INTEGRAL: towards the third decade of X and Gamma ray observations

Registrants Book

Table of contents

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Abstract

Title: Galactic Plane sources at TeV and PeV energies

Authors: Felix Aharonian

Abstract: The first results of the discovery of ultrahigh-energy (UHE; E >0.1 PeV) gamma-ray sources in the Milky Way reported by the LHAASO collaboration will be presented and compared with the galactic plane surveys at TeV energies. I will discuss the origin of the UHE gamma-ray source in the context of Physics and Astrophysics of electron and proton PeVatrons and their link to Galactic Cosmic Rays.

Session:

Type of contribution: Oral

Attendance:

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Abstract

Title: Cosmology and multi-messenger astrophysics with Gamma-Ray Bursts

Authors: L. Amati

Abstract: Gamma-Ray Bursts constitute one of the most fascinating and relevant phenomena in modern science, with strong implications for several fields of astrophysics, cosmology and fundamental physics. In this review, I will focus on the perspective key-role of GRBs for cosmology and multi-messenger astrophysics. Indeed, the huge luminosity, the redshift distribution extending at least up to z~10 and the association with the explosive death of very massive stars make long GRBs (i.e., those lasting up to a few minutes) potentially extremely powerful probes for investigating the early Universe (pop-III stars, cosmic re-ionization, SFR and metallicity evolution up to the "cosmic dawn") and cosmological parameters. At the same time, as demonstrated by the GW170817 event, short GRBs (lasting no more than a few s) are the most prominent electromagnetic counterpart of gravitational-wave sources like NS-NS and NS-BH merging events. Moreover, both long and short GRBs are expected to be associated with neutrino emission. I will also report on the status, concepts and expected performances of space mission projects aiming at fully exploiting these unique potentialities of the GRB phenomenon, thus providing an ideal sinergy with the large e.m. facilities of the future like LSST, ELT, TMT, SKA, CTA, ATHENA in the e.m. domain, advanced second generation (2G++) and third generation (3G) GW detectors and future large neutirno detectors (e.g., Km3NET).

Session: From INTEGRAL to the next generation of X/Gamma-ray facilities: heritage and future, Multi-messenger and time domain astronomy, including GRBs

Type of contribution: Oral

Attendance:

Benjamin Arcier #9

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Abstract

Title: Detection of short high-energy transients in the local universe with SVOM/ECLAIRs

Authors: Arcier, B. ; Atteia, J. L. ; Godet, O. ; Mate, S. ; Guillot, S. ; Dagoneau, N. ; Rodriguez, J. ; Gotz, D. ; Schanne, S. ; Bernardini, M. G.

Abstract: The coincidental detection of the gravitational wave event GW 170817 and the gamma-ray burst GRB 170817A marked the advent of multi-messenger astronomy and represented a milestone in the study of GRBs. Significant progress in this field is expected in the coming years with the increased sensitivity of gravitational waves detectors and the launch of new facilities for the high-energy survey of the sky. In this context, the launch of SVOM in mid-2022, with its two wide-field high-energy instruments ECLAIRs and GRM, will foster the possibilities of coincidental transient detection with gravitational waves and gamma-rays events. The purpose of this talk is to assess the ability of SVOM/ECLAIRs to detect and quickly characterize high-energy transients in the local Universe ($z \leq 0.3$), and to discuss the contribution of this instrument to multi-messenger astronomy and to gamma-ray burst (GRB) astrophysics in the 2020's. A list of local HE transients, along with their main characteristics, is constructed through an extensive literature survey. This list includes 41 transients: 24 long GRBs, 10 short GRBs and 7 SGR Giant Flares. The detectability of these transients with ECLAIRs is assessed with detailed simulations using tools developed for the SVOM mission, including a GEANT4 simulation of the energy response and a simulated trigger algorithm representative of the onboard trigger algorithm. SVOM/ECLAIRs would have been able to detect 88% of the short high-energy transients in our list: 22 out of 24 long GRBs, 8 out of 10 short GRBs and 6 out of 7 SGR Giant Flares. The SNR for almost all detections will be sufficiently high to allow the on-board ECLAIRs trigger algorithm to derive the localisation of the transient, transmitting it to the SVOM satellite and ground-based instruments. Coupled with the anti-solar pointing strategy of SVOM, this will enable an optimal follow-up of the events, allowing the observation of their afterglows, supernovae/kilonovae counterparts, and host galaxies. We conclude with a discussion of the unique contribution expected from SVOM and of the possibility of simultaneous GW detection for each type of transient in our sample.

Session: From INTEGRAL to the next generation of X/Gamma-ray facilities: heritage and future

Type of contribution: Oral

Attendance:

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Abstract

Title:
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Session:
Type of contribution:
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Abstract

Title:
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Session:
Type of contribution:
Attendance:

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Abstract

Title: Open Science from INTEGRAL onwards

Authors: Volker Beckmann (MESRI)

Abstract: Open Science aims to give openly access to scientific data, software, expertise, services, publications and documentation. Astrophysics is often seen as the most advanced natural science in this context. INTEGRAL has shown us how difficult it can be at times to provide to the scientific community the tools and expertise to analyse the incoming data stream. How FAIR and open are data and services of INTEGRAL and other astrophysical experiments today? What steps still have to be taken and what tools are available to help making astrophysics even more open? These aspects will be discussed as a motivation to reflect on the openness of research and to advertise investment of effort. In addition, I will show how the European Open Science Cloud (EOSC) can help with the development and integration of Open Science solutions, and how the Horizon Europe program aims to support development.

Session: From INTEGRAL to the next generation of X/Gamma-ray facilities: heritage and future

Type of contribution: Oral

Attendance:

Björn Biltzinger #19

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Affiliation: Max Planck Institute for Extraterrestrial Physics

Abstract

Title: GRB Spectrospy with PySPI and Physical Models

Authors: Björn Biltzinger MPE, Jochen Greiner MPE, J. Michael Burgess MPE

Abstract: Fitting Gamma-Ray Burst spectra with physical models instead of empirical functions is a subject of great interest undergoing intense study lately. For example, physical models such as synchroton have been fitted successfully to the data of Fermi/GBM to determine the physical quantities, like the cooling frequency. We added Integral/SPI to this analysis, to benefit from its excellent energy resolution. This could help resolving the curvature of the spectra better, which would lead to tighter constraints on the model parameters or even help distinguishing between photospheric and synchrotron emission models. To do this we use a new analysis software called PySPI, which is written in pure python and allows to fit Integral/SPI data within the 3ML framework. We will present this new analysis software and show first results we got from fitting a physical synchrotron model to the data of Integral/SPI and Fermi/GBM simultaneously for GRB120711A. The results show that we can resolve the curvature, and therefore the cooling frequency of the synchrotron model, much better, when we add Integral/SPI to the analysis.

Session: Multi-messenger and time domain astronomy, including GRBs

Type of contribution: Oral

Attendance:

Eugenio Bottacini #42

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Registration state: Completed

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Affiliation: University of Padova (Italy)

Abstract

Title: GECCO, the Mission Exploring the MeV Sky

Authors: Eugenio Bottacini (for the GECCO Team)

Abstract: Technological breakthroughs in telescope development have always driven discoveries in astrophysics. Discoveries are yet to be made in the energy band between a few hundreds keV and a few MeV, which is currently under-explored. This energy band can be explored by the Galactic Explorer with a Coded Aperture Mask Compton Telescope (GECCO) that features the combination of a coded-mask telescope and a Compton telescope. The former allows disentangling sources in crowded regions with its high angular resolution of ~1 arcmin, which is complemented by the latter due to its high sensitivity to the diffuse emission. The ability to tell the diffuse and point sources apart allows exploring the acceleration of cosmic-rays, the origin of the so-called Fermi Bubbles, the 511 keV positron annihilation line, sites of explosive element synthesis, and testing for dark matter candidates. Also different classes of jetted galaxies that display a peak of power output in this unexplored energy range are a major target for GECCO to understand how their central supermassive black holes evolve over cosmic time.

