EUROPEAN COMMISSION
Research Executive Agency (REA)
Director

GRANT AGREEMENT

NUMBER — 721874 — SPM2.0

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

on the one part,

the **Research Executive Agency (REA)** ('the Agency'), under the power delegated by the European Commission ('the Commission'),

represented for the purposes of signature of this Agreement by Head of Unit, Research Executive Agency (REA), Excellent Science Department, Marie Sklodowska-Curie Innovative Training Networks, Klaus-Guenther BARTHEL,

and

on the other part,

1. 'the coordinator':

FUNDACIO INSTITUT DE BIOENGINYERIA DE CATALUNYA (IBEC) ES3, 2263, established in CARRER BALDIRI REIXAC PLANTA 2A 10-12, BARCELONA 08028, Spain, ESG64045719 represented for the purposes of signing the Agreement by Director, Josep SAMITIER

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

2. **INSTITUT NATIONAL DE LA SANTE ET DE LA RECHERCHE MEDICALE (INSERM)**, 180036048, established in RUE DE TOLBIAC 101, PARIS 75654, France, FR31180036048

3. **AGENCIA ESTATAL CONSEJO SUPERIOR DEINVESTIGACIONES CIENTIFICAS (CSIC)**, established in CALLE SERRANO 117, MADRID 28006, Spain, ESQ2818002D

4. **UNIVERSITAT LINZ (JKU)**, 188/1962, established in ALTENBERGER STRASSE 69, LINZ 4040, Austria, ATU57515567

5. **Asociacion - Centro de Investigacion Cooperativa en Nanociencias - CIC NANOGUNE (NANOGUNE)** ES5, AS/G/12418/2006, established in Tolosa Hiribidea 76, San Sebastian 20018, Spain, ESG20903449

6. **NPL MANAGEMENT LIMITED (NPL)** LTD, 2937881, established in HAMPTON ROAD TEDDINGTON, MIDDLESEX TW11 0LW, United Kingdom, GB200429166

7. **KEYSIGHT TECHNOLOGIES GMBH (KEYSIGHT)** GMBH, FN409790H, established in EUROPAPLATZ 2/1/2, WIEN 1150, Austria, ATU68680607

8. **TECHNISCHE UNIVERSITAET WIEN (TUW)**, 5330593, established in KARLSPLATZ 13, WIEN 1040, Austria, ATU37675002

9. **THE BIO NANO CENTRE LIMITED LBG (BNC)** GB5, 06389520, established in EUSTON ROAD 338, LONDON NW1 3BT, United Kingdom, GB919212629

10. **UNIVERSITA DEGLI STUDI DI MODENA E REGGIO EMILIA (UNIMORE)**, CF00427620364, established in VIA UNIVERSITA 4, MODENA 41121, Italy, IT00427620364

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

Annex 3 Accession Forms

Annex 4 Model for the financial statements

Annex 5 Not applicable

Annex 6 Not applicable

TERMS AND CONDITIONS

TABLE OF CONTENTS

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 '***Scanning probe microscopies for nanoscale fast, tomographic and composition imaging — SPM2.0***' **('action')**, as described in Annex 1.

ARTICLE 3 — DURATION AND STARTING DATE OF THE ACTION

The duration of the action will be ***48*** **months** as of *1 January 2017* ('**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 by transfers of amounts between beneficiaries. This does not require an amendment according to Article 55, if the action is implemented as described in Annex 1.

However, no more than 40% of the maximum grant amount (see Article 5.1) may be allocated to beneficiaries located in the same country or to any one international European interest organisation or international organisation.

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 3,593,489.40** (three million five hundred and ninety three thousand four hundred and eighty nine EURO and forty eurocents).

5.2 Form of grant, reimbursement rate and form 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 **3,593,489.40** (three million five hundred and ninety three thousand four hundred and eighty nine EURO and forty eurocents).

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

(a) for **costs for recruited researchers** (living, mobility and family allowances): on the basis of the amount(s) per unit set out in Annex 2 ('**unit costs**') and

(b) for **institutional costs** (research, training and networking costs and management and indirect costs): on the basis of the amount per unit set out in Annex 2 (**unit costs**).

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 Agency — when the payment of the balance is made (see Article 21.4) — in the following steps:

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

Step 2 – Limit to the maximum grant amount

Step 3 – Reduction due to improper implementation or breach of other obligations

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

The reimbursement rate (see Article 5.2) is applied to eligible costs (unit costs; see Article 6) declared by the beneficiaries and approved by the Agency (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 improper implementation or breach of other obligations — Reduced grant amount — Calculation

If the grant is reduced (see Article 43), the Agency will calculate the reduced grant amount by deducting the amount of the reduction (calculated in proportion to the improper implementation of the action or to the seriousness of the 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 and 2 or
- the reduced grant amount following Step 3.

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 Agency 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 Agency 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 Agency 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 its improper implementation of the action or to the seriousness of its 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

Unit cost are eligible ('eligible costs') if:

(a) they are calculated as follows:

{amounts per unit set out in Annex 2

multiplied by

the number of actual units}.

(b) the number of actual units complies with the following:

- 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).

6.2 Specific conditions for costs to be eligible

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

A. Costs for recruited researchers (A.1 Living allowance, A.2 Mobility allowance and A.3 Family allowance) are eligible, if:

(a) the number of units declared:

(i) corresponds to the actual number of months spent by the recruited researchers on the research training activities and

(ii) does not exceed 36 months (per researcher)*;*

(b) the recruited researchers comply with the following conditions:

(i) be recruited by the beneficiary under an **employment contract** (or other direct contract with equivalent benefits, including social security coverage) or — if not otherwise possible under national law — under a fixed amount fellowship agreement with minimum social security coverage;

(ii) be employed for at least 3 months;

(iii) be employed full-time, unless the Agency has approved a part-time employment for personal or family reasons;

(iv) be working exclusively for the action;

(v) not have resided in the country where the research training activities take place for more than 12 months in the 3 years immediately prior to the recruitment date (and not have carried out their main activity (work, studies, etc.) in that country).

For beneficiaries that are the international European interest organisations or international organisations: not have spent with the beneficiary more than 12 months in the 3 years immediately prior to the recruitment date;

(vi) be — at the date of recruitment — an '**early stage researcher**' (i.e. in the first four years of his/her research career and not have a doctoral degree);

(c) the costs have been fully incurred for the benefit of the recruited researchers.

This latter condition is met if:

{{{**total remuneration costs** (salaries, social security contributions, taxes and other costs included in the remuneration under the employment contract or other direct contract) or **total fixed-amount fellowship costs** for the researcher during the action

plus

total mobility costs (household, relocation and travel expenses and, if they must be paid under national law, taxes, duties and social security contributions) for the researcher during the action}

plus

total family costs for the researcher during the action}

divided by

the number of actual units}.

is equal to or higher than the following amount:

{{amount per unit cost set out in Annex 2 as living allowance

plus

amount per unit cost set out in Annex 2 as mobility allowance}

plus

if it is due, amount per unit cost set out in Annex 2 as family allowance}.

The family allowance is due if the researcher has a family at the time of recruitment.

'Family' means persons linked to the researcher by marriage (or a relationship with equivalent status to a marriage recognised by the legislation of the country where this relationship was formalised) or dependent children who are actually being maintained by the researcher.

B. Institutional costs (B.1 Research, training and networking costs and B.2 Management and indirect costs) are eligible if the costs for the recruited researchers (living allowance, mobility allowance, family allowance; see above) are eligible.

6.3 Ineligible costs

'**Ineligible costs**' are:

(a) costs that do not comply with the conditions set out above (in Article 6.1), and in particular costs incurred during suspension of the action implementation (see Article 49);

(b) costs reimbursed 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 Agency for the purpose of implementing the EU or Euratom budget), in particular, management and indirect costs if the beneficiary is already receiving an operating grant financed by the EU or Euratom budget in the same period.

6.4 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

Not applicable

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

Not applicable

ARTICLE 10 — PURCHASE OF GOODS, WORKS OR SERVICES

Not applicable

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

Not applicable

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

Not applicable

ARTICLE 13 — IMPLEMENTATION OF ACTION TASKS BY SUBCONTRACTORS

Not applicable

ARTICLE 14 — IMPLEMENTATION OF ACTION TASKS BY LINKED THIRD PARTIES

Not applicable

ARTICLE 15 — FINANCIAL SUPPORT TO THIRD PARTIES

Not applicable

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

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 '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 Agency 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 *Agency* 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 adequate records and other supporting documentation to prove the number of units declared and that the costs for recruited researchers (living allowance, mobility allowance, family allowance) have been fully incurred for the benefit of the researchers.

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 a '**progress report**' within 30 days after one year from the starting date of the action;
- organise a '**mid-term review meeting**' between the beneficiaries, the partner organisation(s) and the Agency before the deadline for the submission of the report for RP 1 (reporting period 1);
- establish a **supervisory board** of the network;
- submit any **other deliverables** identified in Annex 1, in accordance with the timing and conditions set out in it.

The beneficiaries must:

- submit a '**researcher declaration**' within 20 days after the recruitment of each researcher.

19.2 Consequences of non-compliance

If a beneficiary or the coordinator breaches any of its obligations under this Article, the Agency may apply any of the measures provided for in Chapter 6.

ARTICLE 20 — REPORTING — PAYMENT REQUESTS

20.1 Obligation to submit reports

The coordinator must submit to the *Agency* (see Article 52) the technical and financial reports set out in this Article. These reports include the requests for payments 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 24
- *RP2: from month 25 to month 48*

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 also 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**';

(iii) a **summary** for publication by the Agency;

(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 (see Article 6) for each budget category (see Annex 2).

The beneficiaries must declare all eligible costs even if 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 Agency.

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) not applicable;

(iii) *not applicable;*

(iv) a '**periodic summary financial statement**' (see Annex 4), 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 a '**final summary financial statement**' (see Annex 4), 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**

20.5 Information on cumulative expenditure incurred

Not applicable

20.6 Currency for financial statements

Financial statements must be drafted in euro.

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 — Suspension of the payment deadline — Termination

If the reports submitted do not comply with this Article, the Agency 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 sent by the Agency, the Agreement may be terminated (see Article 50).

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 **2,874,791.52** (two million eight hundred and seventy four thousand seven hundred and ninety one EURO and fifty two eurocents).

The Agency will — except if Article 48 applies — make the pre-financing payment to the coordinator within 30 days 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).

An amount of EUR **179,674.47** (one hundred and seventy nine thousand six hundred and seventy four EURO and forty seven eurocents), corresponding to 5% of the maximum grant amount (see Article 5.1), is retained by the Agency 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 Agency 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 Agency 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 Agency (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 Agency 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 Agency 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 beneficiary's consent — against any other amount owed by the beneficiary to *the Agency,* the Commission or an*other* 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 Agency 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 Agency 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 Agency 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: BANCO DE SABADELL, S.A.
Address of branch: C VIA AUGUSTA 000013 BARCELONA, Spain
Full name of the account holder: F INSTITUT DE BIOENGINYERIA DE CATALUNYA IBEC
Full account number (including bank codes):
IBAN code: ES7400814199290001713275

21.9 Costs of payment transfers

The cost of the payment transfers is borne as follows:

- the Agency 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 Agency 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 Agency 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 Agency and the Commission

22.1.1 Right to carry out checks

The Agency or 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 Agency or the Commission may be assisted by external persons or bodies.

The Agency or the Commission may also request additional information in accordance with Article 17. The Agency or 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 Agency or 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.

The Agency or 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 Agency or 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 Agency or 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 Agency or 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.

The Agency or 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 Agency or 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 Agency or 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 Agency or 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 Agency or 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 883/2013[2] and No 2185/96[3] (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 966/2012[4], 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.

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.

---

[2] 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).

[3] 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).

[4] 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).

22.5.2 Findings in other grants

The Agency or 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 Agency or 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 Agency or 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 Agency or the Commission in justified cases.

The amounts to be rejected will be determined on the basis of the revised financial statements, subject to their approval.

If the Agency or the Commission 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, it will formally notify the beneficiary concerned the application of the initially notified correction rate for extrapolation.

If the Agency or the Commission accepts the alternative correction method proposed by the beneficiary concerned, it will formally notify the application of the accepted alternative correction method.

22.5.3.2 If the findings concern **improper implementation** or a **breach of another obligation**: 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 Agency or 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.

If the Agency or the Commission does not receive any observations or does not accept the observations or the proposed alternative flat-rate, it will formally notify the beneficiary concerned the application of the initially notified flat-rate.

If the Agency or the Commission accepts the alternative flat-rate proposed by the beneficiary concerned, it will formally notify the application of the accepted 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 Agency or 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 Agency or 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 Agency 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 activities[5].

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

The beneficiaries must ensure that researchers are aware of them.

23a.2 Consequences of non-compliance

If a beneficiary breaches its obligations under this Article, the Agency 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.

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**').

[5] 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.

'**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 entities[6] established in an EU Member State or '**associated country**'[7], if this is needed to exploit the results generated by the beneficiaries to which they are affiliated.

[6] 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.

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 researchers

The beneficiaries must — on a royalty-free basis — give access to the recruited researchers to background necessary for their research training activities under the action.

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:

(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).

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.

[7] For the definition, see Article 2.1(3) Rules for Participation Regulation No 1290/2013: '**associated country**' means a non EU-country (third country) which is party to an international agreement with the Union, as identified in Article 7 of the H2020 Framework Programme Regulation No 1291/2013. Article 7 sets out the conditions for association of non-EU countries to Horizon 2020.

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 Agency ownership, to protect results

26.4.1 The Agency 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 Agency 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 Agency decides to assume ownership, it will formally notify the beneficiary concerned within 45 days of receiving notification.

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

26.4.2 The Agency 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 Agency 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 Agency 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 Agency 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 Agency 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 Agency 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 the Marie Skłodowska-Curie grant agreement No 721874".*

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 Agency 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 the Marie Skłodowska-Curie grant agreement No 721874".*

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 Agency 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 *"Marie Skłodowska-Curie Actions"*;

- 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 Agency 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 the Marie Skłodowska-Curie grant agreement No 721874".*

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 Agency.

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 Agency responsibility

Any dissemination of results must indicate that it reflects only the author's view and that the Agency 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

(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 Agency right to object to transfers or licensing

The Agency may — up to four years after the period set out in Article 3 — object to a transfer of ownership or the exclusive licensing of results, if:

(a) it is to a third party established in a non-EU country not associated with Horizon 2020 and

(b) the Agency considers that the transfer or licence is not in line with EU interests regarding competitiveness or is inconsistent with ethical principles or security considerations.

A beneficiary that intends to transfer ownership or grant an exclusive licence must formally notify the Agency before the intended transfer or licensing takes place and:

- *identify the specific results concerned;*
- *describe in detail the new owner or licensee and the planned or potential exploitation of the results, and*
- *include a reasoned assessment of the likely impact of the transfer or licence on EU competitiveness and its consistency with ethical principles and security considerations.*

The Agency may request additional information.

If the Agency decides to object to a transfer or exclusive licence, it must formally notify the beneficiary concerned within 60 days of receiving notification (or any additional information it has requested).

No transfer or licensing may take place in the following cases:

- *pending the Agency decision, within the period set out above;*
- *if the Agency objects;*
- *until the conditions are complied with, if the Agency objection comes with conditions.*

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 researchers

The beneficiaries must — on a royalty-free basis — give access to the recruited researchers to results necessary for their research training activities under the action.

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

ARTICLE 32 — RECRUITMENT AND WORKING CONDITIONS FOR RECRUITED RESEARCHERS

32.1 Obligations towards recruited researchers

The beneficiaries must respect the following recruitment and working conditions for the researchers recruited under the action:

(a) 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 Researchers[8] and ensure that the researchers are aware of them;

(b) advertise and publish vacancies internationally, including on the web-sites requested by the Agency;

(c) recruit the researchers, following an open, transparent, impartial and equitable recruitment procedure, on the basis of:

  (i) their scientific skills and the relevance of their research experience;

  (ii) the impact of the proposed training on the researcher's career;

  (iii) a fair gender representation (by promoting genuine equal access opportunities between men and women throughout the recruitment process);

(d) ensure that no conflict of interest exists in or arises from the recruitment;

(e) ensure that the researchers enjoy at the place of the implementation at least the same standards and working conditions as those applicable to local researchers holding a similar position;

[8] 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).

(f) ensure that the employment contract, other direct contract or fixed amount-fellowship agreement (see Article 6) specifies :

(i) the starting date and duration of the research training activities under the action;

(ii) the monthly support for the researcher under this Agreement (in euro and, if relevant, in the currency in which the remuneration is paid);

(iii) the obligation of the researcher to work exclusively for the action;

(iv) the obligation of the researcher not to receive for activities carried out in the frame of the action, other incomes than those received from the beneficiary (or any other entity referred to in Annex 1);

(v) the obligation of the researcher to inform the beneficiary as soon as possible of any events or circumstances likely to affect the Agreement (see Article 17);

(vi) the arrangements related to the intellectual property rights between the beneficiary and the researcher — during implementation of the action and afterwards;

(vii) the obligation of the researcher to maintain confidentiality (see Article 36);

(viii) the obligation of the researcher to ensure the visibility of EU funding in communications or publications and in applications for the protection of results (see Articles 27, 28, 29 and 38);

(g) assist the researchers in the administrative procedures related to their recruitment;

(h) inform the researchers about:

- the description, conditions, location and the timetable for the implementation of the research training activities under the action and the name of the supervisor;

- the rights and obligations of the beneficiary toward the researcher under this Agreement;

- the obligation of the researcher to complete and submit — at the end of the training — the evaluation questionnaire and — two years later — follow-up questionnaire provided by the Agency;

(i) ensure that the researchers do not receive, for activities carried out in the frame of the action, other incomes than those received from the beneficiaries (or any other entity referred to in Annex 1);

(j) host the researchers at their premises and provide training as well as the necessary means for implementing the action;

(k) ensure that the researchers are adequately supervised;

(l) ensure that a career development plan is established and support its implementation;

(m) ensure an appropriate exposure to the non-academic sector;

(n) limit secondments to a maximum of 30% of the actual months spent implementing the research training activities under the action.

32.2 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 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 Agency may apply any of the measures described in Chapter 6.

ARTICLE 34 — ETHICS

34.1 Obligation to comply with ethical principles

The beneficiaries must carry out the action in compliance with:

(a) ethical principles (including the highest standards of research integrity — as set out, for instance, in the European Code of Conduct for Research Integrity[9] — and including, in particular, avoiding fabrication, falsification, plagiarism or other research misconduct) 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.

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;

[9] The 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

(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.

34.2 Activities raising ethical issues

Activities raising ethical issues must comply with the '**ethics requirements**' set out in Annex 1.

Before the beginning of an activity raising an ethical issue, the coordinator must submit (see Article 52) to the Agency copy of:

(a) any ethics committee opinion required under national law and

(b) any notification or authorisation for activities raising ethical issues required under national law.

If these documents are not in English, the coordinator must also submit an English summary of the submitted opinions, notifications and authorisations (containing, if available, the conclusions of the committee or authority concerned).

If these documents are specifically requested for the action, the request must contain an explicit reference to the action title. The coordinator must submit a declaration by each beneficiary concerned that all the submitted documents cover the action tasks.

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 only if:

- they are set out in Annex 1 or

- the coordinator has obtained explicit approval (in writing) from the Agency (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 Agency 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 Agency 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 Agency 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 to partner organisations 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 Agency may disclose confidential information to its staff, other EU institutions and bodies or 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 1290/2013[10], 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.

[10] 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).

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;

(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 results

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 mainstream media coverage the beneficiaries must inform the Agency (see Article 52).

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

Unless the Agency 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 the Marie Skłodowska-Curie grant agreement No 721874".*
>
> 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 the Marie Skłodowska-Curie grant agreement No 721874".*

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 Agency.

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 Agency responsibility

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

38.2 Communication activities by the Agency

38.2.1 Right to use beneficiaries' materials, documents or information

The Agency 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 that it receives 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.

However, if the Agency's use of these materials, documents or information would risk compromising legitimate interests, the beneficiary concerned may request the Agency 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 Agency 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 1049/2001[11], 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 Agency.

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 Agency will insert the following information:

> "© – [year] – [name of the copyright owner]. All rights reserved. Licensed to the Research Executive Agency (REA) 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.

[11] 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.

ARTICLE 39 — PROCESSING OF PERSONAL DATA

39.1 Processing of personal data by the Agency and the Commission

Any personal data under the Agreement will be processed by the Agency or the Commission under Regulation No 45/2001[12] and according to the 'notifications of the processing operations' to the Data Protection Officer (DPO) of the Agency or the Commission (publicly accessible in the DPO register).

Such data will be processed by the '**data controller**' of the Agency or 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 data controller, via the contact point indicated in the 'service specific privacy statement(s) (SSPS)' that are published on the Agency and 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 Agency or the Commission. For this purpose, they must provide them with the service specific privacy statement (SSPS) (see above), before transmitting their data to the Agency or the Commission.

39.3 Consequences of non-compliance

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

ARTICLE 40 — ASSIGNMENTS OF CLAIMS FOR PAYMENT AGAINST THE AGENCY

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

If the Agency 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 Agency.

[12] 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).

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 Agency

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 Agency 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 '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 Agency or the Commission under the Agreement, unless the Agreement requires the beneficiary to submit this information directly to the Agency or 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 Agency (in particular, providing the Agency with the information described in Article 17), unless the Agreement specifies otherwise;

(iii) request and review any documents or information required by the Agency and verify their completeness and correctness before passing them on to the Agency;

(iv) submit the deliverables and reports to the Agency (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 Agency of the amounts paid to each beneficiary, when required under the Agreement (see Articles 44 and 50) or requested by the Agency.

The coordinator may not delegate the above-mentioned tasks to any other beneficiary or subcontract them to any third party.

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 — PENALTIES — DAMAGES — SUSPENSION — TERMINATION — FORCE MAJEURE

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

ARTICLE 42 — REJECTION OF INELIGIBLE COSTS

42.1 Conditions

42.1.1 The Agency will — 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).

42.1.2 The rejection may also be based on the **extension of findings from other grants to this grant**, under the conditions set out in Article 22.5.2.

42.2 Ineligible costs to be rejected — Calculation — Procedure

Ineligible costs will be rejected in full.

If the Agency rejects costs **without reduction of the grant** (see Article 43) or **recovery of undue amounts** (see Article 44), it will formally notify the coordinator or beneficiary concerned 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 Agency of its disagreement and the reasons why.

If the Agency rejects costs **with reduction of the grant** or **recovery of undue amounts**, it will formally notify the rejection in the '**pre-information letter**' on reduction or recovery set out in Articles 43 and 44.

42.3 Effects

If the Agency 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 Agency — **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 Agency 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

43.1.1 The Agency may — **at the payment of the balance** or **afterwards** — reduce the maximum grant amount (see Article 5.1), if the action has not been implemented properly as described in Annex 1 or another obligation under the Agreement has been breached.

43.1.2 The Agency may also reduce the maximum grant amount on the basis of the **extension of findings from other grants to this grant**, under the conditions set out in Article 22.5.2.

43.2 Amount to be reduced — Calculation — Procedure

The amount of the reduction will be proportionate to the improper implementation of the action or to the seriousness of the breach.

Before reduction of the grant, the Agency 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 Agency 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 Agency reduces the grant at the time of **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 Agency 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 Agency will recover the difference (see Article 44).

ARTICLE 44 — RECOVERY OF UNDUE AMOUNTS

44.1 Amount to be recovered — Calculation — Procedure

The Agency 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 Agency 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 Agency or 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 Agency, the Commission or another executive agency (from the EU or Euratom budget).

In exceptional circumstances, to safeguard the EU's financial interests, the Agency 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 Agency or 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[13] 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 Agency 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.

[13] 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 no observations are submitted or the Agency 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.

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

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

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

{{{{beneficiary's costs declared in the final summary financial statement and approved by the Agency 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 Agency will **recover** the amount:

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

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

(b) by **drawing on the Guarantee Fund**. The Agency or 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 Agency or 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 Agency.

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

{{{beneficiary's costs declared in the final summary financial statement and approved by the Agency 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)}.

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

The Agency 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 Agency 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 Agency will **recover** the amount:

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

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

(b) by **drawing on the Guarantee Fund**. The Agency or 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 Agency or 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 AND FINANCIAL PENALTIES

45.1 Conditions

Under Articles 109 and 131(4) of the Financial Regulation No 966/2012, the Agency may impose **administrative** and **financial penalties** if a beneficiary:

(a) has committed substantial errors, irregularities or fraud or is in serious breach of its obligations under the Agreement or

(b) has made false declarations about information required under the Agreement or for the submission of the proposal (or has not supplied such information).

Each beneficiary is responsible for paying the financial penalties imposed on it.

Under Article 109(3) of the Financial Regulation No 966/2012, the Agency or the Commission may — under certain conditions and limits — publish decisions imposing administrative or financial penalties.

45.2 Duration — Amount of penalty — Calculation

Administrative penalties exclude the beneficiary from all contracts and grants financed from the EU or Euratom budget for a maximum of five years from the date the infringement is established by the Agency.

If the beneficiary commits another infringement within five years of the date the first infringement is established, the Agency may extend the exclusion period up to 10 years.

Financial penalties will be between 2% and 10% of the maximum EU contribution indicated, for the beneficiary concerned, in the estimated budget (see Annex 2).

If the beneficiary commits another infringement within five years of the date the first infringement is established, the Agency may increase the rate of financial penalties to between 4% and 20%.

45.3 Procedure

Before applying a penalty, the Agency will formally notify the beneficiary concerned:

- informing it of its intention to impose a penalty, its duration or amount and the reasons why and

- inviting it to submit observations within 30 days.

If the Agency does not receive any observations or decides to impose the penalty despite of observations it has received, it will formally notify **confirmation** of the penalty to the beneficiary concerned and — in case of financial penalties — deduct the penalty from the payment of the balance or formally notify a **debit note**, specifying 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 Agency or the Commission may **recover** the amount:

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

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

(b) 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 Agency or 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.

SECTION 2 LIABILITY FOR DAMAGES

ARTICLE 46 — LIABILITY FOR DAMAGES

46.1 Liability of the Agency

The Agency 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 Agency 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

46.2.1 Conditions

Except in case of force majeure (see Article 51), the beneficiaries must compensate the Agency 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.

Each beneficiary is responsible for paying the damages claimed from it.

46.2.2 Amount of damages - Calculation

The amount the Agency can claim from a beneficiary will correspond to the damage caused by that beneficiary.

46.2.3 Procedure

Before claiming damages, the Agency will formally notify the beneficiary concerned:

- informing it of its intention to claim damages, the amount and the reasons why and
- inviting it to submit observations within 30 days.

If the Agency does not receive any observations or decides to claim damages despite the observations it has received, it will formally notify **confirmation** of the claim for damages and a **debit note**, specifying 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 Agency or the Commission may **recover** the amount:

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

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

(b) 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 Agency or 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.

SECTION 3 SUSPENSION AND TERMINATION

ARTICLE 47 — SUSPENSION OF PAYMENT DEADLINE

47.1 Conditions

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

The suspension will **take effect** the day notification is sent by the Agency (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 Agency 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 Agency 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 Agency may — at any moment — suspend, in whole or in part, the pre-financing payment and interim payments for one or more beneficiaries or the payment of the balance for all beneficiaries, if a beneficiary:

(a) has committed or is suspected of having committed substantial errors, irregularities, fraud or serious breach of obligations in the award procedure or under this Agreement or

(b) 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).

48.2 Procedure

Before suspending payments, the Agency will formally notify the coordinator:

- 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 Agency 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 Agency.

If the conditions for resuming payments are met, the suspension will be **lifted**. The Agency will formally notify the coordinator.

During the suspension, the periodic report(s) (see Article 20.3) must not contain any individual financial statements from the beneficiary concerned. When the Agency resumes payments, the coordinator may include them in the next 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 Agency 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 Agency.

Once circumstances allow for implementation to resume, the coordinator must immediately formally notify the Agency 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 Agency

49.2.1 Conditions

The Agency may suspend implementation of the action or any part of it:

(a) if a beneficiary has committed or is suspected of having committed substantial errors, irregularities, fraud or serious breach of obligations in the award procedure or under this Agreement;

(b) if 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), or

(c) if the action is suspected of having lost its scientific or technological relevance.

49.2.2 Procedure

Before suspending implementation of the action, the Agency will formally notify the coordinator:

- 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 Agency 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 by the coordinator (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 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 Agency (see Article 46).

