

**3rd Astro-COLIBRI
multi-messenger astrophysics
workshop**



**Rapport sur les
contributions**

ID de Contribution: **9**

Type: **Non spécifié**

Current version and features

lundi 16 septembre 2024 17:00 (45 minutes)

Classification de Session: Astro-COLIBRI

ID de Contribution: 33

Type: **Non spécifié**

Conclusions

vendredi 20 septembre 2024 12:00 (30 minutes)

Orateur: SCHÜSSLER, Fabian (IRFU / CEA Paris-Saclay)

Classification de Session: Sciathon

ID de Contribution: 34

Type: **Non spécifié**

Participants presentations

lundi 16 septembre 2024 10:15 (45 minutes)

Classification de Session: Introduction

ID de Contribution: 35

Type: **Non spécifié**

Multi-messenger theory and modelling

lundi 16 septembre 2024 11:00 (45 minutes)

Orateur: DAIGNE, Frédéric (Institut d'Astrophysique de Paris - Sorbonne University)

Classification de Session: Introduction

ID de Contribution: 36

Type: **Non spécifié**

The Multi-Messenger Astronomy Followup Ecosystem

lundi 16 septembre 2024 11:45 (45 minutes)

The Multi-Messenger Astrophysics (MMA) era has necessitated that we coordinate the community at an entirely new level. Many of these events (e.g., gravitational wave and neutrino sources) are not localized enough to unambiguously identify the electromagnetic counterpart. Instead, large-scale searches are necessary to localize the source to combine the information from the different astrophysical messengers from the event. In addition, these events are often short-lived transients requiring rapid discovery and characterization. The community has developed a plethora of automated tools to enable coordination and rapid this need, from alert brokers to data reduction pipelines, to Target and Observation Management (TOM) systems, to messaging systems to report observational results back to the community. I will present an overview of these tools, walking through a fiducial workflow once a new MMA event is discovered. I will also suggest places where tools can interoperate and how we can lower the barrier to entry for users to adopt this workflow. As a community, we can no longer afford to not coordinate: it behooves us to ensure that as much of the community can adopt these new tools as possible.

Orateur: MCCULLY, Curtis

Classification de Session: Introduction

ID de Contribution: 37

Type: **Non spécifié**

Welcome

lundi 16 septembre 2024 10:00 (15 minutes)

Orateur: SCHÜSSLER, Fabian (IRFU / CEA Paris-Saclay)

Classification de Session: Introduction

ID de Contribution: **38**Type: **Non spécifié**

RAPAS

mardi 17 septembre 2024 17:00 (15 minutes)

RAPAS project : 2024 status

The RAPAS project is on its third year of development. We will present the photometric accuracy of the network and the first results we got from the two spectrograph prototypes to deliver photometric and spectral energy distribution on alerts. A first Astro-COLIBRI filter is connected to the RAPAS network to disseminate alert selection then monitoring.

Orateur: MIDAVAINÉ, Thierry

Classification de Session: Citizen science

ID de Contribution: **39**Type: **Non spécifié**

WIVONA

mardi 17 septembre 2024 17:15 (15 minutes)

Implementing Astro-Colibry query in PRISM and Sharcap

Wivona is a PRO/AM collaboration to develop access to and usage of the Virtual Observatory data in the amateur's Community.

Transients related data are part of the aim .

PRISM and Sharpcap have been chosen to initiate the developments. Related Software will be open source and support will be provided to requesting developers.