Session: From INTEGRAL to the next generation of X/Gamma-ray facilities: heritage and future

Type of contribution: Oral

Attendance:

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance:

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Abstract

Title: Multi-messenger astronomy and future gravitational wave detectors
Authors: Marica Branchesi
Abstract:
Session: Multi-messenger and time domain astronomy, including GRBs
Type of contribution: Oral
Attendance:

Gabriele Bruni #11

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Abstract

Title: Characterizing the gamma-ray sky with new generation radio surveys: the emerging fraction of radio galaxies

Authors: G. Bruni (INAF-IAPS), F. Panessa (INAF-IAPS), L. Bassani (INAF-OAS), M. Brienza (U. Bologna), D. Dallacasa (U. Bologna), T. Venturi (INAF-IRA), A. Malizia (INAF-OAS), A. Bazzano (INAF-IAPS), P. Ubertini (INAF-IAPS), F. Ursini (U. Roma Tre)

Abstract: The advent of new all-sky radio surveys such as VLASS, RACS, and LoTSS, performed with the latest generation radio telescopes, is opening new possibilities on the classification and study of extragalactic gamma-ray sources, specially the underrepresented ones like radio galaxies. In the past years, we characterised radio galaxies previously identified by INTEGRAL/IBIS, Swift/BAT, and Fermi/LAT, unveiling their peculiar properties with respect to radio-selected samples. In particular, I will review the results of the GRACE project (Giant RAdio galaxies and their duty CyclE) that, making use of LOFAR data among others, revealed how giant radio galaxies are more abundant and particularly active in soft gamma-ray samples, showing hints of more than one radio activity cycle during their history. I will also discuss the recent discovery of new gamma-ray radio galaxies from the 4th Fermi/LAT catalogues, among which an INTEGRAL FRII radio galaxy with hints of GeV emission from its lobes. Their classification, only possible thanks to new generation radio surveys, unveils an emerging fraction of radio galaxies in the gamma-ray sky, that could be studied in the next decade with SKA.

Session: Extra galactic astronomy, Surveys from hard X-rays to soft X-rays

Type of contribution: Oral

Attendance: In person

J. Michael Burgess #7

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Abstract

Title: nazgul: GRB position triangulation via non-stationary time-series models

Authors: J. Michael Burgess, Ewan Cameron, Jochen Greiner, Dmitry Svinkin

Abstract: The triangulation of gamma-ray burst locations via time delays detected by multiple satellites has a long tradition in the GRB astronomy. We introduce a new method based on a proper Poisson likelihood, forward-modeling of the signal and approximate Gaussian processes that allows for a statistically robust triangulation. Furthermore, the method can incorporate addition information such as detector geometry and GRB spectroscopy to further reduce the size fo the localization; a crucial task for the future a multi-messenger followup. We show that the method works for simulated data and promising results with real data.

Session: Multi-messenger and time domain astronomy, including GRBs

Type of contribution: Oral

Attendance:

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Abstract

Title: Sensitivity of the anticoincidence system of SPI to detect a galactic supernova

Authors: M.Caixach (Institut de Ciències de l'Espai (ICE-CSIC/IEEC), P.Jean (IRAP, Université de Toulouse, CNRS, CNES, UPS, (Toulouse), France), J.Isern (Institut de Ciències de l'Espai (ICE-CSIC/IEEC/RACAB), E.Bravo (E.T.S.A.V. Universitat Politècnica de Catalunya)

Abstract: Observation of the very early gamma-ray spectra of a type Ia supernova (SNIa) has not yet been possible due to the low luminosity expected during that period and the distance of that kind of supernova. Such an observation would give us a deeper insight into the explosion mechanism and progenitor system. A SNIa explosion occuring in our Galaxy will be close enough to allow a significant measurement of its gamma-ray spectrum few days after the explosion. However, it has to be detected as soon as possible in order to quickly trigger its observation by gamma-ray spectrometers. Such a quick detection can be achieved in gamma-ray when the optical flux of the SNIa is strongly attenuated by interstellar extinction. We are going to present the sensitivity to detect the very early gamma-ray emission of a galactic SNIa with the anticoincidence system (ACS) of SPI on board of the INTEGRAL space observatory. We have computed the rate variations produced by the gamma-ray emission of a SNIa in the ACS of SPI, for different distances and pointing directions. We investigated the case of two SNIa models. The detection sensitivity is estimated taking into account the realistic background using the actual ACS rate data from 275 revolutions. The results make clear that the ACS of SPI can detect the early flux coming from a galactic supernova at about 6 to 10 days after the explosion depending on the model and the distance of the SNIa.

Session: Gamma-ray lines

Type of contribution: Poster

Attendance:

Maria Chernyakova #28

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Abstract

Title: Multi-wavelength observations of 2021 periastron passage of PSR B1259-63.

Authors: Maria Chernyakova (DCU), Sam Mc Keague (DCU), Denys Malyshev (Uni. Tuebingen), Brian van Soelen (Uni. Free State), Shane O'Sullivan (DCU), Charlotte Sobey (CSIRO), Jacob Green (DCU), Matthew Kirwan (DCU)

Abstract: PSR B1259-63 is a gamma-ray binary system hosting a radio pulsar orbiting around a young massive O-type LS 2883, with a period of 3.4 yr. The interaction of the pulsar wind with the LS 2883 outflow leads to unpulsed broad-band emission in the radio, X-rays, GeV, and TeV domains. While the radio, X-ray, and TeV light curves show rather similar behaviour, the GeV light curve appears very different with a huge outburst about a month after a periastron. The energy release during this outburst seems to significantly exceed the spin-down luminosity of the pulsar and both the GeV light curve and the energy release vary from one orbit to the next. Recently we proposed a model to explain the observed peculiar behaviour of the source. To test this model we organised an intensive multiwavelength campaign (including radio, optical, X-ray and GeV observations) to closely follow the 2021 periastron passage of the pulsar. In my talk, I will present the first results of this campaign and discuss their implications to the model.

Session: Galactic astronomy

Type of contribution: Oral

Attendance:

Dmitry Chernyshov #34

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Abstract

Title:
Authors: Dmitry Chernyshov
Abstract:
Session:
Type of contribution:
Attendance:

Ion Cojocari #52

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Registration date: 7 Sep 2021, 17:04

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Abstract

Title: Compact hard X/soft gamma ray scattering polarimeters on-board a nano-satellite

Authors: Ion Cojocari, CEA/DRF/IRFU/DAp; Philippe Laurent,CEA/DRF/IRFU/DAp; Vincent Tatischeff, CNRS/IJCLab; Nicolas de Sereville, CNRS/IJCLab; Susanne Mertens, MPP/TUM; Matthias Meier, MPP/TUM; Carlo Ettore Fiorini, Politecnico di Milano; Pietro King, Politecnico di Milano;

Abstract: Following INTEGRAL measurements of gamma ray polarisation of Cygnus X-1, the Crab and several GRBs, as well as follow-up measurements by AstroSat, polarimetry has become an important parameter for high-energy astrophysics. This is further demonstrated by the multitude detector proposals in the X and gamma ray range that sport polarimetry capabilities, which has become an important prerequisite for any future high-energy mission e.g. AMEGO, e-Astrogam, Polix, Cosi etc. Whilst the only currently planned polarimetry missions stop in the soft X ray band (up to 10 keV for IXPE,eXTP and up to 30 keV for Polix), we present our concept of compact scattering polarimeters in the 50 keV - 1 MeV range that can be mounted on small nano-sattelites either 3 or 6 units in size. These polarimeters are based on Si scatterers and CeBr3 calorimeters read-out by SiPMs. One concept is optimised for the study of GRB polarisation and is being developed in the AHEAD2020 framework. The second concept is a collaboration between CEA/Max Planck Munich and Politecnico di Milano and is focused on the long term study of Cygnus X-1. In this talk I will present these small and relatively inexpensive instruments that will help us better understand high-energy phenomena as well as act as a stopgap soft gamma ray instrument after INTEGRAL and before the next big gamma ray observatory.