Suspension of the action implementation does not affect the Agency'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 Agency (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 Agency 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 Agency 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 Agency 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 and 40) 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 Agency (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 Agency 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 Agency, (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 Agency, the Agreement is **amended** to introduce the necessary changes (see Article 55).

The Agency will **calculate** — on the basis of the periodic reports, the termination report and the report on the distribution of payments — if the (pre-financing and interim) payments received by the beneficiary concerned exceed the beneficiary's EU contribution (calculated by applying the reimbursement rate(s) to the eligible costs declared by the beneficiary and approved by the Agency). 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.

- 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 Agency 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 Agency 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 Agency 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 Agency the amount due and the Agency 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 is 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 Agency 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 Agency the amount due. The Agency 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 Agency 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 Agency 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 and 40) continue to apply.

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

50.3.1 Conditions

The Agency 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 affecting the EU's financial interests;

(l) a beneficiary (or a natural person who has the power to represent or take decisions on its behalf) has — in the award procedure or under the Agreement — committed:

(i) substantial errors, irregularities, fraud or

(ii) serious breach of obligations, 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**').

50.3.2 Procedure

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

- 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 Agency of the measures to ensure compliance with the obligations under the Agreement.

If the Agency does not receive observations or decides to pursue the procedure despite the observations it has received, it will formally notify to the coordinator **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), and (l.ii) 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 by the coordinator.

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 the reports (see Articles 20.8 and 50.3.1(l)), the coordinator may not submit any reports after termination.

If the Agency 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 Agency 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 Agency's right to reduce the grant (see Article 43) or to impose administrative and financial penalties (Article 45).

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

After termination, the beneficiaries' obligations (in particular Articles 20, 22, 23, Section 3 of Chapter 4, 36, 37, 38 and 40) 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 Agency (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 Agency, the Agreement is **amended** to introduce the necessary changes (see Article 55).

The Agency will **calculate** — on the basis of the periodic reports, the termination report and the report on the distribution of payments — if the (pre-financing and interim) payments received by the beneficiary concerned exceed the beneficiary's EU contribution (calculated by applying the reimbursement rate(s) to the eligible costs declared by the beneficiary and approved by the Agency). 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.

- 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 Agency 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 Agency 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 Agency 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 Agency the amount due and the Agency 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 the amount unduly received, 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 Agency 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 Agency the amount due. The Agency 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 Agency 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 Agency 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 and 40) 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 a partner organisation), 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 'Terms and Conditions of Use of the electronic exchange system'. 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 Terms and Conditions of Use of the electronic exchange system).

If the electronic exchange system is temporarily unavailable, instructions will be given on the Agency and 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 Agency 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 Agency** must be sent to the following address:

Research Executive Agency (REA)
Marie Sklodowska-Curie Innovative Training Networks
COV2
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 '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 1182/71[14], 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.

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;

[14] 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).

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

The Agency 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 Agency 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 Agency'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).

If a dispute concerns administrative or financial penalties, 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. Actions against enforceable decisions must be brought against the Commission (not against the Agency).

ARTICLE 58 — ENTRY INTO FORCE OF THE AGREEMENT

The Agreement will enter into force on the day of signature by the Agency or the coordinator, depending on which is later.

SIGNATURES

For the coordinator

Josep SAMITIER with ECAS id nsamijos signed in the Participant Portal on 13/07/2016 at 16:01:57 (transaction id SigId-161983-5RUy6CX7AnnTkE1hlF9l1VXLlxQ0k9wEtPrBXf3wtTNOsBSFXxIrJPHJek7FlmiXhzKOZgzSaEru38aouR0cazW-Jj71zxYb8yrYygdmV9MCry-vmDSuCzLSczxbjWKv0lK3gnFvOx9r9wInW5kU94SkO70). Timestamp by third party at Wed Jul 13 17:02:05 CEST 2016

For the Agency

Signed by Klaus-Guenther BARTHEL with ECAS id barthkl as an authorised representative on 16-08-2016 15:14:41 (transaction id SigId-118241-1zi6qJzZk2WzPCcawTH3TDH95ut3oCthR5zmlwbyfqFge7UzeqVWTQbOEAN2aNxZxb8tOyS1ctHNY8UgzHzk7Bb0-Jj71zxYb8yr5dzX2DFZb8K-ATqBVC3CAvBmzbrNNgrslTJJW7LtcisJ00AJmsRWdzqW) Tue Aug 16 15:14:51 CEST 2016

EUROPEAN COMMISSION
Research Executive Agency (REA)
Marie Sklodowska-Curie Innovative Training Networks

ANNEX 1 (part A)

European Training Networks

NUMBER — 721874 — SPM2.0

Table of Contents

1.1. The project summary

Project Number [1]	721874	Project Acronym [2]	SPM2.0

One form per project

General information	
Project title [3]	Scanning probe microscopies for nanoscale fast, tomographic and composition imaging
Starting date [4]	01/01/2017
Duration in months [5]	48
Call (part) identifier [6]	H2020-MSCA-ITN-2016
Topic	MSCA-ITN-2016 Innovative Training Networks
Fixed EC Keywords	Biophysics, Nanotechnology, nano-materials, nano engineering, Metrology and measurement, Nano-materials (production and properties), Electrical and electronic engineering: semiconductors, components, systems
Free keywords	Scanning probe microscopy, nanotomography, nanocomposition, high speed imaging, probe microfabrication, nanocomposites, nanoelectronics, nanobiotechnology

Abstract [7]

Advanced Microscopy techniques are widely recognized as one of the pillars onto which the research and manufacture of Nanotechnology based products is sustained. At present, the greatest challenge faced by these techniques is the realization of fast and non-destructive tomographic images with chemical composition sensitivity and with sub-10 nm spatial resolution, in both organic and inorganic materials, and in all environmental conditions. Scanning Probe Microscopes are currently the Advanced Microscopy techniques experiencing the fastest evolution and innovation towards solving this challenge. Scanning Probe Microscopes have crossed fundamental barriers, and novel systems exist that show potential unparalleled performance in terms of 3D nanoscale imaging capabilities, imaging speed and chemical sensitivity mapping. The objective of the SPM2.0 European Training Network is to train a new generation of researchers in the science and technology of these novel Scanning Probe Microscopes, in which Europe is currently in a leading position, in order to enforce its further development and its quick and wide commercialization and implementation in public and private research centers and industrial and metrology institutions. The researchers of the network will acquire a solid state-of-the-art multidisciplinary scientific training in this field of research, covering from basic science to industrial applications, which should enable them to generate new scientific knowledge of the highest impact. In addition, they will receive a practical training on transferable skills in order to increase their employability perspectives and to qualify them to access to responsibility job positions in the private and public sectors. The final aim of the network is to consolidate Europe as the world leader in Scanning Probe Microscopy technologies and its emerging applications in key sectors like Materials, Microelectronics, Biology and Medicine.

1.2. List of Beneficiaries

Project Number [1]	721874	Project Acronym [2]	SPM2.0

List of Beneficiaries

No	Name	Short name	Country	Project entry month[8]	Project exit month
1	FUNDACIO INSTITUT DE BIOENGINYERIA DE CATALUNYA	IBEC	Spain	1	48
2	INSTITUT NATIONAL DE LA SANTE ET DE LA RECHERCHE MEDICALE	INSERM	France	1	48
3	AGENCIA ESTATAL CONSEJO SUPERIOR DEINVESTIGACIONES CIENTIFICAS	CSIC	Spain	1	48
4	UNIVERSITAT LINZ	JKU	Austria	1	48
5	Asociacion - Centro de Investigacion Cooperativa en Nanociencias - CIC NANOGUNE	NANOGUNE	Spain	1	48
6	NPL MANAGEMENT LIMITED	NPL	United Kingdom	1	48
7	KEYSIGHT TECHNOLOGIES GMBH	KEYSIGHT	Austria	1	48
8	TECHNISCHE UNIVERSITAET WIEN	TUW	Austria	1	48
9	THE BIO NANO CENTRE LIMITED LBG	BNC	United Kingdom	1	48
10	UNIVERSITA DEGLI STUDI DI MODENA E REGGIO EMILIA	UNIMORE	Italy	1	48

1.3. Workplan Tables - Detailed implementation

1.3.1. WT1 List of work packages

WP Number [9]	WP Title	Lead beneficiary [10]	Start month [12]	End month [13]
WP1	Ethics requirements	1 - IBEC	1	48
WP2	Theoretical modelling for SPM2.0 techniques.	1 - IBEC	6	24
WP3	Novel SPM2.0 instrumentation.	7 - KEYSIGHT	6	36
WP4	Novel probes for SPM2.0 technologies.	8 - TUW	6	36
WP5	SPM2.0 applications to materials and electronics.	3 - CSIC	6	42
WP6	SPM2.0 applications in Medicine and Biology.	9 - BNC	6	42
WP7	SPM2.0 metrology and standardization.	9 - BNC	6	42
WP8	Scientific and complementary skills training.	4 - JKU	1	42
WP9	Management, recruitment and dissemination.	1 - IBEC	1	48

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	HCT - Requirement No. 1	WP1	1 - IBEC	Ethics	Confidential, only for members of the consortium (including the Commission Services)	6
D1.2	EPQ - Requirement No. 2	WP1	1 - IBEC	Ethics	Confidential, only for members of the consortium (including the Commission Services)	6
D1.3	POPD - Requirement No. 3	WP1	1 - IBEC	Ethics	Confidential, only for members of the consortium (including the Commission Services)	6
D2.1	Tip-sample interaction models for composition mapping.	WP2	3 - CSIC	Report	Confidential, only for members of the consortium (including the Commission Services)	24
D2.2	Reconstruction algorithms for SPM 3D tomography.	WP2	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	24
D3.1	IR-s-SNOM for sub-10 nm optical composition mapping.	WP3	5 - NANOGUNE	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D3.2	m-SFM for sub-5 nm mechanical compositional mapping.	WP3	3 - CSIC	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D3.3	EFM for sub-10 nm dielectric composition mapping.	WP3	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	30

Deliverable Number [14]	Deliverable Title	WP number [9]	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
D3.4	Molecular recognition HS-AFM.	WP3	4 - JKU	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D3.5	EFM for 3D dielectric nanotomography.	WP3	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D3.6	SMM for 3D doping profiling.	WP3	7 - KEYSIGHT	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D4.1	Environmental control kit for HS-AFM.	WP4	2 - INSERM	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D4.2	Novel high speed AFM probes.	WP4	8 - TUW	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D4.3	Chemical high speed AFM probes.	WP4	4 - JKU	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D4.4	Antenna probes for Infrared SNOM.	WP4	5 - NANOGUNE	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D5.1	2D nanocomposition mapping of polymers/ biomolecules.	WP5	3 - CSIC	Report	Confidential, only for members of the consortium (including the Commission Services)	42

Deliverable Number [14]	Deliverable Title	WP number [9]	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
D5.2	Subsurface mapping of nanoparticles in polymers.	WP5	5 - NANOGUNE	Report	Confidential, only for members of the consortium (including the Commission Services)	42
D5.3	Nanocomposition optimization in organic electronic devices.	WP5	10 - UNIMORE	Report	Confidential, only for members of the consortium (including the Commission Services)	42
D5.4	3D doping profiling of semiconductor devices.	WP5	7 - KEYSIGHT	Report	Confidential, only for members of the consortium (including the Commission Services)	42
D6.1	High speed mapping of single proteins.	WP6	4 - JKU	Report	Confidential, only for members of the consortium (including the Commission Services)	42
D6.2	Label free imaging of nanoparticle cell uptake.	WP6	9 - BNC	Report	Confidential, only for members of the consortium (including the Commission Services)	42
D6.3	Sub-10 nm label free biomembrane composition mapping.	WP6	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	42
D6.4	Single protein mutation by HS-AFM.	WP6	2 - INSERM	Report	Confidential, only for members of the consortium (including the Commission Services)	42
D7.1	Cantilever calibration good practices.	WP7	6 - NPL	Report	Confidential, only for members of the consortium (including the Commission Services)	24
D7.2	Tip-sample interaction area.	WP7	6 - NPL	Report	Confidential, only for members	42

Deliverable Number [14]	Deliverable Title	WP number [9]	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
					of the consortium (including the Commission Services)	
D8.1	Personal Career Development Plans (14).	WP8	2 - INSERM	Report	Confidential, only for members of the consortium (including the Commission Services)	12
D8.2	Report of the assessment commissions (1st).	WP8	2 - INSERM	Report	Confidential, only for members of the consortium (including the Commission Services)	12
D8.3	Network wide courses minutes (Training Workshop 1).	WP8	2 - INSERM	Report	Public	12
D8.4	Network Newsletters (1st).	WP8	9 - BNC	Report	Public	12
D8.5	Network wide courses minutes (Training Workshop 2).	WP8	10 - UNIMORE	Report	Public	18
D8.6	Report of the assessment commissions (2nd).	WP8	2 - INSERM	Report	Confidential, only for members of the consortium (including the Commission Services)	24
D8.7	Network wide courses minutes (Training Workshop 3).	WP8	4 - JKU	Report	Public	24
D8.8	Network Newsletters (2nd).	WP8	9 - BNC	Report	Public	24
D8.9	Network wide courses minutes (Training Workshop 4).	WP8	6 - NPL	Report	Public	30
D8.10	Report of the assessment commissions (3rd).	WP8	2 - INSERM	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D8.11	Network wide courses minutes (Training Workshop 5).	WP8	7 - KEYSIGHT	Report	Public	36

Deliverable Number [14]	Deliverable Title	WP number [9]	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
D8.12	Network Newsletters (3rd).	WP8	9 - BNC	Report	Public	36
D8.13	Personal Employability Plans (14).	WP8	7 - KEYSIGHT	Report	Confidential, only for members of the consortium (including the Commission Services)	42
D8.14	Network wide courses minutes (Training Workshop 6).	WP8	5 - NANOGUNE	Report	Public	42
D9.1	Network meeting minutes (Kick off).	WP9	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	1
D9.2	Supervisory Board of the Network.	WP9	1 - IBEC	Other	Confidential, only for members of the consortium (including the Commission Services)	2
D9.3	Website completion.	WP9	9 - BNC	Websites, patents filling, etc.	Public	6
D9.4	Network meeting minutes (Meeting 1).	WP9	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	12
D9.5	Progress Report.	WP9	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	13
D9.6	Mid-term report	WP9	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	22
D9.7	Network meeting minutes (Meeting 2).	WP9	1 - IBEC	Report	Confidential, only for members of the consortium (including the	26

Deliverable Number [14]	Deliverable Title	WP number [9]	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
					Commission Services)	
D9.8	SPM2.0 virtual lab.	WP9	1 - IBEC	Websites, patents filling, etc.	Public	36
D9.9	Network meeting minutes (Meeting 3).	WP9	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D9.10	Application Notes (1st).	WP9	7 - KEYSIGHT	Report	Public	39
D9.11	Application Notes (2nd).	WP9	7 - KEYSIGHT	Report	Public	42
D9.12	Application Notes (3rd).	WP9	7 - KEYSIGHT	Report	Public	45
D9.13	Network meeting minutes (Final Meeting).	WP9	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	48
D9.14	Network Newsletters (4th).	WP9	9 - BNC	Report	Public	48
D9.15	Final Management, economic and scientific reports.	WP9	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	48
D9.16	Scientific publications and presentations.	WP9	1 - IBEC	Report	Public	48
D9.17	Consortium Agreement.	WP9	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	2

1.3.3. WT3 Work package descriptions

Work package number [9]	WP1	**Lead beneficiary** [10]	1 - IBEC
Work package title	Ethics requirements		
Start month	1	**End month**	48

Objectives

The objective is to ensure compliance with the 'ethics requirements' set out in this work package.

Description of work and role of partners

WP1 - Ethics requirements [Months: 1-48]
IBEC
This work package sets out the 'ethics requirements' that the project must comply with.

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
D1.1	HCT - Requirement No. 1	1 - IBEC	Ethics	Confidential, only for members of the consortium (including the Commission Services)	6
D1.2	EPQ - Requirement No. 2	1 - IBEC	Ethics	Confidential, only for members of the consortium (including the Commission Services)	6
D1.3	POPD - Requirement No. 3	1 - IBEC	Ethics	Confidential, only for members of the consortium (including the Commission Services)	6

Description of deliverables

The 'ethics requirements' that the project must comply with are included as deliverables in this work package.

D1.1 : HCT - Requirement No. 1 [6]

More information should be provided about the origins of the living cells used in the project. 1. In case of use of human cells/tissues available commercially, details on cells/tissues type and provider must be submitted. 2. In case human cells/tissues are obtained within the project, details on cells/tissues type and ethics approval must be provided. 3. In case human cells/tissues are obtained within another project, details on cells/tissues type and authorisation by primary owner of data (including references to ethics approval) must be provided. 4. In case of human cells/tissues stored in a biobank, details on cells/tissues type must be provided, as well as details on the biobank and access to it.

D1.2 : EPQ - Requirement No. 2 [6]

1. The applicant must provide further information about the possible harm to the environment caused by the research (during production and disposal of the nanomaterial). 2. The applicant must ensure that appropriate health and safety

procedures conforming to relevant local/national guidelines/legislation are followed for staff involved in this project (e.g. protection cloth, adequate training for staff handling nanoparticles, etc.).

D1.3 : POPD - Requirement No. 3 [6]

1. In case the project will use human HIV infected cells, the applicant has to confirm that these cells cannot be backtracked to personal data.

Schedule of relevant Milestones

Milestone number [18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification

Work package number [9]	WP2	Lead beneficiary [10]	1 - IBEC
Work package title	Theoretical modelling for SPM2.0 techniques.		
Start month	6	End month	24

Objectives

Development of mathematical reconstruction algorithms and quantitative tip-sample interaction models for SPM nanoscale 3D tomography and composition mapping.

Description of work and role of partners

WP2 - Theoretical modelling for SPM2.0 techniques. [Months: 6-24]
IBEC
Task 2.1. Tip-sample interaction models for nanoscale composition mapping with SPM: (a) multimode scanning force microscopy (m-SFM) (ESR5-ICMM), (b) Electrostatic Force Microscopy (EFM) (ESR1-IBEC) and s-SNOM (ESR8-NANOGUNE).
Task 2.2. Mathematical reconstruction algorithms for 3D SPM tomography with (a) EFM (ESR2-IBEC) and (b) Scanning Microwave Microscopy (SMM) (ESR10-KEYSIGHT).

Participation per Partner

Partner number and short name [10]
1 - IBEC
3 - CSIC
5 - NANOGUNE
7 - KEYSIGHT

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
D2.1	Tip-sample interaction models for composition mapping.	3 - CSIC	Report	Confidential, only for members of the consortium (including the Commission Services)	24
D2.2	Reconstruction algorithms for SPM 3D tomography.	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	24

Description of deliverables

D2.1. Tip-sample interaction models for composition mapping (M24).
D2.2. Reconstruction algorithms for SPM 3D tomography (M24).

D2.1 : Tip-sample interaction models for composition mapping. [24]

Tip-sample interaction models for composition mapping.

D2.2 : Reconstruction algorithms for SPM 3D tomography. [24]

Reconstruction algorithms for SPM 3D tomography.

Schedule of relevant Milestones

Milestone number [18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS9	3D Nanotomographic EFM.	1 - IBEC	36	3D Nanotomographic EFM. Means of Verification: Laboratory prototype completed.

Work package number [9]	WP3	Lead beneficiary [10]	7 - KEYSIGHT
Work package title	Novel SPM2.0 instrumentation.		
Start month	6	End month	36

Objectives

Development of novel SPM instruments for high-speed, 3D tomographic and composition mapping at sub-10 nm spatial resolution.

Description of work and role of partners

WP3 - Novel SPM2.0 instrumentation. [Months: 6-36]
KEYSIGHT
Task 3.1. Sub-10 nm composition mapping with SPM in air and liquid with: (a) Enhanced Infrared scattering type scanning near field optical microscopy (s-SNOM) (ESR7-NANOGUNE); (b) multifrequency scanning force microscopy (ESR5-ICMM) and (c) nanoscale dielectric microscopy (ESR1-IBEC).
Task 3.2. Enhanced high speed AFM for single molecule recognition (ESR6-JKU).
Task 3.3. 3D composition nanotomography with SPM based on Electrostatic Force Microscopy (ESR2-IBEC) and (b) Scanning Microwave Microscopy (ESR10-KEYSIGHT).

Participation per Partner

Partner number and short name [10]
1 - IBEC
3 - CSIC
4 - JKU
5 - NANOGUNE
7 - KEYSIGHT

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
D3.1	IR-s-SNOM for sub-10 nm optical composition mapping.	5 - NANOGUNE	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D3.2	m-SFM for sub-5 nm mechanical compositional mapping.	3 - CSIC	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D3.3	EFM for sub-10 nm dielectric	1 - IBEC	Report	Confidential, only for members of the consortium	30

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
	composition mapping.			(including the Commission Services)	
D3.4	Molecular recognition HS-AFM.	4 - JKU	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D3.5	EFM for 3D dielectric nanotomography.	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D3.6	SMM for 3D doping profiling.	7 - KEYSIGHT	Report	Confidential, only for members of the consortium (including the Commission Services)	30

Description of deliverables

D3.1. IR-s-SNOM for sub-10 nm optical composition mapping (M30).
D3.2. m-SFM for sub-5 nm mechanical compositional mapping (M30).
D3.3. EFM for sub-10 nm dielectric composition mapping (M30).
D3.4. Molecular recognition HS-AFM (M30).
D3.5. EFM for 3D dielectric nanotomography (M30).
D3.6. SMM for 3D microwave tomography (M30).

D3.1 : IR-s-SNOM for sub-10 nm optical composition mapping. [30]

IR-s-SNOM for sub-10 nm optical composition mapping.

D3.2 : m-SFM for sub-5 nm mechanical compositional mapping. [30]

m-SFM for sub-5 nm mechanical compositional mapping.

D3.3 : EFM for sub-10 nm dielectric composition mapping. [30]

EFM for sub-10 nm dielectric composition mapping.

D3.4 : Molecular recognition HS-AFM. [30]

Molecular recognition HS-AFM.

D3.5 : EFM for 3D dielectric nanotomography. [30]

EFM for 3D dielectric nanotomography.

D3.6 : SMM for 3D doping profiling. [30]

SMM for 3D doping profiling.

Schedule of relevant Milestones

Milestone number [18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS7	High speed AFM molecular tracking.	4 - JKU	36	High speed AFM molecular tracking. Means of Verification: Laboratory prototype completed.
MS8	Chemical IR-s-SNOM in liquid.	5 - NANOGUNE	36	Chemical IR-s-SNOM in liquid. Means of Verification: Laboratory prototype completed.
MS9	3D Nanotomographic EFM.	1 - IBEC	36	3D Nanotomographic EFM. Means of Verification: Laboratory prototype completed.

Work package number [9]	WP4	Lead beneficiary [10]	8 - TUW
Work package title	Novel probes for SPM2.0 technologies.		
Start month	6	End month	36

Objectives

Develop specific SPM probes and accessories to enhance high speed molecular recognition imaging and infrared chemical sensitive optical mapping.

Description of work and role of partners

WP4 - Novel probes for SPM2.0 technologies. [Months: 6-36]
TUW
Task 4.1. Improved environmental control kit for the HS-AFM system (ESR3-INSERM).
Task 4.2 Novel high speed AFM probes (ESR12-TUW).
Task 4.3 Chemical functionalized probes for high speed AFM (ESR6-JKU).
Task 4.4 Antenna probes for improved sensitivity and spatial resolution composition mapping with infrared s-SNOM. (ESR7-NANOGUNE).

Participation per Partner

Partner number and short name [10]
2 - INSERM
4 - JKU
5 - NANOGUNE
8 - TUW

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
D4.1	Environmental control kit for HS-AFM.	2 - INSERM	Report	Confidential, only for members of the consortium (including the Commission Services)	30
D4.2	Novel high speed AFM probes.	8 - TUW	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D4.3	Chemical high speed AFM probes.	4 - JKU	Report	Confidential, only for members of the consortium (including the	36

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
				Commission Services)	
D4.4	Antenna probes for Infrared SNOM.	5 - NANOGUNE	Report	Confidential, only for members of the consortium (including the Commission Services)	36

Description of deliverables

D4.1. Environmental control kit for HS-AFM (M30).
D4.2. Novel high speed AFM probes (M36).
D4.3. Chemical high speed AFM probes (M36).
D4.4. Antenna probes for Infrared SNOM (M36).

D4.1 : Environmental control kit for HS-AFM. [30]

Environmental control kit for HS-AFM.

D4.2 : Novel high speed AFM probes. [36]

Novel high speed AFM probes.

D4.3 : Chemical high speed AFM probes. [36]

Chemical high speed AFM probes.

D4.4 : Antenna probes for Infrared SNOM. [36]

Antenna probes for Infrared SNOM.

Schedule of relevant Milestones

Milestone number [18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS7	High speed AFM molecular tracking.	4 - JKU	36	High speed AFM molecular tracking. Means of Verification: Laboratory prototype completed.
MS8	Chemical IR-s-SNOM in liquid.	5 - NANOGUNE	36	Chemical IR-s-SNOM in liquid. Means of Verification: Laboratory prototype completed.
MS10	High speed molecular tracking probes.	8 - TUW	36	High speed molecular tracking probes. Means of Verification: Laboratory prototype completed.

Work package number [9]	WP5	Lead beneficiary [10]	3 - CSIC
Work package title	SPM2.0 applications to materials and electronics.		
Start month	6	End month	42

Objectives

To demonstrate the unique capabilities of the SPM2.0 techniques for the 3D nanoscale structural imaging and 2D and 3D composition mapping of materials and organic and semiconductor electron devices.

Description of work and role of partners

WP5 - SPM2.0 applications to materials and electronics. [Months: 6-42]
CSIC
Task 5.1. Sub-10 nm 2D chemical mapping of block co-polymers and biomolecules with m-SFM (ESR5-ICMM).
Task 5.2. Subsurface mapping of nanoparticle in polymer nanocomposites based on infrared s-SNOM (ESR8-NANOGUNE).
Task 5.3. Nanoscale composition optimization of organic electronic devices (ESR14-UNIMORE).
Task 5.4. 3D nanoscale sub-10 nm doping profiling with SMM (ESR11-KEYSIGHT).

Participation per Partner

Partner number and short name [10]
3 - CSIC
5 - NANOGUNE
7 - KEYSIGHT
10 - UNIMORE

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
D5.1	2D nanocomposition mapping of polymers/ biomolecules.	3 - CSIC	Report	Confidential, only for members of the consortium (including the Commission Services)	42
D5.2	Subsurface mapping of nanoparticles in polymers.	5 - NANOGUNE	Report	Confidential, only for members of the consortium (including the Commission Services)	42
D5.3	Nanocomposition optimization in organic electronic devices.	10 - UNIMORE	Report	Confidential, only for members of the consortium (including the	42

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
				Commission Services)	
D5.4	3D doping profiling of semiconductor devices.	7 - KEYSIGHT	Report	Confidential, only for members of the consortium (including the Commission Services)	42

Description of deliverables

D5.1. 2D nanocomposition mapping of block co-polymers and biomolecules (M42).
D5.2: Subsurface mapping of nanoparticle in polymer nanocomposites (M42).
D5.3. Composition optimization of organic electronic devices (M42).
D5.4. 3D doping profiling of semiconductor devices (M42).

D5.1 : 2D nanocomposition mapping of polymers/ biomolecules. [42]

2D nanocomposition mapping of polymers/ biomolecules.

D5.2 : Subsurface mapping of nanoparticles in polymers. [42]

Subsurface mapping of nanoparticles in polymers.

D5.3 : Nanocomposition optimization in organic electronic devices. [42]

Nanocomposition optimization in organic electronic devices.

D5.4 : 3D doping profiling of semiconductor devices. [42]

3D doping profiling of semiconductor devices.

Schedule of relevant Milestones

Milestone number [18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS11	10 nm polymer composition mapping.	3 - CSIC	42	10 nm polymer composition mapping. Means of Verification: Survey completed and validated.

Work package number [9]	WP6	Lead beneficiary [10]	9 - BNC
Work package title	SPM2.0 applications in Medicine and Biology.		
Start month	6	End month	42

Objectives

To demonstrate the unique capabilities of the SPM2.0 techniques for sub-10 nm spatial resolution composition mapping of biomembranes, high speed tracking of single proteins and nanoparticle imaging in cells.