Orateur: GODARD, Jean-Paul

Classification de Session: Citizen science

ID de Contribution: **40**

Type: **Non spécifié**

IceCube

mardi 17 septembre 2024 13:30 (15 minutes)

Orateur: BLAUFUSS, Erik

Classification de Session: Wavelengths and messengers

ID de Contribution: 41

Type: **Non spécifié**

KM3NeT

mardi 17 septembre 2024 13:45 (15 minutes)

Orateur: DUCOIN, Jean-Grégoire

Classification de Session: Wavelengths and messengers

ID de Contribution: 42

Type: **Non spécifié**

SuperK-SN

mardi 17 septembre 2024 14:00 (15 minutes)

The detection of SN burst neutrinos from a nearby/Galactic core-collapse supernova (SN) can provide an early warning to the multi-messenger astronomy community. As the world's largest water-Cherenkov detector, Super-Kamiokande (SK) maintains an independent SN alert system, "SNWatch", and also contributes to SNEWS. Recent upgrades to the SK detector and SNWatch have increased the capabilities and speed of SN burst detection and added a new automated alert on GCN. As well, SK has the unique capability to independently reconstruct an accurate SN pointing direction. This system was also upgraded with significant improvements in speed and accuracy. This work has led to significant reduction in SN alert latency with improved pointing information. These advances improve the opportunity for multi-messenger astronomers to detect the initial SBO radiation in the event of the next galactic supernova.

In this talk I will describe the SN burst neutrino detection and direction reconstruction at SK and the recent upgrades to the alert system. I will also open the discussion of how these improvements might impact SN alert response plans for multi-messenger observers.

Orateur: POINTON, Barry

Classification de Session: Wavelengths and messengers

ID de Contribution: 43

Type: **Non spécifié**

LIGO-Virgo-KAGRA

mardi 17 septembre 2024 14:30 (15 minutes)

Orateur: SEGLAR ARROYO, Monica (IFAE)

Classification de Session: Wavelengths and messengers

ID de Contribution: 44

Type: **Non spécifié**

Redback

mardi 17 septembre 2024 14:45 (15 minutes)

Orateur: SARIN, Nikhil

Classification de Session: Theory/phenomenology

ID de Contribution: 45

Type: **Non spécifié**

Neutrino sources

mardi 17 septembre 2024 15:00 (15 minutes)

Orateur: OIKONOMOU, Foteini (Norwegian University of Science and Technology (NTNU))

Classification de Session: Theory/phenomenology

ID de Contribution: 46

Type: **Non spécifié**

SNEWS

mardi 17 septembre 2024 14:15 (15 minutes)

The Supernova Early Warning System (SNEWS) is a network of neutrino and dark matter detectors which aims to detect coincident neutrino signals in multiple detectors and alert the worldwide observer community. It has been in automated operation since 2005, but is now undergoing a significant upgrade with goals including increasing sensitivity for both neutrino bursts as well as pre-supernova neutrinos, reducing alert latency, and providing real-time estimates of observationally relevant quantities such as direction and distance. It also aims to engage with follow-up communities to maximize the science from a galactic supernova.

Orateur: TSENG, Jeff**Classification de Session:** Wavelengths and messengers

ID de Contribution: 47

Type: **Non spécifié**

GCN

mardi 17 septembre 2024 15:45 (15 minutes)

General Coordinates Network (GCN): NASA's Next Generation Time-Domain and Multimessenger Astronomy Alert SystemA

The General Coordinates Network (GCN) is a public collaboration platform run by NASA for the astronomy research community to share alerts and rapid communications about high-energy, multimessenger, and transient phenomena. Over the past 30 years, GCN has helped enable many seminal advances by disseminating observations, quantitative near-term predictions, requests for follow-up observations, and observing plans. Recently, GCN has introduced the Unified Schema, which acts as the foundation for the new GCN Notices that are exclusively streamed through Kafka and employ a JSON format for easy machine readability and accessibility through an open-source repository. In this talk, we will introduce (1) how to produce the new GCN Notices, inclusion of new missions BurstCube, Einstein Probe, and SVOM, (2) Astro Flavored Markdown for enriching GCN Circulars and astronomical bulletins, (3) revisions and errata for GCN Circulars and (4) application of large-language model for information extraction from the Circulars

Orateur: SHARMA, Vidushi

Classification de Session: Platforms

ID de Contribution: **48**

Type: **Non spécifié**

TNS

mardi 17 septembre 2024 16:00 (15 minutes)

