



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



AHEAD 2020

 Ref. Ares(2022)2432493 - 01/04/2022

WP 4 Deliverable No.4.11

Report on open days, summer schools year-2

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 March 2022

Submission date: 28 March 2022

File Name: WP 4 Deliverable 4.11 Report on Open Days, summer schools year-2

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Introduction

The Public Outreach package (WP4) has as a goal to publicize the scientific results in High Energy Astrophysics and Gravitational waves to the general public and primarily students. This is accomplished via a series of instruments which include running two regularly updated web-pages, in both Astrophysics and Gravitational waves, production of scientific videos, posters and organization of schools and open day events. This work package is based on the joint efforts of at least seven research Institutes and Universities (Greece, United Kingdom, France, Italy, Spain, Germany). Here, we report on the work performed and the problems encountered in the organization of schools and open day events

Activities performed

A number of the originally planned activities took place the second year of the project. Despite the pandemic situation, we succeeded in hosting Open Air meetings, talks and other public outreach activities, keeping safe distances and all protection measures against covid-19. Additionally, many other activities have been hosted on the web. In some cases, this had a positive outcome. For example, the two schools organized by NOA (summer camp and winter school) were conducted online and this resulted in the participation of children from all over Greece and Cyprus that it would be difficult for them to attend in person in the case of an in situ event.

In the majority of the activities, we used the produced AHEAD2020 educational material and received feedback from the participating schools and audience in general. In particular, we used CLAXSON (the X-ray game produced by IRAP), mini-movie screenings from the AHEAD & AHEAD2020 produced videos (including both the 3-minute videos produced by IFCA and the dome videos), and other educational material from the AHEAD2020 webpages. Below, we describe in short the activities (with most of them devoted only to high-energy astrophysics) held by each of the institutes participating in the WP4:

1) NOA:

- We organized an **Astronomy summer school** that lasted two days intended for final year high-school students (1-2/09/2021).
- Furthermore, we organized a summer school meant for children of 5th & 6th grade, from 28 to 30 June 2021. This was the first time presenting a **summer camp devoted only to high energy Astrophysics**. The school was conducted online and this resulted in the participation of ~20 children from all over Greece, while among the speakers were the specialized staff and researchers of NOA. The program aimed at the participation of the children and their acquaintance with the various research fields of Astrophysics starting from our solar system and extending to the invisible X-ray Universe and the black holes and active galactic nuclei.
- The success of the summer camp prompted us to also organize a **winter school** in February 2022 lasting three Sundays (13th, 20th and 27th) of three hours each day. Around 20 students took part from Greece but also Cyprus. In both schools, there were interactive talks, exercises (e.g. CLAXSON: the X-ray game produced by IRAP), mini-movie screenings from the AHEAD & AHEAD2020 produced videos (including the 3-minute videos produced by IFCA for

AHEAD2020), and many quizzes (Kahoot platform), while there were many hands-on activities and also astronomical observations of the Sun.

- Moreover, we organized the **second online X-ray Astronomy session for adults** that took place on the 13th of March 2021 reaching ~40 persons. It included an introduction to X-ray astronomy and high-energy astrophysics as well as an introduction to the AHEAD2020 project. Part of this session was also a talk dedicated to black holes by Dr. Ioannis Georgantopoulos (<https://www.youtube.com/watch?v=IAIAEmvG2Sk>) .

2) INAF-OAR-IAPS:

- **The Energy of the Universe** (11th march 2021): This activity is a double speaker speech made in cooperation with the “Museo dell’Energia di Ripi”. The activity was opened to about 20/30 students and it involved the use of small experiments performed via web. The activity was divided in 3 parts: the first was the explanation of what is “Energy” and the list of how many forms of energy we can find in the Universe, the second part shows the public the most energetic events in the Universe to also explain the concept of multi-messenger observations, the last part was about the use of Energy in the real life (using small experiments).
- **Researchers Night 2021** (24th sept 2021): During the RN2021 we managed to take part online to some conference and seminar also involving directly the researchers, connected in streaming from their house or Labs. One of these activities involved High Energy Astrophysicists talking about gender balance and the women's role in modern Astronomy.
- After a long time without the direct contact with people we were able to manage an event in person at “Città dell’altra economia” in Rome. At this venue the research institutes involved in the RN2021 in Rome performed talks and labs for kids. During this event **several hundreds of people were able to talk with the researchers in stands and in the open spaces**. Researchers involved in High energy astrophysics research and Gravitational waves research from the INAF OAR were involved in the talks and labs to explain their work and research.
- **How the Universe works – The scariest and most energetic places ever** (July - August 2021): The third activity was a sort of Special Project not scheduled at the moment of the Grant agreement. We designed and managed an online activity in collaboration with a Clinic for Mental Health. About 50 participants were involved in a three-session project. First we took contact with the guys following local meetings (online tutoring) focused on their ideas on Universe and Energy in the Universe, then we had an interactive session, ppt presentation with Q&A, during a seminar designed to show them the topics they were mostly interested in. In the end we had an offline Q&A session by email (and skype with the local tutors).
- In the past months, we have designed and developed a project within the National Youth Apprenticeship program entitled “**L’ADAE - approaching high energy astrophysics**”: L’ADAE is carried out both in presence and online, from January 2022 to June 2022, and consists of approximately 40 hours of activities, in which ~ 25 students are introduced to high-energy astrophysics and science communication. In the first 10 hours, students have attended lectures introducing the basic knowledge of cosmology, cosmic structure formation, high-energy astrophysics, and science communication, including an introduction to the philosophy of science, in order to answer two fundamental questions: “what is high energy astrophysics and why is science communication fundamental?”. The remaining 30 hours are dedicated to a series of podcasts. The students will work in groups, developing podcasts on high-energy astrophysics and related topics. Podcasts - which will be in Italian and based on interviews - will be written, produced, and directed by them. In particular, students will be divided into groups of three, in each of which the work will be divided into writing, recording/interviewing, and editing. In addition, some students will not be directly involved in creating these podcasts but will contribute to the success of the project through other roles. For instance, as social media managers, they will create

and produce content for a dedicated social media page (considering the target audience will be other teenager students), or as graphic designers, they will be responsible for the creation of a visual identity and posters for social media, or as musicians, they will compose the soundtrack of the podcasts.

3) EGO:

- We organized the event “Lo Spazio e i Sensi” on the occasion of the European Researchers Night 2021. The “Lo Spazio e i Sensi” event took place on the 24th September 2021, in Pisa, Italy. It was a **night of science and music organized by EGO** with the participation of Marica Branchesi (GSSI), the astronomer Wanda Díaz-Merced and the Italian-Greek singer Marina Mulopulos. During the event Prof. Stavros Katsanevas (EGO) conversed with Wanda Díaz-Merced and Marica Branchesi on science and music beyond the senses. The event was attended by 150 persons and had 330 visualizations of the facebook live (live streamed on social media). The recording of the event is available at the following URL: https://www.facebook.com/watch/live/?ref=watch_permalink&v=605762537264745
- The EGO node has started a programme of remote live visits of its facilities in Cascina (PISA) and of the Virgo detector. The programme started at the end of October 2020. In the referred period (March up to June 2021), we organized ~18 remote visits and collected up to 1400 remote visitors on zoom and around 1700 visualizations on Facebook and Youtube.

4) IFCA: We organized a series of **talks related to high-energy astrophysics**:

- European Researchers Night (20-23 March 2021):
 - 4 Online talks to scholars : Solar System, X-ray Universe, Black Holes
- Science Week (8-12 Nov 2021):
 - 4 Online talks to scholars : Solar System, X-ray Universe, Black Holes
- International Day of Women and Girls in Science (11 feb 2022):
 - This was the first time a joint international initiative took place between the AHEAD2020, Athena Community Office, Athena/X-IFU, Athena/WFI and H2020 XMM2Athena projects with the aim of showing the contributions of women to science and in particular to the field of astronomy and astrophysics.

5) ULEIC: During this period, we organized three **talks in person related to high-energy astrophysics** (each talk was attended by ~30 persons):

- Talk at the National Space Centre on Lobster Eye Telescopes, World Space Week, 8 October 2021 (Dr. Charly Feldman)
- "Kilonovae, Gravitational Waves and short-duration GRBs", Mansfield and Sutton Astronomical Society, 25 January 2021 (Professor Nial Tanvir)
- "Kilonovae, Gravitational Waves and short-duration GRBs", Cambridge University Astronomical Society, 15 February (Professor Nial Tanvir)

6) IRAP: A number of **public outreach talks on X-ray and gamma-ray Astronomy** have been organized in person and on the web:

- March 2021 : Work with journalist Jonathan O'Callaghan on an outreach article in Quanta Magazine on intermediate mass black holes (Natalie Webb)

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- 24 March 2021 : 1 hour visit of the IRAP high bay clean room showing X-ray detector program for High Energy Astrophysics to 14 year old students (François Pajot)
 - 6 April 2021 : 1 hour discussion on high energy astrophysics (via zoom) with a group of first year University Toulouse III students at IRAP (Natalie Webb)
 - 7 April 2021 : 1 hour discussion on high energy astrophysics (via zoom) with a group of first year University Toulouse III students at IRAP (Natalie Webb)
 - May 2021 : Work with journalist Benoît Rey on an outreach article in Science & Vie on intermediate mass black holes (Natalie Webb)
 - 18 June 2021 : 1 hour talk on the Athena space mission on High Energy Astrophysics with 14 & 15 year old students at IRAP (François Pajot)
 - July 2021 : Release of an app/ website for the general public showing variability of high energy sources <http://xmm-ssc.irap.omp.eu/oya/>
 - August 2021: Epicycles of modern astronomy at the festival de ciel et de l'espace, Fleurance (Peter von Ballmoos), in person, several hundred attendees <https://www.festival-astronomie.com/>
 - October 2021 : Light on the dark side of the Universe, at the French Space Agency (Peter von Ballmoos), in person
 - November 2021 : 2*1 h discussion on high energy astrophysics with a group of 15 year olds (Natalie Webb), at IRAP, Toulouse, ~15 students, see <https://www.irap.omp.eu/formation-emploi/stages/>
 - November 2021 : Round table for UPS in Space on the future of High Energy observatories (Natalie Webb), at the University Toulouse III, 30 people in person and retransmitted online (~30 people) <https://twitter.com/upsinspace/status/1461325853409918980>
 - December 2021 : 2*1 h discussion on high energy astrophysics with a group of 15 year olds (Natalie Webb), at IRAP, Toulouse, ~15 students, see <https://www.irap.omp.eu/formation-emploi/stages/>
 - January 2022 : 2*1 h discussion on high energy astrophysics with a group of 15 year olds (Natalie Webb), at IRAP, Toulouse, ~15 students, see <https://www.irap.omp.eu/formation-emploi/stages/>
 - February 2022 : 2*1 h discussion on high energy astrophysics with a group of 15 year olds (Natalie Webb), at IRAP, Toulouse, ~15 students, see <https://www.irap.omp.eu/formation-emploi/stages/>
 - February 2021 : Dr. Tournesol et Mr. Folamour (la succes-story des relations entre astronomes et militaires), Toulouse popular astronomy society (Peter von Ballmoos), in person
 - March 2022: Interview on the University Toulouse radio on Women in astrophysics (Natalie Webb)
 - March 2022: "Science Speed dating" - a series of 10 min meetings over 1.5 h with the general public explaining Astrophysics (Natalie Webb) at the Museum, Quai des Savoirs, ~ 10 people, <https://www.quaidessavoirs.fr/agenda?oaq%5Buid%5D=3240448>
 - March 2022 : Questions and answer session (1.5 h) on the profession of astrophysicist with PhD students (Natalie Webb), at the University Toulouse III, ~100 people
 - March 2022 : Questions and answer session on the profession of astrophysicist with the general public (Natalie Webb), at the University Toulouse III, ~100 people over the day, <https://www.upsinspace.com/2022/02/19/evenement-chercheuses-detoiles/>