded persons [A.6 Personnel for providing access to research infrastructure]		A.4 SME owners without salary A.5 Beneficiaries that are natural persons without salary		D.1 Travel D.2 Equipment D.3 Other goods and services D.4 Costs of large research infrastructure		F.1 "Costs for providing trans-national access to research infrastructure" **					Estimated costs of in-kind contributions not used on premises	Declaration of costs under Point D.4	Estimated costs of beneficiaries/linked third parties not receiving EU funding		
Form of costs ⁶	Actual	Unit ⁷	Unit ⁸		Actual	Actual	Actual	Flat-rate ⁹							
	(a)	Total (b)	No hours	Total (c)	(d)	(e)	(f)	(g)=0,25x ((a)+(b)+(c)+(f)+[(h1)+(h2)]-(m))	Total (h1)	(i)=(a)+(b)+(c)+(d)+(e)+(f)+(g)+(h1)+(h2)+(h3)	(j)	(k)	(l)	(m)	Yes/No
1. JIV-ERIC	1063333.00	0.00	0	0.00	0.00	0.00	405200.00	367133.25		1835666.25	100.00	1835666.25	1835666.25	0.00	No
2. CNRS	150000.00	0.00	0	0.00	0.00	0.00	9000.00	39750.00		198750.00	100.00	198750.00	198750.00	0.00	No
3. CHALMERS	54250.00	0.00	0	0.00	0.00	0.00	9000.00	15812.50		79062.50	100.00	79062.50	79062.50	0.00	No
4. DST	216384.20	0.00	0	0.00	0.00	0.00	42666.67	64762.72		323813.59	100.00	323813.59	0.00	0.00	No
5. INAF	70830.00	0.00	0	0.00	0.00	0.00	16000.00	21707.50		108537.50	100.00	108537.50	108537.50	0.00	No
6. MFOM-E	3750.00	0.00	0	0.00	0.00	0.00	0.00	937.50		4687.50	100.00	4687.50	0.00	0.00	No
7. SKAO	200000.00	0.00	0	0.00	0.00	0.00	2000.00	50500.00		252500.00	100.00	252500.00	252500.00	0.00	No
8. ASTRON	61000.00	0.00	0	0.00	0.00	0.00	12000.00	18250.00		91250.00	100.00	91250.00	91250.00	0.00	No
9. ILT	0.00	0.00	0	0.00	0.00	0.00	100.00	25.00		125.00	100.00	125.00	0.00	0.00	No
10. TUM	170000.00	0.00	0	0.00	0.00	0.00	14000.00	46000.00		230000.00	100.00	230000.00	230000.00	0.00	No
11. UNIVLEEDS	51333.00	0.00	0	0.00	0.00	0.00	8000.00	14833.25		74166.25	100.00	74166.25	74166.25	0.00	No
12. UMAN	75000.00	0.00	0	0.00	0.00	0.00	16000.00	22750.00		113750.00	100.00	113750.00	113750.00	0.00	No
Total consortium	2115880.20	0.00			0.00	0.00	533966.67	662461.72		3312308.59		3312308.59	2983682.50	0.00	0.00

ESTIMATED BUDGET FOR THE ACTION (page 2 of 2)

- (1) See Article 6 for the eligibility conditions
- (2) The indirect costs covered by the operating grant (received under any EU or Euratom funding programme; see Article 6.5.(b)) are ineligible under the GA. Therefore, a beneficiary that receives an operating grant during the action's duration cannot declare indirect costs for the year(s)/reporting period(s) covered by the operating grant (see Article 6.2.E).
- (3) This is the theoretical amount of EU contribution that the system calculates automatically (by multiplying all the budgeted costs by the reimbursement rate). This theoretical amount is capped by the 'maximum grant amount' (that the Commission/Agency decided to grant for the action) (see Article 5.1).
- (4) The 'maximum grant amount' is the maximum grant amount decided by the Commission/Agency. It normally corresponds to the requested grant, but may be lower.
- (5) Depending on its type, this specific cost category will or will not cover indirect costs. Specific unit costs that include indirect costs are: costs for energy efficiency measures in buildings, access costs for providing trans-national access to research infrastructure and costs for clinical studies.
- (6) See Article 5 for the forms of costs
- (7) Unit : hours worked on the action; costs per unit (hourly rate) : calculated according to beneficiary's usual accounting practice
- (8) See Annex 2a 'Additional information on the estimated budget' for the details (costs per hour (hourly rate)).
- (9) Flat rate : 25% of eligible direct costs, from which are excluded: direct costs of subcontracting, costs of in-kind contributions not used on premises, direct costs of financial support, and unit costs declared under budget category F if they include indirect costs
- (10) See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit).
- (11) See Annex 2a 'Additional information on the estimated budget' for the details (units, costs per unit, estimated number of units, etc)
- (12) Only specific unit costs that do not include indirect costs
- (13) See Article 9 for beneficiaries not receiving EU funding
- (14) Only for linked third parties that receive EU funding

ANNEX 2a

ADDITIONAL INFORMATION ON THE ESTIMATED BUDGET

Unit cost for SME owners/natural beneficiaries without salary

1. Costs for a /SME owner//beneficiary that is a natural person/ not receiving a salary

Units: hours worked on the action

Amount per unit ('hourly rate'): calculated according to the following formula:

{ { EUR 4,650 / 143 hours }
multiplied by
{country-specific correction coefficient of the country where the beneficiary is established }

Country-specific correction coefficient (in force at the time of the call):

EU Member States

country	coefficient	country	coefficient	country	coefficient	country	coefficient	country	coefficient
AT	104.8%	DK	135.3%	HR	97.5%	LV	75.9%	SE	111.7%
BE	100.0%	EE	78.3%	HU	76.2%	MT	89.6%	SI	86.1%
BG	71.5%	EL	92.7%	IE	113.5%	NL	104.3%	SK	82.6%
CY	91.8%	ES	97.6%	IT	106.7%	PL	76.4%	UK	120.3%
CZ	83.8%	FI	116.6%	LT	73.1%	PT	89.1%		
DE	98.8%	FR	111.0%	LU	100.0%	RO	68.3%		

H2020 associated countries

country	coefficient	country	coefficient	country	coefficient	country	coefficient	country	coefficient
AL	76.1%	FO	134.1%	LI	110.0%	MK	68.4%	TR	86.6%
BA	73.6%	IL	108.7%	MD	61.1%	NO	131.9%		
CH	113.1%	IS	116.6%	ME	66.9%	RS	67.1%		

Other countries

country	coefficient	country	coefficient	country	coefficient	country	coefficient	country	coefficient
AM	89.9%	CU	83.8%	JP	115.9%	NI	57.3%	TJ	64.9%
AO	114.6%	CV	76.4%	KE	78.1%	NP	73.5%	TL	78.3%
AR	58.5%	DJ	93.4%	KG	83.1%	NZ	94.1%	TN	70.5%
AU	105.0%	DO	66.9%	KH	70.5%	PA	57.0%	TO	85.0%
AZ	93.0%	DZ	81.7%	KR	105.2%	PE	75.5%	TT	74.1%
BB	116.6%	EC	68.8%	KZ	100.2%	PG	83.0%	TW	83.6%
BD	47.2%	EG	48.6%	LA	77.7%	PH	65.8%	TZ	65.2%
BF	93.8%	ER	61.2%	LB	86.4%	PK	49.4%	UA	92.3%
BJ	92.6%	ET	85.2%	LK	61.6%	PS	100.4%	UG	65.7%
BM	151.5%	FJ	68.1%	LR	100.1%	PY	71.9%	US	99.4%
BO	51.3%	GA	113.1%	LS	56.7%	RU	115.5%	UY	75.3%
BR	92.0%	GE	89.5%	LY	60.0%	RW	87.3%	UZ	51.4%
BW	55.3%	GH	68.2%	MA	83.5%	SA	84.8%	VE	70.0%
BY	65.0%	GM	67.7%	MG	80.0%	SB	93.3%	VN	51.1%
BZ	75.3%	GN	60.4%	ML	90.4%	SD	65.1%	VU	112.6%
CA	86.4%	GT	78.8%	MR	64.5%	SG	102.5%	WS	75.8%
CD	127.6%	GW	102.7%	MU	72.7%	SL	85.2%	XK	58.6%
CF	114.3%	GY	58.9%	MW	76.0%	SN	86.2%	YE	68.1%
CG	124.9%	HK	93.8%	MX	70.4%	SR	50.6%	ZA	55.8%
CI	102.0%	HN	69.0%	MY	71.6%	SV	74.3%	ZM	66.4%

H2020 Model Grant Agreements: H2020 General MGA — Multi: v3.0 – dd.mm.2016

CL	67.1%	HT	108.7%	MZ	71.6%	SY	74.8%	ZW	47.2%
CM	103.3%	ID	75.3%	NA	68.3%	SZ	56.8%		
CN	85.0%	IN	52.8%	NC	128.9%	TD	125.3%		
CO	76.6%	JM	94.9%	NE	87.9%	TG	88.7%		
CR	76.7%	JO	75.5%	NG	92.4%	TH	65.0%		

[additional OPTION for beneficiaries/linked third parties that have opted to use the unit cost (in the proposal/with an amendment): For the following beneficiaries/linked third parties, the amounts per unit (hourly rate) are fixed as follows:

- Beneficiary/linked third party [short name]: EUR [insert amount]
 - Beneficiary/linked third party [short name]: EUR [insert amount]
- [same for other beneficiaries/linked third parties, if necessary]]

Estimated number of units: see Annex 2

Energy efficiency measures unit cost

[OPTION if specific unit cost applicable to the grant: 2. Costs for energy efficiency measures in buildings

Unit: m² of eligible ‘conditioned’ (i.e. built or refurbished) floor area

Amount per unit*: see (for each beneficiary/linked third party and BEST table) the ‘unit cost table’ attached

* Amount calculated as follows:
{EUR 0.1 x estimated total kWh saved per m² per year x 10}

Estimated number of units: see (for each beneficiary/linked third party and BEST table) the ‘unit cost table’ attached

Unit cost table (energy efficiency measures unit cost)¹

Short name beneficiary/linked third party	BEST No	Cost Amount per unit	Estimated No of units	Total unit cost (cost per unit x estimated no of units)

]

Research infrastructure unit cost

[OPTION if specific unit cost applicable to the grant: 3. Access costs for providing trans-national access to research infrastructure

Units²: see (for each access provider and installation) the ‘unit cost table’ attached

¹ Data from the ‘building energy specification table (BEST)’ that is part of the proposal and Annex 1.

H2020 Model Grant Agreements: H2020 General MGA — Multi: v3.0 – dd.mm.2016

Amount per unit*: see (for each access provider and installation) the ‘unit cost table’ attached

* Amount calculated as follows:

$$\frac{\text{average annual total access cost to the installation (over past two years}^3)}{\text{average annual total quantity of access to the installation (over past two years}^4)}$$

Estimated number of units: see (for each access provider and installation) the ‘unit cost table’ attached

Unit cost table (access to research infrastructure unit cost)⁵

Short name access provider	Short name infrastructure	Installation		Unit of access	Amount per unit	Estimated No of units	Total unit cost (cost per unit x estimated no of units)
		No	Short name				

]

Clinical studies unit cost

[OPTION if specific unit cost is applicable to the grant: 4. Costs for clinical studies

Units: patients/subjects that participate in the clinical study

Amount per unit*: see (for each clinical study and beneficiary/linked third party) the ‘unit cost table’ attached

Estimated number of units: see (for each clinical study and beneficiary/linked third party) the ‘unit cost table’ attached

* Amount calculated, for each task described in the protocol, as follows:

- {Task 1
 - {unit cost component ‘personnel costs’
 - + unit cost component ‘costs of consumables’
 - + unit cost component ‘costs of medical equipment’
 - + unit cost component ‘costs of other specific services’
 - + unit cost component ‘indirect costs’}
- + Task 2
 - {unit cost component ‘personnel costs’
 - + unit cost component ‘costs of consumables’
 - + unit cost component ‘costs of medical equipment’
 - + unit cost component ‘costs of other specific services’

² Unit of access (e.g. beam hours, weeks of access, sample analysis) fixed by the access provider in proposal.

³ In exceptional and duly justified cases, the Commission/Agency may agree to a different reference period.

⁴ In exceptional and duly justified cases, the Commission/Agency may agree to a different reference period.

⁵ Data from the ‘table on estimated costs/quantity of access to be provided’ that is part of the proposal and Annex 1.

H2020 Model Grant Agreements: H2020 General MGA — Multi: v3.0 – dd.mm.2016

+ unit cost component 'indirect costs'
[same for all other tasks]}

Unit cost components calculated as follows:

Unit cost component '**personnel costs**' (i.e. 'personnel costs of doctors' + 'personnel costs of other medical personnel' + 'personnel costs of technical personnel')

For unit cost component 'personnel costs of doctors':

{ 'average hourly cost for doctors', i.e.:
$$\frac{\text{certified or auditable total personnel costs for doctors for year N-1}}{\{1720 * \text{number of full-time equivalent for the personnel category doctors for year N-1}\}}$$

multiplied by
estimated number of hours worked by doctors for the task (per patient/subject) }

For unit cost component 'personnel costs of other medical personnel':

{ 'average hourly cost for other medical personnel', i.e.:
$$\frac{\text{certified or auditable total personnel costs for other medical personnel for year N-1}}{\{1720 * \text{number of full-time equivalent for the personnel category other medical personnel for year N-1}\}}$$

multiplied by
estimated number of hours worked by other medical personnel for the task (per patient/subject) }

For unit cost component 'personnel costs of technical personnel':

{ 'average hourly cost for technical personnel, i.e.:
$$\frac{\text{certified or auditable total personnel costs for technical personnel for year N-1}}{\{1720 * \text{number of full-time equivalent for the personnel category technical personnel for year N-1}\}}$$

multiplied by
estimated number of hours worked by technical personnel for the task (per patient/subject) }

'total personnel costs' means actual salaries + actual social security contributions + actual taxes and other costs included in the remuneration, provided they arise from national law or the employment contract or equivalent appointing act

Unit cost component '**costs of consumables**' (i.e. 'costs of consumables category 1' + 'costs of consumables category 2' + 'costs of consumables category 3', etc)

For each category of consumables:

{ 'average price per item', i.e.:
$$\frac{\{\text{certified or auditable total costs of purchase of the consumables in year N-1 for the category of consumables concerned}\}}{\text{total number of items purchased in year N-1 for the category of consumables concerned}}$$

multiplied by
estimated number of items used for the task (per patient/subject) }

'total costs of purchase of the consumables' means total value of the supply contracts (including related duties, taxes and charges such as non-deductible VAT) concluded by the beneficiary for consumables delivered in year N-1, provided the contracts were awarded according to the principle of best value-for-money and without any conflict of interests

Unit cost component '**costs of medical equipment**' (i.e. 'costs of medical equipment category 1' + 'costs of medical equipment category 2' + 'costs of medical equipment category 3', etc.)