Orateur: YARON, Ofer

Classification de Session: Platforms

ID de Contribution: 49

Type: **Non spécifié**

AMPEL

Classification de Session: Platforms

ID de Contribution: **50**

Type: **Non spécifié**

FINK

mardi 17 septembre 2024 16:15 (15 minutes)

Orateur: PELOTON, Julien (CNRS-IJCLab)

Classification de Session: Platforms

ID de Contribution: 51

Type: **Non spécifié**

TreasureMap

mardi 17 septembre 2024 16:30 (15 minutes)

The Gravitational Wave Treasure Map is designed to help coordinate electromagnetic followup of gravitational-wave (GW) events. It allows observers to easily report their planned and executed observations in search of counterparts to GW events, and to query the reports of other observers, in a programmatic way. The goal is to enable coordination between observatories in order to minimize unnecessary overlap in these searches, and find the counterpart as quickly and as efficiently as possible. We will discuss the transparent engagement that has taken place during the LVK O4 observing run, and how others can easily get started in integrating the Treasure Map's API into their observing infrastructure.

Orateur: WYATT, Samuel**Classification de Session:** Platforms

ID de Contribution: 52

Type: **Non spécifié**

BHTOM

mardi 17 septembre 2024 16:45 (15 minutes)

Orateur: WYRZYKOWSKI, Lukasz

Classification de Session: Platforms

ID de Contribution: 53

Type: **Non spécifié**

TESS

lundi 16 septembre 2024 16:00 (15 minutes)

TESS Transient Light Curve Patrol

The Transiting Exoplanet Survey Satellite (TESS) is a space telescope mission developed by NASA with the goal of detecting exoplanets. Over the duration of its mission, TESS has trained its wide-field imaging array on dozens of sky sectors, and identified thousands of candidate targets. Our team has developed a subtraction pipeline for these full frame images as well as a tool for the public to generate forced photometry light curves from these image stacks. With these light curves, we can provide high-cadence (2-minute) optical counterpart observations for any high-energy event that occurs within TESS viewing sectors. My talk will include a detailed overview of NASA's TESS mission, its science results, as well as our light curve sharing tool.

Orateur: HART, Kyle**Classification de Session:** Wavelengths and messengers

ID de Contribution: 54

Type: **Non spécifié**

ATLAS

lundi 16 septembre 2024 16:15 (15 minutes)

Orateur: STEVANCE, Heloise

Classification de Session: Wavelengths and messengers

ID de Contribution: 55

Type: **Non spécifié**

LAST

lundi 16 septembre 2024 16:30 (15 minutes)

Orateur: KONNO, Ruslan (Weizmann Institute)

Classification de Session: Wavelengths and messengers

ID de Contribution: 56

Type: **Non spécifié**

Argus Array

lundi 16 septembre 2024 16:45 (15 minutes)

Data products, public access, and survey optimization for the Argus Array

The Argus Array will be a 900-telescope optical survey instrument with a combined collecting area equivalent to a 5-meter telescope and an 8000 sq. deg simultaneous field of view, currently slated for first light in 2027. Operating at depths comparable to those of the deepest active sky surveys, Argus will capture a continuous 55,000-megapixel movie of the night sky at hierarchical cadences from 1 second ($m \sim 16$) to 5 days ($m \sim 23.6$). Argus data will be made public in real time through public transient alerts, images, and long-term, multi-band light curves containing millions of epochs for millions of stars. However, this new class of instrument comes along with a unique set of challenges and constraints for survey optimization. Argus will collect an exabyte-scale dataset over a 10-year survey, requiring both an input catalog of pre-selected science targets to be stored from the base 1- and 30-second cadence data and real-time analysis for inclusion of transients and uncatalogued variables. Survey scheduling is greatly simplified by the all-sky field of view, but optimization of the multi-band coverage pattern based on anticipated science-case impact is currently ongoing. In this presentation, I will describe the science goals, baseline survey strategy, and the planned data products under development for public distribution.