Description of work and role of partners

WP6 - SPM2.0 applications in Medicine and Biology. [Months: 6-42]
BNC
Task 6.1. High speed single protein molecular recognition mapping in biomembranes and biochips (ESR6-JKU).
Task 6.2. Label free imaging of nanoparticle uptake by cells with electrostatic force microscopy tomography (ESR13-BNC).
Task 6.3. Label free mapping of the nanoscale composition of biomembranes at sub-10 nm spatial resolution with quantitative EFM (ESR1-IBEC).
Task 6.4. Single protein mutation imaging with HS-AFM for HIV infection processes (ESR4-INSERM).

Participation per Partner

Partner number and short name [10]
1 - IBEC
2 - INSERM
4 - JKU
9 - BNC

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
D6.1	High speed mapping of single proteins.	4 - JKU	Report	Confidential, only for members of the consortium (including the Commission Services)	42
D6.2	Label free imaging of nanoparticle cell uptake.	9 - BNC	Report	Confidential, only for members of the consortium (including the Commission Services)	42
D6.3	Sub-10 nm label free biomembrane composition mapping.	1 - IBEC	Report	Confidential, only for members of the consortium (including the	42

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
				Commission Services)	
D6.4	Single protein mutation by HS-AFM.	2 - INSERM	Report	Confidential, only for members of the consortium (including the Commission Services)	42

Description of deliverables

D6.1. High speed mapping of single proteins (M42).
D6.2. Label free imaging of nanoparticle cell uptake (M42).
D6.3. Sub-10 nm label free biomembrane composition mapping (M42).
D6.4. Single protein mutation imaging relevant in HIV infection (M42).

D6.1 : High speed mapping of single proteins. [42]

High speed mapping of single proteins.

D6.2 : Label free imaging of nanoparticle cell uptake. [42]

Label free imaging of nanoparticle cell uptake.

D6.3 : Sub-10 nm label free biomembrane composition mapping. [42]

Sub-10 nm label free biomembrane composition mapping.

D6.4 : Single protein mutation by HS-AFM. [42]

Single protein mutation by HS-AFM.

Schedule of relevant Milestones

Milestone number [18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS12	Label free nanoparticle imaging.	9 - BNC	42	Label free nanoparticle imaging. Means of Verification: Survey completed and validated.

Work package number [9]	WP7	Lead beneficiary [10]	9 - BNC
Work package title	SPM2.0 metrology and standardization.		
Start month	6	End month	42

Objectives

Ensure good metrology practices and standardization procedures in SPM2.0 technologies. Prepare for future standardization.

Description of work and role of partners

WP7 - SPM2.0 metrology and standardization. [Months: 6-42]
BNC
Task 7.1: Evaluation of cantilever calibration methods for novel SPM2.0 probes (ESR10-NPL).
Task 7.2: Tip-sample interaction area and depth resolution in novel SPM2.0 techniques (ESR9-NPL).

Participation per Partner

Partner number and short name [10]
6 - NPL

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
D7.1	Cantilever calibration good practices.	6 - NPL	Report	Confidential, only for members of the consortium (including the Commission Services)	24
D7.2	Tip-sample interaction area.	6 - NPL	Report	Confidential, only for members of the consortium (including the Commission Services)	42

Description of deliverables

D7.1. Cantilever calibration good practices (M24).
D7.2. Tip-sample interaction area (M42).

D7.1 : Cantilever calibration good practices. [24]

Cantilever calibration good practices.

D7.2 : Tip-sample interaction area. [42]

Tip-sample interaction area.

Schedule of relevant Milestones

Milestone number [18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS13	Cantilever calibration for HS-AFM.	6 - NPL	42	Cantilever calibration for HS-AFM. Means of Verification: Survey completed and validated.

Work package number [9]	WP8	Lead beneficiary [10]	4 - JKU
Work package title	Scientific and complementary skills training.		
Start month	1	End month	42

Objectives

To coordinate all actions related to the training, supervision and evaluation of ESRs.

Description of work and role of partners

WP8 - Scientific and complementary skills training. [Months: 1-42]
JKU
Task 8.1 Scientific and complementary training courses (JKU).
Task 8.2 Personal career development and employment plans (KEYSIGHT).
Task 8.3 Evaluation of individual projects (INSERM).
Task 8.4. Doctoral studies (UNIMORE).

Participation per Partner

Partner number and short name [10]
2 - INSERM
4 - JKU
7 - KEYSIGHT
10 - UNIMORE

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
D8.1	Personal Career Development Plans (14).	2 - INSERM	Report	Confidential, only for members of the consortium (including the Commission Services)	12
D8.2	Report of the assessment commissions (1st).	2 - INSERM	Report	Confidential, only for members of the consortium (including the Commission Services)	12
D8.3	Network wide courses minutes (Training Workshop 1).	2 - INSERM	Report	Public	12
D8.4	Network Newsletters (1st).	9 - BNC	Report	Public	12

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
D8.5	Network wide courses minutes (Training Workshop 2).	10 - UNIMORE	Report	Public	18
D8.6	Report of the assessment commissions (2nd).	2 - INSERM	Report	Confidential, only for members of the consortium (including the Commission Services)	24
D8.7	Network wide courses minutes (Training Workshop 3).	4 - JKU	Report	Public	24
D8.8	Network Newsletters (2nd).	9 - BNC	Report	Public	24
D8.9	Network wide courses minutes (Training Workshop 4).	6 - NPL	Report	Public	30
D8.10	Report of the assessment commissions (3rd).	2 - INSERM	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D8.11	Network wide courses minutes (Training Workshop 5).	7 - KEYSIGHT	Report	Public	36
D8.12	Network Newsletters (3rd).	9 - BNC	Report	Public	36
D8.13	Personal Employability Plans (14).	7 - KEYSIGHT	Report	Confidential, only for members of the consortium (including the Commission Services)	42
D8.14	Network wide courses minutes (Training Workshop 6).	5 - NANOGUNE	Report	Public	42

Description of deliverables

D8.1-D8.19. Network wide courses (19) (M12,18,24,32,36. Responsible: Course organizer).
D8.20-D8.33: Personal Career Development Plans (14) (M12. Resp.: Supervisor).
D8.34-D8.36: Reports (3) of the assessment commissions (M12,24,36).
D8.37-D8.50: Personal Employability Plans (14) (M42. Resp.: Supervisor).

D8.1 : Personal Career Development Plans (14). [12]
Personal Career Development Plans (14).

D8.2 : Report of the assessment commissions (1st). [12]
Report of the assessment commissions (1st).

D8.3 : Network wide courses minutes (Training Workshop 1). [12]
Network wide courses minutes (Training Workshop 1).

D8.4 : Network Newsletters (1st). [12]
Network Newsletters (1st).

D8.5 : Network wide courses minutes (Training Workshop 2). [18]
Network wide courses minutes (Training Workshop 2).

D8.6 : Report of the assessment commissions (2nd). [24]
Report of the assessment commissions (2nd).

D8.7 : Network wide courses minutes (Training Workshop 3). [24]
Network wide courses minutes (Training Workshop 3).

D8.8 : Network Newsletters (2nd). [24]
Network Newsletters (2nd).

D8.9 : Network wide courses minutes (Training Workshop 4). [30]
Network wide courses minutes (Training Workshop 4).

D8.10 : Report of the assessment commissions (3rd). [36]
Report of the assessment commissions (3rd).

D8.11 : Network wide courses minutes (Training Workshop 5). [36]
Network wide courses minutes (Training Workshop 5).

D8.12 : Network Newsletters (3rd). [36]
Network Newsletters (3rd).

D8.13 : Personal Employability Plans (14). [42]
Personal Employability Plans (14).

D8.14 : Network wide courses minutes (Training Workshop 6). [42]
Network wide courses minutes (Training Workshop 6).

Schedule of relevant Milestones

Milestone number [18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS3	ESRs Recruitment and PCDPs.	8 - TUW	12	ESRs Recruitment and PCDPs. Means of Verification: Task completed and validated.
MS4	Assessment Commissions.	2 - INSERM	12	Assessment Commissions. Means of Verification: Created and operative.
MS5	Doctoral studies.	10 - UNIMORE	12	Doctoral studies. Means of Verification: All ESRs accepted and enrolled.

Work package number [9]	WP9	Lead beneficiary [10]	1 - IBEC
Work package title	Management, recruitment and dissemination.		
Start month	1	End month	48

Objectives

To ensure a fluid management of the network, including a successful recruitment process and dissemination of the results of the network.

Description of work and role of partners

WP9 - Management, recruitment and dissemination. [Months: 1-48]
IBEC
Task 9.1 Recruitment process (TUW).
Task 9.2 Scientific dissemination and general public engagement (BNC).
Task 9.3. Economic and scientific management (IBEC).
Task 9.4 Network meetings (IBEC).

Participation per Partner

Partner number and short name [10]
1 - IBEC
8 - TUW
9 - BNC

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
D9.1	Network meeting minutes (Kick off).	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	1
D9.2	Supervisory Board of the Network.	1 - IBEC	Other	Confidential, only for members of the consortium (including the Commission Services)	2
D9.3	Website completion.	9 - BNC	Websites, patents filling, etc.	Public	6
D9.4	Network meeting minutes (Meeting 1).	1 - IBEC	Report	Confidential, only for members of the consortium (including the	12

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
				Commission Services)	
D9.5	Progress Report.	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	13
D9.6	Mid-term report	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	22
D9.7	Network meeting minutes (Meeting 2).	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	26
D9.8	SPM2.0 virtual lab.	1 - IBEC	Websites, patents filling, etc.	Public	36
D9.9	Network meeting minutes (Meeting 3).	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	36
D9.10	Application Notes (1st).	7 - KEYSIGHT	Report	Public	39
D9.11	Application Notes (2nd).	7 - KEYSIGHT	Report	Public	42
D9.12	Application Notes (3rd).	7 - KEYSIGHT	Report	Public	45
D9.13	Network meeting minutes (Final Meeting).	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	48
D9.14	Network Newsletters (4th).	9 - BNC	Report	Public	48
D9.15	Final Management, economic and scientific reports.	1 - IBEC	Report	Confidential, only for members of the consortium (including the	48

List of deliverables

Deliverable Number [14]	Deliverable Title	Lead beneficiary	Type [15]	Dissemination level [16]	Due Date (in months) [17]
				Commission Services)	
D9.16	Scientific publications and presentations.	1 - IBEC	Report	Public	48
D9.17	Consortium Agreement.	1 - IBEC	Report	Confidential, only for members of the consortium (including the Commission Services)	2

Description of deliverables

D9.1-D9.5. Network meetings minutes (5) (M1,12,24,36,48).
D9.6. Website completion (M6).
D9.7. Recruitment completion (M12).
D9.8-D9.11. Management, economic and scientific reports (4) (M12,24,36,48).
D9.12-9.15. Network Newsletters (4) (M12,24,36,48).
D9.16-D9.18. Application Notes (3) (M36).
D9.19. SPM2.0 virtual lab (M36).
D9.20 Scientific publications and presentations (M48).

D9.1 : Network meeting minutes (Kick off). [1]

Network meeting minutes (Kick off).

D9.2 : Supervisory Board of the Network. [2]

Supervisory Board of the Network.

D9.3 : Website completion. [6]

Website completion.

D9.4 : Network meeting minutes (Meeting 1). [12]

Network meeting minutes (Meeting 1).

D9.5 : Progress Report. [13]

Progress Report.

D9.6 : Mid-term report [22]

Mid-term report.

D9.7 : Network meeting minutes (Meeting 2). [26]

Network meeting minutes (Meeting 2).

D9.8 : SPM2.0 virtual lab. [36]

SPM2.0 virtual lab.

D9.9 : Network meeting minutes (Meeting 3). [36]

Network meeting minutes (Meeting 3).

D9.10 : Application Notes (1st). [39]

Application Notes (1st).

D9.11 : Application Notes (2nd). [42]

Application Notes (2nd).

D9.12 : Application Notes (3rd). [45]
Application Notes (3rd).

D9.13 : Network meeting minutes (Final Meeting). [48]
Network meeting minutes (Final Meeting).

D9.14 : Network Newsletters (4th). [48]
Network Newsletters (4th).

D9.15 : Final Management, economic and scientific reports. [48]
Final Management, economic and scientific reports.

D9.16 : Scientific publications and presentations. [48]
Scientific publications and presentations.

D9.17 : Consortium Agreement. [2]
Consortium Agreement.

Schedule of relevant Milestones

Milestone number [18]	Milestone title	Lead beneficiary	Due Date (in months)	Means of verification
MS1	Intranet and extranet website.	9 - BNC	6	Intranet and extranet website. Means of Verification: Tool completed and functional.
MS2	Guidelines for Recruitment, Personal Career Development Plan (PCDP), Assessment Commission (AC), and Employement Plan (EP).	1 - IBEC	6	Guidelines for Recruitment, Personal Career Development Plan (PCDP), Assessment Commission (AC), and Employement Plan (EP). Means of Verification: Guidelines available and agreed.
MS3	ESRs Recruitment and PCDPs.	8 - TUW	12	ESRs Recruitment and PCDPs. Means of Verification: Task completed and validated.
MS6	Midterm project assessment.	1 - IBEC	24	Midterm project assessment. Means of Verification: Project follows as planned.

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	Intranet and extranet website.	WP9	9 - BNC	6	Intranet and extranet website. Means of Verification: Tool completed and functional.
MS2	Guidelines for Recruitment, Personal Career Development Plan (PCDP), Assessment Commission (AC), and Employement Plan (EP).	WP9	1 - IBEC	6	Guidelines for Recruitment, Personal Career Development Plan (PCDP), Assessment Commission (AC), and Employement Plan (EP). Means of Verification: Guidelines available and agreed.
MS3	ESRs Recruitment and PCDPs.	WP8, WP9	8 - TUW	12	ESRs Recruitment and PCDPs. Means of Verification: Task completed and validated.
MS4	Assessment Commissions.	WP8	2 - INSERM	12	Assessment Commissions. Means of Verification: Created and operative.
MS5	Doctoral studies.	WP8	10 - UNIMORE	12	Doctoral studies. Means of Verification: All ESRs accepted and enrolled.
MS6	Midterm project assessment.	WP9	1 - IBEC	24	Midterm project assessment. Means of Verification: Project follows as planned.
MS7	High speed AFM molecular tracking.	WP3, WP4	4 - JKU	36	High speed AFM molecular tracking. Means of Verification: Laboratory prototype completed.
MS8	Chemical IR-s-SNOM in liquid.	WP3, WP4	5 - NANOGUNE	36	Chemical IR-s-SNOM in liquid. Means of Verification: Laboratory prototype completed.
MS9	3D Nanotomographic EFM.	WP2, WP3	1 - IBEC	36	3D Nanotomographic EFM. Means of Verification: Laboratory prototype completed.
MS10	High speed molecular tracking probes.	WP4	8 - TUW	36	High speed molecular tracking probes. Means of Verification: Laboratory prototype completed.
MS11	10 nm polymer composition mapping.	WP5	3 - CSIC	42	10 nm polymer composition mapping. Means of Verification: Survey completed and validated.

Milestone number [18]	Milestone title	WP number [9]	Lead beneficiary	Due Date (in months) [17]	Means of verification
MS12	Label free nanoparticle imaging.	WP6	9 - BNC	42	Label free nanoparticle imaging. Means of Verification: Survey completed and validated.
MS13	Cantilever calibration for HS-AFM.	WP7	6 - NPL	42	Cantilever calibration for HS-AFM. Means of Verification: Survey completed and validated.

1.3.5. WT5 Critical Implementation risks and mitigation actions

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
1	One participant is not able to full fill the plan of recruitment.	WP9	The remaining person months will be transferred to some other participants according to work plan needs.
2	One recruited researcher is not integrated in the hosting institution.	WP9	The Training Committee will interact between the researcher and his/her supervisor. If solution is not found the Supervisory Board will offer the researcher the transfer to another host institution from the Network.
3	A partner may leave the consortium due to internal or external factors.	WP9	The Supervisory Board will try to redistribute the pending research and training activities, and funding, between other Network members, and will offer the possibility to the hosted ESR to transfer to another member.
4	A milestone cannot be achieved.	WP9	The Lead Beneficiary and the WP leader concerned have to decide about a prolongation of the task/activity time, as well as, proposing an adequate alternative milestone to the Supervisory Board.
5	Some conflicts appear along the Network, including IPR conflicts.	WP9	The Coordinator will intermediate between the parties. Should agreement not be reached, the conflict will be resolved by the Supervisory Board, in line with the recommendations of the EC and the Consortium Agreement.
6	Molecular recognition at high speed is not possible.	WP3	Preliminary tests show the feasibility of this integration. Use of two pass-methods with different setting parameters will be essayed.
7	Sub-10 nm spatial resolution in dielectric composition mapping cannot be achieved.	WP3	Preliminary calculations show the possibility to reach this spatial resolution. Use of insulated shielded probes to focus the dielectric signal can provide additional increase in spatial resolution.
8	Chemical modification of probes changes high speed performance.	WP4	Consortium experts in high speed AFM and probe fabrication develop jointly this task and will introduce other probe chemical functionalisations.
9	Sub-10 nm resolution in 3D doping density profiling cannot be reached.	WP5	Integration of the latest SMM technology and leading electronic device fabrication. Target shallow 3D tomographic doping reconstruction.
10	3D monitoring of nanoparticle cell uptake in living cells not possible.	WP6	3D detection in non-living cells have already been partially achieved and demonstrated. Use of partial cell fixation procedures.
11	Metrology development of validation techniques not possible.	WP7	Consortium experts with exceptional track records in quantitative measurement NPL offer training in uncertainty budget development.

1.3.6. WT6 Summary of project effort contribution

	WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9
1 - IBEC		✓	✓			✓			✓
2 - INSERM				✓		✓		✓	
3 - CSIC		✓	✓		✓				
4 - JKU			✓	✓		✓		✓	
5 - NANOGUNE		✓	✓	✓	✓				
6 - NPL							✓		
7 - KEYSIGHT		✓	✓		✓			✓	
8 - TUW				✓					✓
9 - BNC						✓			✓
10 - UNIMORE					✓			✓	

1.3.7. WT7 Tentative schedule of project reviews

No project reviews indicated

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 fillings, 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.

Marie Skłodowska-Curie Actions (MSCA)
Innovative Training Networks (ITN)
H2020-MSCA-ITN-2016

[SPM2.0 – 721874]

Annex 1 to the Grant Agreement
(Description of the Action)
Part B

TABLE OF CONTENTS

LIST OF PARTICIPANTS

Consortium Member	Legal Entity Short Name	Academic	Non-academic	Awards Doctoral Degrees	Country	Dept./ Division / Laboratory	Scientist-in-Charge	Role of Partner Organisation
BENEFICIARIES								
Fundació Institut de Bioenginyeria de Catalunya	IBEC	X			Spain	Nanoscale Bioelectrical characterization	Gabriel Gomila	
Institut National de la Santé e la Research Medicale	INSERM	X			France	Unité 1006-Aix-Marseille	Simon Scheuring	
Centro Superior de Investigaciones Científicas	ICMM	X			Spain	Instituto de Ciencias de Materials de Madrid	Ricardo Garcia	
Johaness Kepler University of Linz	JKU	X		X	Austria	Institute for Biophysics	Peter Hinterdorfer	
Nanoscience Cooperative Research Centre	NANOGUNE	X			Spain	Nanophotonics	Rainer Hillenbrand	
National Physical Laboratory	NPL		X		United Kingdom	Functional Materials	Alexandre Cuenat	
KeysightTechnologies Oesterreich GmbH	KEYSIGHT		X		Austria	Keysight Electronic Measurement Group	Ferry Kienberger	
Technische Universitaet Wien	TUW	X		X	Austria	Institute of Sensor and Actuator Systems	Ulrich Schmid	
Bio Nano Centre Ltd	BNC		X		United Kingdom	Nanomedicine	David Sarphie	
Universita degli study di Modena e Reggio Emilia	UNIMORE	X		X	Italy	Dipartimento di Scienze della Vita	Fabio Biscarini	
PARTNER ORGANISATIONS								
SCL-Sensor. Tech. Fabrication GmbH	SCL		X		Austria	SCL-Sensor.Tech. Fabrication R+D	Ernest Fantner	Training
Infineon Technologies	INFINEON		X		Germany	Munich Failure Analysis department	Thomas Schweinboeck	Training

Data for non-academic beneficiaries:

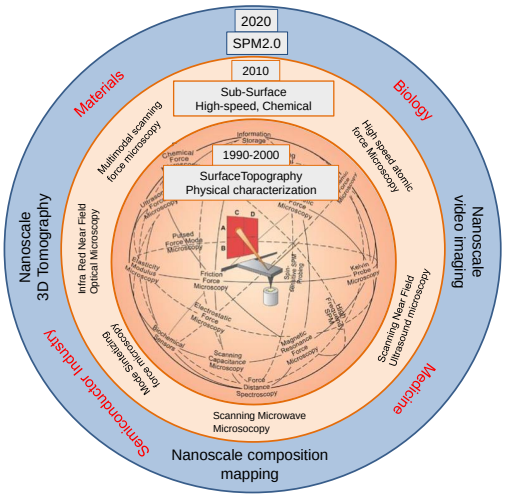
Name	Location of research premises (city / country)	Type of R&D activities	No. of full - time employees	No. of employees in R&D	Web site	Annual turnover (approx., in Euro)	Enterprise status (Yes/No)	SME status (Yes/No)
KEYSIGHT	Linz/Austria	Measurement technology	10.000+	1000+	www.keysight.com	3 Billion	Yes	No
NPL	Teddington/ United Kingdom	National Metrology Institute	760	600	www.npl.co.uk	93 Million	Yes	No
BNC	London/United Kingdom	Nanomedicine	9	7	www.bio-nano-consulting.com	1.2 Million	Yes	Yes

1. EXCELLENCE

1.1 Quality, innovative aspects and credibility of the research programme

1.1.1 Introduction, objectives and overview of the research programme.

The advent of Nanotechnology has boosted the development of Advanced Microscopy devices, like Electron Microscopes and Scanning Probe Microscopes, outsourcing the limited spatial resolution of Optical Microscopes. Advanced Microscopy techniques are widely recognized as one of the pillars onto which the research and manufacture of nanotechnology based products must be sustained. At present, **the greatest challenge of Advanced Microscopy techniques is the realization of fast and non-destructive 3D tomographic images with chemical composition sensitivity and sub-10 nm spatial resolution**.[1] Overcoming such challenge will increase enormously the current capabilities to access the nanoworld and will boost forward the European research and development potential in Nanotechnology, catalysing the transfer of knowledge from research to commercial products in key industrial sectors such as Materials and Semiconductor Industries, Biotechnology and Medicine.



Of the existing Advanced Microscopy techniques, **Scanning Probe Microscopes (SPMs) are currently the ones experiencing the fastest evolution and innovation towards solving this challenge**. In just a few years SPMs have passed from producing nanoscale surface topographic images (1990s) to become a multiparametric nanoscale physical characterization technique for mechanic, electric and magnetic properties (2000s).[2] This evolution has continued in the last decade (2010s), in which SPMs have provided, for the first time, sub-surface images of buried structures deep down to nearly micrometers,[3] nanoscale images in less than one millisecond per image[4] and unambiguous material composition identification with nanoscale spatial resolution.[5] Therefore, SPMs constitute an excellent candidate to address the challenge faced by Advanced Microscopy techniques. The impressive potential capabilities of these recently developed SPM techniques, together with their versatility (applicability to both inorganic and organic materials, in all environmental conditions (air, vacuum and liquid), and with simple sample preparation procedures) **is expected to make SPMs the dominant Advanced Microscopy technique in the near future in Nanotechnology-based applications**. SPM techniques have the potential to produce non-destructive 3D nanoscale tomographic images in a time frame of milliseconds and with sensitivity to the nanoscale chemical composition of the materials, outsourcing the potential capabilities of all other existing advanced Microscopy Techniques, including Electron and X-Ray Microscopies. To make reality this potential of SPMs techniques further research and development becomes necessary. First, the performance of novel SPM techniques needs to be further improved. For instance, the spatial resolution in tomographic and chemical mapping has to reach the critical sub-10 nm range, the imaging ranges in sub-surface and in high speed imaging need to go beyond micrometres in depth and lateral range, respectively, and the chemical mapping techniques should be extended to the liquid environment, just to cite some of the most relevant aspects. Second, SPM systems need to be specialized to perform at it maximum level in key applications relevant for industries, including, (i) the 3D tomographic doping profiling of next generation semiconductor devices or (ii) the 3D nanoscale tomographic and chemical imaging of nanomaterials in living cells or in gel nanocomposites, relevant for biology, toxicology and medicine and for the food and cosmetics industries. Finally, SPM techniques need to evolve from the research laboratory benches to the nanotechnology manufacture companies, innovating in its design to make them reliable, easy to use and reproducible for its integration in general purpose advanced characterization services or quality control and metrology nanotechnology production lines. To overcome these challenges, and cover the future needs of the Nanotechnology-based sectors, it is essential to train today a whole generation of highly qualified researchers in the novel SPM techniques and their applications.

The objective of the SPM2.0 Network is to train through research a new generation of researchers in the most advanced SPM techniques able to address the challenge of sub-surface, high speed and composition sensitive imaging of materials with sub-10 nm spatial resolution. The overall objective is to push forward the current

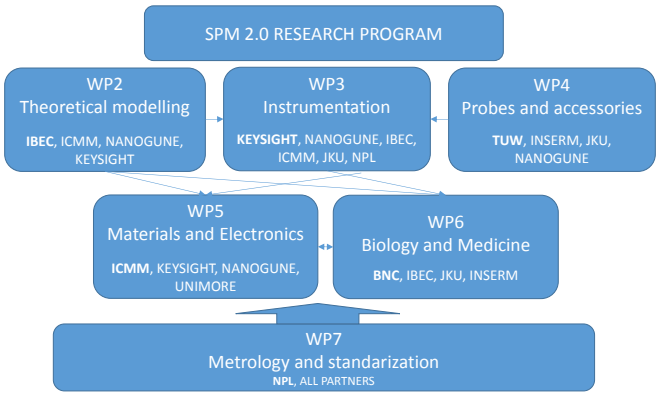
[1] M. C. Roco, Ch. A. Mirkin, M. C. Hersam, Eds. Nanotechnology Research Directions for Societal Needs in 2020: Retrospective and Outlook, (World Technology Evaluation Center under the sponsor of the National Science Foundation (USA), September 2010).
[2] Ch. Gerber and H. P. Lang, How the doors to the nanoworld where open, Nat. Nanotech. 1, 3 (2006).
[3] G. S. Shekhawat et. al., Science, 310, 89 (2005); L. Tetard et al., Nat. Nanotech.5, 105 (2010); Krutokhvostov, R. et al., Opt. Express 20, 593–600 (2011); T.S. Jespersen et al., Appl. Phys. Lett. 90, 183108 (2007).
[4] M. Shibata et. al. Nat. Nanotech 5, 208 - 212 (2010); F. Rico, et al. L., Science 342, 741-743 (2013).
[5] F. Huth et al. Nat. Mat. 10, 352 (2011); L. Fumagalli, et al., Nat. Mat., 11, 808 (2012); R. García et al. Nat. Mat. 6, 405 (2007).

technological limits of advanced SPM techniques for this particular challenge, as well as, to boost forward the adoption of these techniques in key industrial sectors, such as, Materials, Electronics, Biology and Medicine.

In order to achieve these goals**, the Research Program of the SPM2.0 Network will be centred in the development of beyond current state of the art SPM techniques for high spatial resolution non-destructive and fast 3D tomographic chemical imaging of materials and of novel applications based on them. The research program will include the development of novel SPM instruments and accessories (e.g. probes), such as, a high speed SPM system with molecular tracking capabilities, a nanoscale infrared composition mapping SPM system able to operate in liquid media or a 3D SPM tomographic system with 3D reconstruction capabilities beyond microns depth.** In addition, the research program will also include **applications of the developed instruments, or of existing ones, to real problems currently faced in key industrial sectors**, and which cannot be solved with other Advanced Microscopy techniques. The applications include the 3D tomographic mapping of doping profiling in novel semiconductor devices, the sub-10 nm chemical mapping of polymer nanocomposites and biomembranes, the label free imaging of engineered nanomaterials in living cells and the mutation detection in single proteins.

