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Second year meetings and workshops report

Project acronym:
AHEAD2020

Project Title:
Integrated Activities for the High Energy Astrophysics Domain

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Distribution List	Date	Version
AHEAD2020 Consortium Board	25-02-2021	1.0
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Scope

This document concerns the delivery of the WP2 (Networking for the High Energy Astrophysics Community) Meetings and Workshops report, applying to the second year (March 2021-February 2022). Due to the Covid-19 outbreak, all face-to-face activities were cancelled, thereby seriously impacting all activities planned for the first year. The vast majority of them were postponed waiting for a more favorable situation. Unfortunately, this has not happened yet so some of the meetings have been moved to virtual. In the period considered for this report (until August 2021), only two conference has been held, while beyond that date, but still within 2021, another conference has been held. On the other hand, no Schools have yet been performed.

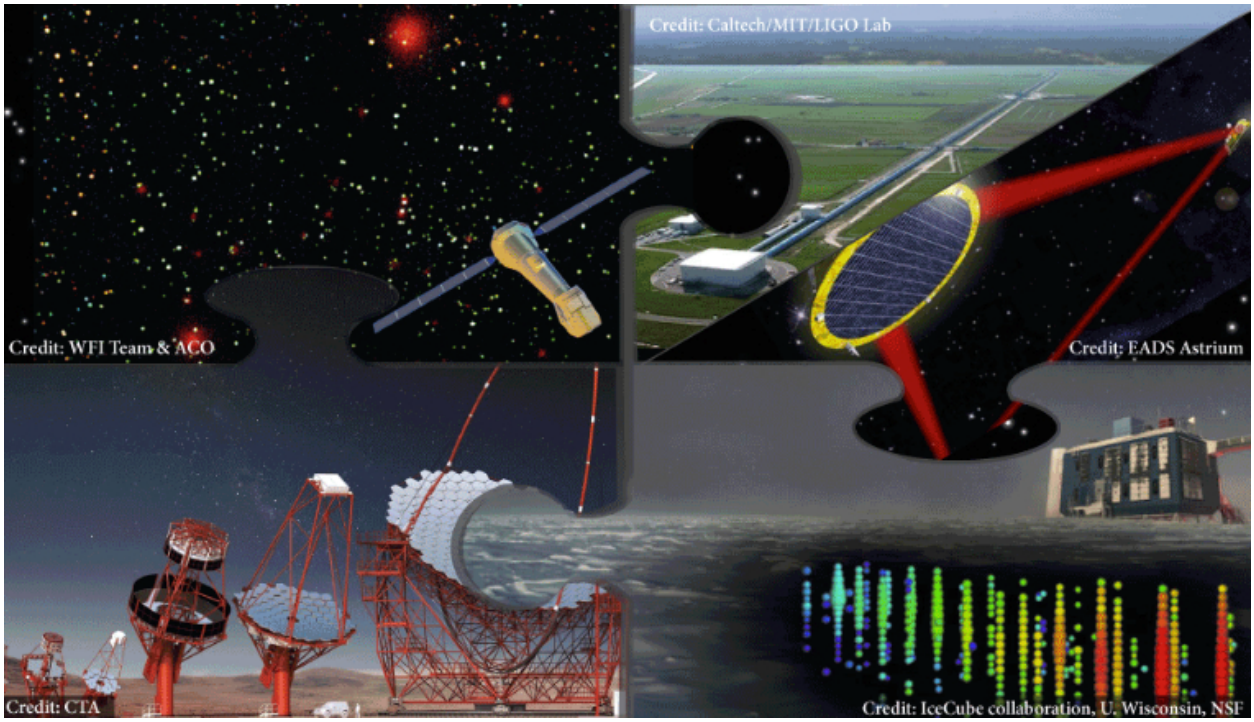
Meetings a Workshops

THESEUS Conference (Task 2.3.10)

The Transient High-Energy Sky and Early Universe Surveyor (THESEUS), candidate M5 mission (now cancelled by ESA) was carried out during 23-26 March 2021. After some delays due to the pandemics, it was carried out virtually. The conference was followed by 478 attendees. Within this dedicated scientific conference, the THESEUS science case was presented through dedicated review talks, discussing the status-of-the-art knowledge on GRB science, early Universe studies, gravitation wave physics, and transient Universe phenomena in general. The development status of the instruments on-board THESEUS was reported and discussed, together with the current assumptions for the mission profile. Contributed talks to enrich the program and suggest further exploitations of the THESEUS instrumentation in many other fields of the modern Astronomy, Astrophysics, Cosmology, and fundamental physics, were included. The aim was to strengthen the involvement of the community in the project and boost even more the synergies being developed between THESEUS and all other facilities operational in the 2030s in the multi-wavelength domains. All the relevant information can be found at the dedicated conference website:

https://www.isdc.unige.ch/theseus/theseus-conference-2021.html

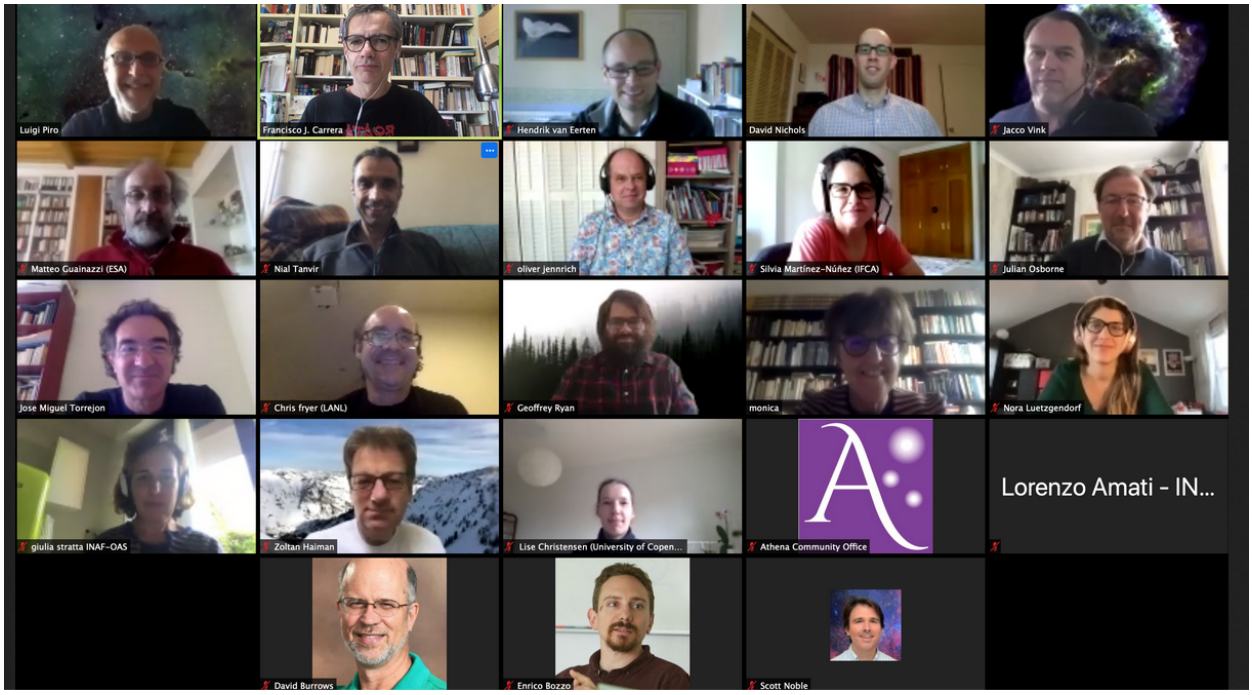
The Athena Multi-messenger and High Energy Astrophysics Synergies (AMHEAS) Workshop II (Task 2.3.12)



Within the WP2 Task 2.3 "AHEAD Conferences and Workshops", the on-line conference (AMHEAS: Athena Multi-messenger and High Energy Astrophysics Synergies), second in a series after the first one hold in Alicante in November, 2019, was co-organized, by CSIC-IFCA and the University of Alicante (UA). The workshop focused on identifying and developing potential scientific synergies between the *Athena* X-ray observatory mission (ESA) and GW/v's/HE/GRB facilities that will be operational contemporary to *Athena*.

The goal is to produce a white paper that should address the scientific topics where the synergetic use of *Athena* and the key multi-messenger facilities operating at the end of this decade will result in a scientific added value.

This conference should have been held face-to-face but was finally turned to virtual due to the Covid-19 situation. Information of the conference can be found at:
https://indico.ifca.es/event/1420/
The conference run from 5 to 6 of May 2020 and was attended by 21 researchers from Europe and USA.



The workshop program was:

Athena- Multi-messenger Synergy Meeting/Videocon

May 5 and 6, 2020

Program

May 5 13.00-18.00 (CEST)

<u>Introduction, GWs from ground and space</u>

- Welcome and Logistics: Francisco Carrera/ACO (5 min)
- Introduction and scope of the meeting: Luigi Piro (15 min)Report from Athena and ground-based GW observatories: LIGO & VIRGO:
- Introduction: Science Themes & Landscape: David Nichols (20 min)
- Off-axis afterglow: Hendrik Van Eerten (15 min)
- Late time kilonova: Geoff Ryan (15 min)
- Observational strategy: Luigi Piro (15 min)
- Current status and next steps: key figures, simulations & schedule: David Nichols (20 m)

<u>Report from Athena & LISA:</u>

- Introduction: Landscape and Science Themes: Oliver Jennrich (20 min)
- SMBH: Monica Colpi (25 min)
- Other mergers: Alberto Sesana (10 min)
- Athena Observational strategy & Caveats: Matteo Guainazzi (15-30 min)
- White dwarfs: Oliver Jennrich (5 min)
- Current status and next steps: key figures, simulations & schedule: Oliver Jennrich (20 min)

May 6 13.00-18.00 (CEST)

- Athena Community Office: resources for simulations: Francisco Carrera (10 min)
- SIXTE: Joern Wilms (15 min)
- Report from Athena v's and VHE(Icecube, KM3net, CTA):
- Introduction: Landscape and Science Themes: Jacco Vink (20 min)
- Galactic and other sources (clusters): Jacco Vink (20 min)
- Jets and outflows from AGN: Paolo Padovani (15 min)
- GRBs, other sources and fundamental physics: Alexis Coleiro (20 min)
- Observational strategy, status & future steps: Alexis Coleiro (20 min)

Report from Athena and Transient Universe with Theseus, Leads P. O'Brien (max 2 hrs):

- Introduction: Landscape and Science Themes: Lorenzo Amati, Paul O'Brien (20 min)
- Cosmic dawn: Lise Christensen (20 min)
- Transients: Julian Osborne (15 min)
- Multimessenger: Giulia Stratta (15 min)
- Observational strategy: Enrico Bozzo (15 min)
- Current status and next steps: key figures, simulations & schedule: Paul O'Brien (20 min)

Wrapping up: next steps, schedule, actions for final WP: Luigi Piro & all (20 min)

The white paper has now finally been released and is available at the address:

https://arxiv.org/abs/2110.15677

Activities beyond 31 August but during 2021

IAUS 363 Neutron Star Astrophysics At The Crossroads: Magnetars And The Multimessenger Revolution (Task 2.3.5)

Held virtually during the dates 29 November - 3 December 2021. The symposium provided an interdisciplinary forum, timely bringing together astrophysicists, computational and nuclear physicists, gravitational wave researchers and others to discuss these new findings and lay down the open questions to be solved in the first decade of multi-messenger astrophysics. The status, perspectives and challenges in the blossoming era of multi-messenger astronomy were presented along with an exploration of the many facets of magnetars, from theory to their most to extreme observational manifestations, cosmic fireworks, such as giant flares, gamma-ray bursts, kilonovae and supernovae. Discussions on next generation facilities for multi-messenger astronomy and their associated science cases were included. The number of attendees was ~ 250. All the relevant information can be found at the conference dedicated website:

https://astromeeting.gssi.it/

Finally, the topics and nature of the content of the workshop **"Algorithms, statistical tools and software: advanced data analysis" (Task 2.3.8)** clearly called for a face-to-face meeting. It was initially foreseen for the end of 2021 but the worsening of the pandemics after the summer 2021, forced its delay to 22 February 2022, when it was finally carried out online.

http://ahead2020-advanced-da.oats.inaf.it

Schools

So far, and due to the worldwide impact of the pandemics, no School has been organized. The Schools under WP2 Task 2.4 are meant to be organized along the whole duration of the project. Some of them (2.4.2 for example) were foreseen for the first years. However, contrary to the solution adopted for some workshops and conferences, namely, to carry them online, we prefer to defer the schools hoping for an improvement of the pandemic's situation. This is because a) the schools are addressed to young people (students), for whom face-to-face interaction with teachers and mates is considered very important for their academic formation and b) because of the heavy focus of the schools in hands-on sessions. Furthermore, the topics of the schools pertain to space missions which are still well in the future (the closest one related to XRISM telescope, to be launched in 2023). Therefore, we will organize the schools from 2022 on. Below we list all the planned schools throughout the duration of the project.

Task	Title	Leading Institution	Dates
2.4.1	Small satellites, ground support, HE Astrophysics	CTU	2023
2.4.2	Athena X-IFU Science Simulator (SIXTE)	IFCA	29-31 March 2022 (virtual)
2.4.3	eROSITA	MPE	2022-2023
2.4.4	Time domain and multimessenger astronomy	ULEIC	2023-2024
2.4.5	High Resolution X-ray Spectroscopy	UA-SRON	January 2023
2.4.6	Nanosats	NUI UCD	2022-2023