Orateur: CORBETT, Hank

Classification de Session: Wavelengths and messengers

ID de Contribution: 57

Type: **Non spécifié**

Swift

lundi 16 septembre 2024 14:00 (15 minutes)

Orateur: EVANS, Phil

Classification de Session: Wavelengths and messengers

ID de Contribution: 58

Type: **Non spécifié**

Einstein Probe

lundi 16 septembre 2024 14:30 (15 minutes)

Einstein probe: searching the Universe for cosmic variable objects and transient phenomena shining in X-ray light

The Einstein Probe (EP) is a mission of the Chinese Academy of Sciences (CAS) in collaboration with ESA, MPE and CNES dedicated to time-domain high-energy astrophysics. Its primary goals are to discover high-energy transients and monitor variable objects. To achieve this, EP employs a very large instantaneous field-of-view (3600 square degrees), along with moderate spatial resolution (FWHM ~ 5 arcmin) and energy resolution. Its wide-field imaging capability is achieved by using established technology of novel lobster-eye optics, thereby offering unprecedentedly high sensitivity and large Grasp, which would supersede previous and existing X-ray all-sky monitors. To complement this powerful capability to discover and monitor sources over a wide area, EP also carries a conventional X-ray focusing telescope with a larger effective area to perform follow-up characterization and precise localization of newly-discovered transients. Public transient alerts will be issued rapidly to trigger multi-wavelength follow-up observations from the world-wide community.

Orateur: KUULKERS, Erik

Classification de Session: Wavelengths and messengers

ID de Contribution: **59**

Type: **Non spécifié**

SVOM

lundi 16 septembre 2024 14:45 (15 minutes)

Orateur: TURPIN, Damien

Classification de Session: Wavelengths and messengers

ID de Contribution: 60

Type: **Non spécifié**

NITRATES / GUANO

lundi 16 septembre 2024 14:15 (15 minutes)

Alerts and results from Swift-BAT GUANO data and the NITRATES analysis

In 2019 the Gamma-ray Urgent Archiver for Novel Opportunities (GUANO) was implemented, allowing for time-tagged event data for the Swift Burst Alert Telescope (BAT) to be saved on command around times of interest. This allows for more sensitive analyses to be performed on the ground. The most sensitive being, the Non-Imaging Transient Reconstruction And Temporal Search (NITRATES), a likelihood based analysis that boosts the detection rate of GRBs like 170817A by a factor of ~5 over the onboard analysis. GUANO has been used to save data around GW alerts, FRBs, high-energy neutrinos, and externally detected GRBs, leading to additional arcminute scale localization of dozens of GRBs and sensitive upper limits to multi-messenger alerts. In this talk I will give an overview of the GUANO system and NITRATES analysis as well as recent results. I will also describe the alerts we distribute, which include localizations that span from arcminute scale circles to full sky probability maps.

Orateur: DELAUNAY, Jimmy

Classification de Session: Wavelengths and messengers

ID de Contribution: **61**

Type: **Non spécifié**

Fermi

lundi 16 septembre 2024 15:00 (15 minutes)

Orateur: HORAN, Deirdre

Classification de Session: Wavelengths and messengers

ID de Contribution: 62

Type: **Non spécifié**

IACTs

lundi 16 septembre 2024 15:15 (15 minutes)

Multimessenger astrophysics recently provided groundbreaking results, in many cases involving transient sources. The study of this type of objects can be challenging, especially from an observational point of view. In particular, in the electromagnetic domain, the very-high-energy gamma-ray band ($E > \sim 100$ GeV) can provide vital information on the sources themselves and their environment. In this domain, the scene is dominated by imaging atmospheric Cherenkov telescopes (IACTs). In this contribution, I will go over the main results achieved by IACTs in the study of transient sources, describing the main challenges and highlighting the importance of multimessenger searches.