For each category of medical equipment:

{ 'average cost of depreciation and directly related services per unit of use', i.e.:

H2020 Model Grant Agreements: H2020 General MGA — Multi: v3.0 – dd.mm.2016

{ certified or auditable total depreciation costs in year N-1 for the category of equipment concerned + certified or auditable total costs of purchase of services in year N-1 for the category of equipment concerned }

 total capacity in year N-1
 multiplied by
 estimated number of units of use of the equipment for the task (per patient/subject) }

‘total depreciation costs’ means total depreciation allowances as recorded in the beneficiary’s accounts of year N-1 for the category of equipment concerned, provided the equipment was purchased according to the principle of best value-for-money and without any conflict of interests + total costs of renting or leasing contracts (including related duties, taxes and charges such as non-deductible VAT) in year N-1 for the category of equipment concerned, provided they do not exceed the depreciation costs of similar equipment and do not include finance fees

Unit cost component ‘costs of other specific services’ (i.e. ‘costs of contracts for specific service 1’ + ‘costs of contracts for specific service 2’ + ‘costs of contracts for specific service 3’, etc.)

For each category of specific service:

‘average cost of a specific service per patient or subject’, i.e.:

 certified or auditable total costs of purchase of a service in year N-1 for the category of specific services necessary for the conduct of clinical studies

 total number of patients or subjects included in the clinical studies for which the specific service was delivered in year N-1

‘total costs of purchase of a service’ means total value of the contracts concluded by the beneficiary (including related duties, taxes and charges such as non-deductible VAT) for the specific service delivered in year N-1 for the conduct of clinical studies, provided the contracts were awarded according to the principle of best value-for-money and without any conflict of interests

Unit cost component ‘indirect costs’

{ 25%
 multiplied by
 { unit cost component ‘personnel costs’ + unit cost component ‘costs of consumables’ + unit cost component ‘costs of medical equipment’ } }

The following must be excluded:

- costs of in-kind contributions provided by third parties which are not used on the beneficiary’s premises and
- costs of providing financial support to third parties (if any).

Unit cost table: clinical studies unit cost⁶

[Insert name of clinical study]							
Tasks and unit cost components	Resources per patient	Amount per unit for beneficiary /linked third party	Amount per unit for beneficiary /linked third party	Amount per unit for beneficiary/linked third party 3 [insert short name]	...		

⁶ Same table as in proposal and Annex 1.

H2020 Model Grant Agreements: H2020 General MGA — Multi: v3.0 – dd.mm.2016

			1 [insert short name]	2 [insert short name]		in-kind contributions by third party*	
Task No. 1 Blood sample							
Personnel costs	doctors	----	0	0	0	0	
	other medical personnel	Phlebotomy (nurse), 10 minutes	8,33 EUR	11,59 EUR	10,55 EUR	9,76 EUR	
	technical personnel	Sample Processing (lab technician), 15 minutes	9,51 EUR	15,68 EUR	13,77 EUR	12,35 EUR	
Costs of consumables	Category 1	Syringe, 1	XX EUR	XX EUR	XX EUR	XX EUR	
	Category 2	Cannula, 1	XX EUR	XX EUR	XX EUR	XX EUR	
	Category 2	Blood container, 1	XX EUR	XX EUR	XX EUR	XX EUR	
	...						
Costs of medical equipment	Category 1	Use of -80° deep freezer, 60 days	XX EUR	XX EUR	XX EUR	XX EUR	
	Category 2	Use of centrifuge, 15 minutes	XX EUR	XX EUR	XX EUR	XX EUR	
						
Costs of other specific services	Category 1						
	Category 2						
	...						
Indirect costs							
Task No. 2							
...							
Total amount per unit			XX EUR	XX EUR	XX EUR	XX EUR**	
Estimated No of units (patients/subjects participating in the study)			XX	XX	XX	XX	
Total unit cost for beneficiary/linked third party (total cost per unit x estimated no of units)			XX EUR	XX EUR	XX EUR		

* Use costs of third party making in-kind contribution.

** Capped at payment to third party, if any.

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

CENTRE NATIONAL DE LA RECHERCHE SCIENTIFIQUE CNRS (CNRS), 180089013, established in RUE MICHEL ANGE 3, PARIS 75794, France, VAT number FR40180089013, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('2')

in Grant Agreement No 730884 ('the Agreement')

between JOINT INSTITUTE FOR VERY LONG BASELINE INTERFEROMETRY AS A EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (JIV-ERIC) **and** the European Union ('the EU'), represented by the European Commission ('the Commission'),

for the action entitled 'Joining up Users for Maximising the Profile, the Innovation and the Necessary Globalisation of JIVE (JUMPING JIVE)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

CHALMERS TEKNISKA HOEGSKOLA AB (CHALMERS) AB, 5564795598, established in -, GOETEBORG 41296, Sweden, VAT number SE556479559801, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('3')

in Grant Agreement No 730884 ('the Agreement')

between JOINT INSTITUTE FOR VERY LONG BASELINE INTERFEROMETRY AS A EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (JIV-ERIC) **and** the European Union ('the EU'), represented by the European Commission ('the Commission'),

for the action entitled 'Joining up Users for Maximising the Profile, the Innovation and the Necessary Globalisation of JIVE (JUMPING JIVE)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

DEPARTMENT OF SCIENCE AND TECHNOLOGY (DST), established in Meiring Naude Road 53 CSIR Campus, BRUMMERIA 0001, South Africa, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('4')

in Grant Agreement No 730884 ('the Agreement')

between JOINT INSTITUTE FOR VERY LONG BASELINE INTERFEROMETRY AS A EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (JIV-ERIC) **and** the European Union ('the EU'), represented by the European Commission ('the Commission'),

for the action entitled 'Joining up Users for Maximising the Profile, the Innovation and the Necessary Globalisation of JIVE (JUMPING JIVE)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

ISTITUTO NAZIONALE DI ASTROFISICA (INAF), 97220210583, established in Viale del Parco Mellini 84, ROMA 00136, Italy, VAT number IT06895721006, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('5')

in Grant Agreement No 730884 ('the Agreement')

between JOINT INSTITUTE FOR VERY LONG BASELINE INTERFEROMETRY AS A EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (JIV-ERIC) **and** the European Union ('the EU'), represented by the European Commission ('the Commission'),

for the action entitled 'Joining up Users for Maximising the Profile, the Innovation and the Necessary Globalisation of JIVE (JUMPING JIVE)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

MINISTERIO DE FOMENTO (MFOM-E), established in PASEO DE LA CASTELLANA 67, MADRID 28071, Spain, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('6')

in Grant Agreement No 730884 ('the Agreement')

between JOINT INSTITUTE FOR VERY LONG BASELINE INTERFEROMETRY AS A EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (JIV-ERIC) **and** the European Union ('the EU'), represented by the European Commission ('the Commission'),

for the action entitled 'Joining up Users for Maximising the Profile, the Innovation and the Necessary Globalisation of JIVE (JUMPING JIVE)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

SKA ORGANISATION (SKAO) GB5, 07881918, established in JODRELL BANK OBSERVATORY LOWER WITHINGTON, MACCLESFIELD SK11 9DL, United Kingdom, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('7')

in Grant Agreement No 730884 ('the Agreement')

between JOINT INSTITUTE FOR VERY LONG BASELINE INTERFEROMETRY AS A EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (JIV-ERIC) **and** the European Union ('the EU'), represented by the European Commission ('the Commission'),

for the action entitled 'Joining up Users for Maximising the Profile, the Innovation and the Necessary Globalisation of JIVE (JUMPING JIVE)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

STICHTING ASTRON, NETHERLANDS INSTITUTE FOR RADIO ASTRONOMY (ASTRON) NL6, 41166026, established in Oude Hoogeveensedijk 4, DWINGELOO 7991PD, Netherlands, VAT number NL003447741B01, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('8')

in Grant Agreement No 730884 ('the Agreement')

between JOINT INSTITUTE FOR VERY LONG BASELINE INTERFEROMETRY AS A EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (JIV-ERIC) **and** the European Union ('the EU'), represented by the European Commission ('the Commission'),

for the action entitled 'Joining up Users for Maximising the Profile, the Innovation and the Necessary Globalisation of JIVE (JUMPING JIVE)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

STICHTING INTERNATIONAL LOFAR TELESCOPE (ILT) NL6, 51272059, established in OUDE HOOGVEENSEDIJK 4, Dwingeloo 7991 PD, Netherlands, VAT number NL n/a, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('9')

in Grant Agreement No 730884 ('the Agreement')

between JOINT INSTITUTE FOR VERY LONG BASELINE INTERFEROMETRY AS A EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (JIV-ERIC) **and** the European Union ('the EU'), represented by the European Commission ('the Commission'),

for the action entitled 'Joining up Users for Maximising the Profile, the Innovation and the Necessary Globalisation of JIVE (JUMPING JIVE)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

TECHNISCHE UNIVERSITAET MUENCHEN (TUM), Bay. Hochschulgesetz, established in Arcisstrasse 21, MUENCHEN 80333, Germany, VAT number DE811193231, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('10')

in Grant Agreement No 730884 ('the Agreement')

between JOINT INSTITUTE FOR VERY LONG BASELINE INTERFEROMETRY AS A EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (JIV-ERIC) **and** the European Union ('the EU'), represented by the European Commission ('the Commission'),

for the action entitled 'Joining up Users for Maximising the Profile, the Innovation and the Necessary Globalisation of JIVE (JUMPING JIVE)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

UNIVERSITY OF LEEDS (UNIVLEEDS) GB22, RC000658, established in WOODHOUSE LANE, LEEDS LS2 9JT, United Kingdom, VAT number GB613451470, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('11')

in Grant Agreement No 730884 ('the Agreement')

between JOINT INSTITUTE FOR VERY LONG BASELINE INTERFEROMETRY AS A EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (JIV-ERIC) **and** the European Union ('the EU'), represented by the European Commission ('the Commission'),

for the action entitled 'Joining up Users for Maximising the Profile, the Innovation and the Necessary Globalisation of JIVE (JUMPING JIVE)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

THE UNIVERSITY OF MANCHESTER (UMAN) GB22, RC000797, established in OXFORD ROAD UNIVERSITY OF MANCHESTER OFFICE OF DIRECTOR OF FINANCE, MANCHESTER M13 9PL, United Kingdom, VAT number GB849738956, ('the beneficiary'), represented for the purpose of signing this Accession Form by the undersigned,

hereby agrees

to become beneficiary No ('12')

in Grant Agreement No 730884 ('the Agreement')

between JOINT INSTITUTE FOR VERY LONG BASELINE INTERFEROMETRY AS A EUROPEAN RESEARCH INFRASTRUCTURE CONSORTIUM (JIV-ERIC) **and** the European Union ('the EU'), represented by the European Commission ('the Commission'),

for the action entitled 'Joining up Users for Maximising the Profile, the Innovation and the Necessary Globalisation of JIVE (JUMPING JIVE)'.

and mandates

the coordinator to submit and sign in its name and on its behalf any **amendments** to the Agreement, in accordance with Article 55.

By signing this Accession Form, the beneficiary accepts the grant and agrees to implement it in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

print
format A4
landscape

MODEL ANNEX 4 FOR H2020 GENERAL MGA — MULTI

FINANCIAL STATEMENT FOR [BENEFICIARY [name]/ LINKED THIRD PARTY [name]] FOR REPORTING PERIOD [reporting period]

Eligible ¹ costs (per budget category)													Receipts	EU contribution			Additional information
A. Direct personnel costs		B. Direct costs of subcontracting		[C. Direct costs of fin. support]		D. Other direct costs		E. Indirect costs ²		[F. Costs of ...]		Total costs	Receipts	Reimbursement rate %	Maximum EU contribution ³	Requested EU contribution	
A.1 Employees (or equivalent)		A.4 SME owners without salary		[C.1 Financial support]		D.1 Travel		[D.4 Costs of large research infrastructure]		[F.1 Costs of ...]		Receipts of the action, to be reported in the last reporting period, according to Article 5.3.3					
A.2 Natural persons under direct contract		A.5 Beneficiaries that are natural persons without salary		[C.2 Prizes]		D.2 Equipment											
A.3 Seconded persons [A.6 Personnel for providing access]						D.3 Other goods and											
Form of costs ⁴	Actual	Unit		Actual	Actual	Actual	Actual	Flat-rate ⁵	[Unit][Lump sum]		Unit	k	l	m	n		
	a	Total b	No hours	Total c	d	[e]	f	[g]	h=0,25 x (a+b+c+f+g)	No units	Total [i1]					Total [i2]	j=a+b+c+d+h+e+f+g
[short name beneficiary /linked third party]																	

The beneficiary/linked third party hereby confirms that:
 The information provided is complete, reliable and true.
 The costs declared are eligible (see Article 6).
 The costs can be substantiated by adequate records and supporting documentation that will be produced upon request or in the context of checks, reviews, audits and investigations (see Articles 17, 18 and 22).
 For the last reporting period: that all the receipts have been declared (see Article 5.3.3).

Please declare all eligible costs, even if they exceed the amounts indicated in the estimated budget (see Annex 2). Only amounts that were declared in your individual financial statements can be taken into account later on, in order to replace other costs that are found to be ineligible.

¹ See Article 6 for the eligibility conditions

² The indirect costs claimed must be free of any amounts covered by an operating grant (received under any EU or Euratom funding programme; see Article 6.2.E). If you have received an operating grant during this reporting period, you cannot claim any indirect costs.

