



# MUSA

## Manual for MUSA Mobility Programme

Version 2 - January 2020



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## The MUSA Project - Management and Uncertainties of Severe Accident

Officially started 1 June 2019, the European Horizon 2020 MUSA project, under the grant agreement No 847441, will last 48 months. The project is coordinated by CIEMAT Madrid and gathers 28 partners from 16 countries worldwide.

In the current state of maturity of severe accident (SA) codes in terms of phenomena addressed and extensive validation conducted, the time has come to foster BEPU (Best Estimate Plus Uncertainties) application in the SA domain, including accident management (AM). The advantages with respect to deterministic analysis are known: avoid adopting conservative assumptions in the model and allow identifying safety margins, quantify likelihood of reaching specific values and, through the distribution variance, provide insights into dominating uncertain parameters. The overall objective of the project is to assess the capability of SA codes when modelling reactor and SFP (Spent Fuel Pool) accident scenarios for Gen II and III nuclear power plants. To do so UQ (Uncertainty Quantification) methods are to be used, with emphasis on the effect of already-set and innovative AM measures on accident unfolding, particularly those related to Source Term (ST) mitigation. Therefore, ST related Figures Of Merit (FOM) are to be used in the UQ application.

MUSA proposes an innovative research agenda in order to move forward the predictive capability of SA analysis codes by combining them with the best available/improved UQ tools and embedding AM as an intrinsic aspect of SA analyses.

MUSA develops through key activities, which also describe the main outcomes foreseen:

- identification and quantification of uncertainty sources in SA analyses;
- review and adaptation of UQ methods;
- testing such methods against reactor and SFP accident analyses, including AM.

Given the focus of FOM, the project will identify variables governing ST uncertainties that would be worth investigating further. All the ingredients necessary to conduct the project are already available: analytical tools, experimental data, postulated reactor and SFP scenarios and, technical and scientific competences.

### Introduction to MUSA education and training activities

One of the main exploitation results of the MUSA project is to build a sound set of activities concerning education and training of Master/Ph.D. students and young researchers in the area of SA and Uncertainties tools, so that the knowledge and know-how transfer to the next generation will be guaranteed for these aspects of nuclear safety. The overall objective of this action is to strengthen the links between MUSA European R&D organizations and MUSA end-users/members, in particular students, technicians, scientists and engineers in their early carrier.

Specific education and training actions will be developed in the MUSA Working Package 7 (WP7) COREDIS (COmmunication and REsults DISsemination), as:

- **Production of learning modules compiling the major outcomes of from the project, to be published in the MUSA open web site.** These modules (presentations and/or mp4 videos) will be realized to disseminate the project outcomes to nuclear students and to a generic audience, and will address the following topics:
  1. major sources of uncertainties in SA, with particular emphasis on ST;
  2. methodologies for uncertainty assessment in SA, with particular emphasis on the ST estimates;
  3. assessment of ST Uncertainties in Fukushima-like scenarios.
- **Production of a lecture on “*Uncertainty Quantification in Severe Accident Analyses*”** for the different international Courses that might be given on SA and/or on "uncertainties". It should be highlighted that a long-term collaboration exists with the well-established NUGENIA TA2/SARNET Course on Severe Accident Phenomenology, where MUSA partners have often given the lectures on ST in the several Course editions.
- A **mobility exchange programme**, described in the following, for young researchers and Ph.D./Masters students supporting:
  1. temporary stays in MUSA partners' labs;
  2. attendance of the MUSA workshops or international conferences and seminars related to the MUSA activities;
  3. participation in the SA phenomenology Course of NUGENIA TA2/SARNET or similar international courses on SA and/or on "uncertainties".

### The MUSA Mobility Program

The MUSA mobility program, managed by Prof. Sandro Paci (University of Pisa - UNIPI) as WP7 leader, aims fundamentally at training young researchers and Ph.D./Masters students through delegations in the MUSA partners' laboratories in order to enhance the exchanges and the dissemination of knowledge in the area of SA codes and Uncertainty tools. These mobility actions could be also useful for the master's students to achieve the requirements of the European Master of Science in Nuclear

Engineering (EMSNE) certification, delivered by the European Nuclear Education Network (ENEN) Association to certify the highest quality standards of Nuclear Engineering Education and the European dimension pursued achieved by the EMSNE laureate.

Additionally, the presence of MUSA young researchers in international conferences, MUSA workshops and seminars to present some results obtained through their research activities in MUSA, will be also supported. A non-exhaustive list of possible “focus” conferences includes the main international conferences in nuclear field as ICONE, NURETH, ANS Meetings and ICAP but also specific ones as the next BEPU 2020 Conference or the Meetings of the national nuclear societies. About this particular action, it has to be highlighted that the **possible participation to general conferences will be supported only for the presentation of research results obtained in MUSA and this support will have to be acknowledged in the presentation.**

Supporting the inclusion in external Courses on areas related to MUSA, either on the core subject of the project and/or on methodologies used within MUSA, will be also considered.

Thus, MUSA will publish an open call for the mobility of these figures at the beginning of 2020 to promote 1) technical exchanges around “MUSA infrastructures”<sup>1</sup> and 2) for the participation to MUSA workshops, conferences, seminars and courses. The planned MUSA total budget for these mobility actions (€ 128,000.00), as stated in the Project Grant Agreement, has the following distribution:

- |   |             |
|---|-------------|
| • Conference, seminars or MUSA workshop participation | € 20,000.00 |
| • course participation                                | € 20,000.00 |
| • mobility cost                                       | € 88,000.00 |

It is foreseen to attribute a grant of max 6,000 euros as financial contribution per long visit (about 1,000 euros for month) and max 4 long visit are planned each year. This amount is not fixed and will be approved by the MUSA Executive Board (ExB) after being re-assessed on a case by case basis by the leaders of WP1 and WP7.

About the participation to conferences, seminars, MUSA workshops and courses, the MUSA grant will cover the registration fees plus travel and subsistence expenses, with a maximum of 2,000 euros for each action, again with the evaluation of the application by the MUSA ExB.

In summary, according to the above budget distributions and planning, it is foreseen that the total number of participations sponsored by MUSA in conferences and workshops would be between 8 and 12, and this same number is foreseen for courses participation. As for mobility, about 15 “long” actions might be allocated within the MUSA budget.

## Who can apply?

The MUSA grant offers short training/formation periods (at least 2 weeks, max 6 months for the training mobility, and max 1 week for the mobility actions related to the participation to courses/MUSA workshop/conferences/seminars) for EU master/Ph.D. students, early career researchers, engineers and technicians.

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<sup>1</sup> “MUSA infrastructure” refers to “all R&D modelling and simulation tools listed in the MUSA Grant Agreement number 847441 and offered for the purposes of a training according to the local rules of the host.”

In particular, the participation to the call is limited to:

- a) Master students in nuclear related courses of EU Universities;
- b) First Stage Researcher R1 (Up to the point of Ph.D.);
- c) Recognized Researcher R2 (Ph.D. holders or equivalent who are not yet fully independent).

R1 and R2 levels are intended as described in the European Commission EURAXESS initiative <https://euraxess.ec.europa.eu/>.

For the mobility actions related to temporary stays in MUSA partners' laboratory both the applicant and the host organization shall be members of MUSA, so the grants are limited to EU members of MUSA and the applicants shall be employed or have other formal arrangement at one of the MUSA member organization's inside the EU.

For mobility actions related to the participation to courses, congress, seminars and MUSA workshop, the applicant organization shall be members of MUSA inside the EU or an EU university for master students.

### How to apply?

- 1) Fill-up the suitable application form available at the end of this document (for a “temporary stay action” or for a “participation action”), including motivation for the action plus additional information as the description of the training proposal (consisting of summary, methods and anticipated results) or the course/MUSA workshop/congress/seminar description and the possible proposed contribution by the applicant to the event;
- 2) Provide a confirmation letter from the applicant organisation stating the applicant effective enrolment<sup>2</sup>;
- 3) Provide a confirmation letter from the host organisation stating its willingness to host the applicant for a specific period of time (only for the temporary stay actions);
- 4) Applicant's CV, ideally in the Europass format:  
<https://europass.cedefop.europa.eu/editors/fr/cv/compose>

### Application submission

This is an open call as long as MUSA financial resources for mobility are available. Nonetheless, a reminder will be sent out to the MUSA community twice per year and it will be highlighted in each progress and/or General Assembly meetings.

Applications with the required documentation shall be sent to the MUSA WP7 leader, prof. Sandro Paci (UNIFI) [sandro.paci@unipi.it](mailto:sandro.paci@unipi.it)

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<sup>2</sup> it designates any individual working/enrolled as non/permanent employee within a MUSA member-organization inside EU. For mobility actions related to the participation to courses, congress, seminars and MUSA workshop, the applicant organization shall be members of MUSA or a student in an EU university

## Evaluation

The MUSA Coordinator and the WP7 leader will carry out a first, formal eligibility screening for these applications.

Then MUSA ExB will perform the evaluation of the applications during its formal meetings that occurs with a frequency of 2 months approximately, also fixing the total amount of the cost reimbursements. All applications received 15 days before each meeting will be evaluated within the following one. Thus, it is expected that all applications be evaluated within 0.5 to 3 months.

Typical binding criteria in the selection by MUSA ExB will be:

- The temporary stay or the conference/seminar/course/workshop topic is in line with the MUSA goals.
- The temporary stay is related to testing modelling tools recognised by MUSA.
- The applicant possible contribution to the conference/workshop/seminar is related to MUSA activities.
- The application form is consistently filled up, with sufficient details and justifications.
- The requested budget is well justified (e.g., reasonable transport and accommodation costs, reduce conference fees for student, etc.).
- The duration of the temporary stay is confirmed by both the employee and the host organizations.

When a grant application is approved by the MUSA ExB, a confirmation letter will be sent to the applicant. Then a simple agreement on the specific mobility action will be signed between the applicant organization and UNIFI and the applicant can start to organize and carry out the temporary stay or the participation action.

## Costs reimbursement rules

The applicant has to submit to MUSA WP7 leader a final short temporary stay/participation report (5-10 pages) at the latest 30 days after the end of the mobility action. The MUSA ExB will evaluate these reports during its formal meetings. All reports received 15 days before each meeting will be evaluated within the following one.

The final report shall be:

- summarising the lessons learnt and the results obtained during the temporary stay, or
- a copy of the contribution to the event for the mobility actions related to the participation to a conference/MUSA workshop/seminar;
- showing ideas on how to apply the knowledge acquired within the MUSA project for the founding related to a courses participation.

A copy of the participation certificate for courses/conferences/workshop/seminars has to be also submitted to MUSA WP7 leader.

MUSA reserves the right to publish (i.e. on the MUSA public website), fully or partially, the final training report.

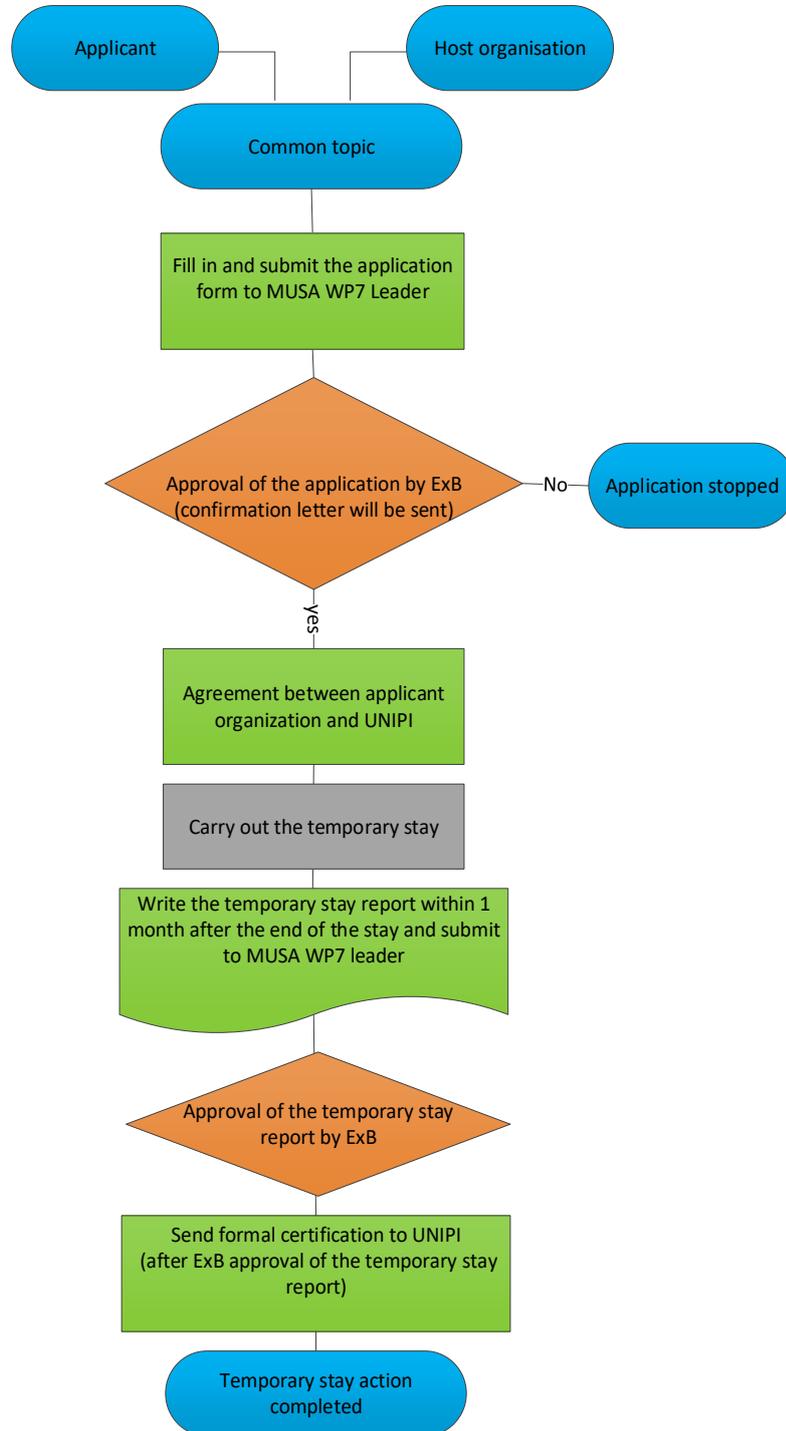
The organisation of the applicant has:

- 1) to sign with UNIPI a **simple agreement** on the rules for the refunding by UNIPI of the grant for the specific mobility action, before its beginning. The template of this agreement is available on the MUSA website <http://musa-h2020.eu/educationtraining/> but it will be finalized after the ExB approval of the application;
- 2) to submit a **formal certification** - supported by original receipts - to Pisa University, corresponding to the total amount to be reimbursed, after the approval of the final participation report by the MUSA ExB. The costs reimbursement request, based on the internal rules of the applicant organization, shall correspond to fees, travel and accommodation costs based on original receipts submitted to UNIPI together with the cost formal certification. This amount has to be lower or equal to the total amount fixed by the MUSA ExB at the time of the approval of the mobility action proposal.

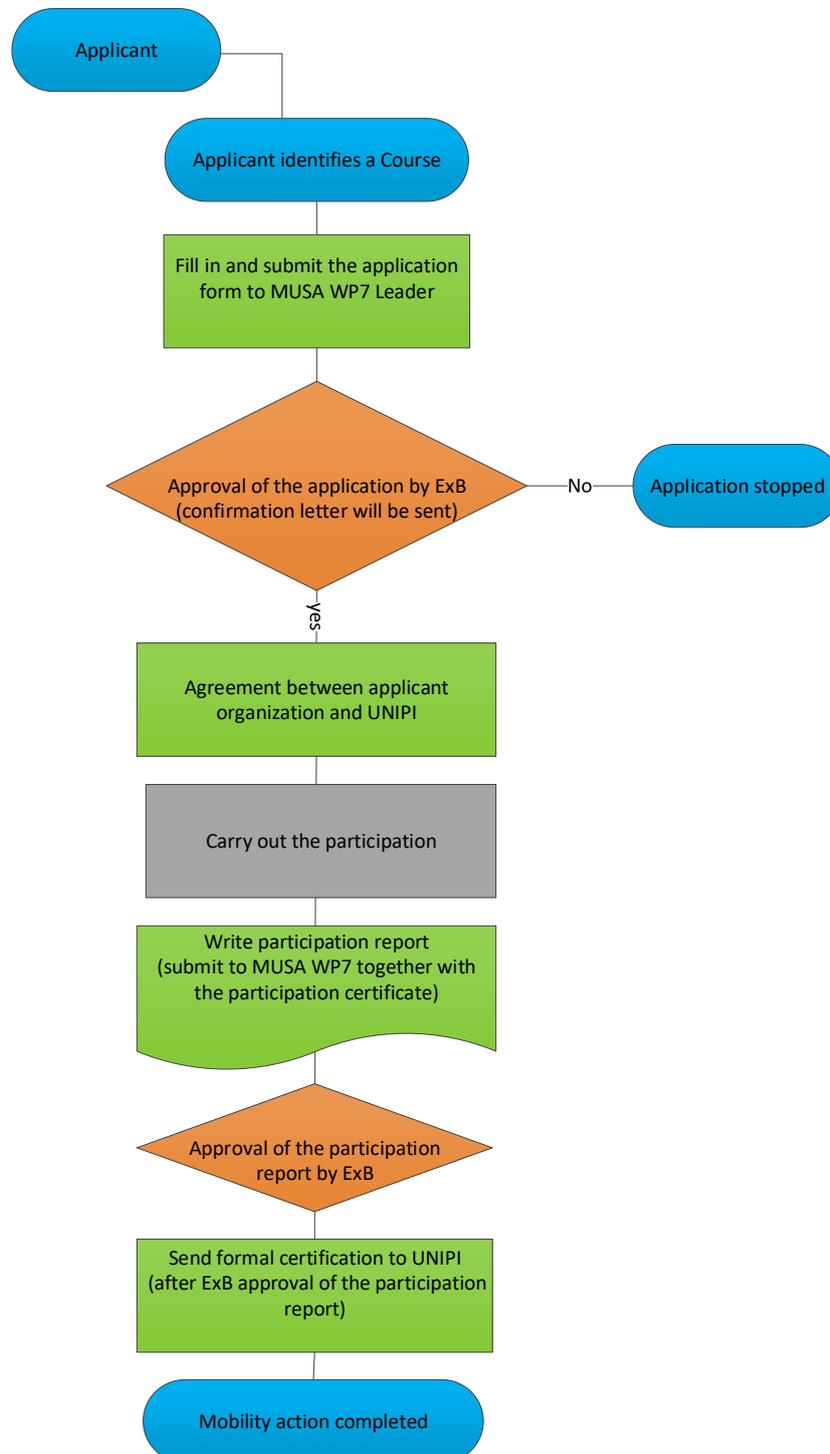
**The mobility reimbursement will be paid to the applicant organization by UNIPI only if these two actions (signed agreement and formal cost certification) will be completed and the final temporary stay/participation report approved by the MUSA ExB.**

**No direct reimbursement or contribution anticipation will be possible towards the applicant or to the host organization by UNIPI or CIEMAT.**