Orateur: BERTI, Alessio (Max Planck Institute for Physics)

Classification de Session: Wavelengths and messengers

ID de Contribution: 63

Type: **Non spécifié**

Fast Radio Burst Alerts : frb-voe and the CHIME/FRB Virtual Observatory Event Service

mardi 17 septembre 2024 09:30 (15 minutes)

Discovered in 2007, fast radio bursts (FRBs) are luminous, millisecond duration radio bursts that have quickly become one of the most fascinating classes of radio transients. The progenitor of FRBs remains a mystery, however, through observations like that of the FRB-like bursts detected from a galactic magnetar, SGR 1935+2154, it has been shown that collaborative efforts from multiple observatories can lead to meaningful constraints on FRB progenitor models. In order to detect, localize, and observe FRBs across many wavelengths, rapid communication between observatories is vital. frb-voe is an open-source low-latency alert service that provides standardized infrastructure through which observatories can communicate FRB detections. A virtual observatory event (VOE) is a machine-readable alert that describes an astrophysical transient event. Virtual Observatory Events (VOEs) have proven to be successful in providing an effective mode of communication, for example, dozens of gamma ray burst follow-ups achieved through the Gamma Ray Coordinates Network. We also describe a specific use-case of frb-voe at the Canadian Hydrogen Intensity Mapping Experiment (CHIME). Over the past 2 years, this service has demonstrated the benefits of frb-voe, as CHIME is an excellent FRB detector, but cannot provide the tightest constraints on localization nor on multi-wavelength observations. Fortunately, through frb-voe, other observatories such as Swift GUANO can perform follow-up observations of FRBs detected by CHIME, potentially providing more information on the progenitor and FRB emission mechanisms.

Orateur: ABBOTT, Thomas**Classification de Session:** Contributed talks

ID de Contribution: 64

Type: **Non spécifié**

ACROSS: The Astrophysics CRoss Observatory Science Support Initiative

mardi 17 septembre 2024 09:15 (15 minutes)

In October 2022, NASA HQ directed the Physics of the Cosmos program office initiated a study to identify requirements and formulate implementation options for a TDAMM Guest of Observer Facility, in response to Astro2020 TDAMM recommendations. Phase 1 of the study investigated the coordination of NASA space-based missions. As a result of this study, NASA approved a pilot program for The Astrophysics CRoss Observatory Science Science Initiative (ACROSS). ACROSS seeks to enrich the TDAMM infrastructure through three main areas: Providing expertise in coordination and collaboration on large TDAMM events in the future such as GW170817; Developing tools and APIs to provide up to data state and status information on observatories, and developing open source tools that observatories can adopt such as visibility planners, a TOO Toolkit to easily build TOO pages and APIs and more; finally we plan a new funding opportunity for TDAMM science in the USA, initially focused on development of software infrastructure in TDAMM science. I will present the current progress of the ACROSS pilot program, and show how ACROSS will fit in to the current TDAMM infrastructure, with open source tools and APIs that should help every observer.

Orateur: KENNEA, Jamie

Classification de Session: Contributed talks

ID de Contribution: 65

Type: **Non spécifié**

Multi-Messenger Online Data Analysis and Galaxy platform

mardi 17 septembre 2024 09:00 (15 minutes)

Multi-Messenger Online Data Analysis platform (MMODA) and Galaxy platforms provide services for on-the-fly analysis of publicly available data astronomical and astroparticle data for a range of telescopes. The platforms also provide a possibility for users to add new services based on user-contributed analysis workflows formulated in the form of python notebooks.

Orateur: NERONOV, Andrii

Classification de Session: Contributed talks

ID de Contribution: 66

Type: **Non spécifié**

Predicting the topics of a follow-up Astronomical Telegram using knowledge graphs and natural language processing

mardi 17 septembre 2024 09:45 (15 minutes)

We have developed an automatic pipeline to predict the topics of a follow-up ATel and to assign data-analysis workflows, that will be publicly available at <https://www.astro.unige.ch/mmoda/>. To achieve this, we have created an ontology of telescopes, observatories and instruments in order to detect them in Astronomical Telegrams. Studying the occurrences of these telescopes in the ATels, we have built a statistical model to predict a possible follow-up telescope-type (gamma-ray, x-ray etc) based on a newly published ATel. In addition, given the detected telescope-type, we suggest possible data-analysis workflows.

