WP3: Provision of scientific expertise for multi-messenger observations (TA/VA)
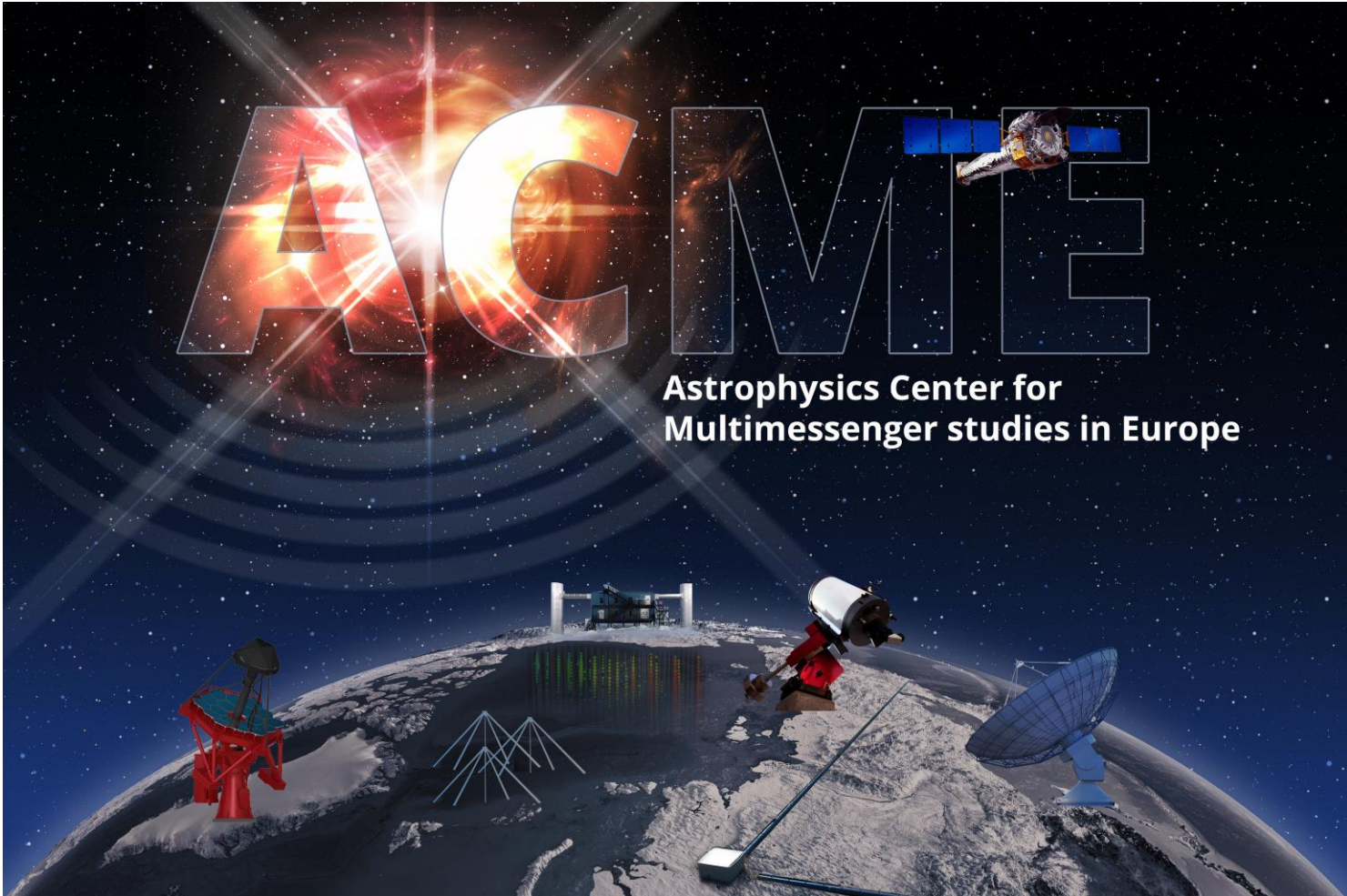
Marica Branchesi (GSSI), Zsolt Paragi (JIV-ERIC)