³ This is the *theoretical* amount of EU contribution that the system calculates automatically (by multiplying the reimbursement rate by the total costs declared). The amount you request (in the column 'requested EU contribution') may be less

⁴ See Article 5 for the form of costs

⁵ Flat rate : 25% of eligible direct costs, from which are excluded: direct costs of subcontracting, costs of in-kind contributions not used on premises, direct costs of financial support, and unit costs declared under budget category F if they include indirect costs (see Article 6.2.E)

⁶ Only specific unit costs that do not include indirect costs

ANNEX 5

MODEL FOR THE CERTIFICATE ON THE FINANCIAL STATEMENTS

- For options [*in italics in square brackets*]: choose the applicable option. Options not chosen should be deleted.
- For fields in [grey in square brackets]: enter the appropriate data

TABLE OF CONTENTS

TERMS OF REFERENCE FOR AN INDEPENDENT REPORT OF FACTUAL FINDINGS ON COSTS DECLARED UNDER A GRANT AGREEMENT FINANCED UNDER THE HORIZON 2020 RESEARCH FRAMEWORK PROGRAMME

INDEPENDENT REPORT OF FACTUAL FINDINGS ON COSTS DECLARED UNDER A GRANT AGREEMENT FINANCED UNDER THE HORIZON 2020 RESEARCH FRAMEWORK PROGRAMME

Terms of Reference for an Independent Report of Factual Findings on costs declared under a Grant Agreement financed under the Horizon 2020 Research and Innovation Framework Programme

This document sets out the ‘**Terms of Reference (ToR)**’ under which

[*OPTION 1: [insert name of the beneficiary] (‘the Beneficiary’) [OPTION 2: [insert name of the linked third party] (‘the Linked Third Party’), third party linked to the Beneficiary [insert name of the beneficiary] (‘the Beneficiary’)]*]

agrees to engage

[**insert legal name of the auditor**] (‘the Auditor’)

to produce an independent report of factual findings (‘the Report’) concerning the Financial Statement(s)¹ drawn up by the [*Beneficiary*] [*Linked Third Party*] for the Horizon 2020 grant agreement [insert number of the grant agreement, title of the action, acronym and duration from/to] (‘the Agreement’), and

to issue a Certificate on the Financial Statements’ (‘CFS’) referred to in Article 20.4 of the Agreement based on the compulsory reporting template stipulated by the Commission.

The Agreement has been concluded under the Horizon 2020 Research and Innovation Framework Programme (H2020) between the Beneficiary and [*OPTION 1: the European Union, represented by the European Commission (‘the Commission’)] [OPTION 2: the European Atomic Energy Community (Euratom,) represented by the European Commission (‘the Commission’)] [OPTION 3: the [Research Executive Agency (REA)] [European Research Council Executive Agency (ERCEA)] [Innovation and Networks Executive Agency (INEA)] [Executive Agency for Small and Medium-sized Enterprises (EASME)] (‘the Agency’), under the powers delegated by the European Commission (‘the Commission’).]*]

The [*Commission*] [*Agency*] is mentioned as a signatory of the Agreement with the Beneficiary only. The [*European Union*][*Euratom*][*Agency*] is not a party to this engagement.

1.1 Subject of the engagement

The coordinator must submit to the [*Commission*][*Agency*] the final report within 60 days following the end of the last reporting period which should include, amongst other documents, a CFS for each beneficiary and for each linked third party that requests a total contribution of EUR 325 000 or more, as reimbursement of actual costs and unit costs calculated on the basis of its usual cost accounting practices (see Article 20.4 of the Agreement). The CFS must cover all reporting periods of the beneficiary or linked third party indicated above.

The Beneficiary must submit to the coordinator the CFS for itself and for its linked third party(ies), if the CFS must be included in the final report according to Article 20.4 of the Agreement..

The CFS is composed of two separate documents:

- The Terms of Reference (‘the ToR’) to be signed by the [*Beneficiary*] [*Linked Third Party*] and the Auditor;

¹ By which costs under the Agreement are declared (see template ‘Model Financial Statements’ in Annex 4 to the Grant Agreement).

H2020 Model Grant Agreements: H2020 General MGA — Multi: v3.0 – dd.mm.2016

- The Auditor's Independent Report of Factual Findings ('the Report') to be issued on the Auditor's letterhead, dated, stamped and signed by the Auditor (or the competent public officer) which includes the agreed-upon procedures ('the Procedures') to be performed by the Auditor, and the standard factual findings ('the Findings') to be confirmed by the Auditor.

If the CFS must be included in the final report according to Article 20.4 of the Agreement, the request for payment of the balance relating to the Agreement cannot be made without the CFS. However, the payment for reimbursement of costs covered by the CFS does not preclude the [Commission,] [Agency,] the European Anti-Fraud Office and the European Court of Auditors from carrying out checks, reviews, audits and investigations in accordance with Article 22 of the Agreement.

1.2 Responsibilities

The [Beneficiary] [Linked Third Party]:

- must draw up the Financial Statement(s) for the action financed by the Agreement in compliance with the obligations under the Agreement. The Financial Statement(s) must be drawn up according to the [Beneficiary's] [Linked Third Party's] accounting and book-keeping system and the underlying accounts and records;
- must send the Financial Statement(s) to the Auditor;
- is responsible and liable for the accuracy of the Financial Statement(s);
- is responsible for the completeness and accuracy of the information provided to enable the Auditor to carry out the Procedures. It must provide the Auditor with a written representation letter supporting these statements. The written representation letter must state the period covered by the statements and must be dated;
- accepts that the Auditor cannot carry out the Procedures unless it is given full access to the [Beneficiary's] [Linked Third Party's] staff and accounting as well as any other relevant records and documentation.

The Auditor:

- [Option 1 by default: is qualified to carry out statutory audits of accounting documents in accordance with Directive 2006/43/EC of the European Parliament and of the Council of 17 May 2006 on statutory audits of annual accounts and consolidated accounts, amending Council Directives 78/660/EEC and 83/349/EEC and repealing Council Directive 84/253/EEC or similar national regulations].
- [Option 2 if the Beneficiary or Linked Third Party has an independent Public Officer: is a competent and independent Public Officer for which the relevant national authorities have established the legal capacity to audit the Beneficiary].
- [Option 3 if the Beneficiary or Linked Third Party is an international organisation: is an [internal] [external] auditor in accordance with the internal financial regulations and procedures of the international organisation].

The Auditor:

- must be independent from the Beneficiary [and the Linked Third Party], in particular, it must not have been involved in preparing the [Beneficiary's] [Linked Third Party's] Financial Statement(s);
- must plan work so that the Procedures may be carried out and the Findings may be assessed;
- must adhere to the Procedures laid down and the compulsory report format;
- must carry out the engagement in accordance with this ToR;
- must document matters which are important to support the Report;
- must base its Report on the evidence gathered;
- must submit the Report to the [Beneficiary] [Linked Third Party].

The Commission sets out the Procedures to be carried out by the Auditor. The Auditor is not responsible for their suitability or pertinence. As this engagement is not an assurance engagement, the Auditor does not provide an audit opinion or a statement of assurance.

1.3 Applicable Standards

The Auditor must comply with these Terms of Reference and with²:

- the International Standard on Related Services ('ISRS') 4400 *Engagements to perform Agreed-upon Procedures regarding Financial Information* as issued by the International Auditing and Assurance Standards Board (IAASB);
- the *Code of Ethics for Professional Accountants* issued by the International Ethics Standards Board for Accountants (IESBA). Although ISRS 4400 states that independence is not a requirement for engagements to carry out agreed-upon procedures, the [Commission][Agency] requires that the Auditor also complies with the Code's independence requirements.

The Auditor's Report must state that there is no conflict of interests in establishing this Report between the Auditor and the Beneficiary [and the Linked Third Party], and must specify - if the service is invoiced - the total fee paid to the Auditor for providing the Report.

1.4 Reporting

The Report must be written in the language of the Agreement (see Article 20.7).

Under Article 22 of the Agreement, the Commission[, the Agency], the European Anti-Fraud Office and the Court of Auditors have the right to audit any work that is carried out under the action and for which costs are declared from [the European Union] [Euratom] budget. This includes work related to this engagement. The Auditor must provide access to all working papers (e.g. recalculation of hourly rates, verification of the time declared for the action) related to this assignment if the Commission [, the Agency], the European Anti-Fraud Office or the European Court of Auditors requests them.

1.5 Timing

The Report must be provided by [dd Month yyyy].

1.6 Other terms

[The [Beneficiary] [Linked Third Party] and the Auditor can use this section to agree other specific terms, such as the Auditor's fees, liability, applicable law, etc. Those specific terms must not contradict the terms specified above.]

[legal name of the Auditor]	[legal name of the [Beneficiary][Linked Third Party]]
[name & function of authorised representative]	[name & function of authorised representative]
[dd Month yyyy]	[dd Month yyyy]
Signature of the Auditor	Signature of the [Beneficiary][Linked Third Party]

² Supreme Audit Institutions applying INTOSAI-standards may carry out the Procedures according to the corresponding International Standards of Supreme Audit Institutions and code of ethics issued by INTOSAI instead of the International Standard on Related Services ('ISRS') 4400 and the Code of Ethics for Professional Accountants issued by the IAASB and the IESBA.

**Independent Report of Factual Findings on costs declared
under Horizon 2020 Research and Innovation Framework Programme**

(To be printed on the Auditor's letterhead)

To
[name of contact person(s)], [Position]
[[Beneficiary's] [Linked Third Party's] name]
[Address]
[dd Month yyyy]

Dear [Name of contact person(s)],

As agreed under the terms of reference dated [dd Month yyyy]

with [OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')],

we

[name of the auditor] ('the Auditor'),

established at

[full address/city/state/province/country],

represented by

[name and function of an authorised representative],

have carried out the procedures agreed with you regarding the costs declared in the Financial Statement(s)³ of the [Beneficiary] [Linked Third Party] concerning the grant agreement [insert grant agreement reference: number, title of the action and acronym] ('the Agreement'),

with a total cost declared of
[total amount] EUR,

and a total of actual costs and 'direct personnel costs declared as unit costs calculated in accordance with the [Beneficiary's] [Linked Third Party's] usual cost accounting practices' declared of

[sum of total actual costs and total direct personnel costs declared as unit costs calculated in accordance with the [Beneficiary's] [Linked Third Party's] usual cost accounting practices] EUR

and **hereby provide our Independent Report of Factual Findings ('the Report')** using the compulsory report format agreed with you.

The Report

Our engagement was carried out in accordance with the terms of reference ('the ToR') appended to this Report. The Report includes the agreed-upon procedures ('the Procedures') carried out and the standard factual findings ('the Findings') examined.

³ By which the Beneficiary declares costs under the Agreement (see template 'Model Financial Statement' in Annex 4 to the Agreement).

H2020 Model Grant Agreements: H2020 General MGA — Multi: v3.0 – dd.mm.2016

The Procedures were carried out solely to assist the [Commission] [Agency] in evaluating whether the [Beneficiary's] [Linked Third Party's] costs in the accompanying Financial Statement(s) were declared in accordance with the Agreement. The [Commission] [Agency] draws its own conclusions from the Report and any additional information it may require.

The scope of the Procedures was defined by the Commission. Therefore, the Auditor is not responsible for their suitability or pertinence. Since the Procedures carried out constitute neither an audit nor a review made in accordance with International Standards on Auditing or International Standards on Review Engagements, the Auditor does not give a statement of assurance on the Financial Statements.

Had the Auditor carried out additional procedures or an audit of the [Beneficiary's] [Linked Third Party's] Financial Statements in accordance with International Standards on Auditing or International Standards on Review Engagements, other matters might have come to its attention and would have been included in the Report.

Not applicable Findings

We examined the Financial Statement(s) stated above and considered the following Findings not applicable:

Explanation (to be removed from the Report):
If a Finding was not applicable, it must be marked as 'N.A.' ('Not applicable') in the corresponding row on the right-hand column of the table and means that the Finding did not have to be corroborated by the Auditor and the related Procedure(s) did not have to be carried out.
The reasons of the non-application of a certain Finding must be obvious i.e.
i) if no cost was declared under a certain category then the related Finding(s) and Procedure(s) are not applicable;
ii) if the condition set to apply certain Procedure(s) are not met the related Finding(s) and those Procedure(s) are not applicable. For instance, for 'beneficiaries with accounts established in a currency other than euro' the Procedure and Finding related to 'beneficiaries with accounts established in euro' are not applicable. Similarly, if no additional remuneration is paid, the related Finding(s) and Procedure(s) for additional remuneration are not applicable.

List here all Findings considered not applicable for the present engagement and explain the reasons of the non-applicability.
....

Exceptions

Apart from the exceptions listed below, the [Beneficiary] [Linked Third Party] provided the Auditor all the documentation and accounting information needed by the Auditor to carry out the requested Procedures and evaluate the Findings.

Explanation (to be removed from the Report):
- If the Auditor was not able to successfully complete a procedure requested, it must be marked as 'E' ('Exception') in the corresponding row on the right-hand column of the table. The reason such as the inability to reconcile key information or the unavailability of data that prevents the Auditor from carrying out the Procedure must be indicated below.
- If the Auditor cannot corroborate a standard finding after having carried out the corresponding procedure, it must also be marked as 'E' ('Exception') and, where possible, the reasons why the Finding was not fulfilled and its possible impact must be explained here below.

List here any exceptions and add any information on the cause and possible consequences of each exception, if known. If the exception is quantifiable, include the corresponding amount.
....

Example (to be removed from the Report):

1. *The Beneficiary was unable to substantiate the Finding number 1 on ... because*
2. *Finding number 30 was not fulfilled because the methodology used by the Beneficiary to calculate unit costs was different from the one approved by the Commission. The differences were as follows: ...*
3. *After carrying out the agreed procedures to confirm the Finding number 31, the Auditor found a difference of _____ EUR. The difference can be explained by ...*

Further Remarks

In addition to reporting on the results of the specific procedures carried out, the Auditor would like to make the following general remarks:

Example (to be removed from the Report):

1. *Regarding Finding number 8 the conditions for additional remuneration were considered as fulfilled because ...*
2. *In order to be able to confirm the Finding number 15 we carried out the following additional procedures:*

Use of this Report

This Report may be used only for the purpose described in the above objective. It was prepared solely for the confidential use of the [Beneficiary] [Linked Third Party] and the [Commission] [Agency], and only to be submitted to the [Commission] [Agency] in connection with the requirements set out in Article 20.4 of the Agreement. The Report may not be used by the [Beneficiary] [Linked Third Party] or by the [Commission] [Agency] for any other purpose, nor may it be distributed to any other parties. The [Commission] [Agency] may only disclose the Report to authorised parties, in particular to the European Anti-Fraud Office (OLAF) and the European Court of Auditors.