The Research Program of the SPM2.0 Network will, hence, deal with disruptive technologies, concepts and methods which go well beyond those currently implemented in commercial SPM systems or in any other Advanced Microscopy device. The unique consortium formed by world leading academic and industrial research groups, which have already decisively contributed to the latest developments of these advanced SPM techniques and in the development of Nanotechnology based products, constitutes a guarantee for the success of the Network and for a brilliant future of the network Fellows. **The success of the ETN will contribute to position Europe in a leading position in the Advanced Microscopy sector and in the manufacture of Nanotechnology based products.**

The research programme of the Network is organized into six research Work Packages (WPs). WP2 will deal with the theoretical modelling of the novel SPM techniques. WP3 will deal with the development of novel advanced SPM instruments for high-speed imaging, composition sensitive mapping and 3D tomographic reconstruction. WP4 will include the development of novel SPM probes and other accessories to enhance the capabilities of the new SPM techniques. WP5 will include relevant applications of the novel techniques to the Materials and Electronics sectors, while WP6 will include those relevant for the Biology and Medicine sectors. Finally, WP7 will cover metrology and standardization aspects of the novel techniques.



1.1.2. Research methodology and approach

In **WP2 (Theoretical Modelling)** efforts will be devoted to develop specific mathematical algorithms for the reconstruction of 3D SPM tomographic images from 2D sub-surface images and to the modelling of tip sample interactions for the quantitative interpretation of optical, mechanical and electrical measurements for nanoscale composition mapping. Tomographic reconstruction algorithms will be based on the so called algebraic reconstruction algorithms, similar to the ones used in macroscopic ultrasound tomographic techniques, which are adapted to situations in which image projections are not built from straight line integrals but from path integrals which depend on the heterogeneous material properties of the object. The tip sample interaction models will be based on Maxwell equations for optics and microwaves, Poisson's equation for electrostatics and Euler-Bernuilli equation for mechanics, and will be solved by 3D finite element methods incorporating detailed geometries for the tip and sample. WP2 will be led by IBEC (a world recognized expert in tip-sample modelling for nanoscale dielectric quantification), and will integrate, ICMM (expert in SPM mechanical modelling and quantification), NANOGUNE (expert in infrared scattering type near field optical microscopy (IR-s-SNOM) modelling) and KEYSIGHT (expert in scanning microwave microscopy modelling). The success of WP2 is expected to provide **quantitative models for label free composition mapping with SPM techniques, as well as, 3D image reconstruction algorithms for SPM tomographic imaging**. Five ESRs researchers (ESR1-IBEC, ESR2-IBEC, ESR5-ICMM, ESR8-NANOGUNE, ESR10-KEYSIGHT) will develop part of his/her research within this WP.

In **WP3 (Instrumentation)** novel functionalities of advanced SPM instruments will be developed. In particular, **a molecular tracking high speed SPM instrument** integrating high speed imaging with single molecular recognition capabilities will be investigated. The system will integrate the topographic and recognition (TREC) method developed originally by the JKU team[6] with an Ando type High Speed Atomic Force Microscope suitably modified. On the other side, **an infrared near field optical microscope** able to operate in the liquid environment for chemical

[6] Hinterdorfer P and Dufrene Y F, Nature Methods 3 347–55 (2006).

mapping will be implemented with the development of a specific liquid cell, a specific illumination of the tip and the collection of the tip-scattered light through a transparent sample holder (e.g. based on a CaF_2 substrate) and an appropriate transmission focussing and collection optics to avoid distortion and absorption of the infrared beam in the liquid cell. Moreover, existing SPM instruments and methods will be enhanced to **achieve sub-10 nm spatial resolution in dielectric and mechanical nanoscale composition mapping.** To increase the spatial resolution in mechanical composition mapping we will use a novel multifrequency scanning force microscope with short cantilevers able to detect sub-20 pN peak forces in liquid at 1 frame/s. To increase the spatial resolution in dielectric composition mapping frequency modulation detection methods will be made quantitative for the first time, providing an enhanced performance with respect to the amplitude modulation techniques. Finally, **two operational 3D SPM tomographic systems based on electrostatic and microwave detection** will be investigated. These systems will incorporate the 3D image reconstruction algorithms developed in WP2 and will be able to provide 3D images from 2D SPM projection images. Specific systems based on Electrostatic Force Microscopy and Scanning Microwave Microscopy will be developed in order to cover from low (kHz) up to high (GHz) frequencies. Special measuring workflows (including frequency sweeps, imaging at different tip sample distances, multiple mode imaging, etc.) will be implemented and automatized to achieve this goal. Test metrological samples will be used in the validation. At the end of the WP, we expect to have developed advanced SPM systems incorporating high speed, 3D tomographic and composition mapping capabilities beyond state of the art systems existing today. The WP will be led by the world leading SPM manufacturer KEYSIGHT (specialist in Scanning Microwave Microscopy), and will include NANOGUNE (expert in IR-s-SNOM), IBEC (expert in electrostatic force microscopy), ICMM (specialist in SPM based mechanical composition mapping), JKU (specialist in SPM molecular recognition) and NPL (specialist in SPM metrology). Six of the ESR researchers (ESR1-IBEC, ESR2-IBEC, ESR5-ICMM, ESR6-JKU, ESR7-NANOGUNE, ESR10-KEYSIGHT) will develop part of his/her research project within this WP.

WP3 will be complemented by **WP4 (Probes and accessories)** devoted to develop SPM probes and accessories to enhance the potential of the novel SPM technologies. First, improved **AFM cantilever and tip fabrication processes will be developed for high speed AFM systems**. To this end tailored materials such as SiN or SiC and fabrication technologies to achieve high resonance frequency probes for high speed applications will be investigated. Additionally, the integration of doped AlN thin films into the device fabrication process will be studied in order to enable mode selective excitation of cantilevers. Second, novel **chemical functionalized probes for high speed molecular recognition** methods will be developed. The novel functionalized probes will incorporate molecules with high affinity to cope with the short time windows allowed in high speed AFM imaging (times of around microseconds per recognition event). Third, **optimized infrared near-field optical probes for chemical composition imaging** in air and liquids will be developed. The probe tips will be based on metals, prototyped by focused ion beam and designed by following antenna and plasmonic concepts. Particularly, the tip shaft (length, shape, material) and apex size will be optimized to match a geometrical infrared resonance in the tips and provide sub-10 nm spatial resolution. Additionally, an **environmental chamber for high speed AFM systems** will be developed to improve environmental control (e.g. temperature and humidity), as well as, specific accessories for flash induced activation. The WP will be led by the world expert microsystem technology group TUW, and will involve experienced research groups in probe and accessories development such as INSERM (high speed environmental accessory), JKU (chemical functionalized probes) and NANOGUNE (nanoantenna probes). Four ESRs (ESR3-INSERM, ESR6-JKU, ESR7-NANOGUNE, ESR12-TUW) will develop part of his/her research project within this WP.

The unique capabilities of the developed and existing SPM2.0 technologies will be demonstrated on relevant open problems not addressable by any other Advanced Microscopy device in two representative sectors of applications, namely, Materials and Electronics (WP5) and Biology and Medicine (WP6).

In **WP5 (Materials and Electronics applications)** we will address the **2D chemical mapping of phase-separated block co-polymers** at the highest spatial resolution ever reached in a soft polymeric sample (sub-5 nm). To this end the advanced mechanical composition mapping SPM system developed in WP3 together with the mechanical quantitative models developed in WP2 will be used. Additionally, the sub-surface imaging of the **nanoparticle distribution in a soft polymer composite** (e.g. polymers containing silver nanoparticles relevant for food and cosmetics industries) will be performed with an existing state of the art subsurface optical infrared SPM technique developed by NANOGUNE and the mathematical models and probes developed in WP2 and WP4, respectively. On the other side, novel methods for **3D nanoscale doping profiling of semiconductor materials** based on a fast capacitance-voltage SMM system developed by KEYSIGHT will be implemented to achieve down to 10 nm spatial resolution. Applications to the non-destructive 3D doping profiling of 20-50 nm transistors and memory SRAM test devices provided by the partner member INFINEON will be carried. Finally, optimization of the nanoscale composition of thin film organic transistors will be carried with the mechanical and electric 2D composition mapping technique developed in WP2 and WP3. In these applications, the potential of the novel 3D and 2D composition mapping capabilities of the SPM2.0 technologies will be demonstrated with real problems encountered in the Materials and Electronics sectors. The WP will be led by ICMM (leading 2D high resolution mechanical composition

mapping), and will include KEYSIGHT (who leads the development of 3D SMM doping profiling), NANOGUNE (leading the optical sub-surface composition mapping) and UNIMORE (leading the development of nanoscale organic field effect transistors). Five ESRs (ESR5-ICMM, ESR8-NANOGUNE, ESR11-KEYSIGHT, ESR14-UNIMORE), will develop part of his/her research project within this application area of the research program.

In **WP6 (Biological and Medical applications),** research will be carried towards demonstrating: the label free imaging of **nanoparticles within living cells** for toxicity and drug delivery applications (e.g. imaging of gold and polymeric nanoparticles) by means of the 3D EFM tomographic system developed in WP3 and the mathematical algorithms in WP2; the **nanomechanical and dynamical analysis of the cell membrane deformation machinery ESCRT-III involved in HIV-fission from infected cells** by means of the high-speed AFM enhanced with environmental control system developed in WP4; the **high speed tracking of single molecules to determine the concentration of cellular receptors in membranes with sub-50 nm and sub-50 ms spatial and temporal resolution**, respectively, by using the high speed AFM molecular tracking system developed in WP3 and the probes developed in WP4; and the **sub-10 nm label free composition mapping of natural and model membranes** with the composition sensitive SPM dielectric system developed in WP3 and models developed in WP2. These applications will highlight the ability of the novel SPM technologies to visualize at an unparalleled speed and spatial resolution cellular and biomolecular processes in native conditions, and to provide novel label free and 3D tomographic methods to identify engineered nanomaterials in biological systems. The WP will be led by BNC, a leading SME on Nanotechnology applications in Medicine, and will include IBEC (bioengineering expert leading the development of the SPM 2D and 3D dielectric composition mapping systems), JKU (biophysics expert in molecular tracking that develops the molecular tracking high speed AFM), and INSERM (biomolecular expert leading the development of environmentally controlled HS-AFM). Four ESRs (ESR1-IBEC, ESR4-INSERM, ESR6-JKU and ESR13-BNC) will develop part of his/her research project within this WP.

In **WP7** (**Metrology and Standardization)** we will group all activities having as common objective to ensure that the developed **SPM2.0 technologies follow the best metrological practices and are compatible with recognized standardization processes**. Specific aspects addressed will include the analytical evaluation and measurement of the existing methods of cantilever calibration, the definition of contact area in contact and non-contact SPM modes, the definition of spatial resolution, the influence of measuring parameters such as environmental humidity or the influence of cross-talk effects between topography and measured physical magnitudes, etc. Metrology and standardization is considered a fundamental aspect in instrument development and in its subsequent commercialization and broad implementation, and, as such, it is considered a fundamental aspect of the training of the ESR in this field. The long term impact of the lack of traceability and standardization for SPM2.0 techniques is the techniques being poorly developed for industrial applications. The short term impact would be difficulties in assessing scientific validity of measurements made. The WP will be led by the European leading metrology company NPL, assisted with the collaboration of ALL partners. One ESR (ESR9-NPL) will develop his/her research project within this area, but all ESRs from the Network will contribute to it.

The successful completion of the research program will end up making available novel SPM instruments, probes and accessories incorporating disrupting nanoscale imaging and characterization capabilities in terms of imaging speed, composition sensitivity and 3D tomographic reconstruction. The capabilities of the novel technologies will be demonstrated to solve real existing problems in Materials, Electronics, Biology and Medicine sectors, thus showing their unique performance and their multisectorial and multidisciplinary character. Last, but not least, the best metrological practices and standardization procedures will be followed all along the project paving the way for SPM2.0 technologies to be adopted by the industrial sector.

1.1.3. Originality and innovative aspects of the research programme

In order to keep pace in the Nanotechnology revolution, **development and implementation of novel Advanced Microscopies to investigate the nanoworld and to assist in the manufacturing and quality control of novel nano-based products have become a real need**. For instance, the Strategic Research Agenda on "Nanosafety in Europe 2015-2025"[7] has identified as a major research priority the development of novel and robust methods for the size determination of engineered nanomaterials (ENM) and the multicomposite **characterization of ENM within complex matrices**. Existing techniques, such as electron microscopy or standard atomic force microscopy, face important limitations when applied to characterize ENM inside complex matrices, such as those of real products in food and cosmetic industries and of living cells, necessary for nanoparticle toxicity evaluation and drug delivery monitoring. This difficulty is hampering a systematic classification of engineered materials and its toxicity evaluation in its matrices, and hence is slowing down the introduction of new nanotechnology-based products into the market (a high priority of the whole H2020 Framework Program). Similarly, the "**International Technology Roadmap for Semiconductors** 2013" issued by the **Semiconductor Industry Association** highlights the key importance of

[7] K. Savolainen (coordinator), Nanosafety in Europe 2015-2025 (Finnish Institute of Occupational Health under the request of the EC).

developing novel and more powerful nanoscale microscopy and characterization techniques to address the current and future challenges posed by the continuous miniaturization of electronic devices and the introduction of novel materials. In particular, the imaging of 3D dopant profiles beyond sub-12 nm technologies (relevant for finFETs), and the **composition mapping** of nanoscale structures and **embedded nano-structures for emerging research materials and devices** for the beyond CMOS technologies, are all identified as **Difficult Challenges**.

The research program of the Network proposes an **innovative approach** to solve some of these currently existing challenges. The advanced SPM techniques investigated here are expected to show fast, 3D non-destructive and sub-10 nm composition imaging capabilities, and to be compatible with inorganic and soft samples and cells and with all environmental conditions. The research program of the network will then address and solve for the first time challenging problems that at present remain unsolved, like the 3D imaging of doping profiles at sub-10 nm resolution, the sub-10 nm composition mapping of organic materials, biomembranes or polymer nanocomposites, the high speed tracking of protein dynamics or the identification of engineered nanomaterials within living cells and polymer materials. **The advanced Scanning Probe Microscopies to be developed within the research program, and their applications, provide, then, an innovative approach to solve real problems faced in the Nanotechnology sector.**

The novel SPM techniques to be developed within the Research Program are innovative in offering fundamental advantatges with respect to other existing Advanced Microscopy techniques based on Electron and X-Ray microsopies. Electron or X-Ray microscopies show limited applications in some type of samples (e.g. soft samples or living cells), are destructive in tomographic imaging for samples thicker than few hundreds nanometers, they can only be applied in restrictive environmental conditions (preventing its use in liquid and, hence, in living organisms) and require of relatively sophisticated sample preparation procedures and costly instruments. The advanced SPM techniques to be developed will be applicable to soft nanostructured materials relevant for Health and Food applications, and in living cells for the label free identification of nanostructures relevant for drug delivery, toxicity or infection processes. Additionally, the SPM techniques will offer the advantage of being simpler instrumentally and less costly than electron and X ray tomographies, non-destructive and applicable to virtually any sample and environmental condition (vaccum, ambient or liquid media). Finally, the novel SPM techniques are potentially faster being capable of imaging the dynamics of single proteins (images in less than 1 ms).

The Research Program offers also a high degree of innovation in **SPM instrumentation and methodologies as compared to commercially available SPM systems** (e.g. Atomic Force Microscope, Scanning Capacitance Microscope, Electrostatic Force Microscope, Kelvin Probe Microscope, Magnetic Force Microscope or PiezoForce Microscope). The capabilities of standard SPM systems include only surface topographic imaging and nanoscale multiparametric physical characterization of the mechanical, electric and magnetic properties of materials. **The SPM techniques to be developed within the research program go well beyond these techniques and are mostly based in techniques developed during the present decade (2010s), and which are still in its infancy and in the process of development and commercialization**. Examples include the IR-s-SNOM, the scanning microwave microscope, the multimodal scanning force microscope or the high speed atomic force microscope. These novel SPM techniques overcome the classical speed limits of standard SPM systems (images in milliseconds instead of minutes), subsurface imaging capability (potentially down to micrometric distances) and limited sensitivity to the sample composition (novel mechanical, electrical and optical SPM methods enable composition mapping).

Within the advanced SPM field, the Research Program also goes well beyond the current state of the art. For instance, in High speed AFM imaging, the current state of the art, to which members of the consortium (INSERM, JKU) contributed decisively, is in obtaining full images in characteristic times below 1 ms[8] as compared to traditional AFM systems (100's of seconds per image) or last generation conventional AFM systems (using short cantilevers and small spot lasers which offer 10's of seconds per image). To achieve it, high speed AFM systems use a special design, careful engineering and clever feedback systems to prevent mechanical resonances in large mechanical loops, making difficult to adapt novel functionalities. In the research program will overcome this limitation and develop, for the first time, an advanced environmental control system for high speed AFM for Life Sciences applications, and integrate an HS-AFM system with a single molecular recognition system, which will open the door to video AFM imaging and tracking of fast dynamic biological processes at the nanoscale. Similarly, concerning SPM 3D-Tomographic techniques a number of SPM techniques with sub-surface imaging capabilities have been demonstrated in recent years, such as, the scanning microwave microscope, the electrostatic force microscope or the infrared near-field microscope, with significant contributions from members of the consortium (NANOGUNE, KEYSIGHT). In all cases, it is still to be demonstrated that true tomographic reconstruction can be achieved with them, in the sense that 3D images can be truly reconstructed from projection 2D images. In the research program of the network by addressing the development of specific reconstruction algorithms adapted to the SPM systems we are offering a credible approach to 3D SPM tomographic reconstruction. Concerning, composition sensitive SPM techniques the research program will demonstrate, for the first time, the possibility of IR-s-SNOM to operate in the liquid

[8] T. Ando, T. Uchihashi and S. Scheuring, Filming Biomolecular Processes by High-Speed Atomic Force Microscopy, Chem. Rev. (2014).

environment, opening the possibilty to apply this powerful label-free technique, largely developed by a member of the consortium (NANOGUNE)[9], to living biological entities. Furthermore, the composition mapping capabilities of recently demonstrated dielectric and mechanical SPM techniques, originally developed by members of the consortium (ICMM, IBEC), will be pushed towards its ultimate spatial resolution limits (sub-10-nm) for the first time. Identifying the material composition of nanoscale objects without labeling molecules at such scales is crucial for materials science and biology, in applications ranging from nano-composite engineering and characterization to label-free detection for biomedical diagnostics and therapy. Concerning the development of specific probes for SPM2.0 technologies, currently only a few commercially available probes can be used with the advanced SPM technologies investigated in the project, and do not allow reaching is maximum performance. In the research program we will provide novel probes for High speed AFM systems for biological applications and for novel probes for infraread based composition sensitive SPM systems, not exisitng at present. Finally, we highlight that the novel SPM techniques can provide **novel views on existing open problems**. For instance, many pathologies emerge from single mutations in molecules, yet it is intrinsically difficult to study them at the level of single molecules. The HS-AFM system to be developed will allow detecting single mutation in proteins, offering a non-biochemical view to the problem and, hence, potentially providing a different approach in mutation based medical diagnostics.

The Research Programme is original in the **emphasis and orientation of research towards the technology transfer to the private sector and the development of novel products (e.g. instruments, probes, software, etc.)**. A number of items have been already identified as suitable for IP protection and, eventual, commercial exploitation in the short term (see detailed list in Section 2.3.2). A specific IPR protection and exploitation plan has been designed to exploit these discoveries and to stablish specific conflict resolution mechanisms, as detailed in Section 3. Exposing the Network Fellows to research activities covering **from basic science to commercial exploitation** constitutes an invaluable experience for their future prospects.

The **combined approach to inorganic, organic and biological materials** in a single Network is also original in the field of SPM technologies, in which these branches evolved traditionally separately. SPM technologies by their nature are **multidisciplinar**, and this Network is just another demonstration. Within the Network six disciplines will be addressed: Instrumentation, Metrology, Materials, Electronics, Biology and Medicine, by a group of ESRs including engineers, physicists, biologists and material scientists. The research program is organized to benefit from the similarities between SPM applications to both inorganic and organic materials, so that results can be translated easily from different fields of application within the Network and outside from it. To reach this objective a common theoretical, instrumental and technological module comprising of WP2-WP4 has been organized from where there emerge two application workspaces (WP5 and WP6) devoted to Materials and Electronics and to Biology and Medicine, respectively. The research program will expose ESRs to a rich variety of ideas, methodologies and phenomena providing a unique environment for the cross-fertilization of ideas.

The research program is also innovative by the introduction of **research aspects related to Metrology and Standardization** (WP7). These are key aspects in product development and commercialization. Good metrology practice constitutes the best route for relevant scientific discoveries, and standardization is at the basis of product development and commercialization. Since the research programme of the network covers from basic science to product development, the presence of WP7 constitutes an important added value.

The research programme shows a **strong implication of the non-academic sector and multitude of academic-non-academic research efforts**. The private sector in the consortium is represented by one reputed industrial partner in the AFM instrumentation sector (KEYSIGHT), one industrial partner (NPL), which is the UK National Measurement Institute and represents the private and public sectors interests in metrology and standardization, and one SME (BNC) expert in developing innovative Nanotechnology based solutions for Medicine. Additionally, one SME representative of the SPM probe manufacturer sector (SCL) and a multinational industrial partner from the Semiconductor Industry sector (INFINEON) contribute as associated partners. The three non-academic beneficiaries will recruit a total of 4 early stage researchers (29% of the total). In addition, they will lead 3 out of the 6 research WPs and will be responsible of 5 research deliverables (21% of the total). The strong commitment of the non-academic partners will enable them to evaluate new market opportunities: development of new SPM systems (KEYSIGHT), novel metrology services (NPL), novel targeted drug delivery and nanotoxicity evaluation strategies (BNC), novel semiconductor structures for microelectronics (INFINEON), and novel SPM probes (SCL) as detailed in Section 2. The research program will then allow the training of Early Stage Researchers sensitive to industrial and production needs, and grow them towards market opportunities.

In summary, **a revolution in the SPM sector is emerging, as well in their natural fields of application in the Microelectronic Industry, Material Sciences or Life Sciences, offering a wealth of new opportunities for high impact research and product development**. The research program of the network precisely addresses these

[9] Following initial developments performed within the ERC starting grant TERATOMO.

opportunities with the objective that Europe becomes a major player in this new era of SPM. The vision and ambition behind the research programme is to **boost the development of SPM systems to a level to make these techniques the gold standard in modern Advanced Microscopy techniques for Nanotechnology applications**.

Table 1.1: Work Package (WP) List.

WP	Work Package Title	Leader nº	Start	End	Activity	Leader	ESRs
1	Ethics requirements	1	1	48	Ethics	IBEC	All
2	Theoretical modelling for SPM2.0 techniques	1	6	24	R	IBEC	1,2,5,8,10
3	SPM2.0 novel instruments	7	6	36	R	KEYSIGHT	1,2,5,6,7,10
4	Novel SPM2.0 probes and accessories	8	6	36	R	TUW	3,6,7,12
5	SPM2.0 for Materials and Electronics	3	6	42	R	ICMM	2,5,8,11,14
6	SPM2.0 for Biology and Medicine	9	6	42	R	BNC	1,4,6,13
7	SPM2.0 metrology and standardization	6	6	42	R	NPL	10, All
8	Scientific and Complementary Skills	4	1	42	T	JKU	All
9	Management, recruitment and dissemination	1	1	48	M	IBEC	All

1.2 Quality and innovative aspects of the training programme

1.2.1. Overview and content structure of the training programme

The objective of the SPM2.0 Network is to provide a solid multidisciplinary **scientific and technical training** in **advanced SPM technologies for fast, 3D tomographic and composition imaging of materials at the nanoscale.** The training should constitute the basis onto which to generate a wealth of new developments, knowledge and applications, well beyond the current state of the art in the field. In addition, the researchers of the Network will also receive a comprehensive training on **complementary scientific skills**, including communication and knowledge protection and technology transfer and exploitation, to ensure a wide dissemination of the generated knowledge to the scientific, non-academic and general public and a fluid transfer to the private sector (**SPM manufacturers** and end-users in **Electronics, Material Science, Biology and Medicine**). Finally, a wide training on **transferable skills** will be also provided, including entrepreneurship skills and project raising and management, which will increase the future employability of ESRs and their access to job positions in the private and public sectors.

The SPM2.0 Network will recruit a total of 14 ESRs (Table 1.2). The duration of appointments has been chosen to be 36 months, to allow ESRs developing individual research projects to be qualified to obtain a Doctoral degree.

Table 1.2 Recruitment Deliverables per Participant.

Researcher No.	Recruiting Participant	Planned Start Month	Duration (months)
1.	IBEC	6	36
2.	IBEC	6	36
3.	INSERM	6	36
4.	INSERM	6	36
5.	ICMM	6	36
6.	JKU	6	36
7.	NANOGUNE	6	36
8.	NANOGUNE	6	36
9.	NPL	6	36
10.	KEYSIGHT	6	36
11.	KEYSIGHT	6	36
12.	TUW	6	36
13.	BNC	6	36
14.	UNIMORE	6	36
TOTAL			504

The **Scientific and Technological Training** will be aligned with the objectives of the Research Program detailed in Section 1 and will provide the necessary background on the following aspects:

a) Advanced SPM measuring instrumentation, tools and methods to access the sub-surface properties of materials, its nanoscale composition and its dynamic evolution (SPM2.0 technologies).
b) Unique application capabilities of the SPM2.0 technologies in the Materials and Electronics sectors, in particular, in imaging the 2D and 3D nanoscale composition of polymers, doping profiles and organic nanoelectronic devices.
c) Novel applications of the SPM2.0 technologies in Biology and Medicine, in particular, in tracking the molecular dynamics of single proteins, and in the label free imaging of nano objects in living cells and biomembranes.
d) Good metrological and standardization practices in the novel developed SPM technologies.

The scientific and technological training will be organized trough **Local Scientific Training** activities, provided by the host institutions, and through network-wide activities, provided through **Secondments** to other partner's laboratories and **Scientific Courses** in **Training Workshops**. The **Local Technical and Scientific Training** will take place on an individual basis at the host institution. It will be conducted by the ESR's Supervisor (and co-supervisor for joint supervision arrangements), as well as, by post-doctoral staff belonging to the host research group. In this training all scientific, methodological and technical aspects relevant for the individual research project of the ESR and in which the host group is expert in, will be approached. Besides specific scientific training on SPM2.0 technologies, ESR will receive also training on general aspects of scientific research such as good scientific practices, experiment design, reproducibility, repeatability, errors, sensitivity, meaningful results, etc., which are essential for ESR, especially in their initial years. Local individual training will last for the whole duration of the training process and will constitute the main source of scientific training of the ESR. The specific scientific local training each particular ESR will receive will be in line with its Individual Research Project (Table 3.1).