Session: From INTEGRAL to the next generation of X/Gamma-ray facilities: heritage and future

Type of contribution: Oral

Attendance: In person

Francesco Coti Zelati #69

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Abstract

Title: Magnetic explosions in neutron stars: an observational overview

Authors: F. Coti Zelati (ICE,CSIC)

Abstract: Magnetars are isolated X-ray pulsars whose emission is thought to be powered by the instability and decay of their huge magnetic fields. I will review the state of the art of these sources from an observational perspective. I will describe the results of the first systematic study of all magnetar outbursts observed over the past two decades, focusing in particular on a few sources displaying unusual properties. I will then introduce three magnetars discovered over the past few years and present the recent detection of a fast radio burst in association with a X-ray burst from a Galactic magnetar. I will conclude with a mention to some open problems in the field and future prospects.

Session: Galactic astronomy

Type of contribution: Oral

Attendance: Remotely

Flavio D'Amico #27

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Abstract

Title: The temperature and optical depth of 1E\,1740.7$-$2942's corona based in the long-term monitoring of INTEGRAL

Authors: Flavio D'Amico, INPE Paulo Eduardo Stecchini, INPE and IAG/USP Jurandi Le\~ao Santos, IFSP Manuel Castro, UNICAMP

Abstract: A straightforward way to explain the hard X-ray spectra of X-ray binaries is to assume that comptonization of soft photons from the accretion disk is occurring. The region in which this comptonization takes place, called the corona, is characterized by only two parameters: its thermal energy kT and its optical depth τ. Hard X-ray spectra analysis is the tool in diagnosing the behavior of these parameters, but the adversity in obtaining and thus analyzing long-term databases has perhaps hindered the characterization of the corona in X-ray binaries with black holes. With the aim of better understanding such behavior for the black hole candidate 1E\,1740.7$-$2942, we performed an homogeneous analysis for a large data set from the ISGRI telescope on-board the INTEGRAL satellite. From modeling a large number of hard X-ray spectra (20--200\,keV) of 1E\,1740.7$-$2942 with widely accepted models, we derived the median corona physical parameters to be: kT\,=\,44\,$\pm$\,18\,keV and τ\,=\,1.5\,$\pm$\,0.6. The length of the database also allowed us to produce a very long lightcurve of 1E\,1740.7$-$2942, which could be expressed in Eddington units due to a recent tentative mass estimate of the black hole mass made by our group. Although we observe variations (of a factor of 10) in the flux, it is still unclear whether these variations are tied to changes in the corona's parameters. Results suggest that changes in the power-law index of these hard X-ray spectra are, however, directly caused by even small variations of the corona's physical parameters.

Session: Galactic astronomy

Type of contribution: Poster

Attendance:

Nicolas De Angelis #53

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Registration date: 7 Sep 2021, 17:33

Registration state: Completed

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Abstract

Title: Development and science perspectives of the POLAR-2 instrument: a large scale GRB polarimeter

Authors: Nicolas De Angelis, PhD student, DPNC, University of Geneva

Abstract: Despite several decades of multi-wavelength and multi-messenger spectral observations, Gamma-Ray Bursts (GRBs) remain one of the big mysteries of modern astrophysics. Polarization measurements are essential to gain a more clear and complete picture of the emission processes at work in these extremely powerful transient events. In this regard, a first generation of dedicated γ-ray polarimeters, POLAR and GAP, were launched into space in the last decade. After 6 months of operation, the POLAR mission detected 55 GRBs, among which 14 have been analyzed in detail, reporting a low polarization degree and a hint of a temporal evolution of the polarization angle. Starting early 2024 and based on the legacy of the POLAR results, the POLAR-2 instrument will aim to provide a catalog of high quality measurements of the energy and temporal evolution of the GRB polarization thanks to its large and efficient polarimeter. Several spectrometer modules will additionally allow to perform joint spectral and polarization analyzes. The mission is foreseen to detect about 50 good quality GRBs per year on board of the China Space Station (CSS). The technical design of the polarimeter modules will be discussed in detail, as well as the expected scientific performances based on the first results of the developed prototype modules.

Session: From INTEGRAL to the next generation of X/Gamma-ray facilities: heritage and future

Type of contribution: Poster

Attendance:

Roland Diehl #62

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Abstract

Title: Gamma-ray spectroscopy results from SPI observations

Authors: Roland Diehl

Abstract: We will summarize the lessons learned from observations of radioactive isotopes in young supernovae (56Ni chain, 44Ti) and from long-lived radioisotopes in diffuse interstellar medium (26Al, 60Fe). We will also address the connections to positron annihilation emission with the 511 keV line and positronium continuum. Open challenges for INTEGRAL's late mission and for followup programs will be discussed.

Session: Gamma-ray lines

Type of contribution: Oral

Attendance: In person

Vladimir Dogiel #30

Registration details

Registration date: 14 Aug 2021, 21:20

Registration state: Completed

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Abstract

Title: A Stellar Tidal Disruption Model for the Fermi Bubbles

Authors: D. Breitschwerdt, Zentrum für Astronomie und Astrophysik, Technische Universität Berlin, Berlin, Germany, D. O. Chernyshov, I.E.Tamm Theoretical Physics Division of P.N.Lebedev Institute of Physics, Moscow, Russia, Moscow Institute of Physics and Technology (State University), Dolgoprudny, Russia, V. A. Dogiel, I.E.Tamm Theoretical Physics Division of P.N.Lebedev Institute of Physics, Moscow, Russia, C.-M. Ko, Institute of Astronomy, National Central University, Zhongli Dist., Taoyuan City, Taiwan (R.O.C.), Department of Physics and Center for Complex Systems, National Central University, Zhongli Dist., Taoyuan City, Taiwan (R.O.C.), G. Ponti, INAF-Osservatorio Astronomico di Brera, Merate, Italy, Max-Planck-Institut für Extraterrestrische Physik, Giessenbachstrasse, Garching, Germany

Abstract: Two enigmatic gamma-ray features in the Galactic central region, known as Fermi Bubbles (FBs), were found from Fermi-LAT data. This structure is seen also in X-ray, IR, UV and radio regions, coinciding with gamma-rays of the FBs. These features were naturally interpreted as a past activity of the central supermassive black hole in the Galactic Centre (GC) with a total energy release of about 10^55-10^56 erg. However, the origin of the FBs is still unknown and debated in the context of a huge single energy release about tens of Myr years ago, or e.g. also of quasi-periodical energy bursts. In a series of publications we suggested a model of quasi-periodical captures of nearby stars by the central black hole, so-called tidal disruption events (TDEs), with an average energy release of about 10^52-10^53 erg each. By the way, these processes of star disruptions were directly observed in other galaxies. The average rate of TDEs is expected to be about 10^−4 □ 10^−5 yr^−1, providing the average power transferred from the GC into the halo of Ẇ □ 3 × 10^41 erg s^−1. It seems that recent results by eROSITA may point to a connection between local energy release by TDEs in the GC and the huge structure of the FBs, surrounded by the so-called eROSITA bubbles (EBs). Their eROSITA data display huge two-sided X-ray features extending approximately 14 kpc above and below the GC. The total energy of the FBs, required for their formation, must have been very large, i.e. 10^55 erg. On the other hand, these data of X-ray, radio, and infrared emissions found coherent local features of the energy release of 4x10^52 erg in the form of “chimneys” near the GC on scales of hundreds of parsecs, which may indicate a physical link with the GC outflow. It is assumed that the EBs and the FBs are associated causally with the same (gradual or instantaneous) energy release. To inflate the EBs, an

average luminosity of the order of 10^41 erg s^−1 during the past tens of millions of years would be required. Our team developed a physical model based on analytical and numerical calculations which describe processes in the GC region, explaining the eROSITA data consistently and quite naturally. The model suggests the expansion of strong shocks propagating from the GC into a density stratified Galactic halo, thereby generating elongated bubble-like symmetric features in the Galactic disk and halo, thus explaining both the origin and the connection between EBs and FBs.