This Report relates only to the Financial Statement(s) submitted to the [Commission] [Agency] by the [Beneficiary] [Linked Third Party] for the Agreement. Therefore, it does not extend to any other of the [Beneficiary's] [Linked Third Party's] Financial Statement(s).

There was no conflict of interest⁴ between the Auditor and the Beneficiary [and Linked Third Party] in establishing this Report. The total fee paid to the Auditor for providing the Report was EUR [] (including EUR [] of deductible VAT).

We look forward to discussing our Report with you and would be pleased to provide any further information or assistance.

[legal name of the Auditor]

[name and function of an authorised representative]

[dd Month yyyy]

Signature of the Auditor

⁴ A conflict of interest arises when the Auditor's objectivity to establish the certificate is compromised in fact or in appearance when the Auditor for instance:

- was involved in the preparation of the Financial Statements;
- stands to benefit directly should the certificate be accepted;
- has a close relationship with any person representing the beneficiary;
- is a director, trustee or partner of the beneficiary; or
- is in any other situation that compromises his or her independence or ability to establish the certificate impartially.

Agreed-upon procedures to be performed and standard factual findings to be confirmed by the Auditor

The European Commission reserves the right to i) provide the auditor with additional guidance regarding the procedures to be followed or the facts to be ascertained and the way in which to present them (this may include sample coverage and findings) or to ii) change the procedures, by notifying the Beneficiary in writing. The procedures carried out by the auditor to confirm the standard factual finding are listed in the table below.

If this certificate relates to a Linked Third Party, any reference here below to ‘the Beneficiary’ is to be considered as a reference to ‘the Linked Third Party’.

The ‘result’ column has three different options: ‘C’, ‘E’ and ‘N.A.’:

- ‘C’ stands for ‘confirmed’ and means that the auditor can confirm the ‘standard factual finding’ and, therefore, there is no exception to be reported.
- ‘E’ stands for ‘exception’ and means that the Auditor carried out the procedures but cannot confirm the ‘standard factual finding’, or that the Auditor was not able to carry out a specific procedure (e.g. because it was impossible to reconcile key information or data were unavailable),
- ‘N.A.’ stands for ‘not applicable’ and means that the Finding did not have to be examined by the Auditor and the related Procedure(s) did not have to be carried out. The reasons of the non-application of a certain Finding must be obvious i.e. i) if no cost was declared under a certain category then the related Finding(s) and Procedure(s) are not applicable; ii) if the condition set to apply certain Procedure(s) are not met then the related Finding(s) and Procedure(s) are not applicable. For instance, for ‘beneficiaries with accounts established in a currency other than the euro’ the Procedure related to ‘beneficiaries with accounts established in euro’ is not applicable. Similarly, if no additional remuneration is paid, the related Finding(s) and Procedure(s) for additional remuneration are not applicable.

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
A	ACTUAL PERSONNEL COSTS AND UNIT COSTS CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICE		
	<p>The Auditor draws a sample of persons whose costs were declared in the Financial Statement(s) to carry out the procedures indicated in the consecutive points of this section A.</p> <p><i>(The sample should be selected randomly so that it is representative. Full coverage is required if there are fewer than 10 people (including employees, natural persons working under a direct contract and personnel seconded by a third party), otherwise the sample should have a minimum of 10 people, or 10% of the total, whichever number is the highest)</i></p> <p>The Auditor sampled [] people out of the total of [] people.</p>		