The **Secondment based individual scientific training** will take place in an institution different from the host institution and has the double objective of: (i) to provide specific scientific training on techniques or knowledge necessary for the development of the Individual Research Project and not available at the host institution and (ii) to favour the development of joint research efforts. The Secondments will be organized between members of the network with complementary expertise and nature, ensuring that all fellows will be exposed to different disciplines (bio/non-bio, theory/instrumentation) and different sectors (academic/non-academic). The duration of the secondments will be of minimum 1 months and secondments for a total of 4 months (8 months for jointly supervised ESRs) should be carried out by each fellow. The specific secondments and their schedule will be organized on a bilateral basis between the involved partners, after authorization by the Training Committee. The secondments foreseen for each ESR of the network are detailed in Table 3.1. A total of 72 months of secondments are planned. Each partner will offer secondment opportunities on one aspect relevant for the research program, as detailed below:

S1. Material composition identification through quantitative Electrostatic Force Microscopy (IBEC). Secondments at IBEC will deal with a state-of-the-art technique developed by the IBEC partner concerning the material composition identification through quantitative electrostatic force microscopy. This technique is complementary to other composition sensitive technique (e.g. optical or mechanical) offered by other institutions. Users: ESR5-ICMM (1 Month), ESR8-NANOGUNE (1 M), ESR13-BNC (6 M).
S2. High speed AFM imaging of biomembranes in physiological conditions (INSERM). Secondments at INSERM will deal with a state-of-the-art technique developed by INSERM concerning the high speed imaging of biomembranes under physiological conditions. This technique is necessary for partners willing to extend HS-AFM capabilities or improve in membrane nanoscale bioimaging. Users: ESR1-IBEC (6 M), ESR6-JKU (3 M), ESR12-TUW (2 M).
S3. Material composition identification through multifrequency nano-energy dissipation quantification (ICMM). Secondments at ICMM will deal with a state-of-the-art technique developed by the ICMM partner concerning the material composition identification through multifrequency quantitative energy dissipation microscopy. This technique is complementary to other composition sensitive techniques (e.g. electrical or optical) offered by other institutions. Users: ESR4-INSERM (1 M), ESR7-NANOGUNE (1 M), ESR14-UNIMORE (6 M).
S4. Molecular recognition force microscopy (JKU). Secondments at JKU will deal with an original technique developed by the JKU partner concerning the atomic force microscopy molecular recognition. This technique is complementary to other composition sensitive techniques (e.g. mechanical, electrical or optical) offered by other members of the consortium. Users: ESR2-IBEC (1 M), ESR3-INSERM (2 M), ESR4-INSERM (2 M), ESR12-TUW (1 M).
S5. Infrared near field scanning optical microscopy (NANOGUNE). Secondments at NANOGUNE will deal with a state-of-art technique developed, among others, by the NANOGUNE partner, concerning the material composition identification through infrared near-field scanning optical microscopy. This technique is complementary to other composition sensitive technique (e.g. electric or mechanical). Users: ESR9-NPL (1 M), ESR10-KEYSIGHT (2 M), ESR11-KEYSIGHT (1 M), ESR13-BNC (2M)
S6. Organic thin film nanomaterial fabrication (UNIMORE). Secondments at UNIMORE will deal with state-of-the-art techniques available at UNIMORE for the fabrication of state of the art organic thin film nanomaterials. These techniques will be very useful for ESRs involved in the development of 2D composition mapping techniques applied to organic samples. Users: ESR1-IBEC (2 M), ESR5-ICMM (2 M), ESR9-NPL (1 M), ESR11-KEYSIGHT (2 M).
S7. Sample preparation for tomographic applications (NPL). Secondments at NPL will deal with reliable techniques developed by the NPL partner concerning sample preparation techniques for tomographic imaging in inorganic samples. This technique is especially necessary for ESRs developing tomographic applications into the material science sector. Users: ESR2-IBEC (1 M), ESR8-NANOGUNE (1 M), ESR10-KEYSIGHT (6 M), ESR11-KEYSIGHT (1 M).

S8. Sub-surface imaging with scanning microwave microscopy (KEYSIGHT). Secondments at KEYSIGHT will deal with training on the scanning microwave microscope commercialized by the company. This technique by using high frequency electrical signals in the GHz range offers unique capabilities for the electrical characterization of materials and its sub-surface imaging. Users: ESR5-ICMM (1 M), ESR7-NANOGUNE (2 M), ESR8-NANOGUNE (2 M).
S9. High speed AFM probe fabrication (TUW). Secondments at TUW will deal with state-of-the-art techniques available at TUW for the microfabrication of AFM probes. These techniques will be very useful for ESRs involved in the development of novel probes for HS-AFM. Researchers will learn the principles of probe design and fabrication at TUW. Users: ESR3-INSERM (1 M), ESR6-JKU (1 M), ESR7-NANOGUNE (1M), ESR9-NPL (2 M), ESR14-UNIMORE (2 M).
S10. Nanoparticle based drug delivery and nanotoxicity (BNC). Secondments at BNC will deal with state-of-the art techniques available at BNC for the development of drug delivery carriers based on nanoparticles and for the monitoring of the processes and nanotoxicity. These techniques will be very useful to ESR developing nanotomography techniques and medicine applications. Users: ESR2-IBEC (2 M), ESR3-INSERM (1 M), ESR4-INSERM (1 M), ESR12-TUW (1 M).

The individual scientific training will be complemented by **Common Scientific Training** activities that will be offered through **network-wide scientific courses** organized into **Training Workshops**. The main objective of the common scientific training will be to provide a wide and common scientific and technological background to all ESRs of the network on SPM2.0 technologies and of their emerging fields of application. This training will guarantee a common language and knowledge on these technologies, will facilitate the communication between the members of the Network and will provide a high level training baseline to all ESRs. The content of the courses will be designed for a multidisciplinary audience adapted to the **different backgrounds of the recruited ESRs** (Physics, Engineering, Biology, Chemistry, etc.). The fact that most of the groups participating in the Network are themselves of a multidisciplinary character constitutes a guarantee for the success of this approach. The attendance to the Training Workshops is mandatory for all ESRs. Each beneficiary (plus INFINEON) will be in charge of organizing one scientific course on an area of its expertise. The course organizer will be responsible to define the detailed content of the course, the schedule and the lecturers participating in it. Course duration will be between 1 and 2 days, with a total number of hours between 8 and 12. A detailed list with a summary of the contents of the courses is offered in what follows, together with the course partner organizer, duration and Training Workshop. The schedule of the courses (Table 1.3) has been selected in order to guarantee that all ESR of the Network are active and can attend all the courses. The level of the courses evolves in time from basics to advanced applications. The scientific courses are:

C1. Atomic force microscopy topographic and physical characterization modes (KEYSIGHT, 2 days 1st TW). Description: The world leader AFM manufacturer KEYSIGHT will offer an overview of the basic atomic force microscopy topographic modes and of the advanced physical characterization modes (e.g. current sensing AFM, Electrostatic Force Microscopy, Scanning Microwave Microscopy, etc.).
C2. High speed Atomic Force Microscopy (INSERM, 1 day, 1st TW). Description: An introduction to the principles and methods of high speed AFM will be offered, together with selected applications in biology. Practical demonstrations of high speed AFM operation will also be given. INSERM is one of the world leading groups in high speed AFM methods and applications.
C3. Composition sensitive Scanning Probe Microscopy techniques (ICMM, 2 days, 2nd TW). Description: This course will describe the main composition sensitive Scanning Probe Microscopy techniques. Among others the course will introduce techniques such as multifrequency AFM, quantitative electrostatic force microscopy and infrared near field optical microscopy. ICMM is a world expert in these techniques.
C4. 3D tomographic atomic force microscopy techniques. (NANOGUNE, 1 day, 2nd TW). Description: In this course we will introduce the main SPM tomographic techniques, i.e. ultrasound SPM tomography, IR-SNOM tomography, tomographic EFM and SMM, and compare their performance with respect to non-SPM techniques. NANOGUNE is a leading group in the development of SPM nanotomographic methods.
C5. Winter school on single molecule biophysics for nano-biotechnology (JKU, 2 days, 3rd TW). Description: The annual Linz Winter school is a 2-days event with talks and hands-on sessions on new techniques in single molecule biophysics for life science applications. It includes technologies like combined force microscopy and fluorescence microscopy or patch clamp technology. It has been already held twelve times.
C6. Metrology and standardization in Scanning Probe Microscopy (NPL, 2 days, 4th TW). Description: An introduction to the basic concepts of metrology and standardization will be offered, together with specific examples related to atomic force microscopy techniques. NPL is the National Measurement Institute in UK and has long experience in the training of courses with metrology content.

C7. Fabrication of Atomic force microscopy probes (TUW, 1 day, 4th TW). Description: The principles of probe design and fabrication will be given in this course together with explicit examples for probes of interest for the research program (e.g. high speed probes). A visit to the probe fabrication facilities of TUW will be also offered as part of the course.
C8. Emerging applications of SPM2.0 technologies to Biology (IBEC, 1.5 days, 5th TW). Description: The course will cover the more promising areas of application of the novel SPM2.0 technologies in the Life Sciences sector. An overview of results already achieved with these novel technologies, together with emerging areas of applications will be given. IBEC has a wide experience in the training of nanobiology courses.
C9. Emerging applications of SPM2.0 technologies in materials science (UNIMORE, 1 day, 6th TW). Description: The course will cover the more promising areas of application of the SPM2.0 technologies in the Material Science sector. An overview of results already achieved, together with emerging areas of applications will be given during the course. UNIMORE is one the more active groups in this area.
C10. Emerging applications of SPM2.0 technologies in Microelectronics (INFINEON, 1 day, 6th TW). Description: An overview of the potential applications of SPM2.0 technologies in the microelectronic industry will be offered, particularly focussing on 3D tomographic doping profiling needs and imaging of 3D stacked nanostructures. INFINEON is one of the world leading microelectronic industries.
C11. Emerging applications of SPM2.0 technologies in Medicine (BNC, 1 day, 6th TW). Description: An overview of the potential applications of SPM2.0 technologies in Medicine will be offered, particularly focussing on 3D tomographic imaging needs to monitor nanoparticle drug delivery processes and nanotoxicology evaluation. BNC is an SME focused in the applications of Nanotechnology to Medicine.

ESRs will receive also training on **complementary scientific skills**, with the main objective to provide a solid education and practice on skills complementing scientific and technological ones, and that can contribute to a better development of the scientific career. The main axes of action will be centred on (i) developing outstanding communication skills to address a variety of audiences and interlocutors: scientific, general public, professional and economical and (ii) developing skills related to IPR protection and scientific events organization. This part of the training program will be organized through common training courses offered in the Training Workshops. There will be a total of 4 courses on complementary scientific skills (containing theoretical and practical parts). The practical part will be related either to the activity of the Network (meeting organization, webpage design) or to the exploitation of the skills for the research activities of the ESRs. The complementary scientific skills courses are:

N1. Designing a Personal Career Development Plan (IBEC, 1 day, Kick-off (for supervisors) and 1st TW). Description: This short course will introduce the concept of Personal Career Development Plan, and provide guidelines for its elaboration. The course will be given at the Kick-off Meeting addressed to Supervisors and to the Fellows in the 1st Training Workshop. The practical implementation will be the definition of the PCDPs.
N2. Scientific communication for scientists and general public (INSERM, 1 day, 1st TW). Description: The course will cover aspects of communication addressed to scientific and non-scientific audiences, skills in the oral and written expression, delivery of presentations and use of Open-Source repositories. The practical implementation of the course will include the participation in the webpage update.
N3. Organization of scientific events (ICMM, 1 day, 2nd Workshop). Description: The course will include aspects such as getting funding, finding appropriate places and dates, infrastructure needed, etc. for event organization. As a practical implementation of this course ESR will organize the 3rd Network Meeting. ICMM has organized several International Scientific Conferences.
N4. Intellectual property rights: protecting your discoveries and findings (UNIMORE, 1 day, 3rd TW). Description: A short course on intellectual property rights will be given by a partner very active in these aspects (16 licenced patents & 2 spin-off companies created). The course will contain both theoretical & practical aspects, the latter being devoted to designing a protection knowledge strategy for the research being carried by each ESR.

Finally, the scientific and technical training of the ESRs will be completed by a number of courses on **Transferable Skills** centred on general aspects of personal professional career development. This training will have as main objective to promote the researchers of the Network to access highly qualified job positions in the private and public sectors from where they can foster the development of new products and projects based on SPM2.0 technologies. Specific training will be given on: (i) developing entrepreneurship with wide intellectual property and technology transference education and with knowledge of market rules and spin-off and enterprise generation and (ii) designing personal professional employability plans aimed at accessing to job positions with relevant responsibilities and capacities to foster the development of SPM2.0 applications. The specific transferable skills courses are:

N5. Entrepreneurship: creating technology based companies (SCL, 1 day, 3rd TW). Description: A short course detailing the main steps in the creation of companies from spin-offs to consolidated companies will be provided. As example, the SME SCL will share his own experience on these matters. Practical cases will be developed based on some of the individual research projects being developed by ESRs.
N6. Market studies and product development (KEYSIGHT, 1 day, 4th TW). Description: A short course on market studies and on the different phases of product development will be given. KEYSIGHT will share its expertise in both commercialisation of research and application of research knowledge to solving industry problems. Examples of case studies and real-world commercialisation examples will be given.
N7. Project raising and management (NANOGUNE, 1 day, 5th TW). Description: The course will cover the different ways to get funds to develop research, including the different levels of funding (local, national, European, international) and types of funding (fellowships, grants, coordinated actions, etc.). As practical implementation, ESRs will apply for funding for the organization of the Final Meeting.
N8. Employment strategies in the private and public sectors (JKU, 1 day, 6th TW). Description: A short course on the main aspects analysed by private companies when selecting researchers will be provided. The practical implementation of the course will include the personalized design of an employment plan for each of the ESR of the Network. Particular cases and examples from the SPM sectors will be given.

Table 1.3 Main Network-Wide Training Events, Conferences and Contribution of Beneficiaries.

Nº	Main Training Events & Conferences	ECTS	Leader	Month
C1	Atomic force microscopy topographic and physical characterization modes	-	KEYSIGHT	12
C2	Introduction to high speed Atomic Force Microscopy	-	INSERM	12
N1	Designing a Personal Career Development Plan	-	IBEC	1, 12
N2	Scientific communication for scientists and non-scientists	-	INSERM	12
C3	Introduction to composition sensitive Scanning Probe Microscopy techniques	-	ICMM	18
C4	Introduction to 3D tomographic scanning probe microscopy techniques	-	NANOGUNE	18
N3	Organization of scientific events	-	ICMM	18
C5	Winter school on single molecule biophysics for nano-biotechnology	-	JKU	24
N4	Intellectual property rights: protecting your discoveries and findings	-	UNIMORE	24
N5	Entrepreneurship: creating technology based companies	-	SCL	24
C6	Metrology and standardization in Scanning Probe Microscopy	-	NPL	30
C7	Fabrication of Atomic force microscopy probes	-	TUW	30
N6	Market studies and product development	-	KEYSIGHT	30
C8	Emerging applications of SPM2.0 technologies to life sciences	-	IBEC	36
C9	Emerging applications of SPM2.0 technologies in materials science	-	UNIMORE	36
N7	Project raising and management	-	NANOGUNE	36
C10	Emerging applications of SPM2.0 technologies in Microelectronics	-	INFINEON	42
C11	Emerging applications of SPM2.0 technologies in Medicine	-	BNC	42
N8	Employment strategies in the private and public sectors	-	JKU	42

TW	Host	Days	Month	Courses
1	INSERM	4	12	C1, C2, N1, N2
2	UNIMORE	3	18	C3, C4, N3
3	JKU	4	24	C5, N4, N5
4	NPL	4	30	C6, C7, N6
5	KEYSIGHT	3	36	C8, C9, N7.
6	NANOGUNE	3	42	C10, C11, N8

The common network courses (listed in Table 1.3) will be organized within six **Training Workshops** (TW) with a total duration between 3 and 4 days. The organizer of the TW will be the hosting partner. The TWs including, host partner, duration, date and courses is listed in the Table. The first TWs provide a higher emphasis on scientific training and basic knowledge while the latest ones on complementary and transferable skills and advanced contents. **TW will be open to ESR from outside the network as part of the dissemination strategy of the Network.**

A valuable tool in the implementation of the training of the ESRs will be the individual **Personal Career Development Plan** (PCDP). The PCDP will contain the ensemble of research objectives and training actions to be undertaken by each researcher of the Network, in particular: (i) the scientific objectives and methodology of the Individual Research Project, ensuring it is an original project requiring the advancement of science through the development of original research, (ii) the local scientific training necessary to ensure the successful completion of the research project, (iii) the individual secondment plan to complete the scientific training and to ensure exposure to multidisciplinar, multisectorial and multicultural environments; (iv) the transferable skills training actions to be undertaken, (v) the details on the supervision and assessment procedure to be carried to monitor the development of the training acquired (including details on joint supervision arrangements, when applicable) and (vi) a prospective

on the professional career. The PCPD will be agreed between the ESR and the Supervisors. The present ETN considers the PCDP a valuable instrument in the ESR professional development and for this reason all PCDPs will be approved by the Training Committee. Special care will be taken to ensure that the PCDP fulfil the needs of the current employment market. In order to guarantee a common structure and the best practices in the elaboration of the PCDP, **guidelines for the elaboration of the PCDP** will be approved by the Supervisory Board at the Kick-off Meeting. The PCDP should be approved within six months after the ESR recruitment and will be updated yearly.

The Training Programme of the SPM2.0 Network offers several aspects of **originality and innovation**. First, the contents of the technical scientific courses, except the introductory one (C1), are completely original and will offer a unique opportunity **to train ESRs in advanced aspects of SPM technologies that currently are not covered by undergraduate or graduate courses on SPM, or in textbooks** on SPM techniques.[10,11,12,13] Undergraduate or graduate courses on SPM typically cover only the basics of SPM (topographic imaging) and some of its physical characterization capabilities (that the Network will cover with the C1 introductory course). Also, courses and webinars offered by SPM manufacturers and SPM distributors only cover those aspects, since they are the only ones incorporated into commercial systems. No other Network exists that approaches the contents of SPM2.0 technologies covered in the present training program (sub-surface imaging, high speed AFM, SPM composition mapping, applications to Materials, Electronics, Biology and Medicine, etc.). The present Network will be the first in addressing research and training in this area and hence it offers a unique opportunity for the European Research Area. In addition, the partners have been selected among the groups that most decisively have contributed to the development of these advanced SPM techniques, thus providing a unique opportunity to the ESRs to be trained by many of the inventors of the techniques. The leading position of Europe in this field of application has allowed building a **European Network covering all aspects of the required training**, thus not making necessary the presence of visiting scientists in favour of including full (and partner) members. This constitutes a clear added value.

The second original aspect of the Training Programme of the Network is the **central importance given to the Network-wide training activities**. These activities include secondments (for a total duration of 4 and 8 months depending on joint supervision arrangements) and common training activities on technical scientific aspects (11 courses), complementary scientific skills (4 courses) and transferable skills (4 courses). These Network-wide activities will ensure the fellows are effectively exposed to beyond local training activities (offered by the host partner) and hence providing an added value with respect to conventional ESR training offered by individual institutions. They will also ensure ESRs are exposed to training activities from partners belonging to different disciplines (instrumentation, metrology, Microelectronics, Materials, Biology and Medicine) and different sectors (academic and non-academic). This will constitute a unique training effort in the field of SPM2.0 technologies and in the formation of new researchers actively participating to the development of a knowledge based society. Such training effort cannot be afforded at a national level for any country in Europe and hence requires an international European effort, like the proposed one, to cover all aspects of the training.

The Training Program is also very ambitious and has been organized to guarantee that all **ESRs of the Network end up by defending a PhD thesis** and being awarded a **Doctoral Degree, with the European mention**. To achieve it a detailed analysis of the regulations of the Doctoral studies of the different countries participating in the Network (Spain, Italy, UK, France and Austria) has been performed. In all cases, it has been verified that the training programme proposed by the Network is fully compatible with the ESRs being enrolled in a Doctoral Programme in a University and being awarded a Doctoral degree by the end of the 36 month contract (the duration of Doctoral Studies in these countries). On the other side, it has been verified that all ESR supervisors can act as PhD thesis supervisors (with its function complemented by an Academic Tutor designed by the Doctoral Programme itself, if necessary). Finally, the secondment programme guarantees secondments for at least 3 months in a foreign university, necessary for the European mention. In the Table in Section 3.2.5 the specific Universities and Doctoral programmes for all ESRs are detailed. **It is highlighted that all ESR supervisors (including those belonging to institutions not awarding Doctoral degrees) are well aware of all the procedures and regulations related to Doctoral studies since in the past, they all have supervised ESRs that have been awarded with a Doctoral Degree** (see Table in Section 1.3.1 about supervisors experience). For this reason, the fact that 7 beneficiaries out of 10 belong to institutions not awarding doctoral degrees does not constitute any risk to fulfil the present objective.

1.2.2. Role of non-academic sector in the training programme

The Training Program of the SPM2.0 Network shows a **strong involvement of the non-academic beneficiaries and partner organizations of the Network**. A total of 4 ESRs out of 14 (28%) (144 ESR person/months over a total of 504 person/months) will be recruited by non-academic beneficiaries. In addition, the non-academic beneficiaries and

[10] G. Haugstad, Atomic Force Microscopy: Understanding Basic Modes and Advanced Applications (John Wiley-Sons, Inc., 2012).
[11] S. Kalinin et al. eds., Scanning Probe Microscopy: Electrical and Electrochemical Phenomena at the Nanoscale (Springer, 2007).
[12] B. Bushan, H. Fuchs and M. Tomitori, Applied Scanning Probe Methods, vols. 1-11, (Springer).
[13] V. J. Morris, A. R. Kirby and A. P. Gunning, Atomic Force Microscopy for Biologists (Imperial College, 1999).

non-academic partner organizations will be in charge of organizing 6 of the 19 common network-wide training courses (32% of the total) and of organizing 2 of the 6 Training Workshops. Moreover, non-academic beneficiaries will actively participate in the secondment plan of the network, offering secondment opportunities for a total of 19 months, which is a 25% of the total, and will promote the participation of their hosted-ESRs into the secondments to other partners' places. Finally, a non-academic beneficiary (KEYSIGHT) is member of the Training Committee.

1.3 Quality of the supervision

1.3.1 Qualifications and supervision experience of the supervisors

The research and training programs of the ETN will offer the **highest standards in ESR supervision**. This supervision will take place at two levels, locally and network-wide. Locally, each ESR, on an individual basis, will be assigned a **Supervisor** at the host institution, which will be the main responsible for the training of the researcher. In order to ensure the best practices and unify the mechanisms of the supervision process, in the Kick-off Meeting of the Network a training course for supervisors will be offered (mandatory for all aspirants to supervisors). This training activity will provide a common approach to ESR supervision within the Network and its compliance with current recommendations by the EC. The **Supervisors appointed in the Network have a wide experience in the training of ESRs**, with plenty of success histories among their trainees, as summarized in the Table below:

Supervisor	Qualifications	Research, Training and Supervision Experience at PhD level
G. Gomila IBEC	PhD in Physics. Associate Professor. Group Leader.	18 years research experience. 9 years lecturing experience at Master/Doctoral level. 8 PhD theses supervised or still.
S. Scheuring INSERM	PhD in biochemistry-biophysics. Research Director. Lab head.	12 years research experience. 10 years of supervision and teaching. 5 PhD theses supervised (or still).
I. Casuso INSERM	Physics. PhD in Electronics. Senior Researcher.	7 years research experience. 6 years of supervision and teaching. 2 PhD students supervised (or still).
R. García ICMM	PhD in Physics. Full Professor. Group leader.	22 years research experience. 15 years teaching experience at Master level. 20 PhD theses supervised (or still).
P. Hinterdorfer JKU	PhD in Physics. Full Professor. Depart/Lab Head. CEO SME.	22 years research and 21 years lecturing experience at Master/Doctoral level. 23 PhD theses supervised (or still).
R. Hillenbrand NANOGUNE	PhD in Physics. Full Professor. Group Leader. Co-founder SME.	10 years research experience. 5 years lecturing experience at Master and Doctoral level. 9 PhD theses supervised.
A. Cuenat NPL	PhD in Physics. Coordinator European metrology Network.	8 years research experience. 4 years lecturing experience 2 MSc and 3 PhD supervised (or still)
F. Kienberger KEYSIGHT	PhD in Physics. Group leader of AFM and microscopy research.	15 years research experience. Expert for the EC (evaluator and PTA) and OECD (BIAC). 6 PhD theses supervised.
U. Schmid TUW	PhD in Physics. Prof. Micro-systems Tech. Head of Institute.	11 years research 9 and years lecturing experience at Master/Doctoral level. 23 PhD theses supervised (or still).
P. Actis BNC	PhD in Electrochemistry. Project Coordinator/Manager.	5 years' research experience. 5 BSc, 2 MSc and 2 PhD theses supervised (or still).
F. Biscarini UNIMORE	PhD in Chemistry. Full Professor. Head of unit.	21 years research experience. 21 years lecturing experience at Master/Doctoral level. 24 PhD theses supervised (or still).

The Network as a whole will take also responsibility in the supervision of the ESR. To achieve it, each ESR will be assigned an individual **Assessment Commission (AC)** composed of three members belonging to partners other than the host partner and with different expertise (experimental/theoretical, material science/biology, etc.) and profiles (academic/non-academic sectors). The ACs will meet with the ESR three times coinciding with Network Meetings 1, 2 and 3 and will have as main mission to offer a broader perspective to the training and research being carried by the ESR. It will also act as intermediate to solve conflicts or misconduct issues between the ESR and supervisor (implementation details are given in Section 3.2.4).

The same high standards in the supervision of ESR will be required to both academic and non-academic partners. All the academic and non-academic participants' structure contemplates the possibility for the training of early stage researchers through research and have qualified supervisors. In addition, they are fully aware on the procedures to enable ESR to enrol in doctoral programmes at universities. In all aspects, **the role of non-academic and academic beneficiaries with respect to supervision will be uniform along the network**.

1.3.2 Quality of the joint supervision arrangements

Four of the ESRs of the ETN will have joint supervision arrangements (ESR1-IBEC with INSERM, ESR11-KEYSIGHT with NPL, ESR13-BNC with IBEC and ESR14-UNIMORE with ICMM). Joint supervision arrangements have been stablished for those ESR projects requiring the substantial contribution from more than one beneficiary of the consortium, i.e. for those projects that require a continuous and intense collaborative research effort

(e.g. requiring the continuous use of a SPM technique or sample preparation facility not available at the host institution). The ESRs jointly supervised will be assigned a principal supervisor at the host institution and a co-supervisor at another beneficiary's institution. Each supervisor will assume the responsibility from the corresponding part of the ESR's scientific project. The joint supervision will imply the joint monitoring and progress assessment of the fellow. These ones will be achieved through regular joint discussions through videoconference (at least one every six weeks), and meetings (two per year, one at the Network meeting and one at the in between Training Workshop). Moreover, the ESRs will spend long secondments at the co-supervisor's institution (6 months in total), and when necessary, will schedule short visits (less than one week). The joint supervision will also imply the joint recruitment of the fellow. Jointly supervised ESRs will be enrolled in a single University for its Doctoral studies and will receive a single Doctoral degree from that University, since at present no joint Doctoral program on the topic of the ETN exist between the Universities of enrolment. Jointly supervised ESRs will benefit from the complementary background of the two supervising beneficiaries, receiving an in depth multidisciplinary and international training.

1.4 Quality of the proposed interaction between the participating organisations

1.4.1. Contribution of all participants to the research and training programme

All beneficiaries are directly involved and committed in all aspects of the research and training programme of the network. As a general rule, each beneficiary will host at least one ESR for a duration of 36 months, who will develop the main part of his individual research project at the premises of the host institution addressing the research programme objectives. The beneficiary then will be responsible of the local training of the ESR. In addition, it will offer training secondments to other ESRs from other beneficiaries for a total duration of minimum 5 months, and will support the development of secondments from his hosted researchers for at least 4 months in other's beneficiary laboratories. Furthermore, each beneficiary will be in charge of organizing one scientific network wide training course, and most of them (7 beneficiaries out of 10) will organize also a course on complementary scientific or transferable skills. Finally, all beneficiaries will be members of at least one assessment commission of an ESR other than his hosted one(s). Partner members, on each side, will be in charge of organizing 2 training courses, and will make accessible their expertise, facilities and technology to the beneficiaries.

1.4.2. Synergies between participants

There are **important synergies between participating organizations**. For instance, UNIMORE (as well as INFINEON) are very much interested in a successful achievement of the objectives on 3D and 2D nanocomposition imaging, sought by different partners using different techniques (KEYSIGHT, ICMM or NANOGUNE), while these partners are interested in the best performance of their instruments for the particular needs of UNIMORE (and INFINEON) since this would give support and notoriety to their developed instruments. Similar synergies exist between other partners like NPL and the tomographic instrumentation developing groups (KEYSIGHT, IBEC), between BNC and the live cell imaging tomographic techniques developing group (IBEC), or between TUW and the high speed molecular recognition instrumentation development groups (INSERM, JKU), just to cite a few. The existence of these synergies, and the development of effective collaboration between the members, is supported by the **existence of previous joint collaborations between members of the Network**. For instance, four of the partners, IBEC, KEYSIGHT, NPL and BNC collaborated on the SME-led FP7 project V-SMMART Nano (FP7-NMP-2011-280516), while partners IBEC, KEYSIGHT, JKU and BNC are collaborating on the Marie Curie ITN NANOMICROWAVE (FP7-PEOPLE-2012-ITN-317116). Both projects are related to research and training on microwave nanotechnologies (including SPM based ones), thus offering a complementary to the present Network. Finally, partners IBEC, INSERM, ICMM and JKU were members of the Management Committees of their respective countries of the Cost Action TD1002-AFM4NanoMed&Bio, where medical and biological applications of AFM technologies, in general, are promoted. Furthermore, UNIMORE and ICMM have jointly participated in 2 EU projects, namely, I-ONE (FP7-NMP-2011-SMALL-5-280772) on implantable organic nanoelectronics for spinal cord injury and BIDOT (FP6-NMP-2005-STREP-32652) on sensing biosystems in fluids with organic transistors. The training Network will contribute to strengthen these collaborations, but overall to increase the number of them and to focus the collaboration further on the research training aspects. The mentioned synergies will promote **to stablish prolonged collaborations that extend beyond the duration of the Network**, especially because, as described above, a number of new applications and scientific problems will emerge related to the expected rapid expansion of the SPM2.0 nanotechnology field. Indeed, at the end of the Network, a well-established network of research groups covering every step of SPM2.0 nano-technology processes will be constituted. This will foster research excellence in this exciting field and the rapid development of novel technology and applications within the field. The inclusion of industry in the Network will ensure an optimal and efficient transfer of knowledge and commercialisation and of collaboration between public and private sectors. To favour the post-network collaboration all members of the SPM2.0 Network have agreed to **mutually recognize the training acquired by the ESRs within the SPM2.0 Network**, qualifying them to access to Experienced Researcher positions at the different institutions.