Session: Galactic astronomy

Type of contribution: Oral

Attendance:

Lorenzo Ducci #17

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Registration date: 2 Aug 2021, 18:12

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Abstract

Title: Monitoring of the long-term variability of the cyclotron line energy in Her X-1 - most recently from INTEGRAL and NuSTAR

Authors: L. Ducci (IAAT, Tuebingen), R. Staubert (IAAT, Tuebingen), L. Ji (Sun Yat-Sen University, Zhuhai), F. Fürst (ESA-ESAC, Madrid), J. Wilms (ECAP, Bamberg), R. E. Rothschild (Center for Astrophysics and Space Sciences, University of California at San Diego, La Jolla), K. Pottschmidt (NASA-Goddard Spaceflight Center, Greenbelt; Department of Physics and Center for Space Science and Technology, Baltimore), F. Harrison (Cahill Center for Astronomy and Astrophysics, California Institute of Technology, Pasadena)

Abstract: We present the recent results from a programme aimed at investigating the long-term variability of the cyclotron line energy in Her X-1, which has been carried out over the last three decades with RXTE, INTEGRAL, Swift, Astrosat, HXMT and NuSTAR (the latest in May 2021). Four discoveries were made: 1) a dramatic upward jump of the cyclotron line energy Ecyc from ~36 keV to beyond 42 keV between 1993 and 1996, 2) a positive correlation of Ecyc with X-ray luminosity, 3) a gradual decay of the flux-normalized Ecyc since ~1995, reaching a stable plateau of ~37 keV since a few years, and finally, 4) a positive correlation of all parameters describing the spectral continuum (gamma, Ecut, Efold of the high-e-cut function) with X-ray luminosity. All phenomena provide a strong motivation for a continued monitoring. We discuss the physical processes underlying the observed cyclotron line energy changes and the other results emerging from our spectral analysis.

Session: Galactic astronomy

Type of contribution: Oral

Attendance:

Matthias Ehle #1

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance:

Maurizio Falanga #40

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Abstract

Title: Einstein Probe science and synergies with INTEGRAL
Authors: Maurizio Falanga, Weimin Yuan
Abstract: TBD
Session: From INTEGRAL to the next generation of X/Gamma-ray facilities: heritage and future
Type of contribution: Oral
Attendance:

Carlo Ferrigno #65

Registration details

Registration date: 13 Sep 2021, 14:52
Registration state: Completed

Personal Data

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Abstract

Title: Multi-messenger astronomy with INTEGRAL

Authors: Carlo Ferrigno, Volodymyr Savchenko (University of Geneva)

Abstract: At the time of defining the science objectives of the INTernational Gamma-Ray Astrophysics Laboratory (INTEGRAL), such a rapid and spectacular development of multi-messenger astronomy could not have been predicted, with new impulsive phenomena becoming accessible through different channels. Neutrino telescopes have routinely detected energetic neutrino events coming from unknown cosmic sources since 2013. Gravitational wave detectors opened a novel window on the sky in 2015 with the detection of the merging of two black holes and in 2017 with the merging of two neutron stars, followed by signals in the full electromagnetic range. Finally, since 2007, radio telescopes detected extremely intense and short burst of radio waves, known as Fast Radio Bursts (FRBs) whose origin is for most cases extragalactic, but enigmatic. The exceptionally robust and versatile design of the INTEGRAL mission has allowed researchers to exploit data collected not only with the pointed instruments, but also with the active cosmic-ray shields of the main instruments to detect impulses of gamma-rays in coincidence with unpredictable phenomena. The full-sky coverage, mostly unocculted by the Earth, the large effective area, the stable background, and the high duty cycle (85%) put INTEGRAL in a privileged position to give a major contribution to multi-messenger astronomy. In this review, we describe how INTEGRAL has provided upper limits on the gamma-ray emission from black-hole binary mergers, detected a short gamma-ray burst in coincidence with a binary neutron star merger, contributed to define the spectral energy distribution of a blazar associated with a neutrino event, set upper limits on impulsive and steady gamma-ray emission from cosmological FRBs, and detected a magnetar flare associated with fast radio bursting emission.

Session: Multi-messenger and time domain astronomy, including GRBs

Type of contribution:

Attendance:

Mariateresa Fiocchi #25

Registration details

Registration date: 9 Aug 2021, 10:46
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Abstract

Title:
Authors: Mariateresa Fiocchi
Abstract:
Session:
Type of contribution:
Attendance:

Ilkham Galiullin #48

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Abstract

Title: X-ray observations of historical Classical Novae by SRG/eROSITA in the all-sky survey

Authors: I.Galiullin (KFU,MPA), M.Gilfanov (IKI,MPA)

Abstract: Using the data of three SRG/eROSITA all-sky surveys we study X-ray emission from hosts of historical Classical Novae (CN) in our Galaxy. The sample includes 309 historical CN located in the Eastern Galactic hemisphere which erupted between 1670 AD to 2021. Cross-matching this list with SRG/eROSITA sources catalogue we found 52 X-ray counterparts, majority of which are CVs in quiescent state. Two sources associated with recent CN have super-soft X-ray spectra and are associated with the post-novae X-ray phase. A surprisingly large fraction of sources show hard X-ray spectra with the photon index of $\Gamm\sim 1$, suggesting that these cataclysmic variables may harbour magnetised white dwarfs. This hypothesis will be tested in the course of further SRG/eROSITA sky surveys. The CNs represent a reliable sample of accreting WDs, on the surface of which the thermonuclear burning proceeds in the unstable manner. Their quiescent X-ray luminosity is a good proxy for the accretion rate in the binary system. Using this fact, we obtained the accretion rate distribution of WDs with unsteady hydrogen burning and compared it to the accretion rate distribution of known stable super-soft X-ray sources in our and in nearby galaxies. There is a clear dichotomy between these two distributions, in accord with predictions of the theory of thermonuclear hydrogen burning on the surface of the WD.

Session: Galactic astronomy

Type of contribution: Oral

Attendance:

Jochen Greiner #6

Registration details

Registration date: 21 Jul 2021, 15:10

Registration state: Completed

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Abstract

Title: The 2nd generation Galileo system as a GRB network

Authors: J. Greiner (MPE), U. Hugentobler (TUM), J.M. Burgess (MPE), F. Berlato (MPE), A. Tsvetkova (Ioffe & MPE), M. Rott (TUM)

Abstract: Preparations have begun for the next generation Galileo navigation system. Given their MEO orbit, their accurate clocks and the accurately known positions, the Galileo constellation is perfectly suited to host a network of Gamma-ray Burst detectors, and provide rapid triangulation localisation to better than 1 degree precision. This would surpass Fermi capabilities, and provide a number of scientific opportunities not just for GRBs, but also for gravitational-wave astronomy with neutron star mergers, and time-domain astronomy in general. We will report on simulations of some required detector properties, the number of Galileo satellites to be equipped with GRB detectors and related technical requirements to generate the optimum science impact.