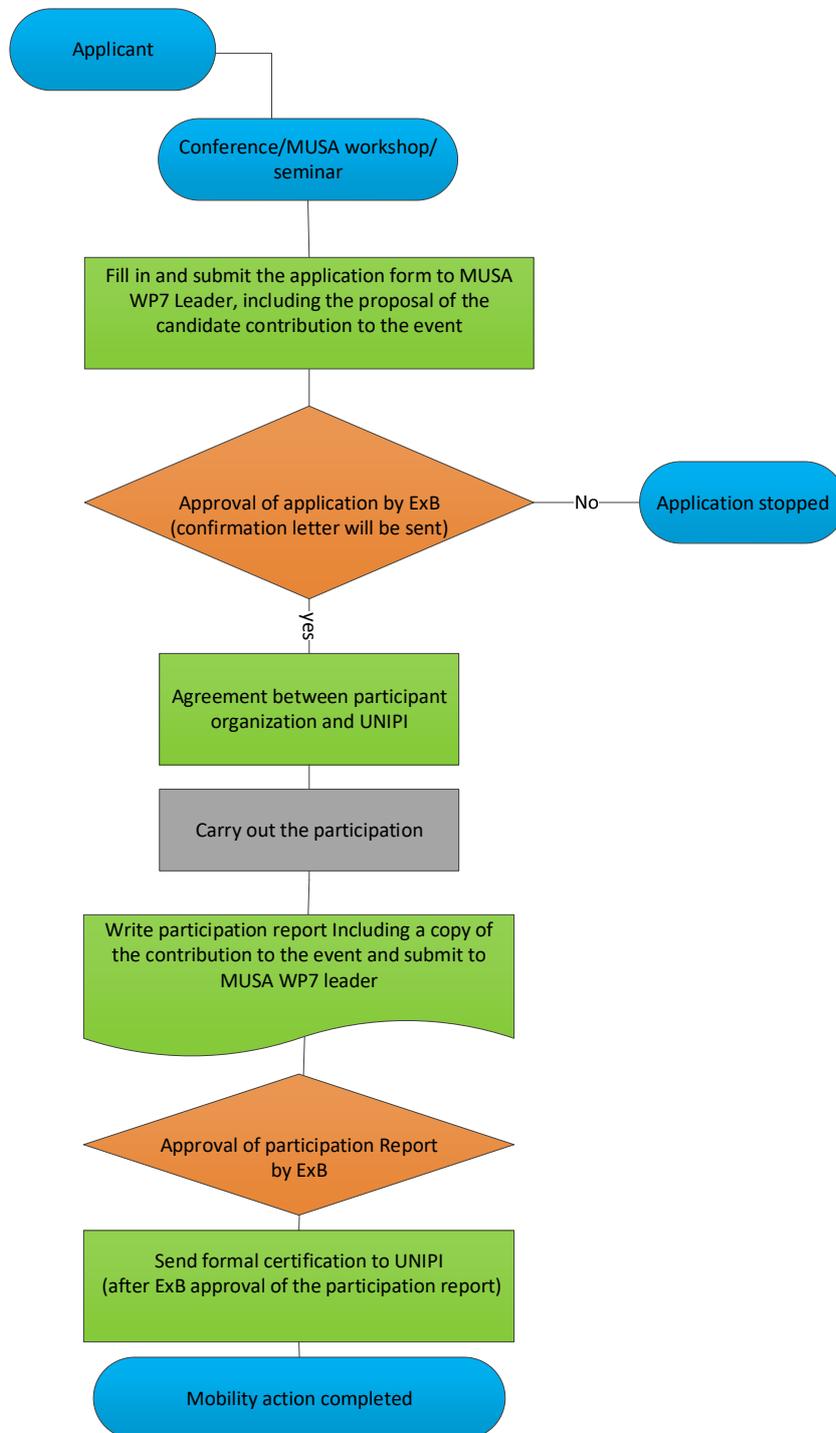
## Flow chart of the application process for a temporary stay



## Flow chart of the application process for course participation



## Flow chart of the application process for Conference/MUSA workshop/seminar participation



## Application form for a grant allocation (temporary stay)

APPLICANT	
Family name:	Institute:
First name:	Country:
Position*:	E-mail:
Contact Person:	E-mail:

HOST ORGANISATION	
Contact person:	Institute:
Position*:	Country:
E-mail:	

PRACTICAL INFORMATION ON THE TEMPORARY STAY	
Date of application:	Time period (in weeks):
Starting date:	End date:
Topic of the temporary stay:	
Estimated costs (Euro):	
Amount of the allocation requested (max 6,000 Euro):	

SIGNATURES (NAME + DATE)	
Applicant:	Applicant Organization Contact person:

\* *Master or Ph.D. students/Researcher / engineer / technician + profession*

## Application form for a grant allocation (participation)

APPLICANT	
Family name:	Institute:
First name:	Country:
Position*:	E-mail:
Contact Person:	E-mail:

Conference/Workshop/Seminar/Course info	
Title :	Organizer:
Location :	Country:
Period :	Website:

PRACTICAL INFORMATION ON THE MOBILITY ACTION	
Date of application:	Time period (in days):
Starting date:	End date:
Title of the contribution to the event (blank for a Course):	
Estimated costs (Euro):	
Amount of the allocation requested (max 2,000 Euro):	

SIGNATURES (NAME + DATE)	
Applicant:	Applicant Organization Contact person:

\* *Master or Ph.D. students/Researcher / engineer / technician + profession*

Short CV of the APPLICANT (max 200 words)

**MOTIVATION**

Explain why and how the temporary stay /participation is important for the candidate and what is the added value for the host organisation, taking into account the MUSA objectives

**Candidate**

**Host organisation motivation (for a mobility actions related to a temporary stay) or  
Conference/Workshop/Seminar/Course description and Contribution title and authors**

**ADDITIONAL INFORMATION:**

**Description of the temporary stay proposal consisting of summary, methods and anticipated results (only for temporary stay actions)**

Summary

Methods

Anticipated results