Orateur: VARIU, Andrei**Classification de Session:** Contributed talks

ID de Contribution: 67

Type: **Non spécifié**

Constraining Astrophysical Observables using Gravitational Wave Background

mardi 17 septembre 2024 11:00 (15 minutes)

Pulsar Timing Array (PTA) is close to detecting Gravitational Wave Background (GWB) in the frequency range of nHz to μ Hz. We present an extended analytic model to describe the characteristic spectrum of the GWB using the merger rate of supermassive black hole binary (SMBHB) in the Universe. Astrophysical observables (Galaxy stellar mass function (GSMF), pair fraction, merger timescale and mass relation of supermassive black hole with host galaxy) are used to develop this model. We constrain these astrophysical observables with the help of observational priors and predicted range of GWB. <https://academic.oup.com/mnras/article/531/1/1931/7667924>

Orateur: KOZHIKKAL, Musfar Muhamed

Classification de Session: Contributed talks

ID de Contribution: 68

Type: **Non spécifié**

TBC (Stellar Physics & Ground-based observation & data analysis)

mardi 17 septembre 2024 11:30 (15 minutes)

Orateur: CHADID, Merieme

Classification de Session: Contributed talks

ID de Contribution: 69

Type: **Non spécifié**

Accretion and ejection in binary systems

mardi 17 septembre 2024 10:30 (15 minutes)

I will review accretion and ejection phenomena in low-mass and high-mass X-ray binary systems

Orateur: CHATY, Sylvain (Université Paris Cité)

Classification de Session: Contributed talks

ID de Contribution: **70**

Type: **Non spécifié**

DLT40 + short plateau SNe (tbc)

Orateur: MEHTA, Darshana

Classification de Session: Contributed talks

ID de Contribution: 71

Type: **Non spécifié**

Investigate the impact of magnetar on the kilonova afterglow emission in short GRBs through late-time radio observations

mardi 17 septembre 2024 11:15 (15 minutes)

The coincident detection of Gravitational Wave (GW¹⁷⁰⁸¹⁷) and short Gamma Ray Burst (GRB^{170817A}) confirmed their common origin from the coalescence of binary neutron stars (BNS). Depending on the BNS masses and equations of state, the outcome could be a black hole or a millisecond magnetar. In the presence of a magnetar, a significant portion of its rotational energy is transferred to the emerging ejecta, leading to late-time radio brightening known as “kilonova afterglow” emission upon interaction with the surrounding medium. Detection of this late-time radio brightening in short GRBs can have profound implications for understanding the progenitor physics. This study presents the deepest and extensive search for radio emission at late times from a short GRB up to 2016 incorporating a proper frequency regime, a wider observation span, and a relativistic correction. Using the Giant Meter Wave Radio Telescope (GMRT) at 1250, 610, and 325 MHz bands, observations were conducted approximately 2 to 11 years post-burst for five short GRBs. The estimated upper limits at the burst location are used to constrain the parameters of the burst and its surrounding environment. The magnetar model, with appropriate modifications, constrains the number density of the ambient medium for these bursts to be between $10^{-4} - 10^{-2} \text{ cm}^{-3}$. Our analysis rules out a stable magnetar with an energy of 10^{53} erg for four out of the five GRBs in our sample. The upcoming radio telescope like the Square Kilometer Array (SKA) (in MHz frequencies) with increased sensitivity of μJy level will push the detection limits of kilonova afterglow emission at late times.

Orateur: GOSH, Ankur

Classification de Session: Contributed talks

ID de Contribution: 72

Type: **Non spécifié**

Online analyses in KM3NeT

mardi 17 septembre 2024 10:45 (15 minutes)

Orateur: CELLI, Silvia

Classification de Session: Contributed talks