Session: From INTEGRAL to the next generation of X/Gamma-ray facilities: heritage and future

Type of contribution: Oral

Attendance:

Margarita Hernanz #46

Registration details

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Registration state: Completed

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance:

Jordi Isern #32

Registration details

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Registration state: Completed

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Abstract

Title: Gamma-ray diagnostics from the 48Cr-48V radioactive chain

Authors: M. Caixach (ICE-CSIC,IEEC), E. Bravo (UPC), J. Isern (ICE-CSIC,IEEC,RACAB) & P. Jean (IRAP)

Abstract: Type Ia supernovae are divided into several subtypes giving room to the existence of several scenarios, all of them involving a white dwarf, to account for the explosion. One way to discriminate among the different models consists on the measurement of the abundances of freshly synthesized radioisotopes like 48V, 55Fe, 56Ni and 57Ni, which is only possible with gamma rays. The emission lines of 48V, the daughter of 48Cr, one of the radioisotopes synthesized during alpha-capture, is specially well suited to explore the behavior of Type Ia supernovae around the maximum of the light curve. In this work we examine its hypothetical emission by some of the models used to interpret the observations of SN2014J.

Session: Gamma-ray lines

Type of contribution: Poster

Attendance:

Soon-Wook Kim #64

Registration details

Registration date: 13 Sep 2021, 14:44
Registration state: Completed

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance: Remotely

Merlin Kole #8

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Registration state: Completed

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Abstract

Title: Gamma-Ray Polarimetry of GRBs with the POLAR and POLAR-2 missions

Authors: on behalf of the POLAR-2 collaboration

Abstract: Despite over 50 years of Gamma-Ray Burst (GRB) observations many open questions remain about their nature and the environments in which the emission takes place. Polarization measurements of the GRB prompt emission have long been theorized to be able to answer most of these questions. The POLAR detector was a dedicated GRB polarimeter developed by a Swiss, Chinese and Polish collaboration. The instrument was launched, together with the second Chinese Space Lab, theTiangong-2, in September 2016 after which it took 6 months of scientific data. During this period POLAR detected 55 GRBs as well as several pulsars. From the analysis of the GRB polarization catalog we see that the prompt emission is lowly polarized or fully unpolarized. There is, however, the caveat that within single pulses there are strong hints of an evolving polarization angle which washes out the polarization degree in the time integrated analysis. Building on the success of the POLAR mission, the POLAR-2instrument is currently under development. POLAR-2 is a Swiss, Chinese, Polish and German collaboration and was recently approved for launch in 2024. Thanks to its large sensitivity POLAR-2 will produce polarization measurements of at least 50 GRBs per year with a precision equal or higher than the best results published by POLAR. POLAR-2 thereby aims to make the prompt polarization a standard observable and produce catalogs of the gamma-ray polarization of GRBs. Here we will present an overview of the POLAR mission and all its scientific measurement results. Additionally, we will present an overview of the future POLAR-2 mission, and how it will answer some of the questions raised by the POLAR results.

Session: From INTEGRAL to the next generation of X/Gamma-ray facilities: heritage and future

Type of contribution: Oral

Attendance:

Peter Kretschmar #14

Registration details

Registration date: 30 Jul 2021, 16:53

Registration state: Completed

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Abstract

Title: High-Mass X-ray Binaries with INTEGRAL - what did we learn and where are we going?

Authors: Peter Kretschmar (ESA), Felix Fürst (Quasar Science Resources S.L for ESA), Lara Sidoli (INAF-IASF), Enrico Bozzo (Univ. Geneva), et al.

Abstract: We give a broad summary of the physical processes in High-Mass X-ray Binaries and highlight the role of the INTEGRAL mission in the discovery of many of the most interesting objects in this source class and opening new windows of investigation. We conclude with an overview of future facilities and how they will help to tackle the questions raised by INTEGRAL observations.

Session: Galactic astronomy

Type of contribution: Oral

Attendance:

Erik Kuulkers #41

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance:

Ekaterina Kuznetsova #18

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Registration state: Completed

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Abstract

Title: Sgr B2 hard X-ray emission with INTEGRAL after 2009: still detectable?

Authors: Kuznetsova E. (1), Krivonos R. (1), Lutovinov A. (1), Clavel M. (2) (1) Space Research Institute of the Russian Academy of Sciences, Profsoyuznaya 84/32, 117997 Moscow, Russia (2) Univ. Grenoble Alpes, CNRS, IPAG, F38000 Grenoble, France

Abstract: Molecular clouds of the Central Molecular Zone demonstrate variability in the X-ray continuum and Fe Ka 6.4 keV emission line, that indicates, as believed, on a past X-ray flare activity of the super massive black hole Sgr A*. The largest molecular cloud Sgr B2 was investigated with INTEGRAL observatory at hard X-rays in 2003-2009 (Terrier et al. 2010), showing clear decay of its hard X-ray emission, which probably related to the Sgr A* flare reflection scenario. We will present the long-term time evolution of the Sgr B2 hard X-ray continuum obtained with INTEGRAL/IBIS in 2003-2019. After 2009 the 30-80 keV maps demonstrated a significant excess spatially consistent with Sgr B2. The observed 2003–2019 light curve of IGR J17475–2822 is characterized by an overall drop with a factor of □2 before □2011 and then followed by a constant level of □1 mCrab. The Sgr B2 emission before ~2011 is well explained by the reflection scenario, while origin of the residual emission after ~2011 is still unclear.

Session: Galactic astronomy

Type of contribution: Oral

Attendance:

philippe laurent #51

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance:

Teng Liu #50

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Registration state: Completed

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Abstract

Title: The eROSITA Final Equatorial Depth Survey (eFEDS)

Authors: Teng Liu

Abstract: The eROSITA X-ray telescope onboard the Spectrum-Roentgen-Gamma (SRG) observatory combines a large field of view and a large collecting area in the energy range between □0.2 and □8.0 keV with the capability to perform uniform scanning observations of large sky areas. After the successful launch of the SRG in July 2019, eROSITA performed scanning observations of a large contiguous field, namely the eROSITA Final Equatorial Depth Survey (eFEDS), ahead of the planned four-year all-sky survey. eFEDS yielded a large sample of X-ray sources with very rich multi-band photometric and spectroscopic coverage. We present a primary catalog of 27910 X-ray sources (including 542 with significant spatial extent) detected in the 0.2–2.3 keV band, corresponding to a (point source) 0.5-2 keV flux limit of ≈ 7e−15 erg/cm^2/s, and, in addition, a hard-band (2.3-5 keV) selected sample of 246 sources. Through extensive simulations, we optimize the source detection procedures and measure the completeness and purity of the eFEDS catalogs. We also present the eFEDS Active Galactic Nuclei (AGN) catalog, which comprises 79% of the eFEDS point sources. Using a Bayesian method, we perform a systematic X-ray spectral analysis on the eFEDS sources.

Session: Surveys from hard X-rays to soft X-rays

Type of contribution: Oral

Attendance:

Alexander Lutovinov #67

Registration details

Registration date: 14 Sep 2021, 08:01
Registration state: Completed

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Abstract

Title: Highlights from the Mikhail Pavlinsky ART-XC telescope on board SRG

Authors: A. Lutovinov (IKI RAS)

Abstract: The Mikhail Pavlinsky ART-XC telescope is the hard X-ray instrument with grazing incidence imaging optics on board the SRG observatory which successively works in the orbit from July 2019. The ART-XC telescope is designed to provide the first ever true imaging all-sky survey in the 4-30 keV energy band and to study spectral and timing characteristics of X-ray sources. The review of scientific results obtained with ART-XC during first two years of operation will be presented.

