AHEAD 2020
Funded by the Horizon 2020 Framework Program of the European Union
Grant Agreement No. 871158

WP 3 Deliverable No. 3.2

Second year workshop report

Project acronym:
AHEAD2020

Project Title:
Integrated Activities for the High Energy Astrophysics Domain

Grant Agreement No: **871158**
This deliverable is part of a project that has received funding from the European Union's Horizon 2020 research and innovation programme

Start date of the project:
2020-03-02

Due date of deliverable: 01 Mar 2022
Submission date: 23 Mar 2022
File Name: WP3_D3.2_Second year workshop report_vs1
Prepared by: EGO

Version	Revision Date	Prepared by	Review and approval
0.1	21.02.2022	Francesca Spagnuolo	Stavros Katsanevas
1	19.03.2022	Francesca Spagnuolo	Lorenzo Natalucci

Distribution List	Date	Version
Benoit Mours (CNRS)	22-02-2022	0.1
Michele Punturo (INF), Frank Linde (Nikhef), Lorenzo Natalucci (INAF)	02.03.2022	0.1

INTRODUCTION

This document brings together the networking activities for the synergies between the Gravitational wave and High Energy Astrophysics community done during the second year of the AHEAD2020 project (*i.e.* from March 2nd, 2021 to March 1st, 2022).

As already explained in the previous activities report (Deliverable 3.1), due to the COVID-19 pandemic the Initial Plan of NA activities (fig. 1) was modified and the activities originally planned for the years 2020 and 2021 were rescheduled according to the new circumstances. Furthermore, a new wave of COVID-19 infections made it necessary to move online networking activities initially postponed to early 2022 (details in Section 2).

Task	Lead partner	NA	When
3.2. Multimessenger research	EGO	2 symposia	2020;2024
3.3. Synergies with High Energy and Geoscience	EGO	2 symposia	2021;2023
3.4 Research and Development	CNRS	2 workshops	2022;2023
3.5. Low Latency Triggers and Access to Data	NIKHEF	2 workshops	2021;2023
3.6. Next generation Large Infrastuctures	INFN	2 workshops	2020; 2022

Figure 1 – Initial Plan of NA activities

Therefore, the next sections will (1) describe networking activities done in the course of the Second Year of AHEAD2020 and (2) explain changes made in the schedule of the planned workshops.

NETWORKING ACTIVITIES DURING THE SECOND YEAR

WP3 focuses on networking activities for the synergies between the gravitational wave and high energy astrophysics community to integrate the two communities into a coherently acting multi-messenger consortium.

Strong links are maintained with the European agencies funding Astronomy, Astrophysics and Astroparticle Physics (APPEC, ASTRONET) and with the European Southern Observatory (ESO), with the objective of promoting theoretical research activities and strengthen collaboration.

In this framework, during the second year of the project, the following activities were held to network with the gravitational wave and high energy astrophysics communities (**Task 3.2**) and to build synergies with the high energy and geoscience communities (**Task 3.3**):

- Several remote meetings involving the high energy and geoscience communities were held under the coordination of EGO. Due to the COVID-19 pandemic, that has not made it possible to organize the in-person symposium planned for 2021, we decided to replace this event with a number of virtual meetings (**5** held from September 2021 to February 2022). During the virtual meetings (fig.2) the two communities discussed opportunity for future collaboration (including submission of a project proposal to the HORIZON-INFRA-2022-TECH-01) and advancements in a number of fields of common interests (including fibers/undersea fibers; muography applications; neutrino tomography, and others).

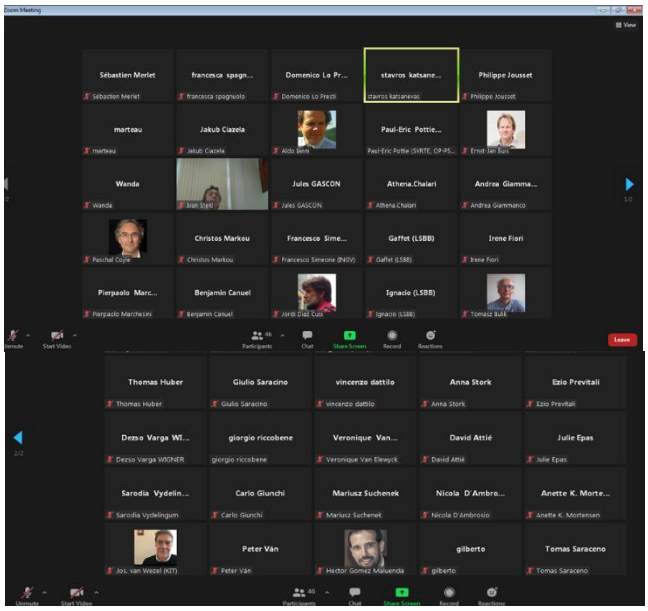

Figure 2 – virtual meeting between the high energy and geoscience communities, held on January 20th, 2022

Figure 3- 2nd Gravi-Gamma Workshop

- The "2nd Gravi-Gamma" Workshop was held online on June 23-25, 2021 (see fig. 3) with the participation of experts in the fields of multi-messenger instrumentation and data analysis, fundamental physics and cosmology, to address the science potential with current and future detectors and the requirements for the future network. The agenda of the meeting and the presentations of the invited speakers are available at the following URL: https://agenda.infn.it/event/20758/timetable/

- The 1st international workshop for "Gravitational-Wave Detection on the Moon" was held in-person at EGO (Cascina, Pisa- Italy) and online (on the ZOOM platform), on October 14-15, 2021, (see fig.4). The workshop brought together leading experts from the fields of gravitational wave science, planetary science, and lunar exploration to discuss the opportunities and challenges of building a gravitational wave observatory on the lunar surface. Synergies with proposed and approved GW detectors, like the joint European Space Agency and NASA space mission LISA and the proposed Einstein Telescope and Cosmic Explorer were also discussed during the workshop.

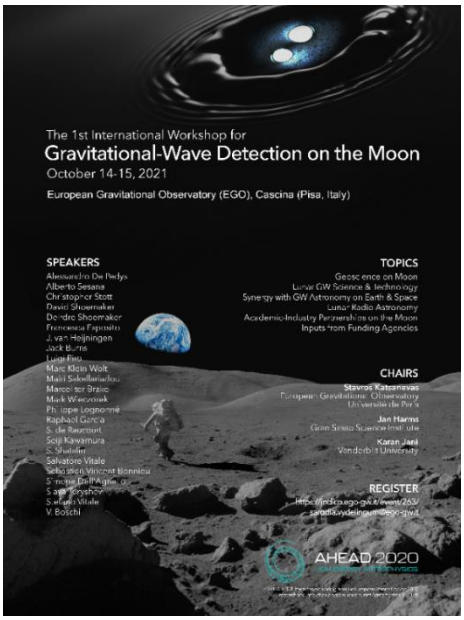

Figure 4- The 1st International workshop for Gravitational-Wave Detection on the Moon

Figure 5- Low-latency alerts & data analysis for Multi-messenger Astrophysics

- The "Low-latency alerts & Data analysis for Multi-messenger Astrophysics", held online (ZOOM platform) on January 13-14, 2022 (see fig.5), was organized in collaboration with **Task 3.5**. The workshop, initially meant as an in-person event in Paris (France), was converted in an online event (ZOOM) due to a new wave of COVID-19 infection in Europe. The roundtable sessions fostered discussion on several topics of shared interested between experiments, including new analysis tools for

the transient Universe, data format, sharing of results; big data; efficient and scalable machine learning algorithms; EOSC and open data for observatories.

Within the activities of **Task 3.6** (Next generation Large Infrastructure) the first workshop on future large infrastructures, initially planned for 2020, was held from November 8 to November 11, 2021, in Nuoro (Italy). The workshop focused on the seismic, geological and geotechnical studies preliminary to the realization of a large infrastructure. The agenda of the workshop, that was a hybrid (in-presence/remote) event, can be found at the following URL: https://agenda.infn.it/event/28070/

PLANNED WORKSHOPS

Due to the unexpected spread of the COVID-19 pandemic and repeated waves of the infection, the networking activities originally planned for the years 2020 and 2021 have been rescheduled, and in some cases re-planned as virtual events. Table 1 provides a synopsis of the update plan of NA:

Task	**Lead partner**	**NA**	**When**
3.2. Multimessenger research	EGO	2 symposia	~~2020~~ **2021**; 2024
3.3. Synergies with High Energy and Geoscience	EGO	**Virtual meetings** ~~2~~ **1** symposium	2021/**2022** 2023
3.4 Research and Development	CNRS	2 workshops	2022; 2023
3.5. Low Latency Triggers and Access to Data	NIKHEF	2 workshops	~~2021~~ **2022**; 2023
3.6. Next generation Large Infrastructures	INFN	2 workshops	~~2020~~ 2**021**; 2022

Table 1- updated plan of NA

In 2022, the following networking activities are expected to take place:

- A second "Low-latency alerts & Data analysis for Multi-messenger Astrophysics" event to be held in person in October (5/7 October);
- virtual meetings with the involvement of the high energy and geoscience communities (to be held on ZOOM);
- A second workshop on future large infrastructures (to be held in –person in spring-summer);
- A small workshop on the development of tools to identify GW event candidate, suitable for multimessenger search (to be held before the start of the LIGO-Virgo-KAGRA observing run- TBD).