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
A.1	<p>PERSONNEL COSTS</p> <p><u>For the persons included in the sample and working under an employment contract or equivalent act (general procedures for individual actual personnel costs and personnel costs declared as unit costs)</u></p> <p>To confirm standard factual findings 1-5 listed in the next column, the Auditor reviewed following information/documents provided by the Beneficiary:</p> <ul style="list-style-type: none"> ○ a list of the persons included in the sample indicating the period(s) during which they worked for the action, their position (classification or category) and type of contract; ○ the payslips of the employees included in the sample; ○ reconciliation of the personnel costs declared in the Financial Statement(s) with the accounting system (project accounting and general ledger) and payroll system; ○ information concerning the employment status and employment conditions of personnel included in the sample, in particular their employment contracts or equivalent; ○ the Beneficiary’s usual policy regarding payroll matters (e.g. salary policy, overtime policy, variable pay); ○ applicable national law on taxes, labour and social security and ○ any other document that supports the personnel costs declared. <p>The Auditor also verified the eligibility of all components of the retribution (see Article 6 GA) and recalculated the personnel costs for employees included in the sample.</p>	<p>1) The employees were i) directly hired by the Beneficiary in accordance with its national legislation, ii) under the Beneficiary’s sole technical supervision and responsibility and iii) remunerated in accordance with the Beneficiary’s usual practices.</p> <p>2) Personnel costs were recorded in the Beneficiary's accounts/payroll system.</p> <p>3) Costs were adequately supported and reconciled with the accounts and payroll records.</p> <p>4) Personnel costs did not contain any ineligible elements.</p> <p>5) There were no discrepancies between the personnel costs charged to the action and the costs recalculated by the Auditor.</p>	
	<p><i>Further procedures if ‘additional remuneration’ is paid</i></p> <p>To confirm standard factual findings 6-9 listed in the next column, the Auditor:</p> <ul style="list-style-type: none"> ○ reviewed relevant documents provided by the Beneficiary (legal form, legal/statutory 	<p>6) The Beneficiary paying “additional remuneration” was a non-profit legal entity.</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p>obligations, the Beneficiary’s usual policy on additional remuneration, criteria used for its calculation...);</p> <ul style="list-style-type: none"> ○ recalculated the amount of additional remuneration eligible for the action based on the supporting documents received (full-time or part-time work, exclusive or non-exclusive dedication to the action, etc.) to arrive at the applicable FTE/year and pro-rata rate (see data collected in the course of carrying out the procedures under A.2 ‘Productive hours’ and A.4 ‘Time recording system’). <p><i>IF ANY PART OF THE REMUNERATION PAID TO THE EMPLOYEE IS NOT MANDATORY ACCORDING TO THE NATIONAL LAW OR THE EMPLOYMENT CONTRACT ("ADDITIONAL REMUNERATION") AND IS ELIGIBLE UNDER THE PROVISIONS OF ARTICLE 6.2.A.1, THIS CAN BE CHARGED AS ELIGIBLE COST TO THE ACTION UP TO THE FOLLOWING AMOUNT:</i></p> <p>(A) <i>IF THE PERSON WORKS FULL TIME AND EXCLUSIVELY ON THE ACTION DURING THE FULL YEAR: UP TO EUR 8 000/YEAR;</i></p> <p>(B) <i>IF THE PERSON WORKS EXCLUSIVELY ON THE ACTION BUT NOT FULL-TIME OR NOT FOR THE FULL YEAR: UP TO THE CORRESPONDING PRO-RATA AMOUNT OF EUR 8 000, OR</i></p> <p>(C) <i>IF THE PERSON DOES NOT WORK EXCLUSIVELY ON THE ACTION: UP TO A PRO-RATA AMOUNT CALCULATED IN ACCORDANCE TO ARTICLE 6.2.A.1.</i></p>	<p>7) The amount of additional remuneration paid corresponded to the Beneficiary’s usual remuneration practices and was consistently paid whenever the same kind of work or expertise was required.</p>	
		<p>8) The criteria used to calculate the additional remuneration were objective and generally applied by the Beneficiary regardless of the source of funding used.</p>	
		<p>9) The amount of additional remuneration included in the personnel costs charged to the action was capped at EUR 8,000 per FTE/year (up to the equivalent pro-rata amount if the person did not work on the action full-time during the year or did not work exclusively on the action).</p>	
	<p><i>Additional procedures in case “unit costs calculated by the Beneficiary in accordance with its usual cost accounting practices” is applied:</i></p> <p>Apart from carrying out the procedures indicated above to confirm standard factual findings 1-5 and, if applicable, also 6-9, the Auditor carried out following procedures to confirm standard</p>	<p>10) The personnel costs included in the Financial Statement were calculated in accordance with the Beneficiary's usual cost accounting practice. This methodology was consistently</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p>factual findings 10-13 listed in the next column:</p> <ul style="list-style-type: none"> ○ obtained a description of the Beneficiary's usual cost accounting practice to calculate unit costs; ○ reviewed whether the Beneficiary's usual cost accounting practice was applied for the Financial Statements subject of the present CFS; ○ verified the employees included in the sample were charged under the correct category (in accordance with the criteria used by the Beneficiary to establish personnel categories) by reviewing the contract/HR-record or analytical accounting records; ○ verified that there is no difference between the total amount of personnel costs used in calculating the cost per unit and the total amount of personnel costs recorded in the statutory accounts; ○ verified whether actual personnel costs were adjusted on the basis of budgeted or estimated elements and, if so, verified whether those elements used are actually relevant for the calculation, objective and supported by documents. 	<p>used in all H2020 actions.</p> <p>11) The employees were charged under the correct category.</p> <p>12) Total personnel costs used in calculating the unit costs were consistent with the expenses recorded in the statutory accounts.</p> <p>13) Any estimated or budgeted element used by the Beneficiary in its unit-cost calculation were relevant for calculating personnel costs and corresponded to objective and verifiable information.</p>	
	<p><u>For natural persons included in the sample and working with the Beneficiary under a direct contract other than an employment contract, such as consultants (no subcontractors).</u></p> <p>To confirm standard factual findings 14-18 listed in the next column the Auditor reviewed following information/documents provided by the Beneficiary:</p> <ul style="list-style-type: none"> ○ the contracts, especially the cost, contract duration, work description, place of work, ownership of the results and reporting obligations to the Beneficiary; ○ the employment conditions of staff in the same category to compare costs and; ○ any other document that supports the costs declared and its registration (e.g. invoices, 	<p>14) The natural persons reported to the Beneficiary (worked under the Beneficiary's instructions).</p> <p>15) They worked on the Beneficiary's premises (unless otherwise agreed with the Beneficiary).</p> <p>16) The results of work carried out belong to the Beneficiary.</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	accounting records, etc.).	17) Their costs were not significantly different from those for staff who performed similar tasks under an employment contract with the Beneficiary.	
		18) The costs were supported by audit evidence and registered in the accounts.	
	<p><u>For personnel seconded by a third party and included in the sample (not subcontractors)</u></p> <p>To confirm standard factual findings 19-22 listed in the next column, the Auditor reviewed following information/documents provided by the Beneficiary:</p> <ul style="list-style-type: none"> ○ their secondment contract(s) notably regarding costs, duration, work description, place of work and ownership of the results; ○ if there is reimbursement by the Beneficiary to the third party for the resource made available (in-kind contribution against payment): any documentation that supports the costs declared (e.g. contract, invoice, bank payment, and proof of registration in its accounting/payroll, etc.) and reconciliation of the Financial Statement(s) with the accounting system (project accounting and general ledger) as well as any proof that the amount invoiced by the third party did not include any profit; ○ if there is no reimbursement by the Beneficiary to the third party for the resource made available (in-kind contribution free of charge): a proof of the actual cost borne by the Third Party for the resource made available free of charge to the Beneficiary such as a statement of costs incurred by the Third Party and proof of the registration in the Third Party's accounting/payroll; ○ any other document that supports the costs declared (e.g. invoices, etc.). 	19) Seconded personnel reported to the Beneficiary and worked on the Beneficiary's premises (unless otherwise agreed with the Beneficiary).	
		20) The results of work carried out belong to the Beneficiary.	
		<p><i>If personnel is seconded against payment:</i></p> <p>21) The costs declared were supported with documentation and recorded in the Beneficiary's accounts. The third party did not include any profit.</p>	
		<p><i>If personnel is seconded free of charge:</i></p> <p>22) The costs declared did not exceed the third party's cost as</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
		recorded in the accounts of the third party and were supported with documentation.	
A.2	<p>PRODUCTIVE HOURS</p> <p>To confirm standard factual findings 23-28 listed in the next column, the Auditor reviewed relevant documents, especially national legislation, labour agreements and contracts and time records of the persons included in the sample, to verify that:</p> <ul style="list-style-type: none"> ○ the annual productive hours applied were calculated in accordance with one of the methods described below, ○ the full-time equivalent (FTEs) ratios for employees not working full-time were correctly calculated. <p>If the Beneficiary applied method B, the auditor verified that the correctness in which the total number of hours worked was calculated and that the contracts specified the annual workable hours.</p> <p>If the Beneficiary applied method C, the auditor verified that the ‘annual productive hours’ applied when calculating the hourly rate were equivalent to at least 90 % of the ‘standard annual workable hours’. The Auditor can only do this if the calculation of the standard annual workable hours can be supported by records, such as national legislation, labour agreements, and contracts.</p> <p><i>BENEFICIARY'S PRODUCTIVE HOURS' FOR PERSONS WORKING FULL TIME SHALL BE ONE OF THE FOLLOWING METHODS:</i></p> <p><i>A. 1720 ANNUAL PRODUCTIVE HOURS (PRO-RATA FOR PERSONS NOT WORKING FULL-TIME)</i></p> <p><i>B. THE TOTAL NUMBER OF HOURS WORKED BY THE PERSON FOR THE BENEFICIARY IN THE YEAR (THIS METHOD IS ALSO REFERRED TO AS ‘TOTAL NUMBER OF HOURS WORKED’ IN THE NEXT COLUMN). THE CALCULATION OF THE TOTAL NUMBER OF HOURS WORKED WAS DONE AS FOLLOWS: ANNUAL WORKABLE HOURS OF THE PERSON ACCORDING TO THE EMPLOYMENT</i></p>	<p>23) The Beneficiary applied method [<i>choose one option and delete the others</i>] [A: 1720 hours] [B: the ‘total number of hours worked’] [C: ‘standard annual productive hours’ used correspond to usual accounting practices]</p> <p>24) Productive hours were calculated annually.</p> <p>25) For employees not working full-time the full-time equivalent (FTE) ratio was correctly applied.</p> <p><i>If the Beneficiary applied method B.</i></p> <p>26) The calculation of the number of ‘annual workable hours’, overtime and absences was verifiable based on the documents provided by the Beneficiary.</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p><i>CONTRACT, APPLICABLE LABOUR AGREEMENT OR NATIONAL LAW PLUS OVERTIME WORKED MINUS ABSENCES (SUCH AS SICK LEAVE OR SPECIAL LEAVE).</i></p> <p><i>C. THE STANDARD NUMBER OF ANNUAL HOURS GENERALLY APPLIED BY THE BENEFICIARY FOR ITS PERSONNEL IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICES (THIS METHOD IS ALSO REFERRED TO AS 'STANDARD ANNUAL PRODUCTIVE HOURS' IN THE NEXT COLUMN). THIS NUMBER MUST BE AT LEAST 90% OF THE STANDARD ANNUAL WORKABLE HOURS.</i></p> <p><i>'ANNUAL WORKABLE HOURS' MEANS THE PERIOD DURING WHICH THE PERSONNEL MUST BE WORKING, AT THE EMPLOYER'S DISPOSAL AND CARRYING OUT HIS/HER ACTIVITY OR DUTIES UNDER THE EMPLOYMENT CONTRACT, APPLICABLE COLLECTIVE LABOUR AGREEMENT OR NATIONAL WORKING TIME LEGISLATION.</i></p>	<p>26.1) The Beneficiary calculates the hourly rates per full financial year following procedure A.3 (method B is not allowed for beneficiaries calculating hourly rates per month).</p> <p><i>If the Beneficiary applied method C.</i></p> <p>27) The calculation of the number of 'standard annual workable hours' was verifiable based on the documents provided by the Beneficiary.</p> <p>28) The 'annual productive hours' used for calculating the hourly rate were consistent with the usual cost accounting practices of the Beneficiary and were equivalent to at least 90 % of the 'annual workable hours'.</p>	
A.3	<p>HOURLY PERSONNEL RATES</p> <p><u>D) For unit costs calculated in accordance to the Beneficiary's usual cost accounting practice (unit costs):</u></p> <p>If the Beneficiary has a "Certificate on Methodology to calculate unit costs " (CoMUC) approved by the Commission, the Beneficiary provides the Auditor with a description of the approved methodology and the Commission's letter of acceptance. The Auditor verified that the</p>	<p>29) The Beneficiary applied [<i>choose one option and delete the other</i>]:</p> <p>[Option I: "Unit costs (hourly rates) were calculated in accordance with the Beneficiary's usual cost</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p>Beneficiary has indeed used the methodology approved. If so, no further verification is necessary.</p> <p>If the Beneficiary does not have a "Certificate on Methodology" (CoMUC) approved by the Commission, or if the methodology approved was not applied, then the Auditor:</p> <ul style="list-style-type: none"> ○ reviewed the documentation provided by the Beneficiary, including manuals and internal guidelines that explain how to calculate hourly rates; ○ recalculated the unit costs (hourly rates) of staff included in the sample following the results of the procedures carried out in A.1 and A.2. <p><u>II) For individual hourly rates:</u></p> <p>The Auditor:</p> <ul style="list-style-type: none"> ○ reviewed the documentation provided by the Beneficiary, including manuals and internal guidelines that explain how to calculate hourly rates; ○ recalculated the hourly rates of staff included in the sample (recalculation of all hourly rates if the Beneficiary uses annual rates, recalculation of three months selected randomly for every year and person if the Beneficiary uses monthly rates) following the results of the procedures carried out in A.1 and A.2; ○ (only in case of monthly rates) confirmed that the time spent on parental leave is not deducted, and that, if parts of the basic remuneration are generated over a period longer than a month, the Beneficiary has included only the share which is generated in the month. <p><u>“UNIT COSTS CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH ITS USUAL COST ACCOUNTING PRACTICES”:</u></p> <p><i>IT IS CALCULATED BY DIVIDING THE TOTAL AMOUNT OF PERSONNEL COSTS OF THE CATEGORY TO WHICH THE EMPLOYEE BELONGS VERIFIED IN LINE WITH PROCEDURE A.1 BY THE NUMBER OF FTE AND THE ANNUAL TOTAL PRODUCTIVE HOURS OF THE SAME CATEGORY CALCULATED BY THE BENEFICIARY IN ACCORDANCE WITH PROCEDURE A.2.</i></p>	<p>accounting practices”]</p> <p>[Option II: Individual hourly rates were applied]</p> <p><i>For option I concerning unit costs and if the Beneficiary applies the methodology approved by the Commission (CoMUC):</i></p> <p>30) The Beneficiary used the Commission-approved methodology to calculate hourly rates. It corresponded to the organisation's usual cost accounting practices and was applied consistently for all activities irrespective of the source of funding.</p> <p><i>For option I concerning unit costs and if the Beneficiary applies a methodology not approved by the Commission:</i></p> <p>31) The unit costs re-calculated by the Auditor were the same as the rates applied by the Beneficiary.</p> <p><i>For option II concerning individual hourly rates:</i></p> <p>32) The individual rates re-</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p><u>HOURLY RATE FOR INDIVIDUAL ACTUAL PERSONAL COSTS:</u> <i>IT IS CALCULATED FOLLOWING ONE OF THE TWO OPTIONS BELOW:</i></p> <p>A) [OPTION BY DEFAULT] BY DIVIDING THE ACTUAL ANNUAL AMOUNT OF PERSONNEL COSTS OF AN EMPLOYEE VERIFIED IN LINE WITH PROCEDURE A.1 BY THE NUMBER OF ANNUAL PRODUCTIVE HOURS VERIFIED IN LINE WITH PROCEDURE A.2 (FULL FINANCIAL YEAR HOURLY RATE);</p> <p>B) BY DIVIDING THE ACTUAL MONTHLY AMOUNT OF PERSONNEL COSTS OF AN EMPLOYEE VERIFIED IN LINE WITH PROCEDURE A.1 BY 1/12 OF THE NUMBER OF ANNUAL PRODUCTIVE HOURS VERIFIED IN LINE WITH PROCEDURE A.2.(MONTHLY HOURLY RATE).</p>	<p>calculated by the Auditor were the same as the rates applied by the Beneficiary.</p> <p>32.1) The Beneficiary used only one option (per full financial year or per month) throughout each financial year examined.</p>	
A.4	<p>TIME RECORDING SYSTEM</p> <p>To verify that the time recording system ensures the fulfilment of all minimum requirements and that the hours declared for the action were correct, accurate and properly authorised and supported by documentation, the Auditor made the following checks for the persons included in the sample that declare time as worked for the action on the basis of time records:</p> <ul style="list-style-type: none"> ○ description of the time recording system provided by the Beneficiary (registration, authorisation, processing in the HR-system); ○ its actual implementation; ○ time records were signed at least monthly by the employees (on paper or electronically) and authorised by the project manager or another manager; ○ the hours declared were worked within the project period; ○ there were no hours declared as worked for the action if HR-records showed absence due to holidays or sickness (further cross-checks with travels are carried out in B.1 below) ; ○ the hours charged to the action matched those in the time recording system. 	<p>33) All persons recorded their time dedicated to the action on a daily/ weekly/ monthly basis using a paper/computer-based system. <i>(delete the answers that are not applicable)</i></p> <p>34) Their time-records were authorised at least monthly by the project manager or other superior.</p> <p>35) Hours declared were worked within the project period and were consistent with the presences/absences recorded in HR-records.</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p><i>ONLY THE HOURS WORKED ON THE ACTION CAN BE CHARGED. ALL WORKING TIME TO BE CHARGED SHOULD BE RECORDED THROUGHOUT THE DURATION OF THE PROJECT, ADEQUATELY SUPPORTED BY EVIDENCE OF THEIR REALITY AND RELIABILITY (SEE SPECIFIC PROVISIONS BELOW FOR PERSONS WORKING EXCLUSIVELY FOR THE ACTION WITHOUT TIME RECORDS).</i></p>	36) There were no discrepancies between the number of hours charged to the action and the number of hours recorded.	
	<p><u>If the persons are working exclusively for the action and without time records</u></p> <p>For the persons selected that worked exclusively for the action without time records, the Auditor verified evidence available demonstrating that they were in reality exclusively dedicated to the action and that the Beneficiary signed a declaration confirming that they have worked exclusively for the action.</p>	37) The exclusive dedication is supported by a declaration signed by the Beneficiary's and by any other evidence gathered.	
B	COSTS OF SUBCONTRACTING		
B.1	<p>The Auditor obtained the detail/breakdown of subcontracting costs and sampled cost items selected randomly <i>(full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest).</i></p> <p>To confirm standard factual findings 38-42 listed in the next column, the Auditor reviewed the following for the items included in the sample:</p> <ul style="list-style-type: none"> ○ the use of subcontractors was foreseen in Annex 1; ○ subcontracting costs were declared in the subcontracting category of the Financial Statement; ○ supporting documents on the selection and award procedure were followed; ○ the Beneficiary ensured best value for money (key elements to appreciate the respect of this principle are the award of the subcontract to the bid offering best price-quality ratio, under conditions of transparency and equal treatment. In case an existing framework contract was used the Beneficiary ensured it was established on the basis of the principle of best value for money under conditions of transparency and equal treatment). 	<p>38) The use of claimed subcontracting costs was foreseen in Annex 1 and costs were declared in the Financial Statements under the subcontracting category.</p> <p>39) There were documents of requests to different providers, different offers and assessment of the offers before selection of the provider in line with internal procedures and procurement rules. Subcontracts were awarded in accordance with the principle of best value for money.</p> <p><i>(When different offers were not collected the Auditor explains</i></p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	<p>In particular,</p> <ul style="list-style-type: none"> i. if the Beneficiary acted as a contracting authority within the meaning of Directive 2004/18/EC (or 2014/24/EU) or of Directive 2004/17/EC (or 2014/25/EU), the Auditor verified that the applicable national law on public procurement was followed and that the subcontracting complied with the Terms and Conditions of the Agreement. ii. if the Beneficiary did not fall under the above-mentioned category the Auditor verified that the Beneficiary followed their usual procurement rules and respected the Terms and Conditions of the Agreement.. <p>For the items included in the sample the Auditor also verified that:</p> <ul style="list-style-type: none"> o the subcontracts were not awarded to other Beneficiaries in the consortium; o there were signed agreements between the Beneficiary and the subcontractor; o there was evidence that the services were provided by subcontractor; 	<p><i>the reasons provided by the Beneficiary under the caption "Exceptions" of the Report. The Commission will analyse this information to evaluate whether these costs might be accepted as eligible)</i></p> <p>40) The subcontracts were not awarded to other Beneficiaries of the consortium.</p> <p>41) All subcontracts were supported by signed agreements between the Beneficiary and the subcontractor.</p> <p>42) There was evidence that the services were provided by the subcontractors.</p>	
C	COSTS OF PROVIDING FINANCIAL SUPPORT TO THIRD PARTIES		
C.1	<p>The Auditor obtained the detail/breakdown of the costs of providing financial support to third parties and sampled [REDACTED] cost items selected randomly (full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest).</p> <p>The Auditor verified that the following minimum conditions were met:</p> <ul style="list-style-type: none"> a) the maximum amount of financial support for each third party did not exceed EUR 60 000, unless explicitly mentioned in Annex 1; 	<p>43) All minimum conditions were met</p>	

Ref	Procedures	Standard factual finding	Result (C / E / N.A.)
	b) the financial support to third parties was agreed in Annex 1 of the Agreement and the other provisions on financial support to third parties included in Annex 1 were respected.		

D	OTHER ACTUAL DIRECT COSTS		
D.1	<p>COSTS OF TRAVEL AND RELATED SUBSISTENCE ALLOWANCES</p> <p>The Auditor sampled [REDACTED] cost items selected randomly (<i>full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is the highest</i>).</p> <p>The Auditor inspected the sample and verified that:</p> <ul style="list-style-type: none"> ○ travel and subsistence costs were consistent with the Beneficiary's usual policy for travel. In this context, the Beneficiary provided evidence of its normal policy for travel costs (e.g. use of first class tickets, reimbursement by the Beneficiary on the basis of actual costs, a lump sum or per diem) to enable the Auditor to compare the travel costs charged with this policy; ○ travel costs are correctly identified and allocated to the action (e.g. trips are directly linked to the action) by reviewing relevant supporting documents such as minutes of meetings, workshops or conferences, their registration in the correct project account, their consistency with time records or with the dates/duration of the workshop/conference; ○ no ineligible costs or excessive or reckless expenditure was declared. 	44) Costs were incurred, approved and reimbursed in line with the Beneficiary's usual policy for travels.	
		45) There was a link between the trip and the action.	
		46) The supporting documents were consistent with each other regarding subject of the trip, dates, duration and reconciled with time records and accounting.	
		47) No ineligible costs or excessive or reckless expenditure was declared.	
D.2	<p>DEPRECIATION COSTS FOR EQUIPMENT, INFRASTRUCTURE OR OTHER ASSETS</p> <p>The Auditor sampled [REDACTED] cost items selected randomly (<i>full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is the highest</i>).</p> <p>For “equipment, infrastructure or other assets” [from now on called “asset(s)”] selected in the sample the Auditor verified that:</p> <ul style="list-style-type: none"> ○ the assets were acquired in conformity with the Beneficiary's internal guidelines and procedures; ○ they were correctly allocated to the action (with supporting documents such as delivery 	48) Procurement rules, principles and guides were followed.	
		49) There was a link between the grant agreement and the asset charged to the action.	
		50) The asset charged to the action was traceable to the accounting records and the underlying documents.	