Session: Surveys from hard X-rays to soft X-rays

Type of contribution: Oral

Attendance: In person

Angela Malizia #20

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Registration date: 4 Aug 2021, 10:41
Registration state: Completed

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance:

Denys Malyshev #36

Registration details

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Registration state: Completed

Personal Data

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Abstract

Title: Multiwavelength observations of PSR J2032+4127 during the 2017 periastron passage

Authors: Chernyakova M. , Malyshev D. , Blay P. , van Soelen B. , Tsygankov, S.

Abstract: PSR J2032+4127 is only the second known gamma-ray binary where it is confirmed that a young radio pulsar is in orbit around a Be-star. The interaction of the pulsar wind with the mass outflow from the companion leads to broad-band emission from radio up to TeV energies. In this paper we present results of optical monitoring of the 2017 periastron passage with the Nordic Optical Telescope. These observations are complemented by X-ray (Swift/XRT, NuSTAR) and GeV (Fermi/LAT) monitoring. Joint analysis of the evolution of the parameters of the H α line and the broad-band (X-ray to TeV) spectral shape allows us to propose a model linking the observed emission to the interaction of the pulsar and Be-star winds under the assumption of the inclined disc geometry. Our model allows the observed flux and spectral evolution of the system to be explained in a self-consistent way.

Session: Galactic astronomy

Type of contribution: Oral

Attendance:

Giulia Mantovani #60

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Registration date: 10 Sep 2021, 17:31
Registration state: Completed

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Abstract

Title: prova
Authors: prova2
Abstract: prova3
Session: From INTEGRAL to the next generation of X/Gamma-ray facilities: heritage and future
Type of contribution: Oral
Attendance: In person

Isabella Mereu #54

Registration details

Registration date: 7 Sep 2021, 19:23

Registration state: Completed

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Abstract

Title: Catalog of Long-Term Transient Sources in the First 10 Years of Fermi-LAT Data

Authors: Isabella Mereu, Sara Cutini, Elisabetta Cavazzuti, Gino Tosti on behalf of the Fermi-LAT Collaboration

Abstract: The catalog of long-term transient sources comprises sources that were detected on monthly time intervals during the first decade of Fermi-LAT operations (1FLT). The monthly time scale allows us to identify transient and variable sources that may have not been reported in Fermi-LAT general catalogs. In the analysis we considered only photons with galactic latitude > 10° to exclude the Galactic plane and therefore to avoid confusion with low-latitude diffuse emission. The resulting catalog list has 142 different sources not included in 4FGL-DR2 and detected with a statistical significance above 4sigma in at least one monthly bin. About 70% are associated with spectrally soft AGN-type counterparts, principally blazar candidates of uncertain type and flat spectrum radio quasars, and about 30% of 1FLT sources remain unassociated. This is similar to the fraction of unassociated sources found in the Fermi-LAT general catalogs. The median gamma-ray spectral index of the 1FLT-AGN sources is softer than the median index reported in the latest Fermi-LAT AGN general catalog (4LAC). The identification of these soft-spectrum sources shows that integrating over monthly timescales allowed us to investigate the soft part of the gamma-ray source distribution, which is usually suppressed (or confused with the low energy component of the gamma-ray background) when analyzed over longer, multi-year timescales. The population of soft-spectrum gamma-ray sources could include members of the so-called “MeV-blazars” (blazars that are exceptionally bright at MeV energies). These objects have shown variability in their gamma-ray flux when integrated over timescales of months. Starting from this work, we have constructed a pipeline dedicated to the routine search of the transient sources on monthly time scale, complementary to the routine search on shorter time scale (day and week) done by the Fermi-LAT Flare Advocate activity and Fermi All-sky Variability Analysis (FAVA). This incremental source list (iFLT) will be updated yearly.

Session: Extra galactic astronomy

Type of contribution: Oral

Attendance: In person

Alexander Moiseev #35

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Registration state: Completed

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance:

Manuela Molina #21

Registration details

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance:

Fabio Muleri #59

Registration details

Registration date: 9 Sep 2021, 15:06

Registration state: Completed

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Abstract

Title: Science objectives of the IXPE mission

Authors: Fabio Muleri on behalf of the IXPE team

Abstract: The Imaging X-ray Polarimetry Explorer (IXPE) will be the next SMEX mission lead by NASA in collaboration with the Italian Space Agency (ASI). The mission will perform groundbreaking measurements of imaging polarization in X-rays for a number of different classes of sources. The mission is integrated and ready for the launch scheduled in December 2021. In this talk I will present the main science objectives of the mission.

Session: From INTEGRAL to the next generation of X/Gamma-ray facilities: heritage and future

Type of contribution: Oral

Attendance:

Lorenzo Natalucci #24

Registration details

Registration date: 9 Aug 2021, 10:13
Registration state: Completed

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Abstract

Title:
Authors: Lorenzo Natalucci
Abstract:
Session:
Type of contribution:
Attendance:

Gor Oganesyan #45

Registration details

Registration date: 31 Aug 2021, 16:07

Registration state: Completed

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Abstract

Title: Gamma-ray/optical monster originated from the magnetized jet pointing towards us

Authors: Gor Oganesyan

Abstract: Detecting the earliest optical emission from a gamma-ray burst (GRB) is pivotal to probe the properties of the jet since both the internal dissipation of the jet and the propagation of the reverse shock into the GRB ejecta are expected to produce a significant optical emission. Thanks to the robotic telescopes, the detection of GRB afterglows has turned almost into a routine process. These devices, however, often provide late-time and single-band unfiltered observations, and as a result, analyses of prompt GRB emission lacks optical data. We report the discovery of the early and bright optical emission from an exceptionally luminous and energetic event, which provided us with a unique opportunity to study the spectral evolution of an early afterglow emission that transitioned from a reverse to forward shock radiation. Rich multi-wavelength data spanning from the optical band to GeVs allowed us to constrain the magnetization of the jet. Propagation of a narrow and highly magnetized jet into a very rarefied circumburst medium has produced the observed optical emission as bright as 10 mag from a source located at redshift 2. The detection of this monster shed light on the composition of the GRB jets. If located in a "normal" circumburst environment or observed slightly off-axis, it would have been detected as a usual GRB. The chromatic X-ray/optical radiation requires the presence of an additional component in X-rays which we successfully model by prompt emission from the jet wings.

Session: Multi-messenger and time domain astronomy, including GRBs

Type of contribution: Oral

Attendance:

Elena Orlando #26

Registration details

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Registration state: Completed

Personal Data

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Abstract

Title: The Inner Galaxy: Interstellar Emission or Sources?

Authors:

Abstract: The inner Galaxy seen at high energies is a complex region where the interstellar emission and sources may not be easily disentangled because they may both result as observed diffuse emission. To tackle this problem, we use the available source-subtracted SPI and COMPTEL data and we compare them with our models of the interstellar emission, which produced by inverse Compton emission of Galactic cosmic-ray electrons and positrons on the interstellar photons and CMB. Our models account for cosmic ray propagation in the Galaxy and multifrequency observations from radio, microwaves, and gamma rays, and they are based on the latest cosmic-ray measurements. We found that the diffuse emission in the inner Galaxy observed by SPI and COMPTEL is well reproduced by interstellar inverse Compton models with an enhanced cosmic-ray all-electron density in the □10^2 –10^4 MeV range. However, these models are in tension with observed gamma-rays and with the observed synchrotron emission in radio and microwaves, due to their enhanced cosmic-ray all-electrons. This suggests that SPI and COMPTEL diffuse data in the inner Galaxy region are affected by contamination of unresolved sources or source confusion, which would mimic the inverse Compton emission produced by the enhanced all-electron density in the □10^2–10^4 MeV range of some models. We also define the best interstellar model that fits multifrequency data from radio to high-energy gamma rays, and latest cosmic-ray measurements, and we make predictions for future observations in the keV-MeV energy band with forthcoming telescopes, such as GECCO and AMEGO.