1.4.3 Exposure of recruited researchers to different environments, and the complementarity thereof

The Network will offer to their recruited researchers numerous opportunities for fruitful **Multidisciplinary and Intersectorial** cooperation and interactions. Within the Network research and training will be performed on six major fields of research, namely, Instrumentation, Metrology, Materials, Electronics, Biology and Medicine. It also involves beneficiaries belonging to four different sectors, namely, 2 private companies (1 industrial and 1 SME), 3 Universities, 4 research centres and 1 metrology institution. In addition 1 SME and 1 Industrial private company appear as partner members. This multidisciplinary and intersectorial nature of the Network is evidenced in the Network wide scientific courses offered by the Network (detailed in Table 1.3), which include curses on all these disciplines. Furthermore, nearly half of the secondments planned, involve participants belonging to different research areas, and involve participants belonging to different sectors. In particular, nearly one third of the total of interactions involve academic/non-academic partners, fully in line with the objectives of the H2020 to promote the technology transfer from academic to non-academic institutions. This fact constitutes a guarantee for the exposure of researchers to other research fields and sectors in the more practical and applied parts of the training program. Finally, the training on complementary and transferable skills will also reflect the multisectorial nature of the Network, with 2 course being conducted by a University, 2 by non-academic partners and 4 by research centres.

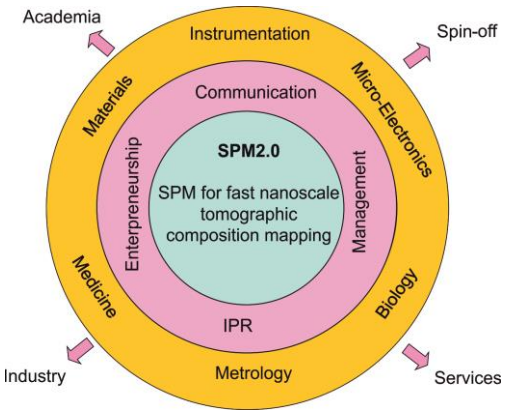
2. IMPACT

2.1 Enhancing the career perspectives and employability of researchers and contribution to their skills development

According to a study sponsored by the National Science Foundation (USA) under the National Nanotechnology Initiative, **nanotechnology products and workers worldwide will double every three years** in the 2010-2020 period.[1] The forthcoming years, then, will witness a strong demand for experienced researchers and highly qualified workers in all areas of Nanotechnology and, in particular, in the area of Advanced Microscopy Techniques.

Specific sectors where ESRs of the Network are expected to continue its professional career include, in the first place, **research and development units of SPM instrumentation and accessories providers**. The global market for SPMs was estimated to be of more than USD 400 million in 2013 and a growth perspective of more than a 20% for 2020[14]. The main competitors in the SPM instrumentation sector include large instrumentation companies (like Bruker, Oxford Instruments, or KEYSIGHT, the latter present in the consortium), as well as, medium and small size companies selling on a regional basis or on a prize competitive basis in niche microscope markets (like JPK, Nanosurf, NT-MDT, etc.). Specialized companies also exist devoted to manufacture probes and accessories like Nanoworld, Olympus or SCL, the later present in the consortium. Competition between the SPM providers is strong and relies on the introduction of new instruments, probes and imaging modes with capabilities overcoming the limits of the existing SPM instruments on the market and focusing on the today and future needs of end-users. **The ESRs of the SPM2.0 Network will receive a unique training on advanced SPM techniques (not available in any other existing SPM training program) and will conduct research in the next generation of advanced SPM systems and applications. For these reasons their employability perspectives in this sector are unparalleled**.

For similar reasons, the **employability perspectives of the ESRs of the Network are also excellent in the end-users sector**. In this sector we find metrology and quality control departments in Nanotechnology based industries (mainly semiconductor, polymer and metallurgic industries), scientific characterization service providers (public and private) and public research laboratories. The end-user sector acquires, at present, around 2.000 new SPM units per year (and up to 2.500 in 2020)[14]. In this sector there is a continuous need to improve the performance and accuracy of Advanced Microscopies and its adaptation to novel samples, materials and environmental conditions, or to access novel fundamental phenomena. **The ESRs of the SPM2.0, with their training on advanced and novel SPM techniques and applications are fully qualified to access these job positions.**



ESRs from the SPM2.0 Network will possess a number of advantages with respect to other ESRs trained in advanced SPM techniques elsewhere. On the first place, **they will benefit from the presence in the Network of beneficiaries and partner members representative of all the potential employability sectors**: KEYSIGHT (and SCL), as SPM instrumentation and probe manufacturers; BNC (and INFINEON) as industrial end-users with SPM needs; NPL, as metrology institution; UNIMORE, TUW and JKU, as university institutions and INSERM, IBEC, ICMM and NANOGUNE, as research centres. This fact will provide a global perspective to the ESR on their career prospects in

[14] The Global Market for Scanning Probe and Electron Microscopes (Future Markets, August 2014).

the SPM sector, which can only be achieved with a Network with the characteristics of the SPM2.0 Network. On the second place, **ESRs will benefit from receiving training from world-leading research leaders and institutions on advanced SPM techniques and innovative applications.** For instance, INSERM is among the world-leading groups in high-speed AFM with recent publications in Science and Cell. Similarly, NANOGUNE is one of the world leaders in scattering type Near Field Optical Microscopy for composition mapping and sub-surface imaging, with numerous publications in prestigious journals like Science, Nature, Nature Nanotechnology or Nano Letters. ICMM, on its side, is a world reference in nanoscale composition mapping and multimode SPM and nanolithography, with authoritative review articles in journals like Nature Materials or Nature Nanotechnology, and original articles in prestigious journals like Cell. And finally, IBEC is a world leader in quantitative electrostatic force microscopy for composition mapping, with recent publications in journals like Nature Materials, Nano Letters or PNAS. On the application side, KEYSIGHT pioneered the world commercialization of the Scanning Microwave Microscope, with applications in sub-surface imaging and doping profiling; BNC is one of the more active players in the applications of Nanotechnologies to Medicine with contracts with major industrial Pharmaceutical industries; UNIMORE is an European leader in organic electronics with numerous licenced patents and creation of spin off companies; and NPL is, together with NIST in the USA, the world leader in metrology and standardization. Training by world-leading teams will **enhance the likelihood of ESRs to become the next generation of scientific world leaders in advanced SPM techniques and their applications**. Thirdly, the employability perspectives of the ESRs from the Network will benefit from the clear **multidisciplinary orientation of the Network**. The SPM end-user sector is clearly multidisciplinary in its nature with around 50% of instruments being devoted to Materials applications and the remaining 50% to semiconductor and life science applications[14]. The organization of the training and research programs of the Network reflects precisely this multidisciplinary nature, and all ESRs of the Network will be directly exposed to ideas, concepts and methods from fields of application as diverse as Instrumentation, Materials, Microelectronics, Medicine or Life Sciences through Network-wide training courses, secondments and communication exchanges. This constitutes a unique opportunity in Europe, which certainly cannot be achieved at a national or local level. Multidisciplinary training is widely recognized as an added value in any research training plan. It allows integrating knowledge, developments and methodologies from different fields into a single framework and help to cross barriers between disciplines. **The multidisciplinary training will qualify ESRs to access job positions in all sectors of SPM application thus increasing notably their employability perspectives**.

Another added value of the SPM2.0 Network that will positively affect the career prospects of its ESRs, is the **intersectorial training** nature of the Network. Globally the SPM field is very intersectorial with the market share for SPM being 40% for applied/industrial customers and 60% from academic government customers.[14] The fact that all participants, **including non-academic members**, are deeply involved in the research and training programme at all levels (hosting of ESRs, training courses, secondment opportunities, etc.) guarantees the exposure of all researchers to other sectors and to other research fields different from the one in which they will perform their daily research. The training program has been designed to ensure that such exposure is effectively achieved, with the design of a secondment plan that ensures it. The ESRs researchers of the Network will, then, benefit from training and exposure to different sectors such as academia, research centres and private companies, which have significantly different drivers. This exposure will allow them to better integrate different approaches to research, providing them a versatility that will increase their future employability prospects and professional development. For instance, ESRs developing research on SPM instrumentation on academic institutions (like IBEC or JKU, just to cite a few), will have an excellent opportunity to become aware of the real needs of Instrumentation (KEYSIGHT), Semiconductor (INFINEON) or Medical Industries (BNC), which ultimately **will foster the involvement of ESRs into transfer of knowledge actions between academia and industry**, a valuable merit to access many jobs positions.

Beyond specific scientific and technical training, ESRs will benefit from intense **transnational mobility**. The ambitious secondment plan of the Network, with mandatory secondments in partners from different countries for at least 3 months, and the organization of Training Workshops and Network Meetings hosted also by members from different countries will provide the fellows with multicultural skills. This multicultural dimension will be highly beneficial for ESRs in crossing cultural borders and will enhance their employability in a global job market.

In this same direction will act the wide **complementary skills training programme**. The complementary skills training programme is rather ambitious and it is not offered by most Doctoral Programmes in Europe, where, if present, it is considered as an optional activity. The complementary skills training will have an immediate impact on the researchers' career in the Network. The partners believe that all aspects of the training will benefit all members of the network, for example an appreciation of IPR protection is important to researchers in academia and industry. Specifically, those researchers willing to continue in a public scientific institution, communication abilities will help in increasing the impact of the scientific publications, the grant application training will guarantee the access to research funding in an advantageous position, while event organization skills will help in the future promotion of the field of research. For those researchers wishing to pursue a career in the private sector, the communication and employment strategies training will constitute an advantage, together with the knowledge of intellectual property

protection and market rules. Finally, for researchers intending to start a career as entrepreneurs, all actions will be beneficial, especially those devoted to leadership.

A **Personalized Employability Plan** will be designed for each ESR of the Network to help fitting the professional expectations of the researchers and help them with the first steps in its fulfilment. The personalized employability plan will suggest employability opportunities in different sectors (academic and non-academic) and make recommendations on the actions to be undertaken. Emphasis will be made on the opportunities offered by the private sector in relation to advanced SPM technologies (providers and end-users) and on the main skills sought by private companies during recruitment processes, as well as, the opportunities as self-employers in the spin-out of SMEs. In the midterm a rapidly expanding job market in these technologies is expected so that the employment perspectives for researchers trained within this Network are excellent. The presence of representatives of top class institutions and companies from outside the consortium in the Final Meeting of the Network will serve ESRs as a springboard to job offers, since they will have the opportunity to show their skills and network with potential employers. In summary, the SPM2.0 Network will offer to graduate students an exclusive opportunity to be trained in one promising area of nanotechnology, and will contribute to make Europe and research careers more attractive and appealing.

The state of the art training received by the ESRs of the SPM2.0 Network **in a fast growing field with a strong socio-economic impact** will fully qualify them to access these novel and highly qualified job positions, and to substantially increase its employability and career perspectives.

2.2. Contribution to structuring doctoral/early-stage research training at the European level and to strengthening European innovation capacity

2.2.1. Structuring doctoral/early-stage research training at European level

Early-stage research/Doctoral training has been recognized as one of the pillars to build the European knowledge based society and the Innovation Union concept,[15] one of the seven Flagships of the EU 2020 strategy. Modern Doctoral training in Europe is being implemented following the seven principles of Innovative Doctoral Training, endorsed in the Council conclusions on the modernisation of higher education in November 2011.[16] Modernization and reforms are conducted with the active participation of both the academic (Universities and Research Centres) and non-academic sectors (Industries and SMEs), and should converge in the structuring of the third education cycle (Doctorate) with a broader perspective than the old fashioned master-apprentice University model. The training program of the Network has been elaborated following these modern principles of Doctoral Training, and hence will contribute to consolidate them and to **create a modern culture of Doctoral Training in Europe**. In particular:

1. The network will promote the **Research Excellence** with the presence in the consortium of institutions and research groups with the highest standards in research. In particular, **three of the PIs have been granted with the prestigious European Research Council grants:** R. Garcia (ICMM, ERC Advanced grant), S. Scheuring (INSERM, ERC Consolidator grant) and R. Hillebrant (NANOGUNE, ERC Starting grant). Moreover, KEYSIGHT is a company world leader in research and innovation in instrumentation and NPL, the National Measurement Institution in UK, is one of the world leading metrology institutions. Finally, IBEC has been recognized as a Severo Ochoa Centre of Excellence in Spain. The presence of these members in the consortium, together with their dynamic and wide research environments, will promote Research Excellence and ensure ESRs can fully develop its creativity and autonomy.

2. The network will promote the existence of **interdisciplinary research options** for the ESRs. This fact is guaranteed by the interdisciplinary composition of the consortium and by the interdisciplinary nature of the training and research activities (including secondments), that will expose ESRs to a broad range of disciplines, including Advanced Microscopy, Molecular Biology, Biophysics, Nanophotonics, Materials, Instrumentation, Microsystems, Nanomedicine or Electronics. The interdisciplinary nature of the network will offer a bunch of opportunities for the cross-fertilization of ideas between disciplines and promote an interdisciplinary approach to research.

3. The **training within the network will meet the needs of an employment market that is wider than academia**. The network has been organized to ensure ESRs are exposed to the whole variety of future employment sectors (Universities, Research Centres, SMEs and Industries). All these sectors are duly represented within the consortium and actively participate in all the network activities, including the organization of specific courses, meetings and the hosting of secondments. Moreover, specific training on **transferable skills** will be delivered on essential aspects for the future professional career of the ESRs in the different sectors, including courses on intellectual property rights, entrepreneurship, market studies, project raising and management and employment strategies.

[15] Europe 2020 Flagship Initiative: Innovation Union, European Commission, 6th October 2010. https://ec.europa.eu/research/innovation-union/pdf/innovation-union-communication_en.pdf

[16] Principles for Innovative Doctoral Training, European Commission, 25th November 2011, http://ec.europa.eu/euraxess/pdf/research_policies/Principles_for_Innovative_Doctoral_Training.pdf

4. The network will contribute to increase the **mobility of researchers and their international networking**. Geographical, interdisciplinary and intersectorial mobility opportunities will be offered to all ESRs through an ambitious secondment plan, complemented by short visits and the participation in international conferences. In addition, many research objectives imply the development of collaborative research between two or more partners, which will be particularly intense in the four ESRs projects jointly supervised by more than one beneficiary.

5. The network will also contribute to the **quality assurance** of doctoral training. On the one hand, the selection of the consortium has been made to ensure the highest quality research environment for the ESRs, as mentioned above. On the other hand, transparent and accountable procedures will be implemented in the recruitment (international advertisement, transparent evaluation criteria, etc.), supervision (PhD supervision plus assessment commission, plus Academic tutoring) and career development of the ESRs (gender equality, equal opportunities, etc.). Finally, this same quality standards are offered by the Universities and Doctoral Programmes in which the ESRs will be enrolled.

The research training programme that has emerged from the fruitful discussions among the partners of the consortium reflects the direction towards which early stage research/doctoral education is being organized at a European level, and then will actively contribute to its structuring and consolidation.

2.2.2 Contribution of the non-academic sector to the research training

An added value of the SPM2.0 Network is the **key role played by non-academic partners**. As mentioned above the collaboration between academic and non-academic sector is considered essential in the renewed initial research training structures that are in current implementation in Europe. In the present consortium the involvement of the non-academic sector in the training programme is very relevant as detailed in Section 1 in relation to the research and training programs. In this sense, the collaboration between the academic and non-academic sectors will be strengthened. We expect that some of the fellows will join industry just after performing training in the Network, while some others will advance their academic careers. In both cases, best practice with regards to academic-non-academic sector collaboration in training and research will be transferred to industry, academia and research centres, thus further promoting the collaboration between these different sectors into initial research training. Secondments to partner laboratories will also ensure sharing of best practice and dissemination of skills across Europe and promote academic/non-academic collaboration in initial research training.

2.2.3. Contribution to strengthening European innovation capacity

Nanotechnology is starting to pervade all aspects of every-day lives with over 1.600 nanotechnology-based products already on the market including electronic devices for computers, mobile phones or the internet, medical diagnostic systems based on engineered nanomaterials and miniaturized laboratories on a chip, nanoparticles for consumer products like food preservation and cosmetics, or new materials for energy generation, car production or house construction.[17] The introduction of new Nanotechnology-based products is expected to continue and accelerate in the forthcoming years where the results of the huge investment in Nanoscience and Nanotechnology of the last decade (with over USD 67 billion public funding and over USD 0.21 trillion private funding[18]) will be capitalized with a bunch of new products. Nanotech Research and Development will then continue to grow across Europe and around the globe and will remain a strong cradle for innovation, with a massive introduction of new Nanotechnology based products and the emergence of new applications not existent at present in essential industrial sectors such as the semiconductor industry, medicine, material sciences or Life Sciences. The European Commission within H2020 has recognized the central role of Nanotechnologies and has designed them as one of the **Key Enabling Technologies** (KETs)[19], which has to drive growth and employment in Europe in the next decade. To keep pace with this revolution **Europe needs to train a large number of highly qualified researchers in the latest advances in Nanotechnology able to face the issues that are currently challenging the Nanotechnology based industries and research centers**. In particular, in the area of Advanced Microscopies, identified challenges include the development of fast nanoscale imaging methods, non-destructive 3D nanotomographic techniques to determine materials' structure and sub-10 nm composition mapping methods in both inorganic and organic samples and in all environmental conditions.[1] The research and training program of the SPM2.0 Network, by offering a **state of the art scientific and technical training in this topic to a whole generation of researchers** will decisively contribute to strengthening Europe innovation capacity in the field of Advanced Microscopies and Nanotechnology applications. Europe is globally among the heaviest users of SPM techniques in the world, with around a 25% of the total of end-users being located in Europe[14], so that fundamental innovation in this field will result in competitive advantages for European industries and research centers. These advantages will be transversal in a number of fields. In the semiconductor and data storage industries, for instance, the SPM techniques to be developed within the Network will offer better tools to detect defect free integrated circuits, to access smaller feature sizes towards the 10 nm node and beyond or to

[17] Project on Emerging Nanotechnologies (2014). Consumer Products Inventory. www.nanotechproject.org/cpi/
[18] 2011 Científica Report: www.cientifica.com
[19] "A European strategy for Key Enabling Technologies - A bridge to growth and jobs" Communication adopted on 26 June 2012.

characterize more complex devices including 3D stacked devices. In the Materials sector they will offer novel views on nanostructured materials used in micromechanical, electronic and magnetic devices, and on low dimensional materials like nanoparticles, nanotubes or 2D dimensional materials (like graphene). Finally, in the medical sector they can impact in providing better chemical and physical characterization of drug particles and potential contaminants within living cells, as part of the fulfillment of the stringent requirements of the regulatory bodies.

The present Network offers **excellent perspectives for the development of the European Scanning Probe Microscopy sector and related job market**. The SPM sector is currently highly competitive and has experienced a process of concentration into a relatively reduced number of large multinational companies, which share most of the total market. The main multinational companies of the sector are KEYSIGHT (present in the consortium), Bruker Nano, Hitachi High-Tech Science Corporation, NT-MDT, Oxford Instruments and Park Systems, with headquarters spreading all over the world (USA, Germany, Japan, Russia, UK or Korea). In addition, some medium and small size companies still share important niches of the marked, especially in Europe, like JPK Instruments (Germany) for bio-applications or Nanosurf (Switzerland) for low-medium cost instruments. The success of the existing European companies in the sector, the creation of new ones, and the establishment of an EU leadership in advanced SPM tools highly depends on the existence of a sufficient number of well-trained scientists and technologists in the area.

2.3. Quality of the proposed measures to exploit and disseminate the project results

2.3.1. Dissemination of the research results

The **communication and dissemination of the research results to the scientific community** will be an important asset of the Network. A good **balance between the need for patent protection with the need for achieving scientific publication** has been agreed between beneficiaries. In this project the non-academic beneficiaries also wish to gain publications as part of their work, as this will increase their standing within the technical sectors in which they operate. Each of the beneficiaries is well versed in ensuring the IP-publication balance is struck and will provide all the support necessary to expedite patenting decisions and file patents/protect IP in such a way as to not prevent publication or presentations at conferences. The balance between IP protection and publication will be overseen by the project Supervisory Board at every board meeting. Once consideration has been given to the protection of eventual intellectual property rights, and necessary steps have been undertaken, where appropriate, the scientific results will be made available to the scientific community through conventional types of diffusion (e.g. articles in peer-reviewed journals, presentations at international conferences and meetings, seminars, webpages, etc.). **Targeted journals** for the publication of results include PLOS One, Nanoscale Research Letters, Nano Letters, Nanotechnology, Review of Scientific Instruments, Biophysical Journal, etc., as well as, top level multidisciplinary journals like Science or Nature family journals. It is expected that on the average each ESR of the Network will publish 2 articles during the duration of the network, so that more than 20 articles on the topic are expected. To be in line with the Open Science priority under H2020, and in particular with the Citizen Science term, **mandatory publication in Open Access journals or in open access repositories will be adopted to increase the access of researchers and general public to the results of the project**. In addition, project participants are committed to spread the results of the projects on several **high-level scientific European and international conferences and symposia on SPM and related topics**. Targeted conferences include: Nanomeasure (KEYSIGHT is the main gold sponsor of this yearly event), Linz Workshop on Advances in Single-Molecule Research for Biology & Nanoscience (JKU and KEYSIGHT, are the organizers of this conference), AFMBiomed (largest AFM conference devoted to AFM bioapplications. INSERM is in the Scientific Committee) and the International conference on Scanning Probe Microscopies (ICMM is within the Scientific Committee). The network consortium is also committed to present **scientific communications in non-SPM international scientific conferences** in sectors of application covering Electronics, Materials, Medicine and Life Sciences, in order to make aware to the non-SPM scientific community on the potential of the novel SPM2.0 techniques. Targeted conferences include the European Material Research Society Meeting, the Trends in Nanoscience and Nanotechnology conference, the International Conference on Organic Electronics or the International Conference on Nanotechnology in Medicine, to which representatives of the consortium have already participated. The consortium members will also disseminate the research results through their participation in other **networks and collaborative projects** (e.g. annual meetings, training actions, summer schools, etc.) to which they belong. Examples include the members of the completed COST Action TD-1002: European Network for the applications of AFM to Nanomedicine and Life Sciences (of which Prof. Scheuring (INSERM); Dr. Gomila (IBEC) and Prof. Hinterdorfer (JKU) were members of the management committee), the European Commission (NMP themes) and the OECD (Nanotechnology board in BIAC) (of which Dr. F. Kienberger (KEYSIGHT) is Project Technical Advisor (PTA)) and the European Association of National Metrology Institutes (EURAMET) (of which NPL is one of the main partners and active in several research projects). The participation on these events will be perfect platform for networking and dissemination of the progress of the SPM2.0 Network.

The **Training Workshops** organized by the Network, being open, will be also another important source of dissemination of the results of the Network. It is expected that up to 30 ESR from outside the Network will attend

them and hence to be exposed to the knowledge generated within the Network. In order to make attractive the courses, they will be made free of charge. Similarly, the workshop on Advanced Scanning Probe Microscopies to be organized together with the **Final Network meeting** will act as an important dissemination event. This workshop is aimed to provide to the Network fellows to present their results to a wider scientific community outside the network together with invited leading academic researchers and industry representatives. Given the tremendous potential impact of the SPM2.0 approach in various emerging fields such as nano-materials, nano-electronics, nano-biology and nano-medicine, and the existing network of contacts, ensure that researchers and companies from outside the Network will be interested in its outcome. Finally, the **webpage** of the Network will include a section where dissemination of the research results of the networks will be provided, including links to the published articles, together with a brief explanatory summary, and news on conferences in which members of the Network will present the results.

The **communication and dissemination of the results to the non-academic industrial sector** of the SPM2.0 technologies is also a central aspect of the dissemination plan of the SPM2.0 Network. The dissemination actions will be specifically focused on two targeted sectors: the SPM manufacture sector (including probe providers) and the nanotechnology industries. The results of the Network will be made available to the targeted industrial audience through a variety of channels. A **Newsletter** will be published yearly to show the main results and outputs of the Network. The newsletter will be distributed electronically to all national and international industrial contacts, and industrial consortia and funding agencies, and will be posted on the public part of the Network webpage. In addition, **Application Notes** will be also produced to illustrate the novel applications developed to specific sectors and guide the new users in its implementation. Finally, **a special session of the Final Meeting workshop on Advanced SPM techniques will be addressed to the industrial sector**. The beneficiaries have close links and contacts with the most relevant SPM manufacturer companies of the sector: KEYSIGHT, present in the consortium, is one of the main SPM companies of the sector; ICMM with Oxford Instruments, an AFM manufacturer company, with which he has licenced some patents; IBEC, with two SPM manufacturer companies Nanosurf and JPK and with Nanoworld, the main probe manufacturer in Europe; NANOGUNE with Neaspec manufacturing IR-SNOM systems, UNIMORE with NT-MDT, an AFM manufacturer company, INSERM with RIBM manufacturing High-Speed AFMs, etc.. In addition, concerning Nanotechnology industries INFINEON, partner member of the Network, is the main semiconductor manufacturer company in Europe with close contacts with many major and minor industrial nanotechnology companies, KEYSIGHT and NPL have an extensive portfolio of costumers in the nanotechnology industrial sector, and BNC has an extensive list of contacts within the nanomedicine industrial sector. **This network of contacts within the non-academic industrial area will ensure the information disseminates effectively to a large number of private companies**. In addition, generic dissemination among industrial consortia, such as, the Nanotechnology Industries Association (NIA, www.nanotechia.org), the Semiconductor Industry Association (www.semiconductors.org) or the European Nanomedicine Platform (www.etp-nanomedicine.eu) will also be targeted, as well as, other consortia, such as, the recently created Knowledge and Innovation Communities (KICs) set up by the European Institute of Innovation and Technology as an initiative of the European Union to drive European leadership in various fields of innovation for economic growth and quality of life, such as ICT (EIT ICT Lab), Energy (InnoEnergy) or Health (InnoLife) (of which IBEC is core member).

2.3.2. Exploitation of results and intellectual property

The SPM2.0 will be **very active in the protection of the generated knowledge and in looking for appropriate commercialization routes**. In this context significant commercial opportunities of the novel SPM2.0 technologies to be jointly developed and eventually commercialized have been identified. The identified items are listed below, together with the partners involved, IPR action foreseen and a potential commercialization route:

Items for exploitation	Partners involved	IPR	Potential commercialization route
Environmental High Speed AFM	INSERM	patent	Licence (Inst. Biom. Metrology, Ltd., Japan)
Novel s-SNOM probes	NANOGUNE	patent	Licence (Neaspec, Germany)
Probes for high speed AFM	JKU, TUW	patent	Licence (SCL, partner member)
Multiparametric composition AFM	IBEC, ICMM	patent	Licence (Oxford Instruments, UK)
3D doping profiling microscope	KEYSIGHT	patent	Commercialization (KEYSIGHT)
Novel electronic devices	UNIMORE	patent	Licence (INFINEON)

A guarantee for the success of the exploitation plan is the wide experience of the industrial partners of the consortium on IPR protection and commercialization (KEYSIGHT on SPM instrumentation, BNC on novel applications of Nanotechnology in Medicine, INFINEON on novel semiconductor devices and SCL on SPM probe manufacture). Additionally, academic groups are also expert in IPR protection and exploitation: ICMM, NANOGUNE, JKU and UNIMORE all hold licenced patents in the sector. A key aspect for the success of the exploitation plan is the **IPR protection and management Plan** (including IPR conflict resolution) designed for the Network (Section 3).

2.4. Quality of the proposed measures to communicate the project activities to different target audiences

2.4.1. Communication and public engagement strategy of the project

The **communication and dissemination of the results to the general public** will be addressed within the Network through a dedicated area of the webpage and through the active participation in national and international outreach activities. The area of the **webpage dedicated to the general public** will explain the benefit of the results of the Network for society. This area will promote in plain words how nanoscale SPM2.0 technologies can provide important social advantages derived from their application to key sectors such as the electronics industry and the medical technologies, among others. Special emphasis will be dedicated in this area to increase young people's basic knowledge and involve them in a debate addressing associated social aspects. Via the web portal, students will be able to participate in a range of activities such as a **virtual laboratory, games and dilemmas**, that will enable them to learn and debate concepts and applications related with Advanced Microscopies and Nanotechnologies in a European context. IBEC has experience in designing such virtual laboratory experiments through its past participation, together with the Barcelona Science Park (PCB), in the NANOYOU project (www.nanoyou.eu), funded by the European Commission. The dissemination activities to the general public through the webpage will receive the support from the Barcelona Science Park (PCB), where IBEC is hosted, through the programme Research in Society of PCB which hosts more than 6.000 visits per year. At the end of the Network, the website will be kept 'alive' with the results obtained along the Network. As part of the **outreach plan** all members of the consortium are committed to **encourage the investigators to engage with the public and the stakeholder** by having interviews, round table discussion and exhibition in science festivals in order to raise the status of the field in the Europe and encourage the generation of a significant number of young scientists with the skills to carry forward and diversify the myriad economic and social opportunities promised by SPM2.0. IBEC, coordinator of the Network, is particularly committed to this type of actions and has a long experience in participating in them (e.g. "Week of Science in Catalonia" with seminars and experimental demonstrators, seminars at high schools, open days, etc.). To favour access to the general public, **press releases** will be elaborated on significant breakthroughs achieved by members of the Network and distributed among newspapers and mass media, with the support of the respective communication offices. Given the relevance and novelty of the topics addressed in the network there is a reasonable likelihood that before the end of the Network some news related to the discoveries of the network appears on a national or regional mass media. Several members of the consortium have in the past already achieved this (ICMM national newspaper, JKU national radio, IBEC regional television and local newspaper, etc.). Also there is the commitment to participate in the **European Research Night**, a Europe-wide event taking place in many cities and countries every year on the last Friday of September and sponsored by the European Commission. Members of the consortium will contact local organizers when publicly available to schedule its participation with an activity related to the SPM2.0 technologies. IBEC has participated in the activities of the European Research Night 2014 in Barcelona.

3. IMPLEMENTATION

3.1. Coherence and effectiveness of the work plan

Table 3.1: Individual Research Projects. *(The content and purpose of the secondments are explained in Section 1.2.1)*

Fellow: ***ESR1***	**Host:** ***IBEC***	**PhD Enr: Y**	**Start:** ***M6***	**Duration:** ***36M***	**Deliverables*: D3.3, D6.3***
Title: High resolution nanoscale composition mapping with electrostatic force microscopy (WPs 2, 3, 6)					
Objectives: To push forward the current limits of nanoscale composition mapping based on electrostatic force microscopy on what concerns spatial resolution and imaging in liquid conditions. Demonstrate its capabilities in the label free mapping of the nanoscale composition of natural and model biomembranes.					
Expected Results: It is expected that composition mapping based on electrostatic force microscopy can be achieved at sub-10 nm spatial resolution in both air and liquid media, and that this performance can be used to map for the first time in a label-free way the nanoscale composition of natural and model biomembranes.					
Planned secondment(s): S2-INSERM (M12, 3 M; M24, 3M), S6-UNIMORE (M36, 2 M).					

Fellow: ***ESR2***	**Host:** ***IBEC***	**PhD Enr.: Y**	**Start:** ***M6***	**Duration: 3*6M***	**Deliverables:** ***D2.2, D3.5***
Title: Nanoscale tomography based on electrostatic force microscopy (WPs 2, 3)					
Objectives: Develop a 3D nanoscale tomographic imaging system based on electrostatic force microscopy and demonstrate its capabilities in the 3D tomographic imaging of nanoparticle within validation samples.					
Expected Results: At the end of the project it is expected that the first true 3D nano-tomographic system based on electrostatic force microscopy has been developed. The capabilities of the systems are expected to have been demonstrated on problems of current interest, like the 3D non-destructive imaging of nanoparticles within materials.					
Planned secondment(s): S7-NPL (M18, 1M), S10-BNC (M24, 2 M), S4-JKU (M36, 1 M),					

Fellow: *ESR3*	Host: *INSERM*	PhD Enr.: Y	Start: *M6*	Duration: *36 M*	Deliverables: *D4.1*
Title: High speed atomic force microscopy under controlled environmental conditions (WPs 4)					
Objectives: To develop a high speed atomic force microscope with integrated temperature control and flash induced activation of caged compounds and to apply it in the study of the dynamics of membrane proteins.					
Expected Results: It is expected that a novel instrument able to perform high speed AFM imaging under temperature control and enabling flash activation of caged compounds is fully functional. It is also expected to have demonstrated that the system allows unrevealing unknown properties of the dynamics of biomembranes.					
Planned secondment(s): S4-JKU (M18, 2 M), S9-TUW (M26, 1 M), S10-BNC (M36, 1 M).					

Fellow: *ESR4*	Host: *INSERM*	PhD Enr.: Y	Start: *M6*	Duration: 3*6 M*	Deliverables: *D6.4*
Title: High-speed atomic force microscopy to reveal alterations of mutated protein function (WPs 6)					
Objectives: To use HS-AFM to observe one of the endosomal sorting complexes required for transport (the ESCRT-III) at the single molecule level and mutants of them to describe at the single molecule level how function is altered.					
Expected Results: It is expected to quantitatively assess the forces used in the process of membrane deformation and fission occurring during HIV infection by ESCRT-III protein and some of its mutants. It is expected to provide a novel non-biochemical view to the problem of HIV infection to provide a different approach and medical attack.					
Planned secondment(s): S4-JKU (M12, 2 M), S10-BNC (M24, 1 M), S3-ICMM (30M, 1 M).					

Fellow: *ESR5*	Host: *ICMM*	PhD Enr.: Y	Start: *M6*	Duration: 3*6 M*	Deliv.: *D2.1, D3.2, D5.1*
Title: Compositional mapping of soft matter in air/liquid by multifrequency force microscopy (WPs 2, 3, 5)					
Objectives: To design a multifrequency AFM method, its implementation and modelling with the capabilities to be operated at sub-20 pN peak forces in liquid. The method would use amplitude, dissipation and/or frequency modulation feedbacks and should be compatible with small cantilever probes and sub-1 nm spatial resolution.					
Expected Results: The system will provide topography and compositional images in less than 1 s and with sub-1 nm spatial resolution in certain systems, everything in liquid environment. It is also expected to have demonstrated its capabilities with the label free composition mapping of block co-polymers and to measure strain-stress curves of isolated biomolecules.					
Planned secondment(s): S1-IBEC (M18, 1 M), S6-UNIMORE (M24, 2 M), S8-KEYSIGHT (M36, 1 M).					

Fellow: *ESR6*	Host: *JKU*	PhD Enr.: Y	Start: *M6*	Duration: *36 M*	Deliv.: *D3.4, D4.3, D6.1*
Title: High speed molecular recognition microscopy (WPs 3, 4, 6)					
Objectives: To integrate high speed atomic force microscopy with molecular recognition microscopy. To demonstrate that it is able to localize specific binding sites with nm positional and 50 ms temporal resolution. To determine the concentration of analytes and cellular receptors in model and native biological membranes.					
Expected Results: It is expected to have demonstrated the first high speed recognition imaging microscope utilizing ligand conjugated tips in liquid environment. Specially tailored tip functionalisation protocols are expected to have been developed. The system is expected to be demonstrated on isolated and soluble proteins conjugated to surfaces down to ultra-low densities and on receptors reconstituted into lipid bilayers.					
Planned secondment(s): S2-INSERM (M18, 3 M), S9-TUW (M30, 1 M).					

Fellow: *ESR7*	Host: *NANOGUNE*	PhD Enr.: Y	Start: *M6*	Duration: *36 M*	Deliverables: *D3.1, D4.4*
Title: Enhanced chemical sensitive infrared scattering scanning near optical microscope (WPs 3, 4)					
Objectives: To develop novel spectroscopy methods based on infrared s-SNOM and nano-FTIR and to adapt them to enable imaging and spectroscopy in liquid media. To develop novel probes.					
Expected Results: At the end of the project it is expected that a state of the art s-SNOM system has been developed, with increased sensitivity and spatial resolution, thanks to the use of optimized probes, and able to be operated in the liquid environment for potential biological applications.					
Planned secondment(s): S9-TUW (M12, 1 M), S8-KEYSIGHT (M24, 2 M), S3-ICMM (M36, 1 M).					

Fellow: *ESR8*	Host: *NANOGUNE*	PhD Enr. :Y	Start: *M6*	Duration: *36 M*	Deliverables: *D2.2, D5.2*
Title: Subsurface chemical mapping based on infrared near-field spectroscopy (WPs 2, 5)					
Objectives: To develop methods for subsurface and depth-resolved infrared nanoimaging and spectroscopy based on s-SNOM and nano-FTIR and to demonstrate their capabilities with the chemical mapping of polymer nanocomposite materials.					
Expected Results: It is expected that a system able to perform nanoscale subsurface maps of the chemical composition of materials is available, and that its capabilities have been demonstrated in the mapping of the chemical composition of polymer nanocomposites with nanoparticle phase-separated properties.					
Planned secondment(s): S1-IBEC (M18, 1 M), S8-KEYSIGHT (M24, 2 M), S7-NPL (M36, 1 M).					

Fellow: *ESR9*	Host: *NPL*	PhD Enr.: Y	Start: M*6*	Duration: *36 M*	Deliverables: *D7.1, D7.2*
Title: SPM2.0 metrology and standardization (WP 7)					
Objectives: To improve on the reproducibility of results obtained using advanced scanning probe microscopies by identifying key variables as well as to quantify the uncertainties related to material properties measurement using these methods. The methods developed should be as generic as possible to be applicable and useful to all partners.					
Expected Results: Good practice methods to calibrate instrument response. Instrument variation quantified and uncertainty budget for at least two chosen methods. Accuracy and uncertainty in measured signal will be translated to accuracy and uncertainty in materials property measured. Model and methods for tip interaction area.					
Planned secondment(s): S9-TUW (M12, 2 M), S5-NANOGUNE (M24, 2 M), S6-UNIMORE (M30, 1 M).					

Fellow: *ESR10*	Host: *KEYSIGHT*	PhD Enr.: Y	Start: *M6*	Duration: 36 *M*	Deliverables: *D2.2, D3.6*
Title: Microwave microscope for 3D tomography including hardware, software, and modelling (WP 2, 3)					
Objectives: Development of a scanning microwave microscope (SMM) for 3D tomographic imaging with a focus on shallow subsurface imaging capabilities. 3D SMM experiments will be compared to 3D finite element modelling FEM including EMPro. Performance evaluation experiments will be done.					
Expected Results: An integrated 3D tomographic SMM imaging in air and liquid. Novel nose cone and liquid cells are developed, as well as, S21 sample plates. Novel microwave measurement workflows are implemented including interferometric imaging to increase the sensitivity to 0.3 aF in impedance. 3D FEM EMPro/Comsol modelling to help hardware design and in the data interpretation. Simple imaging scripts are developed.					
Planned secondment(s): S7-NPL (M12, 3 M; M24, 3M); S5-NANOGUNE (M36, 2 M).					

Fellow: *ESR11*	Host: *KEYSIGHT*	PhD Enr.: Y	Start: *M6*	Duration: *36 M*	Deliverables: *D5.4*
Title: 2D and 3D nanoscale doping profiling with the scanning microwave microscope (WP 5)					
Objectives: Development of a fast capacitance-voltage methodology based on the scanning microwave microscope (SMM) for 2D and 3D doping profiling of semiconductor materials and devices. Application of the system to last generation transistors and SRAM.					
Expected Results: It is expected that the integration of fast capacitance-voltage spectroscopic imaging in a scanning microwave microscope will enable to obtain high resolution 2D projection maps of doping profiles to enable a reliable reconstruction of 3D nanoscale doping profiles. The first demonstrations of this capability it is expected to be obtained on last generation microelectron devices close to the production state.					
Planned secondment(s): S7-NPL (M18, 2 M), S6-UNIMORE (M24, 1 M), S5-NANOGUNE (M30, 1 M).					

Fellow: *ESR12*	Host: *TUW*	PhD Enr.: Y	Start: *M6*	Duration: *36 M*	Deliverables: *D4.2*
Title: Novel high speed atomic force microscopy probes (WP 4)					
Objectives: Identify novel materials and fabrication procedures to develop novel high speed AFM probes. Produce prototypes of the novel probes.					
Expected Results: At the end of the project it is expected that novel high speed AFM probes compatible with mode selective cantilever excitation have been produced and tested. It is expected to have evaluated the possibility to fabricate the probes following a batch-fabrication process.					
Planned secondment(s): S2-INSERM (M18, 2 M), S4-JKU (M24, 1M), S11-BNC (M30, 1 M).					

Fellow: *ESR13*	Host: *BNC*	PhD Enr.: Y	Start: *M6*	Duration: 36 *M*	Deliverables: *6.2*
Title: Label free monitoring of nanoparticles uptake by living cells (WP 6)					
Objectives: To study living cells-nanoparticle interactions for nanotoxicity applications. To develop sample preparation protocols and imaging workflows for 3D EFM tomography to monitor nanoparticle distribution within living cells. To study new methods for nanoparticle toxicity evaluation.					
Expected Results: It is expected that a novel method to monitor the distribution of nanoparticles within living cells has been developed. In situ internalization routes and toxicity effects of nanoparticles in cells will have been investigated in a label free way for the first time, providing new insights into methods for nanotoxicity evaluation free from any interference from labelling agents.					
Planned secondment(s): S1-IBEC (M12, 3 M; M24, 3 M), S5-NANOGUNE (M36, 2 M).					

Fellow: *ESR14*	Host: UNIMORE	PhD Enr.: Y	Start: *M6*	Duration: *36 M*	Deliverables: *D5.3*
Title: Optimization of the nanoscale composition of novel organic thin film transistors (WP 5)					
Objectives: To develop novel methods to optimize the nanoscale composition of organic thin film transistors with improved performance based on the composition mapping techniques developed within the project.					
Expected Results: It is expected that organic thin film transistors with improved performance have been developed. The improved performance it is expected to arise from a tighter control of the nanoscale composition of the thin organic film obtained with the use of the composition sensitive SPM2.0 techniques.					
Planned secondment(s): S5-ICMM (M12, 3 M; M24, 3M), S9-TUW (M36, 2 M).					

3.2. Appropriateness of the management structure and procedures

3.2.1 Network organisation and management structure

The management structures of the SPM2.0 Network are composed of the Coordinator, the Supervisory Board, the Recruitment Committee, the Training Committee and the Fellows Committee. These management structures will (i) make management functions clear and verifiable, (ii) facilitate and manage the interaction of the different groups in the consortium and the integration of different backgrounds from academic and industrial environments and (iii) guarantee the highest quality in the recruitment, research and training programmes and in the assessment of the training progress of the fellows. A **Consortium Agreement** will specify the management structure and the relationship among partners concerning the decision-making procedures and the rights and obligations of the partners concerning liability, access rights, dispute resolution and intellectual property.

The **Coordinator (IBEC)**, supported by the Project Management office from IBEC, will be responsible for supervising the day-to-day management, the overall financial administration and distribution of funds and liaison with the European Commission (EC). IBEC, with only 8 years of history, has coordinated 3 European research projects (BIO-LIGHT-TOUCH, MYSPINE, NANGIOFRAC) and one Research and Training project (FIBROGELNET-IAPP), and has been beneficiary in 6 additional ones (V-SMMART Nano, THE GRAIL, ANGIOSCAFF, DISC REGENERATION, EUROSURGE, etc.), and in 1 Marie Curie Training ITN (NANOMICROWAVE). IBEC has also participated in one technology transfer oriented action (NANO2MARKET) and is one of the core members of the recently approved KIC INNOLIFE. The experience in managing multi-institutional, multi-national projects will be applied in ensuring this network runs smoothly and delivers the milestones and deliverables timely. The leading scientist (Dr. Gomila) has also wide experience in project MGT. He has been PI in 2 European Projects (including a Marie Curie ITN from FP7), and has been PI in 4 National ones.

The **network management** will be supported by an effective **internal communication** strategy, whose main instrument will be the intranet part of the webpage of the SPM2.0 Network, with access restricted to the members of the Supervisory Board and fellows. In the intranet a detailed schedule of activities will be continuously updated together with an updated version of the Network Plan. Moreover, a repository of documents containing deliverables, dissemination, meeting minutes and presentations, progress reports, guidelines, and templates will be continuously available and updated. The intranet will be used also for the submission of reports on the deliverables to the Coordinator. This information will be supplemented by oral presentations and discussions at the Network Meetings, and by bilateral and multilateral exchanges of information by email or through videoconferences.

The network will also implement a specific **strategy for dealing with scientific misconduct** (i.e. research involving or generating materials, methods or knowledge that could be misused for unethical purposes and fabrication, falsification and plagiarism). In order to preserve research integrity, at all stages of the project, any alleged or suspected cases of scientific misconduct incurred by applicant Principal Investigators or by applicant legal entities will be duly assessed internally and informed to the EC (if necessary). The Supervisory Board will follow and implement the guidelines reported in "A comprehensive strategy on how to minimize research misconduct and the potential misuse of research in EU funded research" which is based on discussions among 51 Ethics Experts with previous experience in EU Ethics Screening, Review and Audit (chaired by Johannes Rath from 12/2009 to 03/2010).

The **financial management strategy** of the Network will be oriented towards enabling the basis for fulfilling the defined WPs and tasks. The funding distribution will be based on the recruitment planning of each institution and the assessment of the development Network activities according the plans and guidelines given by the European Commission. Individual budgets of the partners could be subject to updating and reallocation if milestones (especially concerning training) are not met and/or reallocation of budgets between Network partners is required for improved functioning of the Network. In such cases and according to rules, prior approval of the European Commission Services will be asked. Each partner will send all documents necessary to justify rightful use of the funds (in accordance with the contract signed with the EC) to the coordinator. Such documents will help the Coordinator and the Management Office to prepare financial reports. The Network will supply financial reports in accordance with the financial guidelines of the EC at the end of each reporting period.

3.2.2. Supervisory Board

The **Supervisory Board** will be in charge of the strategic direction and proper administration of the Network being the ultimate decision-making body for the consortium. It will be composed by the Coordinator and Chair (Dr. Gomila, IBEC) and one representative of each partner (Prof. Scheuring, INSERM; Prof. Hillebrand, NANOGUNE; Prof. Hinterdorfer, JKU; Prof. García, ICMM; Dr. Cuenat, NPL; Dr. Kienberger, KEYSIGHT; Prof. Schmid, TUW, Dr. Actis, BNC and Prof. Fabio Biscarini, UNIMORE). This board will be responsible for (i) ensuring recruitment procedures are open, transparent, and internationally comparable, (ii) supervising the integration of the fellows in the hosting institutions, (iii) ensuring that scientific and technological training through personalised research projects is

balanced with complementary skills training to guarantee their future employability in all sectors, (iv) following the implementation of the research and training plan and solve any problem that may arise, (v) supervising the organisation of Network Meetings, (vi) guaranteeing the exchange of best practices among the partners, (vii) assessing the scientific achievements and progress, scientific matters including research, publishing and possible exploitation issues, (viii) providing uniform procedures to the Network with the elaboration and approval of guidelines for the elaboration of the PCDPs, the Employability Plans and the ESR Assessment and Recruitment.

The **Training Committee**, on its side, will be responsible for implementation of the Network based training activities and will care about the organisation of the Network wide training activities, the intermediation in training related conflicts, advising appropriate training directions, and in the follow up of Doctoral Studies. It will be coordinated by Prof. Hinterdorfer (JKU), and will include Dr. Kienenberg (KEYSIGHT), Prof. Scheuring (INSERM) and Prof. Biscarini (UNIMORE), providing academic, industrial and research experience, respectively. This committee will be responsible for (i) defining together with the fellows and supervisors their PCDP, as well as, monitoring their progress by appointing an assessment commission for each ESR, (ii) define the training programme, both on the Network and individual level, (iii) evaluating the integration of the Network into local training programmes, (iv) supervising and managing of the training activities and (v) follow up of doctoral studies by the ESRs.

The **Recruitment Committee** is the body responsible for identifying and recruiting potential candidates. It will be coordinated by Prof. Schmidt (TUW), and include Prof. Garcia (ICMM) and Dr. Actis (BNC), representing again the academia, research, and industrial sectors. This committee will be responsible for (i) developing a written recruitment plan defining the step by step process of employment, (ii) assuring gender balance within the recruitment procedure, (iii) preparing guidelines of best practice for the recruitment of researchers, (iv) advertising of positions through websites and well-read international scientific journals, (v) preparing posters and flyers to promote the Network vacancies, (vi) dealing with problem that may arise in the recruitment process, including the lack of suitable candidates, (vii) helping validating all data provided by the applicants and (viii) supporting the scientist in charge at the hosting partners in managing the recruitment of fellows.

The **Fellows Committee**, will represent all the research fellows and will be led by one ESR each year, selected yearly by all ESR by majority vote. Within this board ESRs will exchange their experience and information, support each other, increase their level of knowledge on their rights, analyse problems, launch fellow-related initiatives, discuss issues related to expectations and needs, supply input for the improvement of the programme and training, etc.

3.2.3. Recruitment strategy

A total of 14 ESRs will be recruited by the 10 host institutions in the Network. The recruitment of researchers will be open, transparent, international, competitive, and based on an equal opportunity policy following "Charter of researchers" and the "Code of conduct for the recruitment of researchers". The Recruitment Committee will be in charge of implementing the recruitment strategy, together with the host scientific supervisor. To recruit the candidates, the positions will be widely advertised internationally (in particular, Euraxess) inviting the prospective ESRs to search for further information on the SPM2.0 website. Application will be by submission of a CV, detailed list of qualifications, publications, letters of support and a letter describing why they wish to study in this particular research area. Three candidates will be pre-selected for each position, with which subsequent interviews will be held by videoconferencing in order to minimise the travel expenses. The best candidate will be selected and invited to enter the SPM2.0 community, after proper validation of all data and documents provided by the applicants.

3.2.4. Progress monitoring and evaluation of individual projects

The **progress monitoring of the Network** will be achieved by a continuous monitoring and assessment of the progress made on the Research and Training Programmes. To this end, every six month every beneficiary will be asked to present to the Coordinator (IBEC) a short report describing all the actions carried in this period concerning recruitment of fellows, research performed and training actions. Moreover, at the yearly Meetings of the Network, each partner will report in front of the other partners on these same items but for a one year period. All members of the Supervisory Board, Training Committee and Recruitment Committee will attend the meetings, together with the ESRs and Supervisors. The typical duration of a **Network Meeting** will be one day and a half. During the first day (except for the Kick-off meeting), ESR will make short presentations of the progress of their individual research projects, and discuss the results with the rest of the members of the consortium. The Supervisory Board will use these presentations to evaluate the scientific progress of the Network, while the Assessment Commissions will use them to evaluate the individual progress of the ESR. During the remaining half day (restricted only to Board members), the different boards will meet and evaluate the scientific, training and management evolution of the network. The organization of the Meetings will be responsibility of the host institution supported by the Supervisory Board. The meetings will be organized, in order, by IBEC, INSERM, JKU, KEYSIGHT and IBEC. The dates and organizers of the Network Meetings will be made to coincide with the Training Workshops described in Section 1.2.2 to minimize

travel expenses and organization tasks. All Meetings shall be convened by the Coordinator with at least forty-five calendar days prior notice including an agenda of the reunion. Officials from the European Commission will be invited to attend the Network Meetings in order to review the ongoing progress. Minutes of all Meetings will be done by the Project Manager, and transmitted to the partners within fifteen days for approval within fifteen additional days. Finally, the **timely submission of the deliveries** will be considered to monitor the progress of the Network. This information will be collected in the annual progress reports, which will be approved by the Supervisory Board. In the progress reports, in addition to the technical information, the milestones of the period will be analysed, and the eventual activation of contingency plans described, as well as, any eventual readjustment of the schedule plan.

The progress of the **Individual Research Projects** will be locally monitored by the ESR's Supervisor and network-wide by the ESR **Assessment Commissions**. In the first assessment (1st Network Meeting), the ESR will present and discuss the PCDP agreed with the Supervisor and the initial results of the research. In the second assessment (2nd Network Meeting), the ESR will report on the evolution of its research project and of the results obtained. Finally, in the third assessment (3rd Network Meeting), he/she will present the conclusions on the work and a draft version of the PhD thesis. The recommendations of the commissions will be forwarded to the ESR and Supervisory Board and Training Committee. Common grounds on the assessment of ESRs will be guaranteed by the Training Committee.

3.2.5. Doctoral studies and PhD thesis

All ESRs of the Network will be enrolled in a Doctoral Program at a University. The list of Universities and Doctoral programmes corresponding to each ESR fellow are detailed in the Table below:

ESR	University of Enrolment	Doctoral Program/Link to contents and regulations
ESR1, ESR2	Universitat de Barcelona	Nanociences Doctoral Program
ESR3, ESR4	Aix-Marseille Université	Sciences de la Vie et de la Santé / Ecole doctorale 062
ESR5	Universidad Autónoma de Madrid	Condensed Matter Physics, Nanoscience and Biophysics Doctorate
ESR6	Johannes Kepler University Linz	Graduate college on NanoAnalytics of cellular systems
ESR7, ESR8	Universidad del País Vasco	Physics of Nanostructures and Advanced Materials Doctorate
ESR9	University of Surrey	Doctoral Training in Micro- and Nanomaterials and Technologies
ESR10, ESR11	Johanes Kepler University Linz	Graduate college on NanoAnalytics of cellular systems
ESR12	Technical University of Wien	Doctoral Programme in Technical Sciences
ESR13	Imperial College London	Graduate School Imperial College London
ESR14	Università Modena e Regio Emilia	School of graduate studies on Physics and nano sciences

The ESR Supervisor, and the Network as a whole, through the Training Committee, will support ESRs in the whole evolution and procedures of Doctoral studies: application access to the University Doctoral Program, enrolment in the University Doctoral Program, assignment of an Academic Tutor at the University and of the Supervisor as Thesis Supervisor at the beneficiary Institution, yearly assessment and follow up by the Academic Commission of the University Doctoral Program, preparation of the Doctoral Thesis and, finally, defence of the Doctoral Thesis at the University. Special support and assistance on the specific regulations and implementations (detailed in the links above), and that may vary from country to country, will be provided. A specific task in WP7 (Task 7.4 lead by UNIMORE) has been created to monitor the evolution of the Doctoral studies of the ESRs of the Network, and ensure all ESRs complete the corresponding Doctoral phases and defence the PhD thesis by the end of the contract.

3.2.6. Intellectual Property Rights (IPR)

All research results generated by the SPM2.0 Network will be considered for protection with appropriate steps taken towards industrial exploitation (some of them have been identified in Section 2). Before dissemination, research results will be evaluated by the Supervisory Board to determine its possible protectability, working always in accordance to Horizon2020/EC contract rules regarding background and foreground and taking also into account national regulations and the guidelines of the IPR-Helpdesk funded by the European Union (www.ipr-helpdesk.org). The Supervisory Board will determine the ownership of the IP and each co-owner will be the main responsible of adequately protecting its knowledge through the most adequate protecting measure (patenting, copyright, industrial secret, etc.). When more than one partner owns the IP, the co-owners will act in concert to negotiate a joint ownership agreement. For each result the contribution of each partner will be evaluated according to the partner role in the value chain of the product. Specific conditions for the future use of the knowledge and experience obtained and the tools developed in the Network for the remaining partners will be detailed in the Consortium Agreement. The exploitation opportunities arising from the protected knowledge will be evaluated among the owners of the IP, which will determine the better exploitation strategy. The wide experience of the industrial partners will be very valuable on these aspects. A balance between IP protection and scientific publication will be overseen by the project Supervisory Board, which will ensure ESRs achieve timely publication of their research, so as to advance their scientific careers.

3.2.7. Gender aspects

Following the EC recommendation on the implementation of Responsible Research and Innovation as a cross-cutting issue in H2020 projects, as well as in direct relation with national policies of gender impact, gender equality has been and will be carefully considered. In this sense, partners are well aware of the need to promote equality of opportunities between women and men. Most of the topics presented in this Network are, unfortunately, dominated by males. The Recruitment Committee together with the Advisory Board will oversee the recruitment of the researchers in order to ensure not only a good balance of skills and nationalities but also gender equilibrium. It will take all reasonable measures to pursue the objective, defined by the Commission in different Work Programmes, of at least 40% recruitment of women. Actions to accomplish previous objectives will be focused on addressing equal employment policies, including family-friendly plans. All partners will be required to fully respect the best EU regulations on awarding of parental leave. Additionally, flexible working hours to personnel having a family in charge will be offered. The Network will create an environment where gender parity is established so that women will have strong opportunities to reach senior positions in the SPM2.0 field.

3.3. Appropriateness of the infrastructure of the participating organisations

A brief description of each participating organization within the project is given in the Table below.

Beneficiary	Description
IBEC	Bioengineering research institute with over 200 researchers covering most bioengineering fields, from basic research to medical applications, with focus on nanomedicine.
INSERM	French national institute for health research. Founded 50 years ago, covers all facets of fundamental and applied biomedical research, from biophysics to public health.
ICMM	Belongs to CSIC the largest scientific institution in Spain. ICMM has 102 staff members and about 350 employees. The ICMM ranks number 129 in the world (all research areas).
JKU	Over 19,000 students enrolled in over 60 modern, hands-on academic degree programs that have outstanding career prospects. Research recognized worldwide.
NANOGUNE	Research Centre devoted to exploratory and technologically multi-disciplinary research in nanoscience and nanotechnology. Founded in 2009, has 100 employees.
NPL	UK's dominant National Measurement Institute and Governments largest directly owned science and technology (S&T) asset. Over 700 employees.
KEYSIGHT	World's premier measurement company. Broadest range of innovative measurement solutions for Nanotechnology and Electronic Measurement.
TUW	One of the oldest Universities in Europe and among the 10 most successful technical universities in Europe. It is Austria's largest scientific-technical and educational institution.
UNIMORE	Founded in 1598, UNIMORE is the third largest University of Emilia Romagna. It offers interdisciplinary graduate programmes also connected with industries.
BNC	First consultancy in Europe to focus on the interface between bio and nanotechnology, providing product development, strategic consultancy, and state of the art instrumentation.
Partner SCL	SME that focuses on the development of next generation Atomic Force Microscopy (AFM) cantilevers. Multidisciplinary team of specialists.
Partner INFINEON	Major European semiconductor company covering applications for Energy Efficiency, Mobility and Security. Market leader in power semiconductors and smart card ICs.

3.4. Competences, experience and complementarity of the participating organisations and their commitment to the programme

3.4.1. Consortium composition and exploitation of partners' complementarities

The consortium shaped for the SPM2.0 Network is composed of 4 research institutes, 3 high education centres, 2 large industrial companies and 1 SME as beneficiaries, plus 1 large industrial company and 1 SME as partner members, carrying out top quality fundamental and applied research activities. The consortium provides a well-balanced multisectorial approach between research and transfer into industrial practice and covers the entire chain from basic science and technology to product development. By fields of expertise the consortium comprises 2 partners from the Biology area (IBEC, JKU), 2 from the Medical area (INSERM, BNC), 2 from the Material science area (NANOGUNE, ICMM), 2 from the Microtechnology and Electronics area (TUW, UNIMORE) and 2 from the Instrumentation and Metrology area (KEYSIGHT and NPL). With this composition the consortium covers all the research fields required to successfully achieve the goals of SPM2.0 for training the next generation of multidisciplinary researchers in the field of SPM2.0 techniques and related areas of application in biology, medicine, electronics and materials. The interaction of the researchers in such a multidisciplinary Network will contribute in

the formation of professional profiles having a distributed background, with the ability to manage research activities having a common denominator but quite different application. The diversity of groups comprises different but complementary backgrounds bringing their experience in terms of coordination, fundamental and basic scientific research, both training and education expertise, technology exploitation and industrial production. This multidisciplinary and multisectorial approach can't be performed by national initiatives. Having 10 partners from five different European countries (Austria, France, Italy, UK and Spain), sharing a wide range of knowledge competences and technological facilities allows the mobilisation of the human and technological resources all over Europe. The geographical distribution constitutes a living example of collaboration in the European Research Area. Over 30 high profiled researchers and support personnel will be committed by the different partners in the implementation of the training, research and management activities of the Network. The personnel involved belong to different sectors (academia, research centres and private sector), have complementary backgrounds covering the various scientific training and research topics of the Network (instrumentation, material science, microelectronics, life sciences) and the various complementary skills training (communication, entrepreneurship, leadership, etc.). The partners also bring together the more advanced infrastructures and facilities to perform Scanning Probe Microscopy and Nanotechnology research. Among others, we can cite the latest scanning probe microscopy instrumentations, advanced microsystem and microelectronic fabrication micro/nanotechnologies and biology platforms for life science and medical applications. Such an impressive technological and complementary offer is unique in Europe, and will enable researchers of the Network to be trained in the latest nanoscale SPM technologies and related applications. Also valuable, it is the previous experience of all partners in working in consortia in former EU projects or other joint research over the last years. In this sense, the overall competence of the partners can be summarized in their participation in over 50 national and international research projects both with industry and academia. Several partners have been involved in previous Marie Curie Actions such as the IMMUNANOMAP Network (MCRTN-CT-2006-035946) or the NANOMICROWAVE Network mentioned above.

3.4.2. Commitment of beneficiaries and partner organisations to the programme

All partners are deeply committed to both the research and training programme of the network. This is demonstrated by the fact that all partners assume leadership roles either in tasks or WPs (or both), are responsible for deliverables, recruit and host ESR, organize training activities (courses) and offers secondments. This serious commitment of the network beneficiaries, which is shown at the same level for both academic and non-academic partners, is a guarantee for the success of implementation of the network.

4. GANNT CHART

Reflecting ESR recruitments, secondments, training events, management and dissemination / public engagement activities

	Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
Researchers' Recruitment	ESR 1																		S	S	S	S			S						S																	
	ESR 2																		S	S	S				S																							
	ESR 3																		S												S																	
	ESR 4												S	S																	S	S																
	ESR 5																		S						S						S	S																
	ESR 6												S	S	S										S						S																	
	ESR7												S	S											S						S																	
	ESR8																		S	S					S						S																	
	ESR9																		S						S	S					S	S																
	ESR10																		S	S					S						S																	
	ESR11																		S						S						S																	
	ESR12																		S						S						S																	
	ESR13																		S	S											S	S																
	ESR14																		S	S					S						S																	
	ESR15																		S	S	S										S																	
Training	Workshops												1						2						3						4					5										6				
	Conference																																																	
	Visiting Scientist																																																
	Other																		C												C														C				
Moment																																																		
	Meetings	K											1						2						2											3													E
Dissem. / Public e'ment	Dissemn.						P						N												N											N													N W
	Public engagement						P																		E											L													

S = Secondment
K = Kick-off meeting
E = End of project
C=Assessment Commission
N=Newsletters
W=Workshop
P=Webpage
L=Virtual Lab
E=European Research Night

5. ETHICS ISSUES

Based on the work focus of the Network, no conflicts with ethical principles are expected. Still, all fundamental ethical codes will be respected, periodically assessed and performed following the basic ethical principles described in the "Charter of Fundamental Rights" of the European Union (2000/C 364/01)1[20]. All planned activities and experiments are in conformance with national and EU legislation, regulations and ethical standards. All ethical issues related to research, training and conduct will also be based on guidelines and procedures already in place within individual partner institutions. Thus, the consortium confirms that the research in SPM2.0 does not involve research activity aimed at human cloning for reproductive purposes, research activity intended to modify the genetic heritage of human beings which could make such changes heritable, research activity intended 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, research involving the use of human embryos or embryonic stem cells with the exception of banked or isolated human embryonic stem cells in culture. Furthermore, all substances and materials used in the scope of the ETN comply with the respective EU and ISO safety standards. Therefore, no health risk coming from toxic or other materials is involved in any of the activities associated with the Training Network. WP1 will ensure the compliance of these statements.

Concerning the ethics issues identified in the Ethics Summary Report we mention the following:

- *The origins of living cells used in the project*: All living cells to be used in the project will belong to immortalized cell lines. Therefore no animal or human primary cells will be used in the project. The cell lines are commercially available and will be acquired from authorized private companies and cultured in the laboratories of the partners following standard cell culture procedures and biosafety regulations. The specific cells to be used in the project are the immortalized human bronchial epithelial cells (iHBEC) and will be sourced by American Type Culture Collection (ATCC, USA, Ref. HBEC3-KT).
- *Data protection issue if HIV infected cells come from humans and can be connected to personal data*: Within the project no HIV infected cell will be used. Instead, proteins relevant for HIV infection process will be studied. These proteins will be expressed in bacterial cells with the use of appropriate plasmids and obtained from them following stablished purification procedures.
- *The use of nanomaterials and nanoparticles*: Within the project use will be made of gold nanoparticles to study its uptake in-vitro by living cells belonging to immortalized cell lines and in the production of polymer nanocomposite (formed by simple mixing). The nanoparticles to be used will be acquired from commercial sources, and hence will not be chemically produced within the project. We will follow the Code of Conduct for Responsible Nanosciences and Nanotechnologies Research, following the European Commission Recommendation of 07/02/2008. In particular, due health, safety and environmental measures will be adopted by all students, researchers and beneficiaries manipulating the nanoparticles, as well as, good practices in terms of classification and labelling.
- *Environmental protection and safety:* possible harm to the environment caused by the research, during production and disposal of the nanomaterial. The gold nanoparticles to be used within the project are spherical standard gold nanoparticles of diameter around 100 nm non functionalized and supplied in 0.1 mM phosphate buffered saline (PBS) and surface stabilized with citrate sourced be Cytodiagnostics (Canada, Ref. G-100-100). Solutions to be used in the experiments will contain a concentration of gold nanoparticles of around 60 microgram/ml. A total of 50 ml of solution is used in a typical experiment and a total of between 20-30 experiments involving nanoparticles are foreseen during the project. Therefore, a total of around 90 milligrams of gold nanoparticles are expected to be used for the whole duration of the project (four years). This very small amount of nanoparticles is expected not to cause any harm to the environment. But still, and making use of the prevention principle currently applied to nanomaterials, any waste or residue related with the nanoparticle experiments will be treated as cytotoxic, and processed accordingly.

[20] www.europarl.europa.eu/charter/default_en.htm

Associated with document Ref. Ares(2016)3312427 - 11/07/2016

ESTIMATED BUDGET FOR THE ACTION (page 1 of 2)

	Number of units (person-months)	Form of costs[5]	Estimated eligible[1] costs (per budget category)										Total costs	EU contribution		
			A. Costs for recruited researchers						B. Institutional costs					Reimbursement rate %	Maximum EU contribution[2]	Maximum grant amount[3]
			A.1. Living allowance		A.2. Mobility allowance		A.3. Family allowance		B.1. Research, training and networking costs		B.2. Management and indirect[4] costs					
			Unit		Unit		Unit		Unit		Unit					
			Costs per unit[6]	Total a[7]	Costs per unit[6]	Total b[7]	Costs per unit[6,8]	Total c[7]	Costs per unit[6]	Total d[7]	Costs per unit[6]	Total e[7]	f = a+b +c +d+e	g	h	i
1. IBEC	72.00	1. IBEC	3110.00	218545.92	1200	43200	500	18000	1800.00	129600.00	1200.00	86400.00	495745.92	100.00	495745.92	
2. INSERM	72.00	2. INSERM	3110.00	248551.2	1200	43200	500	18000	1800.00	129600.00	1200.00	86400.00	525751.20	100.00	525751.20	
3. CSIC	36.00	3. CSIC	3110.00	109272.96	600	21600	250	9000	1800.00	64800.00	1200.00	43200.00	247872.96	100.00	247872.96	
4. JKU	36.00	4. JKU	3110.00	117334.08	600	21600	250	9000	1800.00	64800.00	1200.00	43200.00	255934.08	100.00	255934.08	
5. NANOGUNI	72.00	5. NANOGUNI	3110.00	218545.92	1200	43200	500	18000	1800.00	129600.00	1200.00	86400.00	495745.92	100.00	495745.92	
6. NPL	36.00	6. NPL	3110.00	134687.88	600	21600	250	9000	1800.00	64800.00	1200.00	43200.00	273287.88	100.00	273287.88	
7. KEYSIGHT	72.00	7. KEYSIGHT	3110.00	234668.16	1200	43200	500	18000	1800.00	129600.00	1200.00	86400.00	511868.16	100.00	511868.16	
8. TUW	36.00	8. TUW	3110.00	117334.08	600	21600	250	9000	1800.00	64800.00	1200.00	43200.00	255934.08	100.00	255934.08	
9. BNC	36.00	9. BNC	3110.00	134687.88	600	21600	250	9000	1800.00	64800.00	1200.00	43200.00	273287.88	100.00	273287.88	
10. UNIMORE	36.00	10. UNIMORE	3110.00	119461.32	600	21600	250	9000	1800.00	64800.00	1200.00	43200.00	258061.32	100.00	258061.32	
Total consortium	504.00	Total consortium		1653089.40		302400.00		126000.00		907200.00		604800.00	3593489.40	100.00	3593489.40	3593489.40

ESTIMATED BUDGET FOR THE ACTION (page 2 of 2)

1 See Article 6 for the eligibility conditions.
2 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).
3 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.
4 The indirect costs covered by the operating grant (received under any EU or Euratom funding programme; see Article 6.3(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 (i.e. the unit cost for management and indirect costs will be halved for person-months that are incurred during the period covered by the operating grant).
5 See Article 5 for the form of costs.
6 See Annex 2a 'Additional information on the estimated budget' for the details on the costs per unit.
7 Total = costs per unit x number of units (person-months)
8 The amount for the family allowance inserted by the system represents an average (with/without family). For the financial statements (Annex 4), this amount will be adjusted according to the actual family status of the recruited researchers (as specified in the 'researcher declaration').

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

INSTITUT NATIONAL DE LA SANTE ET DE LA RECHERCHE MEDICALE (INSERM), 180036048, established in RUE DE TOLBIAC 101, PARIS 75654, France, FR31180036048 ('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 721874 (‘the Agreement’)

between FUNDACIO INSTITUT DE BIOENGINYERIA DE CATALUNYA **and** *the Research Executive Agency (REA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),*

for the action entitled ‘Scanning probe microscopies for nanoscale fast, tomographic and composition imaging (SPM2.0)’.

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 the grant in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

dominique NOBILE with ECAS id nnobilde signed in the Participant Portal on 06/10/2016 at 09:30:23 (transaction id SigId-278698-XeB5mE3gozMCjO9FCLrkfKi9D177AaNN1ErQ8TXjF2nciDpW9YGfLHz HhLNnCdlByRBkl43zWRsQWxL8HesNEvG-Jj71zxYb8yrYiyGUQlxsv0-docmi5Vw3N1WlgBnMg1UDTuP6oCGYZh6rod8N3B4aG). Timestamp by third party at Thu Oct 06 10:30:32 CEST 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

AGENCIA ESTATAL CONSEJO SUPERIOR DEINVESTIGACIONES CIENTIFICAS (CSIC), established in CALLE SERRANO 117, MADRID 28006, Spain, ESQ2818002D ('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 721874 (‘the Agreement’)

between FUNDACIO INSTITUT DE BIOENGINYERIA DE CATALUNYA **and** *the Research Executive Agency (REA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),*

for the action entitled ‘Scanning probe microscopies for nanoscale fast, tomographic and composition imaging (SPM2.0)’.

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 the grant in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

Cristina DE LA PUENTE with ECAS id nfianton signed in the Participant Portal on 22/08/2016 at 13:30:26 (transaction id SigId-9601-k9JntElxydUTxpIs1xs1GnDGsVEeuU1h60omzMw4QegZn3YzaEvBO09KzGRS8JFkZtx0g17fH68qyRmjBiGL1xW-Jj71zxYb8yrRavPD4Brza1-XCUAfwdTKBCbszhhhLWypA4hlIGrqGKt3NnyPsJkrA5). Timestamp by third party at
Mon Aug 22 14:30:33 CEST 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

UNIVERSITAT LINZ (JKU), 188/1962, established in ALTENBERGER STRASSE 69, LINZ 4040, Austria, ATU57515567 ('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 721874 (‘the Agreement’)

between FUNDACIO INSTITUT DE BIOENGINYERIA DE CATALUNYA **and** *the Research Executive Agency (REA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),*

for the action entitled ‘Scanning probe microscopies for nanoscale fast, tomographic and composition imaging (SPM2.0)’.

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 the grant in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

peter HINTERDORFER with ECAS id nhintepe signed in the Participant Portal on 17/08/2016 at 09:29:08 (transaction id SigId-123611-hBceQXHnknuY2B0oaN0RBozSl6494e4GdO6fi6zvgzzWlg1GZ7ZOrY0GBtpSVKZlN3GFrd4qhG74BdsEK5Xkck0-Jj71zxYb8yr5dzX2DFZb8K-noJOaUU4Fab7vk17hQaKl1cCL64CZOvFnzG6TKRle0G). Timestamp by third party at Wed Aug 17 10:29:16 CEST 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

Asociacion - Centro de Investigacion Cooperativa en Nanociencias - CIC NANOGUNE (NANOGUNE) ES5, AS/G/12418/2006, established in Tolosa Hiribidea 76, San Sebastian 20018, Spain, ESG20903449 ('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 721874 (‘the Agreement’)

between FUNDACIO INSTITUT DE BIOENGINYERIA DE CATALUNYA **and** *the Research Executive Agency (REA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),*

for the action entitled ‘Scanning probe microscopies for nanoscale fast, tomographic and composition imaging (SPM2.0)’.

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 the grant in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

Jose Maria PITARKE with ECAS id npitarjo signed in the Participant Portal on 17/08/2016 at 08:20:57 (transaction id SigId-122700-7XooFmIKk5oCmd2bkerm4swN7FgqgbjVy8VfZiJYS6PeF3WU8AnyZCaOzGbDHVIqJBFsPSTGKRfM8BznWnvAzP0-Jj71zxYb8yr5dzX2DFZb8K-zfzwRySZbHRlHDQ7nQoqccYBT1zzyHnoA8rWCe3BpzxvW). Timestamp by third party at Wed Aug 17 09:21:03 CEST 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

NPL MANAGEMENT LIMITED (NPL) LTD, 2937881, established in HAMPTON ROAD TEDDINGTON, MIDDLESEX TW11 0LW, United Kingdom, GB200429166 ('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 721874 (‘the Agreement’)

between FUNDACIO INSTITUT DE BIOENGINYERIA DE CATALUNYA **and** *the Research Executive Agency (REA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),*

for the action entitled ‘Scanning probe microscopies for nanoscale fast, tomographic and composition imaging (SPM2.0)’.

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 the grant in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

Tallulah SUTHERLAND-SPEDDING with ECAS id nsutheta signed in the Participant Portal on 19/08/2016 at 09:43:16 (transaction id SigId-6855-w7pPFsStwo3xuYSpMlOXJPobiBJwaxOp9KVKM5NcLCNSAPm3wNmwQaCfi3QbYUI5U1rJ1zRAmUzr3WIVFsNYxY-PHslUMVSXYCs9DMKG9nW3i-hFQ7icWzL5VALfvY19iACsBWWkyq76NbNiZnnEnjKyo). Timestamp by third party at
Fri Aug 19 10:43:23 CEST 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

KEYSIGHT TECHNOLOGIES GMBH (KEYSIGHT) GMBH, FN409790H, established in EUROPAPLATZ 2/1/2, WIEN 1150, Austria, ATU68680607 ('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 721874 (‘the Agreement’)

between FUNDACIO INSTITUT DE BIOENGINYERIA DE CATALUNYA **and** *the Research Executive Agency (REA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),*

for the action entitled ‘Scanning probe microscopies for nanoscale fast, tomographic and composition imaging (SPM2.0)’.

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 the grant in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

Michael DIEUDONNE with ECAS id ndieudom signed in the Participant Portal on 17/08/2016 at 13:42:02 (transaction id SigId-126890-DcAExInMH7Y35Nip2Sy6TDHL09O8PXlpoluYBDzHmeFl56Nljj93G6ywAmW9pjMFGge4ty928iPx9Wjs2ukNVa-Jj71zxYb8yr5dzX2DFZb8K-CTaeGGQsS8tm6fCLZBeSqKG52qBTQBjzPfi0X6mNATY). Timestamp by third party at Wed Aug 17 14:42:10 CEST 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

TECHNISCHE UNIVERSITAET WIEN (TUW), 5330593, established in KARLSPLATZ 13, WIEN 1040, Austria, ATU37675002 ('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 721874 (‘the Agreement’)

between FUNDACIO INSTITUT DE BIOENGINYERIA DE CATALUNYA **and** *the Research Executive Agency (REA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),*

for the action entitled ‘Scanning probe microscopies for nanoscale fast, tomographic and composition imaging (SPM2.0)’.

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 the grant in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

Ulrich SCHMID with ECAS id nschmiuh signed in the Participant Portal on 17/08/2016 at 09:54:47 (transaction id SigId-124075-SZE15iYGmuR4zGBcCDODY7ApT0YYOkP7mUmzpoPjbqzZ9B5HVBwC63ixtkeAvp1t3J6lOxdGTDPTe0VhOmJC2Im-Jj71zxYb8yr5dzX2DFZb8K-rpjFprR1xl7VzrabSkAMBZobDcfIhuiQ05eOlyeTInl). Timestamp by third party at
Wed Aug 17 10:54:53 CEST 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

THE BIO NANO CENTRE LIMITED LBG (BNC) GB5, 06389520, established in EUSTON ROAD 338, LONDON NW1 3BT, United Kingdom, GB919212629 ('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 721874 (‘the Agreement’)

between FUNDACIO INSTITUT DE BIOENGINYERIA DE CATALUNYA **and** *the Research Executive Agency (REA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),*

for the action entitled ‘Scanning probe microscopies for nanoscale fast, tomographic and composition imaging (SPM2.0)’.

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 the grant in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

David SARPHIE with ECAS id nsarphda signed in the Participant Portal on 30/08/2016 at 15:17:55 (transaction id SigId-70487-JvijOoLOuFEyKxDJpyjTX3qKL20f6EZW8w1dBbtyru47ca95Q8jtdjlFdvHDLHbUdldJUFk8UG7RQWGlCKMnCm-Jj71zxYb8yrRavPD4Brza1-l70qV0O5nMaA4XPLCNBJGEwM0oDbHtzyizbG8OuD8iqG).
Timestamp by third party at
Tue Aug 30 16:18:01 CEST 2016

ANNEX 3

ACCESSION FORM FOR BENEFICIARIES

UNIVERSITA DEGLI STUDI DI MODENA E REGGIO EMILIA (UNIMORE), CF00427620364, established in VIA UNIVERSITA 4, MODENA 41121, Italy, IT00427620364 ('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 721874 (‘the Agreement’)

between FUNDACIO INSTITUT DE BIOENGINYERIA DE CATALUNYA **and** *the Research Executive Agency (REA) ('the Agency'), under the power delegated by the European Commission ('the Commission'),*

for the action entitled ‘Scanning probe microscopies for nanoscale fast, tomographic and composition imaging (SPM2.0)’.

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 the grant in accordance with the Agreement, with all the obligations and conditions it sets out.

SIGNATURE

For the beneficiary

Angelo Oreste ANDRISANO with ECAS id nandaelo signed in the Participant Portal on 19/08/2016 at 12:24:50 (transaction id SigId-9196-zw3oxQsAGh6bm5i8SICzVzjVYzizTI5qYfWHRWZN0rgINGsyuzZfiooUaMmQEACpbOIgRhYacQh3OWXKbFX5Ilrm-PHslUMVSXYCs9DMKG9nW3i-HaHJXmvxbzh3xVdi9Pk4c0iXIrM4fT0KEnuf8EZIhID). Timestamp by third party at
Fri Aug 19 13:25:10 CEST 2016

ⓘ print format A4

MODEL ANNEX 4 FOR H2020 MSC-ITN — MULTI

FINANCIAL STATEMENT FOR BENEFICIARY [name] FOR REPORTING PERIOD [reporting period]

			Eligible[1] costs (per budget category)									EU contribution		
			A. Costs for recruited researchers						B. Institutional costs			Reimbursement rate %	Maximum EU contribution	Requested EU contribution
			A.1 Living allowance		A.2 Mobility allowance		A.3 Family allowance		B.1. Research, training and networking costs		B2. Management and indirect[2] costs			
		Form of costs[3]	Unit		Unit		Unit		Unit		Unit			
Name of the fellows[6]	Number of units (person months)		Costs per unit[4]	Total a[5]	Costs per unit[4]	Total b[5]	Costs per unit[4]	Total c[5]	Costs per unit[4]	Total d[5]	Costs per unit[4]	Total e[5]	f = a+b+c+d+e	g	h	i
Total beneficiary		**Total beneficiary**														

Checkbox 1:	I confirm that the total amount of the allowances used (including compulsory deductions) for the researcher is equal to or higher than the living allowance, the mobility allowance and the family allowance as set out in Annex 2 of the Agreement or that any underpayments in Reporting Period 1 will be corrected by the end of the action.

Checkbox 2 :	Did you receive any EU/Euratom operating grant during this reporting period? YES ❑ NO ❑ If yes, pls indicate how many of the total person-months (see 'total beneficiary' above) were incurred DURING the period covered by the operating grant?	Number of person-months	

The beneficiary 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).

ⓘ Please declare all person-months, even if you exceed the estimated budget (see Annex 2). Only person-months that were declared in your individual financial statements can be taken into account lateron, in order to replace other costs that are found to be ineligible.

[1] See Article 6 for the eligibility conditions

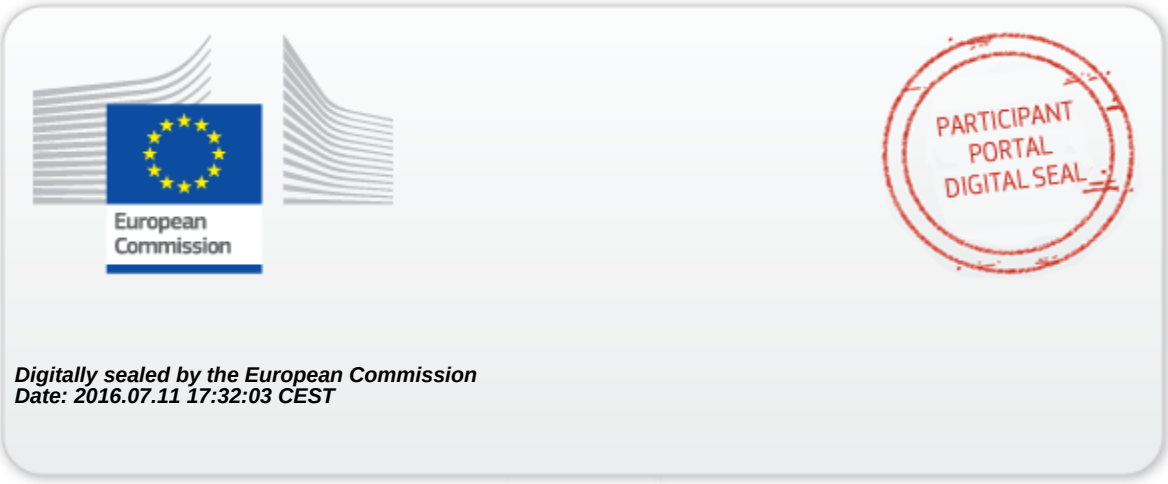
[2] The indirect costs claimed must be free of any amounts covered by an operating grant (received under any EU or Euratom funding programme; see Article 6.3(b)). If you have received an operating grant during this reporting period, indirect costs will not be reimbursed for the person-months incurred during the period covered by the operating grant.

[3] See Article 5 for the forms of costs

[4] See Annex 2a 'Additional information on the estimated budget' for the details on the costs per unit.

[5] Total = costs per unit x number of units (person-months)

[6] Name of the researcher and related units for living (A.1) and family (A.3) allowances will be prefilled on the basis of the information provided by the beneficiary in the 'researcher declaration'



Digitally sealed by the European Commission
Date: 2016.07.11 17:32:03 CEST

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.