Work package No	Work Package Title	Lead Participant No	Lead Participant Short Name	Person-Months	Start Month	End month
1	Coordination & Management	1	CNRS	78	1	48
2	TA2 for Multi-messenger and time-domain Astrophysics	11	UNIMAN	104,54	1	48
3	TA3/VA3 Provision of scientific expertise for multi-messenger observations	12	GSSI	570,03	1	48
4	VA4 Provision of improved access to near-real time and archival multi-messenger data	10	NCBJ	522,05	1	48
5	VA5 Improved coordination for real-time detection of transient events and low-latency alert management	9	CEA	392,18	1	48
6	Training & workshops for researchers and engineers	1	CNRS	27	1	48
7	ACME for environment and society	6	UCL	97,86	1	48
TOTAL				1789,66	1	48

OBJECTIVES

- to provide a new opportunity for European researchers to access scientific expertise on MM astrophysics
- to enlarge the user community
- to maximize the science return of MM observations

Focus on sources of gravitational-waves, neutrinos and cosmic rays: mergers of compact objects (NS-NS/NS-BH/BH-BH), gamma-ray bursts, core-collapse supernovae, kilonovae, magnetars, fast radio bursts, active galactic nuclei

- to provide
- access to MM data analysis methods and tools
- end-to-end expertise for multi-wavelength follow-up of transient signals (from observation proposals, observational strategy, to the data processing)
- theoretical expert support to interpret multi-messenger data

- bring together experts of the different communities to discuss improving the services, experts and the user community to identify future, unique use cases for the ACME facilities

WP3 will provide access to expertise through the establishment of a **virtual acess** and **transnational access** based on visits to key European players in multi-messenger astronomy.

WP3 Tasks

WP3.1 *Coordination and management of TA3/VA3 access provision*

WP3.2 *Virtual Access to Joint Expertise Centres WP3-VA3*

WP3.3 *Transnational Access to experts' institutes WP3-TA3*

WP3.2 Virtual Access to Joint Expertise Centres WP3-VA3

- We will establish **six centres of expertise**, which will offer a complete service of expertise on the infrastructures, observations, data analysis and interpretation for different messenger and multi-wavelength domains.
- Each centre will be constituted of a **network of distributed nodes** which will offer user support through VA.

JOINT CENTERS OF EXPERTISE

JCE-GW

Gravitational-Wave Astronomy

JCE-NeCR

Neutrino and Cosmic-ray Astronomy

JCE-Xray

X-ray Astronomy

JCE-GaHE/VHE

High-energy and VHE Astronomy

JCE-OPT/NIR

near Infrared and Optical astronomy

JCE-RA

Radio Astronomy

JCE-GW

Gravitational-Wave
Astronomy

NODES
AUTh Observatory, GSSI,
INFN, L2IT

Main Experiments/Facilties: Virgo, ET

The centre will provide expert support on:

1) GW sources and detection perspectives
2) Low-latency GW triggers and follow-up
3) GW stata analysis, detection, and parameter estimation

JCE-NeCR

Neutrino and Cosmic-ray
Astronomy

NODES
Laboratoire Astroparticules et Cosmologie CNRS
CPPM, UCLouvain, GSSI, BUW, IGFAE

Main Experiments/Facilties: ANTARES, KM3NeT, IceCube, and Pierre Auger
Observatory

The centre will provide expert support on:

1) real-time and offline neutrino event selections in ANTARES, KM3NeT, and IceCube
2) data analysis framework for neutrino searches from a large variety of astrophysical sources
3) joint neutrino and MM analyses
4) high-energy neutrino diffuse emissions

JCE-Xray

X-ray Astronomy

NODES
INAF, IRAP

Main Experiments/Facilties: XMM, Swift, Integral, XRIM, NICER, Nuster, HERMES, SVOM, EP

The centre will provide expert support on:
1) observational proposal writing assistance
2) data analysis, classification and interpretation of X-ray and gamma emitting sources
3) management of databases and computational astrophysics

JCE-GaHE/VHE
High-energy and VHE Astronomy

NODES
CTAO, APC Universitè Paris Citè, DESY, IFAE, INAF

Main Experiments/Facilties: CTAO, MAGIC, H.E.S. S.