Session: Galactic astronomy

Type of contribution: Oral

Attendance:

Fiona Helen Panther #47

Registration details

Registration date: 1 Sep 2021, 05:52

Registration state: Completed

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Abstract

Title: Probing the explosion mechanisms of thermonuclear supernovae with gamma-ray lines

Authors: Fiona Panther, University of Western Australia

Abstract: Detection of gamma-rays emitted by radioactive isotopes synthesized in stellar outbursts or explosions can give important insights into the processes that power transients such as supernovae, as well as providing a detailed census of the abundance of different isotope species relevant to the chemical evolution of the Universe. Observations of nearby supernovae have yielded observational proof that ^{57}Co powered the late-time evolution of SN1987A's lightcurve, and conclusive evidence that ^{56}Ni and its daughter nuclei power the light curves of Type Ia supernovae. However, not all thermonuclear supernovae are powered solely by the decay of ^{56}Ni. In transients initiated by explosive helium burning (α-capture) of a thick helium shell, the dominant radioactive decays that power the optical lightcurve are those of ^{48}V. Observations of decay lines from isotopes beyond ^{56}Ni can thus be used to deduce detailed information about the explosion mechanisms and nucleosynthesis processes in thermonuclear transients that would otherwise be missed when considering photometry or optical spectra alone.

Session: Gamma-ray lines

Type of contribution: Oral

Attendance:

Elena Pian #61

Registration details

Registration date: 12 Sep 2021, 17:38
Registration state: Completed

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Abstract

Title: INTEGRAL observations of flaring blazars

Authors: Elena Pian

Abstract: I will review the INTEGRAL contribution to this topic and the importance of INTEGRAL data in view of the new era of gamma-ray astronomy.

Session: Extra galactic astronomy
Type of contribution: Oral
Attendance: Remotely

Nicolas Produit #33

Registration details

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Registration state: Completed

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance:

seyed amir hossein riasati fard #29

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Registration state: Completed

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance:

James Rodi #10

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance:

Jerome Rodriguez #57

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance: Remotely

Samuele Ronchini #12

Registration details

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Abstract

Title: Spectral index-flux relation for investigating the origins of steep decay in γ-ray bursts

Authors:

Abstract: γ-ray bursts (GRBs) are transient cataclysmic events, whose role became central in the new multi-messenger era. In the this work I propose a novel investigation of the GRB emission mechanism, via time-resolved spectral analysis of the X-ray tails of bright GRB pulses observed with the XRT instrument onboard the Neil Gehrels Swift Observatory, discovering a unique relation between the spectral index and the flux. The investigation of the spectral evolution during the GRB tail is an ideal diagnostic to understand the connection between the emission processes, the cooling processes and the outflow environment. I thoroughly discuss possible interpretations in relation to current available models and I show the incompatibility of our results with the standard high latitude emission. Our results for the first time strongly suggest evidence of adiabatic cooling of the emitting particles, shedding light on fundamental physics of relativistic outflows in GRBs. Finally I discuss the crucial role of future wide-field X-ray telescopes, such as the mission concept Theseus, for the characterisation of the GRB tail emission, highlighting also its importance in the multi-messenger context.

Session: Multi-messenger and time domain astronomy, including GRBs

Type of contribution: Oral

Attendance:

Celia Sanchez-Fernandez #49

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Registration state: Completed

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Abstract

Title:
Authors: Celia Sanchez
Abstract:
Session:
Type of contribution:
Attendance:

Andrea Sanna #43

Registration details

Registration date: 30 Aug 2021, 12:30

Registration state: Completed

Personal Data

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Abstract

Title: The HERMES project: Hunting for Gravitational Wave Electromagnetic Counterparts and Probing Space-Time Quantum Foam

Authors: A. Sanna, L. Burderi, A. Riggio, F. Fiore, T. Di Salvo, HERMES collaboration

Abstract: The association of GW170817 with GRB170817A proved that electromagnetic counterparts of gravitational wave events are the key to deeply understand the physics of NS-NS merges. Upgrades of the existing GW antennas and the construction of new ones will allow to increasing sensitivity down to several hundred Mpc vastly increasing the number of possible electromagnetic counterparts. Monitoring of the hard X-ray/soft gamma-ray sky with good localization capabilities will help to effectively tackle this problem allowing to fully exploit multi-messenger astronomy. However, building a high-energy all-sky monitor with a large collecting area might be particularly challenging due to the need to place the detectors onboard satellites of limited size. Distributed astronomy is a simple and cheap solution to overcome this difficulty. Here I will give an overview of the HERMES Technological and Scientific pathfinders currently under development that consist of a fleet of six 3U CubeSats to be launched in equatorial Low Earth Orbits by 2023.

Session: From INTEGRAL to the next generation of X/Gamma-ray facilities: heritage and future

Type of contribution: Oral

Attendance:

Sergey Sazonov #70

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Registration date: 15 Sep 2021, 10:43

Registration state: Completed

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Abstract

Title: The Galactic LMXB population

Authors: Sazonov S.

Abstract: Almost two decades of hard X-ray observations with the INTEGRAL observatory have provided a unique database for exploration of the population of low-mass X-ray binaries in our Galaxy and greatly improved our understanding of the diverse energetic phenomena associated with accretion of matter onto neutron stars and black holes in such systems. I will review the LMXB results obtained with INTEGRAL so far and briefly discuss how the on-going all-sky survey by the ART-XC telescope aboard SRG can further advance our knowledge of the Galactic LMXB population.

Session: Surveys from hard X-rays to soft X-rays

Type of contribution: Oral

Attendance: Remotely

Chris Shrader #68

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance: Remotely

Thomas Siegert #63

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Abstract

Title: Recent developments on the 511 keV positron puzzle

Authors: Thomas Siegert

Abstract: It is typically acknowledged that more data improves the results in a counting experiment with a square-root scaling. Therefore, one additional year in a 19 year old mission is marginally constraining anything new. However, novel analyses and dedicated observations can lead to significant progress in this long-lasting problem. I will give an update on the positron puzzle in terms of spatial modelling not only the 511 keV line but also the ortho-positronium continuum down to 200 keV. Thanks to our versatile instrumental background model, including the three-photon decay of ortho-positronium boosts the discriminant power of already existing data. We confirm that diffuse positron annihilation in the Milky Way is traced by the old stellar population, and find that the actual emission is blurred with respect to this population by about 150 pc. I will discuss this length scale in the context of positron propagation as well as supernova kicks. Another update comes from the dwarf galaxy Reticulum II that showed a serendipitous 3-sigma signal. We show that this excess was most likely a fluke and use the new observation campaign to set limits on dark matter models such as evaporating primordial black holes and particle dark matter annihilation and decay. We find that Reticulum II is a prime target for indirect dark matter searches due to its proximity and little source confusion. In terms of light dark matter annihilation/decay, INTEGRAL can set strong bounds that are competitive to other missions.