	<p>note invoice or any other proof demonstrating the link to the action)</p> <ul style="list-style-type: none"> ○ they were entered in the accounting system; ○ the extent to which the assets were used for the action (as a percentage) was supported by reliable documentation (e.g. usage overview table); <p>The Auditor recalculated the depreciation costs and verified that they were in line with the applicable rules in the Beneficiary's country and with the Beneficiary's usual accounting policy (e.g. depreciation calculated on the acquisition value).</p> <p>The Auditor verified that no ineligible costs such as deductible VAT, exchange rate losses, excessive or reckless expenditure were declared (see Article 6.5 GA).</p>	51) The depreciation method used to charge the asset to the action was in line with the applicable rules of the Beneficiary's country and the Beneficiary's usual accounting policy.	
		52) The amount charged corresponded to the actual usage for the action.	
		53) No ineligible costs or excessive or reckless expenditure were declared.	
D.3	<p>COSTS OF OTHER GOODS AND SERVICES</p> <p>The Auditor sampled [REDACTED] cost items selected randomly (<i>full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 items, or 10% of the total, whichever number is highest</i>).</p> <p>For the purchase of goods, works or services included in the sample the Auditor verified that:</p> <ul style="list-style-type: none"> ○ the contracts did not cover tasks described in Annex 1; ○ they were correctly identified, allocated to the proper action, entered in the accounting system (traceable to underlying documents such as purchase orders, invoices and accounting); ○ the goods were not placed in the inventory of durable equipment; ○ the costs charged to the action were accounted in line with the Beneficiary's usual accounting practices; ○ no ineligible costs or excessive or reckless expenditure were declared (see Article 6 GA). <p>In addition, the Auditor verified that these goods and services were acquired in conformity with the Beneficiary's internal guidelines and procedures, in particular:</p> <ul style="list-style-type: none"> ○ if Beneficiary acted as a contracting authority within the meaning of Directive 	54) Contracts for works or services did not cover tasks described in Annex 1.	
		55) Costs were allocated to the correct action and the goods were not placed in the inventory of durable equipment.	
		56) The costs were charged in line with the Beneficiary's accounting policy and were adequately supported.	
		57) No ineligible costs or excessive or reckless expenditure were declared. For internal invoices/charges only the cost element was charged, without any mark-ups.	

	<p>2004/18/EC (or 2014/24/EU) or of Directive 2004/17/EC (or 2014/25/EU), the Auditor verified that the applicable national law on public procurement was followed and that the procurement contract complied with the Terms and Conditions of the Agreement.</p> <ul style="list-style-type: none"> ○ if the Beneficiary did not fall into the category above, the Auditor verified that the Beneficiary followed their usual procurement rules and respected the Terms and Conditions of the Agreement. <p>For the items included in the sample the Auditor also verified that:</p> <ul style="list-style-type: none"> ○ the Beneficiary ensured best value for money (key elements to appreciate the respect of this principle are the award of the contract to the bid offering best price-quality ratio, under conditions of transparency and equal treatment. In case an existing framework contract was used the Auditor also verified that the Beneficiary ensured it was established on the basis of the principle of best value for money under conditions of transparency and equal treatment); <p><i>SUCH GOODS AND SERVICES INCLUDE, FOR INSTANCE, CONSUMABLES AND SUPPLIES, DISSEMINATION (INCLUDING OPEN ACCESS), PROTECTION OF RESULTS, SPECIFIC EVALUATION OF THE ACTION IF IT IS REQUIRED BY THE AGREEMENT, CERTIFICATES ON THE FINANCIAL STATEMENTS IF THEY ARE REQUIRED BY THE AGREEMENT AND CERTIFICATES ON THE METHODOLOGY, TRANSLATIONS, REPRODUCTION.</i></p>	<p>58) Procurement rules, principles and guides were followed. There were documents of requests to different providers, different offers and assessment of the offers before selection of the provider in line with internal procedures and procurement rules. The purchases were made in accordance with the principle of best value for money.</p> <p><i>(When different offers were not collected the Auditor explains the reasons provided by the Beneficiary under the caption “Exceptions” of the Report. The Commission will analyse this information to evaluate whether these costs might be accepted as eligible)</i></p>	
<p>D.4</p>	<p>AGGREGATED CAPITALISED AND OPERATING COSTS OF RESEARCH INFRASTRUCTURE</p> <p>The Auditor ensured the existence of a positive ex-ante assessment (issued by the EC Services) of the cost accounting methodology of the Beneficiary allowing it to apply the guidelines on direct costing for large research infrastructures in Horizon 2020.</p> <p><i>In the cases that a positive ex-ante assessment has been issued (see the standard factual findings 59-60 on the next column),</i></p>	<p>59) The costs declared as direct costs for Large Research Infrastructures (in the appropriate line of the Financial Statement) comply with the methodology described in the positive ex-ante assessment report.</p>	

	<p>The Auditor ensured that the beneficiary has applied consistently the methodology that is explained and approved in the positive ex ante assessment;</p> <p><i>In the cases that a positive ex-ante assessment has NOT been issued (see the standard factual findings 61 on the next column),</i> The Auditor verified that no costs of Large Research Infrastructure have been charged as direct costs in any costs category;</p> <p><i>In the cases that a draft ex-ante assessment report has been issued with recommendation for further changes (see the standard factual findings 61 on the next column),</i></p> <ul style="list-style-type: none"> The Auditor followed the same procedure as above (when a positive ex-ante assessment has NOT yet been issued) and paid particular attention (testing reinforced) to the cost items for which the draft ex-ante assessment either rejected the inclusion as direct costs for Large Research Infrastructures or issued recommendations. 	<p>60) Any difference between the methodology applied and the one positively assessed was extensively described and adjusted accordingly.</p>	
		<p>61) The direct costs declared were free from any indirect costs items related to the Large Research Infrastructure.</p>	
<p>E</p>	<p>USE OF EXCHANGE RATES</p>		
<p>E.1</p>	<p>a) <u>For Beneficiaries with accounts established in a currency other than euros</u></p> <p>The Auditor sampled [REDACTED] cost items selected randomly and verified that the exchange rates used for converting other currencies into euros were in accordance with the following rules established in the Agreement (full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest):</p> <p><i>COSTS RECORDED IN THE ACCOUNTS IN A CURRENCY OTHER THAN EURO SHALL BE CONVERTED INTO EURO AT THE AVERAGE OF THE DAILY EXCHANGE RATES PUBLISHED IN THE C SERIES OF OFFICIAL JOURNAL OF THE EUROPEAN UNION (https://www.ecb.int/stats/exchange/eurofxref/html/index.en.html), DETERMINED OVER THE CORRESPONDING REPORTING PERIOD.</i></p> <p><i>IF NO DAILY EURO EXCHANGE RATE IS PUBLISHED IN THE OFFICIAL JOURNAL OF THE EUROPEAN UNION FOR THE CURRENCY IN QUESTION, CONVERSION SHALL BE MADE AT THE AVERAGE OF THE MONTHLY ACCOUNTING RATES ESTABLISHED BY THE COMMISSION AND PUBLISHED ON ITS WEBSITE (http://ec.europa.eu/budget/contracts_grants/info_contracts/inforeuro/inforeuro_en.cfm), DETERMINED OVER THE CORRESPONDING REPORTING PERIOD.</i></p>	<p>62) The exchange rates used to convert other currencies into Euros were in accordance with the rules established of the Grant Agreement and there was no difference in the final figures.</p>	

	<p>b) <u>For Beneficiaries with accounts established in euros</u></p> <p>The Auditor sampled [REDACTED] cost items selected randomly and verified that the exchange rates used for converting other currencies into euros were in accordance with the following rules established in the Agreement (full coverage is required if there are fewer than 10 items, otherwise the sample should have a minimum of 10 item, or 10% of the total, whichever number is highest):</p> <p><i>COSTS INCURRED IN ANOTHER CURRENCY SHALL BE CONVERTED INTO EURO BY APPLYING THE BENEFICIARY'S USUAL ACCOUNTING PRACTICES.</i></p>	<p>63) The Beneficiary applied its usual accounting practices.</p>	
--	---	--	--

[legal name of the audit firm]

[name and function of an authorised representative]

[dd Month yyyy]

<Signature of the Auditor>

ANNEX 6

MODEL FOR THE CERTIFICATE ON THE METHODOLOGY

- For options [*in italics in square brackets*]: choose the applicable option. Options not chosen should be deleted.
- For fields in [grey in square brackets]: enter the appropriate data.

TABLE OF CONTENTS

TERMS OF REFERENCE FOR AN AUDIT ENGAGEMENT FOR A METHODOLOGY CERTIFICATE IN CONNECTION WITH ONE OR MORE GRANT AGREEMENTS FINANCED UNDER THE HORIZON 2020 RESEARCH AND INNOVATION FRAMEWORK PROGRAMME

INDEPENDENT REPORT OF FACTUAL FINDINGS ON THE METHODOLOGY CONCERNING GRANT AGREEMENTS FINANCED UNDER THE HORIZON 2020 RESEARCH AND INNOVATION FRAMEWORK PROGRAMME

**Terms of reference for an audit engagement for a methodology certificate
in connection with one or more grant agreements financed
under the Horizon 2020 Research and Innovation Framework Programme**

This document sets out the ‘**Terms of Reference (ToR)**’ under which

[OPTION 1: [insert name of the beneficiary] (*‘the Beneficiary’*)] [OPTION 2: [insert name of the linked third party] (*‘the Linked Third Party’*), third party linked to the Beneficiary [insert name of the beneficiary] (*‘the Beneficiary’*)]

agrees to engage

[insert legal name of the auditor] (*‘the Auditor’*)

to produce an independent report of factual findings (*‘the Report’*) concerning the [Beneficiary’s] [Linked Third Party’s] usual accounting practices for calculating and claiming direct personnel costs declared as unit costs (*‘the Methodology’*) in connection with grant agreements financed under the Horizon 2020 Research and Innovation Framework Programme.

The procedures to be carried out for the assessment of the methodology will be based on the grant agreement(s) detailed below:

[title and number of the grant agreement(s)] (*‘the Agreement(s)’*)

The Agreement(s) has(have) been concluded between the Beneficiary and [OPTION 1: *the European Union, represented by the European Commission (‘the Commission’)*][OPTION 2: *the European Atomic Energy Community (Euratom,) represented by the European Commission (‘the Commission’)*][OPTION 3: *the [Research Executive Agency (REA)] [European Research Council Executive Agency (ERCEA)] [Innovation and Networks Executive Agency (INEA)] [Executive Agency for Small and Medium-sized Enterprises (EASME)] (‘the Agency’), under the powers delegated by the European Commission (‘the Commission’).*].

The [Commission] [Agency] is mentioned as a signatory of the Agreement with the Beneficiary only. The [European Union] [Euratom] [Agency] is not a party to this engagement.

1.1 Subject of the engagement

According to Article 18.1.2 of the Agreement, beneficiaries [*and linked third parties*] that declare direct personnel costs as unit costs calculated in accordance with their usual cost accounting practices may submit to the [Commission] [Agency], for approval, a certificate on the methodology (*‘CoMUC’*) stating that there are adequate records and documentation to prove that their cost accounting practices used comply with the conditions set out in Point A of Article 6.2.

The subject of this engagement is the CoMUC which is composed of two separate documents:

- the Terms of Reference (*‘the ToR’*) to be signed by the [Beneficiary] [Linked Third Party] and the Auditor;
- the Auditor’s Independent Report of Factual Findings (*‘the Report’*) issued on the Auditor’s letterhead, dated, stamped and signed by the Auditor which includes; the standard statements (*‘the Statements’*) evaluated and signed by the [Beneficiary] [Linked Third Party], the agreed-upon procedures (*‘the Procedures’*) performed by the Auditor and the standard factual findings

H2020 Model Grant Agreements: H2020 General MGA — Multi: v3.0 – dd.mm.2016

(‘the Findings’) assessed by the Auditor. The Statements, Procedures and Findings are summarised in the table that forms part of the Report.

The information provided through the Statements, the Procedures and the Findings will enable the Commission to draw conclusions regarding the existence of the *[Beneficiary’s] [Linked Third Party’s]* usual cost accounting practice and its suitability to ensure that direct personnel costs claimed on that basis comply with the provisions of the Agreement. The Commission draws its own conclusions from the Report and any additional information it may require.

1.2 Responsibilities

The parties to this agreement are the *[Beneficiary] [Linked Third Party]* and the Auditor.

The *[Beneficiary] [Linked Third Party]*:

- is responsible for preparing financial statements for the Agreement(s) (‘the Financial Statements’) in compliance with those Agreements;
- is responsible for providing the Financial Statement(s) to the Auditor and enabling the Auditor to reconcile them with the *[Beneficiary’s] [Linked Third Party’s]* accounting and bookkeeping system and the underlying accounts and records. The Financial Statement(s) will be used as a basis for the procedures which the Auditor will carry out under this ToR;
- is responsible for its Methodology and liable for the accuracy of the Financial Statement(s);
- is responsible for endorsing or refuting the Statements indicated under the heading ‘Statements to be made by the Beneficiary/ Linked Third Party’ in the first column of the table that forms part of the Report;
- must provide the Auditor with a signed and dated representation letter;
- accepts that the ability of the Auditor to carry out the Procedures effectively depends upon the *[Beneficiary] [Linked Third Party]* providing full and free access to the *[Beneficiary’s] [Linked Third Party’s]* staff and to its accounting and other relevant records.

The Auditor:

- *[Option 1 by default: is qualified to carry out statutory audits of accounting documents in accordance with Directive 2006/43/EC of the European Parliament and of the Council of 17 May 2006 on statutory audits of annual accounts and consolidated accounts, amending Council Directives 78/660/EEC and 83/349/EEC and repealing Council Directive 84/253/EEC or similar national regulations].*
- *[Option 2 if the Beneficiary or Linked Third Party has an independent Public Officer: is a competent and independent Public Officer for which the relevant national authorities have established the legal capacity to audit the Beneficiary].*
- *[Option 3 if the Beneficiary or Linked Third Party is an international organisation: is an [internal] [external] auditor in accordance with the internal financial regulations and procedures of the international organisation].*

The Auditor:

- must be independent from the Beneficiary *[and the Linked Third Party]*, in particular, it must not have been involved in preparing the Beneficiary’s *[and Linked Third Party’s]* Financial Statement(s);
- must plan work so that the Procedures may be carried out and the Findings may be assessed;
- must adhere to the Procedures laid down and the compulsory report format;
- must carry out the engagement in accordance with these ToR;
- must document matters which are important to support the Report;
- must base its Report on the evidence gathered;
- must submit the Report to the *[Beneficiary] [Linked Third Party]*.

The Commission sets out the Procedures to be carried out and the Findings to be endorsed by the Auditor. The Auditor is not responsible for their suitability or pertinence. As this engagement is not an assurance engagement the Auditor does not provide an audit opinion or a statement of assurance.

1.3 Applicable Standards

The Auditor must comply with these Terms of Reference and with¹:

- the International Standard on Related Services ('ISRS') 4400 *Engagements to perform Agreed-upon Procedures regarding Financial Information* as issued by the International Auditing and Assurance Standards Board (IAASB);
- the *Code of Ethics for Professional Accountants* issued by the International Ethics Standards Board for Accountants (IESBA). Although ISRS 4400 states that independence is not a requirement for engagements to carry out agreed-upon procedures, the Commission requires that the Auditor also complies with the Code's independence requirements.

The Auditor's Report must state that there was no conflict of interests in establishing this Report between the Auditor and the Beneficiary *[and the Linked Third Party]* that could have a bearing on the Report, and must specify – if the service is invoiced - the total fee paid to the Auditor for providing the Report.

1.4 Reporting

The Report must be written in the language of the Agreement (see Article 20.7 of the Agreement).

Under Article 22 of the Agreement, the Commission, *[the Agency]*, the European Anti-Fraud Office and the Court of Auditors have the right to audit any work that is carried out under the action and for which costs are declared from *[the European Union] [Euratom]* budget. This includes work related to this engagement. The Auditor must provide access to all working papers related to this assignment if the Commission*[, the Agency]*, the European Anti-Fraud Office or the European Court of Auditors requests them.

1.5 Timing

The Report must be provided by [dd Month yyyy].

1.6 Other Terms

[The [Beneficiary] [Linked Third Party] and the Auditor can use this section to agree other specific terms, such as the Auditor's fees, liability, applicable law, etc. Those specific terms must not contradict the terms specified above.]

[legal name of the Auditor]
[name & title of authorised representative]
[dd Month yyyy]
Signature of the Auditor

[legal name of the [Beneficiary] [Linked Third Party]]
[name & title of authorised representative]
[dd Month yyyy]
Signature of the *[Beneficiary] [Linked Third Party]*

¹ Supreme Audit Institutions applying INTOSAI-standards may carry out the Procedures according to the corresponding International Standards of Supreme Audit Institutions and code of ethics issued by INTOSAI instead of the International Standard on Related Services ('ISRS') 4400 and the Code of Ethics for Professional Accountants issued by the IAASB and the IESBA.

Independent report of factual findings on the methodology concerning grant agreements financed under the Horizon 2020 Research and Innovation Framework Programme

(To be printed on letterhead paper of the auditor)

To
[name of contact person(s)], [Position]
[[Beneficiary's] [Linked Third Party's] name]
[Address]
[dd Month yyyy]

Dear [Name of contact person(s)],

As agreed under the terms of reference dated [dd Month yyyy]

with [OPTION 1: [insert name of the beneficiary] ('the Beneficiary')] [OPTION 2: [insert name of the linked third party] ('the Linked Third Party'), third party linked to the Beneficiary [insert name of the beneficiary] ('the Beneficiary')],

we

[name of the auditor] ('the Auditor'),

established at

[full address/city/state/province/country],

represented by

[name and function of an authorised representative],

have carried out the agreed-upon procedures ('the Procedures') and provide hereby our Independent Report of Factual Findings ('the Report'), concerning the [Beneficiary's] [Linked Third Party's] usual accounting practices for calculating and declaring direct personnel costs declared as unit costs ('the Methodology').

You requested certain procedures to be carried out in connection with the grant(s)

[title and number of the grant agreement(s)] ('the Agreement(s)').

The Report

Our engagement was carried out in accordance with the terms of reference ('the ToR') appended to this Report. The Report includes: the standard statements ('the Statements') made by the [Beneficiary] [Linked Third Party], the agreed-upon procedures ('the Procedures') carried out and the standard factual findings ('the Findings') confirmed by us.

The engagement involved carrying out the Procedures and assessing the Findings and the documentation requested appended to this Report, the results of which the Commission uses to draw conclusions regarding the acceptability of the Methodology applied by the [Beneficiary] [Linked Third Party].

H2020 Model Grant Agreements: H2020 General MGA — Multi: v3.0 – dd.mm.2016

The Report covers the methodology used from [dd Month yyyy]. In the event that the [Beneficiary] [Linked Third Party] changes this methodology, the Report will not be applicable to any Financial Statement¹ submitted thereafter.

The scope of the Procedures and the definition of the standard statements and findings were determined solely by the Commission. Therefore, the Auditor is not responsible for their suitability or pertinence.

Since the Procedures carried out constitute neither an audit nor a review made in accordance with International Standards on Auditing or International Standards on Review Engagements, we do not give a statement of assurance on the costs declared on the basis of the [Beneficiary's] [Linked Third Party's] Methodology. Had we carried out additional procedures or had we performed an audit or review in accordance with these standards, other matters might have come to its attention and would have been included in the Report.

Exceptions

Apart from the exceptions listed below, the [Beneficiary] [Linked Third Party] agreed with the standard Statements and provided the Auditor all the documentation and accounting information needed by the Auditor to carry out the requested Procedures and corroborate the standard Findings.

List here any exception and add any information on the cause and possible consequences of each exception, if known. If the exception is quantifiable, also indicate the corresponding amount.

.....

Explanation of possible exceptions in the form of examples (to be removed from the Report):

- i. the [Beneficiary] [Linked Third Party] did not agree with the standard Statement number ... because...;*
- ii. the Auditor could not carry out the procedure ... established because (e.g. due to the inability to reconcile key information or the unavailability or inconsistency of data);*
- iii. the Auditor could not confirm or corroborate the standard Finding number ... because*

Remarks

We would like to add the following remarks relevant for the proper understanding of the Methodology applied by the [Beneficiary] [Linked Third Party] or the results reported:

Example (to be removed from the Report):

Regarding the methodology applied to calculate hourly rates ...

Regarding standard Finding 15 it has to be noted that ...

The [Beneficiary] [Linked Third Party] explained the deviation from the benchmark statement XXIV concerning time recording for personnel with no exclusive dedication to the action in the following manner:

...

Annexes

Please provide the following documents to the auditor and annex them to the report when submitting this CoMUC to the Commission:

¹ Financial Statement in this context refers solely to Annex 4 of the Agreement by which the Beneficiary declares costs under the Agreement.

H2020 Model Grant Agreements: H2020 General MGA — Multi: v3.0 – dd.mm.2016

1. Brief description of the methodology for calculating personnel costs, productive hours and hourly rates;
2. Brief description of the time recording system in place;
3. An example of the time records used by the [Beneficiary] [Linked Third Party];
4. Description of any budgeted or estimated elements applied, together with an explanation as to why they are relevant for calculating the personnel costs and how they are based on objective and verifiable information;
5. A summary sheet with the hourly rate for direct personnel declared by the [Beneficiary] [Linked Third Party] and recalculated by the Auditor for each staff member included in the sample (the names do not need to be reported);
6. A comparative table summarising for each person selected in the sample a) the time claimed by the [Beneficiary] [Linked Third Party] in the Financial Statement(s) and b) the time according to the time record verified by the Auditor;
7. A copy of the letter of representation provided to the Auditor.

Use of this Report

This Report has been drawn up solely for the purpose given under Point 1.1 Reasons for the engagement.

The Report:

- is confidential and is intended to be submitted to the Commission by the [Beneficiary] [Linked Third Party] in connection with Article 18.1.2 of the Agreement;
- may not be used by the [Beneficiary] [Linked Third Party] or by the Commission for any other purpose, nor distributed to any other parties;
- may be disclosed by the Commission only to authorised parties, in particular the European Anti-Fraud Office (OLAF) and the European Court of Auditors.
- relates only to the usual cost accounting practices specified above and does not constitute a report on the Financial Statements of the [Beneficiary] [Linked Third Party].

No conflict of interest² exists between the Auditor and the Beneficiary [and the Linked Third Party] that could have a bearing on the Report. The total fee paid to the Auditor for producing the Report was EUR [] (including EUR [] of deductible VAT).

We look forward to discussing our Report with you and would be pleased to provide any further information or assistance which may be required.

Yours sincerely

[legal name of the Auditor]
[name and title of the authorised representative]
[dd Month yyyy]
Signature of the Auditor

² A conflict of interest arises when the Auditor's objectivity to establish the certificate is compromised in fact or in appearance when the Auditor for instance:

- was involved in the preparation of the Financial Statements;
- stands to benefit directly should the certificate be accepted;
- has a close relationship with any person representing the beneficiary;
- is a director, trustee or partner of the beneficiary; or
- is in any other situation that compromises his or her independence or ability to establish the certificate impartially.

Statements to be made by the Beneficiary/Linked Third Party ('the Statements') and Procedures to be carried out by the Auditor ('the Procedures') and standard factual findings ('the Findings') to be confirmed by the Auditor

The Commission reserves the right to provide the auditor with guidance regarding the Statements to be made, the Procedures to be carried out or the Findings to be ascertained and the way in which to present them. The Commission reserves the right to vary the Statements, Procedures or Findings by written notification to the Beneficiary/Linked Third Party to adapt the procedures to changes in the grant agreement(s) or to any other circumstances.

If this methodology certificate relates to the Linked Third Party's usual accounting practices for calculating and claiming direct personnel costs declared as unit costs any reference here below to 'the Beneficiary' is to be considered as a reference to 'the Linked Third Party'.

<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p>A. Use of the Methodology</p> <p>I. The cost accounting practice described below has been in use since /dd Month yyyy/.</p> <p>II. The next planned alteration to the methodology used by the Beneficiary will be from [dd Month yyyy/].</p>	<p>Procedure:</p> <p>✓ The Auditor checked these dates against the documentation the Beneficiary has provided.</p> <p>Factual finding:</p> <p>1. The dates provided by the Beneficiary were consistent with the documentation.</p>
<p>B. Description of the Methodology</p> <p>III. The methodology to calculate unit costs is being used in a consistent manner and is reflected in the relevant procedures.</p> <p><i>[Please describe the methodology your entity uses to calculate <u>personnel costs</u>, productive hours and hourly rates, present your description to the Auditor and annex it to this certificate]</i></p> <p><i>[If the statement of section "B. Description of the methodology" cannot be endorsed by the Beneficiary or there is no written methodology to calculate unit costs it should be listed here below and reported as exception by the Auditor in the main Report of Factual Findings:</i></p> <p>- ...]</p>	<p>Procedure:</p> <p>✓ The Auditor reviewed the description, the relevant manuals and/or internal guidance documents describing the methodology.</p> <p>Factual finding:</p> <p>2. The brief description was consistent with the relevant manuals, internal guidance and/or other documentary evidence the Auditor has reviewed.</p> <p>3. The methodology was generally applied by the Beneficiary as part of its usual costs accounting practices.</p>
<p>C. Personnel costs</p> <p><u>General</u></p>	<p>Procedure:</p> <p><i>The Auditor draws a sample of employees to carry out the procedures indicated in</i></p>

<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p>IV. The unit costs (hourly rates) are limited to salaries including during parental leave, social security contributions, taxes and other costs included in the remuneration required under national law and the employment contract or equivalent appointing act;</p> <p>V. Employees are hired directly by the Beneficiary in accordance with national law, and work under its sole supervision and responsibility;</p> <p>VI. The Beneficiary remunerates its employees in accordance with its usual practices. This means that personnel costs are charged in line with the Beneficiary's usual payroll policy (e.g. salary policy, overtime policy, variable pay) and no special conditions exist for employees assigned to tasks relating to the European Union or Euratom, unless explicitly provided for in the grant agreement(s);</p> <p>VII. The Beneficiary allocates its employees to the relevant group/category/cost centre for the purpose of the unit cost calculation in line with the usual cost accounting practice;</p> <p>VIII. Personnel costs are based on the payroll system and accounting system.</p> <p>IX. Any exceptional adjustments of actual personnel costs resulted from relevant budgeted or estimated elements and were based on objective and verifiable information. <i>[Please describe the 'budgeted or estimated elements' and their relevance to personnel costs, and explain how they were reasonable and based on objective and verifiable information, present your explanation to the Auditor and annex it to this certificate].</i></p> <p>X. Personnel costs claimed do not contain any of the following ineligible costs: costs related to return on capital; debt and debt service charges; provisions for future losses or debts; interest owed; doubtful debts; currency exchange losses; bank costs charged by the Beneficiary's bank for transfers from the Commission/Agency; excessive or reckless expenditure; deductible VAT or costs incurred during suspension of the implementation of the action.</p> <p>XI. Personnel costs were not declared under another EU or Euratom grant (including grants awarded by a Member State and financed by the EU budget and grants awarded by bodies other than the Commission/Agency for the purpose of implementing the EU budget).</p>	<p><i>this section C and the following sections D to F.</i> <i>[The Auditor has drawn a random sample of 10 full-time equivalents made up of employees assigned to the action(s). If fewer than 10 full-time equivalents are assigned to the action(s), the Auditor has selected a sample of 10 full-time equivalents consisting of all employees assigned to the action(s), complemented by other employees irrespective of their assignments.].</i> For this sample:</p> <ul style="list-style-type: none"> ✓ the Auditor reviewed all documents relating to personnel costs such as employment contracts, payslips, payroll policy (e.g. salary policy, overtime policy, variable pay policy), accounting and payroll records, applicable national tax, labour and social security law and any other documents corroborating the personnel costs claimed; ✓ in particular, the Auditor reviewed the employment contracts of the employees in the sample to verify that: <ul style="list-style-type: none"> i. they were employed directly by the Beneficiary in accordance with applicable national legislation; ii. they were working under the sole technical supervision and responsibility of the latter; iii. they were remunerated in accordance with the Beneficiary's usual practices; iv. they were allocated to the correct group/category/cost centre for the purposes of calculating the unit cost in line with the Beneficiary's usual cost accounting practices; ✓ the Auditor verified that any ineligible items or any costs claimed under other costs categories or costs covered by other types of grant or by other grants financed from the European Union budget have not been taken into account when calculating the personnel costs; ✓ the Auditor numerically reconciled the total amount of personnel costs used to calculate the unit cost with the total amount of personnel costs recorded in the statutory accounts and the payroll system. ✓ to the extent that actual personnel costs were adjusted on the basis of budgeted or estimated elements, the Auditor carefully examined those elements and checked the information source to confirm that they correspond to objective and verifiable information;

<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p><u>If additional remuneration as referred to in the grant agreement(s) is paid</u></p> <p>XII. The Beneficiary is a non-profit legal entity;</p> <p>XIII. The additional remuneration is part of the beneficiary's usual remuneration practices and paid consistently whenever the relevant work or expertise is required;</p> <p>XIV. The criteria used to calculate the additional remuneration are objective and generally applied regardless of the source of funding;</p> <p>XV. The additional remuneration included in the personnel costs used to calculate the hourly rates for the grant agreement(s) is capped at EUR 8 000 per full-time equivalent (reduced proportionately if the employee is not assigned exclusively to the action).</p> <p><i>[If certain statement(s) of section "C. Personnel costs" cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor in the main Report of Factual Findings: - ...]</i></p>	<p>✓ if additional remuneration has been claimed, the Auditor verified that the Beneficiary was a non-profit legal entity, that the amount was capped at EUR 8000 per full-time equivalent and that it was reduced proportionately for employees not assigned exclusively to the action(s).</p> <p>✓ the Auditor recalculated the personnel costs for the employees in the sample.</p> <p>Factual finding:</p> <ol style="list-style-type: none"> 4. All the components of the remuneration that have been claimed as personnel costs are supported by underlying documentation. 5. The employees in the sample were employed directly by the Beneficiary in accordance with applicable national law and were working under its sole supervision and responsibility. 6. Their employment contracts were in line with the Beneficiary's usual policy; 7. Personnel costs were duly documented and consisted solely of salaries, social security contributions (pension contributions, health insurance, unemployment fund contributions, etc.), taxes and other statutory costs included in the remuneration (holiday pay, thirteenth month's pay, etc.); 8. The totals used to calculate the personnel unit costs are consistent with those registered in the payroll and accounting records; 9. To the extent that actual personnel costs were adjusted on the basis of budgeted or estimated elements, those elements were relevant for calculating the personnel costs and correspond to objective and verifiable information. The budgeted or estimated elements used are: — (indicate the elements and their values). 10. Personnel costs contained no ineligible elements; 11. Specific conditions for eligibility were fulfilled when additional remuneration was paid: a) the Beneficiary is registered in the grant agreements as a non-profit legal entity; b) it was paid according to objective criteria generally applied regardless of the source of funding used and c) remuneration was capped at EUR 8 000 per full-time equivalent (or up to up to the equivalent pro-rata amount if the person did not work on the action full-time during the year or did not work exclusively on the action).

<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p>D. Productive hours</p> <p>XVI. The number of productive hours per full-time employee applied is <i>[delete as appropriate]</i>:</p> <p>A. 1720 productive hours per year for a person working full-time (corresponding pro-rata for persons not working full time).</p> <p>B. the total number of hours worked in the year by a person for the Beneficiary</p> <p>C. the standard number of annual hours generally applied by the beneficiary for its personnel in accordance with its usual cost accounting practices. This number must be at least 90% of the standard annual workable hours.</p> <p><u>If method B is applied</u></p> <p>XVII. The calculation of the total number of hours worked was done as follows: annual workable hours of the person according to the employment contract, applicable labour agreement or national law plus overtime worked minus absences (such as sick leave and special leave).</p> <p>XVIII. ‘Annual workable hours’ are hours during which the personnel must be working, at the employer’s disposal and carrying out his/her activity or duties under the employment contract, applicable collective labour agreement or national working time legislation.</p> <p>XIX. The contract (applicable collective labour agreement or national working time legislation) do specify the working time enabling to calculate the annual workable hours.</p> <p><u>If method C is applied</u></p> <p>XX. The standard number of productive hours per year is that of a full-time equivalent.</p> <p>XXI. The number of productive hours per year on which the hourly rate is based i) corresponds to the Beneficiary’s usual accounting practices; ii) is at least 90% of the standard number of workable (working) hours per year.</p> <p>XXII. Standard workable (working) hours are hours during which personnel are at</p>	<p>Procedure (same sample basis as for Section C: Personnel costs):</p> <ul style="list-style-type: none"> ✓ The Auditor verified that the number of productive hours applied is in accordance with method A, B or C. ✓ The Auditor checked that the number of productive hours per full-time employee is correct. ✓ If method B is applied the Auditor verified i) the manner in which the total number of hours worked was done and ii) that the contract specified the annual workable hours by inspecting all the relevant documents, national legislation, labour agreements and contracts. ✓ If method C is applied the Auditor reviewed the manner in which the standard number of working hours per year has been calculated by inspecting all the relevant documents, national legislation, labour agreements and contracts and verified that the number of productive hours per year used for these calculations was at least 90% of the standard number of working hours per year. <p>Factual finding:</p> <p><u>General</u></p> <p>12. The Beneficiary applied a number of productive hours consistent with method A, B or C detailed in the left-hand column.</p> <p>13. The number of productive hours per year per full-time employee was accurate.</p> <p><u>If method B is applied</u></p> <p>14. The number of ‘annual workable hours’, overtime and absences was verifiable based on the documents provided by the Beneficiary and the calculation of the total number of hours worked was accurate.</p> <p>15. The contract specified the working time enabling to calculate the annual workable hours.</p> <p><u>If method C is applied</u></p> <p>16. The calculation of the number of productive hours per year corresponded to the usual costs accounting practice of the Beneficiary.</p>

<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p>the Beneficiary's disposal performing the duties described in the relevant employment contract, collective labour agreement or national labour legislation. The number of standard annual workable (working) hours that the Beneficiary claims is supported by labour contracts, national legislation and other documentary evidence.</p> <p><i>[If certain statement(s) of section "D. Productive hours" cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor: - ...]</i></p>	<p>17. The calculation of the standard number of workable (working) hours per year was corroborated by the documents presented by the Beneficiary.</p> <p>18. The number of productive hours per year used for the calculation of the hourly rate was at least 90 % of the number of workable (working) hours per year.</p>
<p>E. Hourly rates</p> <p>The hourly rates are correct because:</p> <p>XXIII. Hourly rates are correctly calculated since they result from dividing annual personnel costs by the productive hours of a given year and group (e.g. staff category or department or cost centre depending on the methodology applied) and they are in line with the statements made in section C. and D. above.</p> <p><i>[If the statement of section 'E. Hourly rates' cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the Auditor: - ...]</i></p>	<p>Procedure</p> <ul style="list-style-type: none"> ✓ The Auditor has obtained a list of all personnel rates calculated by the Beneficiary in accordance with the methodology used. ✓ The Auditor has obtained a list of all the relevant employees, based on which the personnel rate(s) are calculated. <p>For 10 full-time equivalent employees selected at random (same sample basis as Section C: Personnel costs):</p> <ul style="list-style-type: none"> ✓ The Auditor recalculated the hourly rates. ✓ The Auditor verified that the methodology applied corresponds to the usual accounting practices of the organisation and is applied consistently for all activities of the organisation on the basis of objective criteria irrespective of the source of funding. <p>Factual finding:</p> <p>19. No differences arose from the recalculation of the hourly rate for the employees included in the sample.</p>
<p>F. Time recording</p> <p>XXIV. Time recording is in place for all persons with no exclusive dedication to one Horizon 2020 action. At least all hours worked in connection with the grant agreement(s) are registered on a daily/weekly/monthly basis <i>[delete as appropriate]</i> using a paper/computer-based system <i>[delete as appropriate]</i>;</p> <p>XXV. For persons exclusively assigned to one Horizon 2020 activity the</p>	<p>Procedure</p> <ul style="list-style-type: none"> ✓ The Auditor reviewed the brief description, all relevant manuals and/or internal guidance describing the methodology used to record time. <p>The Auditor reviewed the time records of the random sample of 10 full-time equivalents referred to under Section C: Personnel costs, and verified in particular:</p>

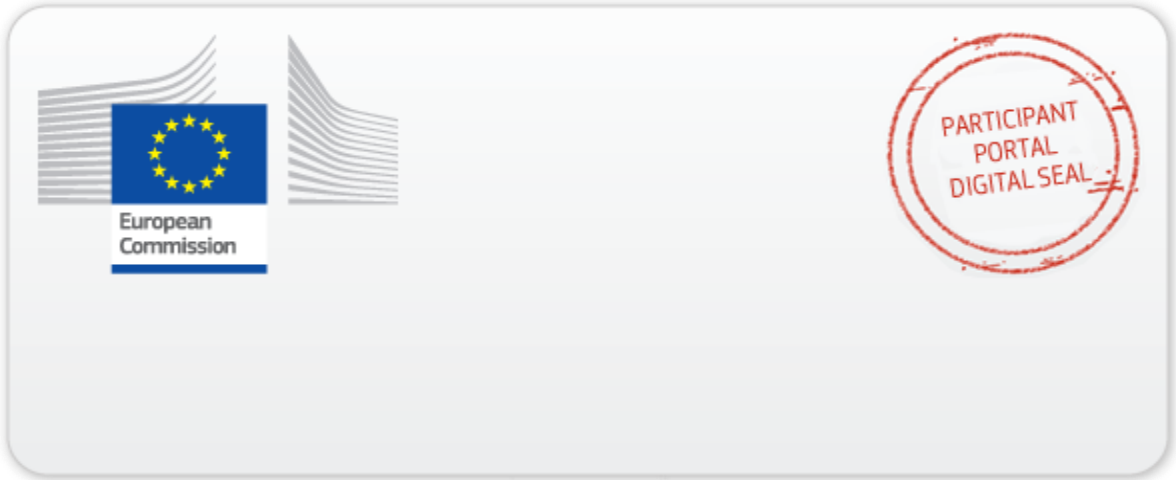
<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p>Beneficiary has either signed a declaration to that effect or has put arrangements in place to record their working time;</p> <p>XXVI. Records of time worked have been signed by the person concerned (on paper or electronically) and approved by the action manager or line manager at least monthly;</p> <p>XXVII. Measures are in place to prevent staff from:</p> <ul style="list-style-type: none"> i. recording the same hours twice, ii. recording working hours during absence periods (e.g. holidays, sick leave), iii. recording more than the number of productive hours per year used to calculate the hourly rates, and iv. recording hours worked outside the action period. <p>XXVIII. No working time was recorded outside the action period;</p> <p>XXIX. No more hours were claimed than the productive hours used to calculate the hourly personnel rates.</p> <p><i>[Please provide a brief description of the <u>time recording system</u> in place together with the measures applied to ensure its reliability to the Auditor and annex it to the present certificate¹].</i></p> <p><i>[If certain statement(s) of section “F. Time recording” cannot be endorsed by the Beneficiary they should be listed here below and reported as exception by the</i></p>	<ul style="list-style-type: none"> ✓ that time records were available for all persons with not exclusive assignment to the action; ✓ that time records were available for persons working exclusively for a Horizon 2020 action, or, alternatively, that a declaration signed by the Beneficiary was available for them certifying that they were working exclusively for a Horizon 2020 action; ✓ that time records were signed and approved in due time and that all minimum requirements were fulfilled; ✓ that the persons worked for the action in the periods claimed; ✓ that no more hours were claimed than the productive hours used to calculate the hourly personnel rates; ✓ that internal controls were in place to prevent that time is recorded twice, during absences for holidays or sick leave; that more hours are claimed per person per year for Horizon 2020 actions than the number of productive hours per year used to calculate the hourly rates; that working time is recorded outside the action period; ✓ the Auditor cross-checked the information with human-resources records to verify consistency and to ensure that the internal controls have been effective. In addition, the Auditor has verified that no more hours were charged to Horizon 2020 actions per person per year than the number of productive hours per year used to calculate the hourly rates, and verified that no time worked outside the action period was charged to the action. <p>Factual finding:</p> <p>20. The brief description, manuals and/or internal guidance on time recording provided by the Beneficiary were consistent with management</p>

¹ The description of the time recording system must state among others information on the content of the time records, its coverage (full or action time-recording, for all personnel or only for personnel involved in H2020 actions), its degree of detail (whether there is a reference to the particular tasks accomplished), its form, periodicity of the time registration and authorisation (paper or a computer-based system; on a daily, weekly or monthly basis; signed and countersigned by whom), controls applied to prevent double-charging of time or ensure consistency with HR-records such as absences and travels as well as its information flow up to its use for the preparation of the Financial Statements.

<i>Please explain any discrepancies in the body of the Report.</i>	
Statements to be made by Beneficiary	Procedures to be carried out and Findings to be confirmed by the Auditor
<p><i>Auditor:</i> - ...]</p>	<p>reports/records and other documents reviewed and were generally applied by the Beneficiary to produce the financial statements.</p> <p>21. For the random sample time was recorded or, in the case of employees working exclusively for the action, either a signed declaration or time records were available;</p> <p>22. For the random sample the time records were signed by the employee and the action manager/line manager, at least monthly.</p> <p>23. Working time claimed for the action occurred in the periods claimed;</p> <p>24. No more hours were claimed than the number productive hours used to calculate the hourly personnel rates;</p> <p>25. There is proof that the Beneficiary has checked that working time has not been claimed twice, that it is consistent with absence records and the number of productive hours per year, and that no working time has been claimed outside the action period.</p> <p>26. Working time claimed is consistent with that on record at the human-resources department.</p>

[official name of the [Beneficiary] [Linked Third Party]]
[name and title of authorised representative]
[dd Month yyyy]
 <Signature of the [Beneficiary] [Linked Third Party]>

[official name of the Auditor]
[name and title of authorised representative]
[dd Month yyyy]
 <Signature of the Auditor>



This document is digitally sealed. The digital sealing mechanism uniquely binds the document to the modules of the Participant Portal of the European Commission, to the transaction for which it was generated and ensures its integrity and authenticity.

Any attempt to modify the content will lead to a breach of the electronic seal, which can be verified at any time by clicking on the digital seal validation symbol.