The centre will provide expert support on:
1) High-energy emitting sources and their detection perspectives
2) Data analysis and results interpretation
3) MWL/MM support
4) Cherenkov Detection technique details

JCE-OPT/NIR
near Infrared and Optical astronomy

NODES
INAF, NCBJ/BHTOM

Main Experiments/Facilties: TNG, Asiago, ESO-VLT, Rubin LSST, JWST, BHTOM

The centre will provide expert support on:
1) observational proposal writing assistance
2) data analysis, classification and interpretation of opt/NIR/UV emitting sources
3) management of databases and computational astrophysics

JCE-RA
Radio Astronomy

NODES
JIVE, UNIMAN/JBC, LOFAR, Effelsberg

Main Experiments/Facilties: EVN, e-MERLIN, LOFAR

The centre will provide expert support on:
1) help with proposal preparation, and expert support on tools that are necessary for the initial planning of a project, 2) scheduling and observe file preparation,
3) a-priori gain calibration and flagging, 4) pipeline data reduction products, 5) post-processing the data, 6) extensive data analysis (EVN Support+ program at JIVE),
7) support to time-domain/ACME-related projects within regular and in out-of-session (in particular, EVN-lite) observations

VA Modality of access

- The access to expertise will be ensured by remote **hands-on sessions** and help **desk user support**.

- The **hands-on sessions** will last from a few hours to a few days. They will be publicly announced and the attendees will be required to register.

- The **user help desk support** (help on tools/software and MMA projects) will be offered to the community through the expert support web-page(s).

- The VA cost is based on the actual cost of the time of the experts dedicated to the hands-on sessions and to provide user support, the unit of access being the number of hours required to provide the services.

VA Modality of access

- The access to expertise will be ensured by remote **hands-** and help **desk user support**.

- The hands-on sessions will last from a few hours to a few days. They will be publicly announced and the attendees will be required to register *(how many, every two weeks, rotating the organization among JCE? When can we start?)*

- The **user help desk support** (help on tools/software and MMA projects) will be offered to the community through the expert support web-page *(how to set up this page, what info we need to require to the users?)*

- The VA cost is based on the actual cost of the time of the experts dedicated to the hands-on sessions and to provide user support, the unit of access being the number of hours required to provide the services. *(how to collect and testified in uniform way the experts's hours dedicated to each user?)*

In the proposal:

- Users will be requested to register to attend the hands-on sessions and then to provide feedback.

- The report on the hands-on sessions will include a description of the topic, duration, number of involved experts and statistics of the attendees (number, gender, location, professional level).

- The report on the user help access will summarize the activities of the experts and the person months dedicated to them.

- Each centre of expertise will keep a record of their users and will provide this information to the ACME portal (with the consent of the users, and removing GDPR sensitive information like e-mail address).

- All of the domains will work to set up the user help desk and organize materials necessary to make it accessible in the first year and increase the functionality and accessibility throughout the project.

When ready? See deleiverable 12 months

                                    …but to be operative before?

WP3.3 Transnational Access to experts' institutes WP3-TA3

This task will enable **visits of the ACME TA users** to the delivery institutes where direct training and expert support on MM astronomy (observations, data analysis and modeling for the different ACME messenger and multi-wavelength domains) will be offered.

- Task 3.2.1 Preparation of TA (definition of the calls & procedures)
- Task 3.2.2 Implementation of the TA access (Calls for Access of Opportunity-AO, selection and delivery of visits)

TA infrastructures (15 institutes)

AUTh Observatory (Nikolaos Stergioulas), **BUW** (Karl-Heinz Kampert), **Laboratoire Astroparticules et Cosmologie** CNRS (Sonia El Hedri), **CPPM** (Vincent Bertin), **GSSI** (Marica Branchesi), **IFAE** (Cosimo Nigro), **IGFAE** (Enrique Arregui Zas), **INAF** (Silvia Piranomonte), **INFN** (Giancarlo Cella), **IRAP** (Natalie Webb), **IRFU** (Fabian Schussler), **L2IT** (Nicola Tamanini), **UCLouvain** (Gwenhaël de Wasseige), **University of Geneva** (Carlo Ferrigno), **NWO-I/SRON** (Jella de Plaa)

TA Modality of access

- Visiting users will be **selected through a competitive process** based on the quality of the scientific applications and the suitability between the proposed project and the required TA providers.

- The users will receive intensive expert support from the hosting institute

- The visit duration will normally be 5 working days per one-week visits and 10 working days per two-week visits.

- The requested EU funds will cover:
a) travel and subsistence costs of the users (depending on local actual costs, but typically, per person travel cost of 400€ and subsistence cost of 130€/day),
b) the costs of support experts working with the user and the cost of IT support.

Open questions-actions

- The selection panel will be nominated by the ACME Board and will consist of six scientists covering the different ACME domains, of which at least the majority will be from outside the ACME consortium

- The selection panel will select and rank the proposals considering scientific merit, additionally will take into account location, gender and support for non-expert. The selection process will give priority to students, young and early career researchers and in general non-skilled users.

Identify the members of the selection committee who needs to cover several expertes. Some of ACME people or all externals?

Summary of the WP3 Activities

- set-up the **web-pages** to describe the **center of expertise**, to **announce Calls for Access of Opportunity-AO**, to collect information on observatories, their use and capabilities, web-tools and software resources. This will be implemented by WP1 in the project web-page.
- make **user-friendly data analysis and theory tools/software**, produce information, documentation for non-skilled users to be included in the expert support web-page (WP3.2)
- support **organization of periodic virtual hands-on sessions** (e.g., proposal writing, setting-up observational strategy, use of web-resources, data analysis and theory software) (WP3.2)
- **provide help desk direct support on user requests** through the VA expert support web-page (WP3.2)
- **develop use cases** to utilize MM instruments and ACME infrastructure in an innovative and unique way to enhance collaboration and coordination among the different domains (WP3.2 and WP3.3)
- set-up and implement the **TA procedures** (WP3.3)

We envision that European researchers will largely profit from this new and unique opportunity, and we expect a high rate of user requests and visits.

In particular, we expect around **170 visits among 15 infrastructures**, and about **1200 users accessing the center of expertise** (a few hundreds for each center).

List of Deliverables

Number	Deliverable name	Short description	Work package number	Short name of lead participant	Type	Dissemination level	Delivery date (in months)
D3.1	JCEWB	Web-page for the centres of expertise	3	GSSI	DEC	PU	12
D3.2	TAREPORT	Report on TA access	3	GSSI	R	PU	46
D3.3	VAREPORT	Report on VA access	3	GSSI	R	PU	46

List of milestones

Milestone number	Milestone name	Related work package(s)	Due date (in month)	Means of verification
M3.1	WP3 TA procedure in place	3	5	Selection committee, call for proposal text in place
M3.1	Open web-site for the centres of expertise (JCEs)	3	6	Web-page appearing on internet
M3.2	First AO call	3	6	Publication on the ACME webpage
M3.3	Second AO call	3	12	Publication on the ACME webpage
M3.4	Third AO call	3	18	Publication on the JCE webpage
M3.5	Fourth AO call	3	24	Publication on the JCE webpage
M3.6	Fifth AO call	3	30	Publication on the JCE webpage
M3.7	Sixth AO call	3	36	Publication on the JCE webpage
M3.8	Seven AO call	3	42	Publication on the JCE webpage
M3.9	Verification of the TA and VA access	3	24	Report
M3.10	Meeting to discuss plan, activities, VA and TA access status	3	26	Report
M3.11	Verification of the TA and VA access	3	40	Report

Urgent actions

Virtual access

- Identify the JCE coordinators
- Start to work on the contents of web-pages
- Define a uniform way to collect information about users and time provided by the experts
- Define a program of hands-on sessions

Transnational Access

- Define the selection committee and selection procedure
- Prepare materials about the hosting institutes
- Prepare the text of the calls and distributions lists
- Web-page to submit the proposals