

# AHEAD Call for letter of interest

## for participation to the HORIZON 2020 call INFRAIA-01-2018-2019: *Integrating Activities for Advanced Communities*

We solicit letters of interest for participating to the next round of proposal for the Horizon 2020 research infrastructure program, in the context of the AHEAD project (Integrating Activities for High Energy Astrophysics).

Letter of interest must include a plan of activities proposed for a specific WP, their scientific and/or technological compliance with the WP content, the goal, the expertise and facilities of the proponent group, partners and whether or not the proposal has been discussed with these partners, and a rough cost assessment.

LoI must be contained in a max 1 page. Specific details on the required information is presented below for each WP.

LoI from research groups and industries at EU or EU [associated countries](#) are welcome.

**Deadline for LoI submission: September 15, 2018**

To be sent by the form available at <http://ahead.iaps.inaf.it/>

Letter of interest will be reviewed by the AHEAD management team. The results and a general presentation of the AHEAD2 project will be given in a workshop that will take place around October/November 2018. Proponents will be notified in due time.

The AHEAD 1<sup>st</sup> cycle started in September 2015 and will end in February 2019. In order to continue the AHEAD activities within the current Horizon 2020 programme, we will apply to the competitive call opening on 14<sup>th</sup> November 2018. The 2019 call is for the so-called *advanced communities*, with a maximum allowed grant of 10MEuro per project. Only a limited number of communities is invited to propose. During its 1<sup>st</sup> cycle, AHEAD has achieved a number of important objectives fully in agreement with the proposed workplan. Beyond a successful technology program, it has realized an efficient networking within the high energy community, fostering and coordinating new activities in the fields of public outreach, training of young scientists, visiting program, meetings and new collaborations.

Following a successful selection, the AHEAD 2<sup>nd</sup> cycle will cover a period of 4 years: approximately 2020-2023. The new program structure will follow closely the organizational scheme currently implemented, with WPs broadly classified into networking activities (NA), joint research activities (JRA) or transnational access activities (TA). See below for a detailed description. In the 2<sup>nd</sup> cycle, we foresee to open to new research activities as laboratory astrophysics, training in computational astrophysics and advanced tools for data analysis. In addition, we open the possibility to propose for the organization of new meetings/conferences and schools.

**Call opening:** November 14, 2018

**Proposal deadline:** March 20, 2019

**Period:** 2020 -> 2023 (4 years)

**Total budget:** 10 Meuro

**Goal:** build up on the strengths of AHEAD, supporting and preparing the community towards the key infrastructures of the field, w.p.r.t. Athena

## **List of Workpackages**

(*italics identifying new WPs in AHEAD-2*). The WP list is provided below with NA standing for Networking Activity, JRA for Joint Research Activity, and TA for Transnational Access Activity.

- WP1 – Project Management
- WP2/NA1 – General Networking
- WP3/NA2 – Public Outreach
- WP4/TA1 – Experimental Facilities
- WP5/TA2 – Data Analysis
- WP6/TA3 – Computational Astrophysics
- WP7/JRA1- Microcalorimeters
- WP8/JRA2 – Instrument Background and Calibration
- WP9/JRA3 – X-ray Optics
- WP10/JRA4– Gamma-Rays
- WP11/JRA5- Laboratory Astrophysics
- WP12/JRA6 – Advanced Tools for Data Analysis
- WP13/JRA7- Technology Innovation

## **Networking**

### WP2/NA1

The general goal of WP2 is to enhance the collaboration (new or existing), capabilities, skills and performance among the scientific and technological groups in Europe involved, or willing to be involved, in High Energy Astrophysics. WP2 aims at preparing the community at large for the successful exploitation of the high-energy

telescopes of the next decade, with particular regard to Athena, but also facilities with European involvement closer to launch or already operational and to support the community in exploiting the synergy of high-energy with multimessenger facilities on Gravitational Waves and  $\nu$ 's. This goal will be achieved through the sponsorship of meetings, workshops, schools for young astronomers and an exchange visitor programme for scientists and engineers.

Meetings will be mostly focused on (a) strengthening the link between the high energy astrophysics community and other communities (such as the radio, infrared and optical), b) strengthening the synergy between high energy facilities, w.p.r.t. Athena, with multifrequency and multimessenger facilities.

LoI are accepted for organizing and hosting workshops (typically with no more than 40 participants) as well as schools for young astronomers. Proponents must describe the scientific and/or technological motivation of the meeting.

### WP3/NA1 Outreach NA2

This networking activity is strengthening ties between the AHEAD community and the general public, students and educators, and inspire young people to follow careers in space astrophysics as well as in the relevant technology. A dedicated AHEAD high energy astrophysics website portal exists for public outreach with online downloadable material such as videos, images, news and press-related material. The PO team coordinates Visitor Centres and other publicly accessible astronomical facilities to provide information on activities in high-energy astrophysics, and coordinates educational material for use at all levels, including organizing events for high-school students and teachers. AHEAD is seeking a widened collaboration for PO, possibly with contact points within the AHEAD network (so, also supported financially).

Letter of interest must include a plan of activities, the goal, the expertise and facilities of the proponent group, partners and whether or not the proposal has been discussed with these partners, and a rough cost assessment. Only LoI consistent with the WP/subWP activities and goal listed above will be considered.

## **Transnational Access**

### WP4/TA1 Experimental facilities

The Transnational Access of AHEAD will provide access to some of the best European facilities for ground test and calibration for high-energy astrophysics and space. All these facilities are offered to external teams via a peer-review process, taking into account scientific excellence and ensuring priority to those users lacking access to the relevant facilities or expertise in their countries. Guest teams are foreseen to come from scientific institutions as well from industrial firms, with particular attention to small size enterprises. Ground test facilities are used to develop, calibrate and test new space-based technology, as well as hardware developed for specific space missions, in a space-representative environment. Facility owners are reimbursed for operating costs of the facility and manpower support.

The LoI should contain a brief description of the offered facility, an indicative cost per day, a typical duration for each access offered (expected range 1- 4 weeks), and the maximum number of accesses offered. As we have experienced a limited usage of this access to experimental facilities, proposals should specify clearly why these facilities will be used during the next phase. The offer must also include a number of site visits (expected duration few days) for allowing the perspective users to assess the feasibility of their test measurements and/or receive specific training.

### WP5/TA2: Data analysis

The Transnational Access of AHEAD will provide access to some of the best European infrastructures for data analysis and exploitation. The services include X-ray and gamma-ray data analysis including use of data tools, archives and space instruments via tutorials and mentoring by experienced scientists at the delivery institutes. The offered facilities provide expert access to a large number of high energy observatories (XMM, INTEGRAL, Chandra, SWIFT, Fermi, NuSTAR, BeppoSAX, AstroSAT, and future facilities to be flown in the AHEAD-2 period) as well as a specific expertise in various science topics relevant to high energy astrophysics, with particular regard to multimessenger (GW and  $\nu$ 's) data exploitation. The primary aim is to widen opportunities for scientists across Europe to exploit both European-funded and international high energy astronomy facilities and data archives in order to enhance high-energy astrophysics science across Europe taking particular care to assist relatively inexperienced users in smaller institutes, and to prepare the community for the exploitation of the next generation future observatories.

All these services will be offered via a peer-review process, taking into account scientific excellence and ensuring priority to those users lacking access to the relevant facilities or expertise in their countries.

The LoI should contain a brief description of the expertise offered in terms of science and data analysis of high-energy astrophysical data, an indicative cost per day, a typical duration for each access offered (expected range 1- 4 weeks), and the maximum number of accesses.

### WP6/TA3: Computational Astrophysics

Scope is to offer an expert tool (e.g. resulting from theoretical computational program of complex physical models) to the user and the support to exploit that tool during the visiting period. A typical example involves an user that would like to fit his/her observational data with the complex models such as (not exhaustive list) GRB modelling of the afterglow, NS mergers, WHIM modelling, Cosmological simulations/Clusters, etc

The LoI should contain a brief description of the expertise offered in terms of science and the computational tool, an indicative cost per day, a typical duration for each access offered (expected range 1- 4 weeks), and the maximum number of accesses.

## **Joint Research Activities**

### JRA1/WP7: Microcalorimeters

Main goal of this WP is to continue and expand AHEAD activities centered on TES microcalorimeters and related technologies, (Filters, electronics,..) aimed at improving the Athena critical technologies to enable future opportunities. New activities will be devoted to new generation microcalorimeter R&D (>100 kpixel) and to strengthen the connection with the Technology innovation WP, aimed at exporting the TES technology into societal application.

Letter of interest must include a plan of activities, the goal, the expertise and facilities of the proponent group, partners and whether or not the proposal has been discussed with these partners, and a rough cost assessment. Only LoI consistent with the WP/subWP activities and goal listed above will be considered.

### JRA2/WP8: Instrument calibration and background

This WP links the knowledge acquired with the current operating missions to the challenges of the new technology needed for the large Athena X-ray observatory, aiming primarily to reduce significantly the background of the instruments or a detailed assessment of the accuracy of the background estimates in present and future missions. This is important especially for faint and diffuse sources. The background and instrument

simulations, as well as (cross) calibration of high-energy instruments is harmonised through the adoption of standards and commonly developed modelling techniques. This WP will comprise the maintenance/update of a central database of instrument calibrations and modeling. Activities include: extension and improvement of GEANT4 simulations, environment, background assessment and cross-calibrations to new missions, maintenance and upgrade of the intercalibration database, Development of models for primary & secondary calibration standards w.p.r.t. high resolution spectroscopy; Advanced methods for background modelling in present (XMM, Chandra) and future missions (Athena) for improving the S/N signal extraction in faint or diffuse X-ray sources (e.g. cluster outskirts)

Letter of interest must include a plan of activities, the goal, the expertise and facilities of the proponent group, partners and whether or not the proposal has been discussed with these partners, and a rough cost assessment. Only Lol consistent with the WP/subWP activities and goal listed above will be considered.

#### JRA3/WP9: X-ray Optics

Main goal of this WP is to continue and expand AHEAD activities centered on mirror technologies, w.p.r.t. the consolidation and calibration of SPO, mostly targeted to Athena and ARCUS, the development of LOBSTER-EYE optics for wide field X-ray transient monitoring satellites which are required in the same timeframe as Athena to detect transient events (e.g. Einstein Probe, Theseus) and multimessenger EM counterparts, support to other optic techniques, improvement of mirror calibration techniques.

Letter of interest must include a plan of activities, the goal, the expertise and facilities of the proponent group, partners and whether or not the proposal has been discussed with these partners, and a rough cost assessment. Only Lol consistent with the WP/subWP activities and goal listed above will be considered

#### JRA3/WP10: Gamma-ray instrumentation

Main goal of this WP is to continue and expand upon AHEAD activities on Gamma-ray astronomy, including new activities following recent developments. The activities will be structured in the following sub-WP: a) support to the Theseus phase A study. b) continued support to the design of a MeV-GeV mission c) support and coordination at European level of Micro/nano satellites for GRBs

Letter of interest must include a plan of activities, the goal, the expertise and facilities of the proponent group, partners and whether or not the proposal has been discussed with these partners, and a rough cost assessment. Only Lol consistent with the WP/subWP activities and goal listed above will be considered.

#### JRA4/WP11: Laboratory Astrophysics

The change of pace in the area of X-ray spectroscopy require an important investment in improving our knowledge of atomic physics relevant for astrophysical measurement. This is already demanded by present instrumentation (Chandra and XMM grating) but it will become mandatory in order to exploit the new spectroscopy mission from XRISM to Athena. In addition, improving the assessment of instrument performances, w.p.r.t. particle background, requires a set of measurements.

The activities will be structured in the following subWP : a) X-ray spectroscopy: Requirements from astrophysical sources, measurements and theory of atomic transitions, plasma codes, atomic databases b) Measurements and interpretation of processes related to instrumental performances such as background (proton reflection, electron scattering, etc).

Letter of interest must include a plan of activities, the goal, the expertise and facilities of the proponent group, partners and whether or not the proposal has been discussed with these partners, and a rough cost assessment. Only Lol consistent with the WP/subWP activities and goal listed above will be considered.

#### [JRA5/WP12: Advanced Tools for Data Analysis for new missions](#)

The new era of spatially resolved high spectral resolution X-ray astronomy with an unprecedented accuracy in the spectral, timing, spatial dimensions requires new and innovative tools and techniques (3D analysis, physical model driven analysis, etc.,), but also requires tools for finding sources with a non-standard PSF for the new generation of narrow and wide field (Lobster-eye) optics.

Letter of interest must include a plan of activities, the goal, the expertise and facilities of the proponent group, partners and whether or not the proposal has been discussed with these partners, and a rough cost assessment. Only Lol consistent with the WP/subWP activities and goal listed above will be considered.

#### [JRA6/WP13: Technology Innovation](#)

Development of cutting edge technologies is inherent to high-energy astrophysics, that involves space-based instrumentation aimed to extract the maximum information from extremely faint sources. It is crucial to transfer this enormously innovative potential to the society. With this package AHEAD aims at studying potential applications of the technologies studied in AHEAD JRA into the society. Significant focus will be given to the high resolution spectroscopy and imaging capabilities of the cryogenic microcalorimeters, that promise to provide a breakthrough device for the low-dose diagnosis, analysis of materials and aerosol samples. This will include the realization of a prototype spectrometer for PIXE applications for diagnostic at low doses (fine arts, aerosol and biological samples). Other possible applications concern the application of gamma-ray devices.

Letter of interest must include a plan of activities, the goal, the expertise and facilities of the proponent group, partners and whether or not the proposal has been discussed with these partners, and a rough cost assessment. Only Lol consistent with the WP/subWP activities and goal listed above will be considered.