Session: Extra galactic astronomy, Gamma-ray lines

Type of contribution: Oral

Attendance: Remotely

Thomas Siegert #66

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Abstract

Title: Hierarchical modelling of 22Na and 7Be from the nova population in the Milky Way

Authors: Thomas Siegert

Abstract: The gamma-ray emission from individual classical novae has never been detected. The expected signals range from a strong 511 keV line flash at the time of the explosive burning from decaying 13N and 18F, over intermediate lifetime isotopes like 7Be and 22Na, to a diffuse glow of radioactivities in the Milky Way. The latter is a result of radioactive buildup because the expected nova rate of 50/yr is larger than the decay rate of 7Be (4.7/yr) or 22Na (0.3/yr). However, only 10-20 novae per year are reported. The information from individual novae that are known to have occurred within the last 20 years in the Galaxy, plus the diffuse glow from the population of unknown events can be combined in a Bayesian hierarchical model. We show how the Galactic-wide gamma-ray emission from 22Na (1275 keV) and 7Be (478 keV) can be constructed hierarchically, and compared to 16 years of INTEGRAL/SPI data. Although we find no excess signal, the model in combination with the data is sensitive enough to finally probe the regime of theoretical expectations. We can exclude that ONe novae produce on average more than 2e-7 solar masses of 22Na, as otherwise SPI would have seen them. This means that most ONe novae occur on white dwarfs with masses lower than 1.35 solar masses, and that at most 10% of the Galactic 511 keV line can originate in classical novae.

Session: Galactic astronomy, Gamma-ray lines

Type of contribution: Oral

Attendance: Remotely

Paolo Soffitta #44

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Abstract

Title: The status the next SMEX mission IXPE the Imaging X-ray Polarimetry Explorer.

Authors: Paolo Soffitta on behalf of IXPE team

Abstract: IXPE, the Imaging X-ray Polarimetry Explorer, is a NASA-ASI mission which will be launched in December 2021 and it will definitely reopen the window of X-ray Polarimetry to tens of galactic and extra-galactic sources. It consists of three telescopes each one hosting a Wolter-I mirror and a Detector Unit separated by an extensible boom. Each DU hosts a detector capable to perform polarimetry resolved in energy, angle and time. Moreover, each DU, also, includes a Filter & Calibration wheel with polarized and un-polarized X-ray sources. The DU were designed, built, tested and calibrated entirely in Italy by INAF and INFN. The mirrors and the spare telescope were calibrated at the Stray-Light facility of the Marshall Space Flight Center. The primary ground station is located in Malindi and crucial tasks for the flight pipeline were developed by the Space Science Data Center of ASI, with INAF and INFN contribution. The observatory has been already integrated and it passed successfully all the environmental tests and it is ready to be transported to the launch facility.

Session: From INTEGRAL to the next generation of X/Gamma-ray facilities: heritage and future

Type of contribution: Oral

Attendance:

John Buchan Stephen #22

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Registration state: Completed

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance:

Steven Sturner #55

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance: Remotely

Valery Suleimanov #56

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Abstract

Title: Hard X-ray radiation of intermediate polars and white dwarf masses.

Authors: V. Suleimanov, V. Doroshenko, K. Werner Institute for Astronomy and Astrophysics, University of Tuebingen, Germany

Abstract: X-ray radiation of intermediate polars (IPs) arises in hot optically thin post-shock structures. The hardness of the emitted spectrum depends on the white dwarf (WD) mass and the magnetospheric radius. We computed an extended two-parameter grid of hard X-ray spectra of IPs and used it to determine the WD masses in 35 IPs. Hard X-ray spectra observed by observatories NuSTAR and Swift/BAT were used. The average WD mass is 0.79 +/- 0.16 solar masses. The magnetic field strengths on the WD surfaces were also evaluated and they range between 1 to 10 MG. Mass accretion rates were obtained using GAIA DR2 distances and they amount to about 10^{-9} solar masses per year.

Session: Galactic astronomy

Type of contribution: Oral

Attendance: In person

Anastasia Tsvetkova #31

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Abstract

Title: Relative cross-comparison of Konus-Wind, Fermi/GBM, and Swift/BAT instruments using simultaneously detected Gamma-Ray Bursts

Authors: Anastasia Tsvetkova (MPE, Ioffe Inst.), Jochen Greiner (MPE), J. Michael Burgess (MPE), Dmitry Frederiks (Ioffe Inst.), Dmitry Svinkin (Ioffe Inst.)

Abstract: The analysis of a sample of GRBs jointly detected by various instruments allows to understand the systematics in gamma-ray burst (GRB) spectral parameters and energetics. We present spectral cross-comparison of Konus-Wind (KW), Fermi/GBM (GBM), and Swift/BAT (BAT) gamma-telescopes using simultaneously observed GRBs as calibration sources. For the first time, a systematic cross-comparison of the KW and the GBM spectral data was performed. Based on the joint spectral analysis, we found that despite possible systematic uncertainties in the individual detectors, the relative normalizations between the instruments agree to within 15%. As compared to the KW normalization fixed to unity, the BAT normalization factor shows ~5%-10% lower value, while the GBM normalization demonstrates a systematically ~10% higher value. Adding the data from the instruments with wider spectral ranges to the BAT data provides steeper low- and high-energy spectral indices and higher peak energies. This study will facilitate the interpretation of the GRB prompt emission data acquired in different experiments.

Session: Multi-messenger and time domain astronomy, including GRBs

Type of contribution: Oral

Attendance:

Pietro Ubertini #4

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance:

Stefan Wagner #2

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Abstract

Title:
Authors:
Abstract:
Session:
Type of contribution:
Attendance:

Weimin Yuan #58

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Registration date: 8 Sep 2021, 17:22

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Abstract

Title: The Einstein Probe mission

Authors: Weimin Yuan (NAOC/CAS)

Abstract: The Einstein Probe (EP) is a space mission designed to discover and characterise high-energy transients and to monitor source variability in the X-ray band. Its large field-of-view telescope equipped with the micro-pore optic will carry out high-cadence all-sky monitoring survey with unprecedented sensitivity in the previously poorly monitored soft X-ray band. It has also the capability of quick and deep onboard follow-up observations and good source localization in X-ray. Currently in the development phase, EP is a project of the Chinese Academy of Science (CAS) with the participation of European Space Agency and Max Planck Institute for extraterrestrial Physics. In this talk I will introduce the Einstein Probe mission, its main science goals and current status.

Session: From INTEGRAL to the next generation of X/Gamma-ray facilities: heritage and future

Type of contribution: Oral

Attendance:

Andrzej Zdziarski #13

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Registration date: 26 Jul 2021, 22:23

Registration state: Completed

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Abstract

Title: Accretion flow, pair production and jet in MAXI J1820+070

Authors: Andrzej Zdziarski et al.

Abstract: I will discuss a number of results on the hard spectral state of the accreting black-hole binary MAXI J1820+070 obtained by fitting INTEGRAL and NuSTAR data and theoretical modelling. We find the X-rays and soft gamma rays are emitted by a hot accretion flow with the radius of more than 10 gravitational radii via Comptonization. The electron distribution is hybrid, i.e, predominantly thermal but with a significant non-thermal tail. The spectra from INTEGRAL are measured up to about 2 MeV, which allows us to accurately measure the electron-positron pair production rate. We find the pair abundance within the hot flow is low, which is supported by the lack of a measurable annihilation feature. However, the gamma rays also produce pairs in the magnetically-dominated base of the jet, which can then provide most of the synchrotron-emitting electrons upstream in the jet, which we find by modelling the contemporaneous radio-to-optical data. Finally, by comparing the jet and accretion emission we find the hot flow can be magnetically arrested.

Session: Galactic astronomy

Type of contribution: Oral

Attendance: