BOOK OF ABSTRACTS

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7th INTEGRAL/BART Workshop
Karlovy Vary 14 – 18 April 2010

The workshop will focus on works performed by Group of High Energy Astrophysics in the Stellar Department of the AI AS CR in Ondrejov and CTU in Prague and relevant international collaborators in the field of high-energy astrophysics with emphasis on satellite projects and related ground-based experiments i.e. ESA INTEGRAL, IXO, ESA Gaia HEA allocated workpackages, Cubesat, robotic telescopes (e.g. RTS2, BOOTES, BART, D50, Watcher), SID VLF GRB detectors, and related science.

The Progress Meetings of ESA INTEGRAL and ESA IXO projects will be also part of the workshop. For more details see http://eos.asu.cas.cz/ibws10

The IBWS Workshop 2010 is the 7th in the series in successful and productive workshops, for the program, abstracts and talks of the previous one see http://eos.asu.cas.cz/ibws09

Organized by Astronomical Institute,
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Data Mining for Faint Triggers in INTEGRAL IBIS

Author : Martin Blažek

Coauthors : R. Hudec, M. Kocka and F. Munz

Abstract : We report on our efforts and developed methods for data mining for faint triggers in INTEGRAL IBIS data. Some examples will be also given and discussed.

The BOOTES worldwide network of Robotic Telescopes

Author : Alberto Castro-Tirado

Coauthors : the BOOTES team

Abstract : I will show the motivation for a world-wide network of fast-reacting robotic telescopes and the achievements obtained so far.

On the intrinsic simplicity of spectral variability of GRBs

Author : Anton Chernenko

Abstract : Relativistically expanding sources produce radiation that manifest rich spectral evolution and diverse light curve structures. Even if individual emitting regions have similar and simple geometry and rest frame spectra, spectral and temporal evolution within any period of observer's time would be very diverse, since many of individual emitters would contribute to this period at different viewing angles, Lorentz factors and at different stages of development. In this paper I present multi-scale correlation analysis of light curves recorded in different energy ranges, which allows one to determine number of emitters and recover simple spectral properties of each emitter.

Glass response to the electron and proton irradiations

Author : Ondrej Gedeon

Abstract : The contribution reviews the irradiation experiments performed on various glasses. The glass response, especially the changes on surface, to irradiation is elucidated on both atomic and macroscopic level.

X-ray Transient Sources: Multifrequency Laboratories

Author : Franco Giovannelli

Coauthors : Lola Sabau-Graziati

Abstract : We will discuss in general the multifrequency behaviour of X-ray transient sources with particular emphasis about the interactions between the two components of the systems. Low energy processes mainly occurring at the Be star strongly influence high energy processes mainly occurring at the neutron star and viceversa. We will show the possibility of predicting high energy emission from the systems by using low energy indicators, such as e.g. Balmer lines, UV lines and optical luminosity.

Wide-Field Low Resolution Spectrometry

Author : Rene Hudec

Coauthors : M. Kocka, L. Hudec and V. Simon

Abstract : One of the outcome of the ESA Gaia Mision will be Wide-Field Low Resolution Spectrometry (BP/RP photometers). We will review the instrument performance and compare with nearest analogy, i.e. wide-field plate surveys with objective prism, and discuss the scientific use and importance.

Czech Participation in INTEGRAL

Author : Rene Hudec

Abstract : The Czech participation in ESA INTEGRAL satellite (with emphasis of ISDC and onboard OMC experiment) will be briefly introduced and presented, including historical background.

Czech Participation in IXO

Author : Rene Hudec

Coauthors : Michaela Skulinova, Veronika Marsikova, Ladislav Pina, Adolf Inneman, Martin Mika, Jan Sik, Michal Lorenc and Martina Landova

Abstract : We will review the Czech participation in the IXO project considered by ESA/NASA/JAXA, with emphasis on development of alternative (back-up) technologies for X-ray optics for this mission.

The Lessons Learned from INTEGRAL: Blazars

Author : Rene Hudec

Coauthors : Martin Blazek, Matus Kocka and Elena Pian

Abstract : We will give a short summary and discussion of INTEGRAL observations of blazars (21 objects detected and observed), with emphasis on hard X-ray and gamma-ray data (IBIS)

Lessons Learned from INTEGRAL: Cataclysmic Variables

Author : Rene Hudec

Coauthors : Rudolf Galis, Martin Blazek and Matus Kocka

Abstract : We will review and discuss the INTEGRAL observations of cataclysmic variables (32 objects detected and investigated in hard X-rays) with emphasis on IBIS data.

Small LE X-ray Telescopes as possible Payload for a Picosatellite

Author : Rene Hudec

Coauthors : V. Marsikova, L. Pina and A. Inneman

Abstract : We will refer on small and light Lobster-Eye X-ray telescopes as potential payload for a Pico-satellite mission.

Hot News: The Puzzle of V407 Cyg

Author : Rene Hudec

Abstract : I will briefly review and discuss the recent results on V407 Cygni, a strange symbiotic star with Mira companion and recent nova outburst in March 2010 with probable gamma-ray emission of > 100 MeV detected by Fermi satellite.

COLORES: an imaging spectrograph for BOOTES-2

Author : Martin Jelinek

Abstract : COmpact LOw REsolution Spectrograph is an imaging spectrograph for BOOTES. It is designed to provide low resolution, photon-counting spectroscopy of faint objects.

Detections of solar flares, GRBs and terrestrial gamma ray flares by SID monitor

Author : Matus Kocka

Coauthors : R. Slosiar

Abstract : SID monitor (Sudden ionospheric disturbance) is a very powerful method for detecting events like Solar flares, terrestrial gamma rays and even GRBs. This method is based on detection scattered waves from far VLF (very low frequency) antennas which are part of submarine communication system. The wave is scattered by D-layer of ionosphere, there are various cosmic events such as SFs, TGRs and GRBs which can disturb the ionosphere and change the signal from VLF antennas. This basic principle of SID monitor allows us to detect such cosmic events.

JULO1 small stratospheric balloon platform for students' near-space experiments

Author : Matus Kocka

Coauthors : Kapus J., Zatko M., Krovina A., Krpalek L., Babuska M., Slosiar R., Erdziak J., Kutka A. and Chrenko B.

Abstract : JULO1 is small platform for near-space (stratospheric) experiments for students and inexpensive atmospheric science. It is custom made small probe with ordinary weather helium baloon designed to be capable of reaching 40km altitudes and $\sim$ 5 hours flight.

White dwarfs masses estimation in IP from INTEGRAL/IBIS

Author : Matus Kocka

Coauthors : Munz F. and Hroch F.

Abstract : INTEGRAL/IBIS is a very powerful instrument for high energy astrophysics. One of the most interesting high energy sources from the Galaxy are intermediate polars and polars. By using spectra from IBIS/ISGRI is possible to determine masses of the white dwarfs in this systems. Determining of WD masses in IP is not a trivial task for astrophysics and this method allows us to establish it according to temperature measurements of the shock region on the poles of WD.

Cosmology with GRBs

Author : András Kovács

Coauthors : Z. Bagoly, L.G. Balázs, I. Horváth and P. Veres

Abstract : In the case of gamma-ray bursts with measured redshift one can calculate k-correction. This method products some valueable data for cosmological probes using L. Amati's relation [Amati et al. arXiv:0805.0377v2 2008], the main goals are density parameter of matter and Hubble diagram.

The scarcely known X-ray pulsar 4U1909+07 - an overlooked pearl

Author : Ingo Kreykenbohm

Coauthors : I. Kreykenbohm, F. Fuerst, L. Barragan, J. Wilms, K. Pottschmidt, S. Suchy and R. E. Rothschild

Abstract : We present a detailed spectral and temporal analysis of the accreting High Mass X-ray Binary (HMXB) pulsar 4U 1909+07 with INTEGRAL and RXTE which was only in the last years discovered to be a pulsar. 4U 1909+07 is typically detected at a level of about 15 mCrab in INTEGRAL/ISGRI, but can reach about 300 mCrab during flaring activity. The neutron star exhibits a very long pulse period of 605s that changes erratically around this value due to accretion from the stellar wind. The pulse profile itself is extremely energy dependent: while it shows a double peaked structure at low energies, the secondary pulse decreases rapidly with increasing energy and vanishes above 20keV such that only the sharp primary pulse is visible. This evolution is consistent between PCA, HEXTE, and ISGRI. While phase averaged spectra are usually well described by a powerlaw modified at higher energies by an exponential cutoff, an additional blackbody component is required to describe the spectrum of 4U1909+07. Pulse phase resolved spectroscopy reveals that this blackbody component as well as the cutoff energy are strongly variable with pulse phase while.

MASTER ROBOTIC NET

Author : Vladimir Lipunov

Coauthors : Victor Kornilov, Evgeny Gorbovskoy, Nikolaj Shatskij, Dmitry Kuvshinov, Nataly Tyurina, Alexander Belinski, Alexander Krylov, Pavel Balanutsa, Vadim Chazov, Artem Kuznetsov, Petr Kortunov, Anatoly Sankovich, Andrey Tlatov, Alexsander Parkhomenko, Vadim Krushinsky, Ivan Zalozhnyh, Alexsander Popov, Taisia Kopytova, Kirill Ivanov, Sergey Yazev, Yuiriy Sergienko and Vladimir Yurkov

Abstract : The main goal of the MASTER-Net project is to produce a unique fast sky survey with all sky observed over a single night down to a limiting magnitude of 21. Such a survey will make it possible to address a number of fundamental problems: search for dark energy via the discovery and photometry of supernovae (including SNIa), search for exoplanets, microlensing effects, discovery of minor bodies in the Solar System, and space-junk monitoring. All MASTER telescopes can be guided by alerts, and we plan to observe prompt optical emission from gamma-ray bursts synchronously in several filters and in several polarization planes. There are 5 sites in Russia with 9 robotic large field of view telescopes and 7 robotic very wide FOV cameras from Moscow to Russian Far East.

XMM observations of metal abundances in galaxy clusters

Author : Lorenzo Lovisari

Coauthors : Sabine Schindler and Wolfgang Kapferer

Abstract : Because of their deep gravitational wells, galaxy clusters retain all the metals produced by the stellar populations of the member galaxies. Most of these metals reside in the hot plasma which dominates the baryon content of the clusters. This makes them excellent laboratories for the study of the chemical enrichment history of the universe.

The distribution of metals in the ICM gives insight into the evolution process of the cluster galaxies and also of the whole cluster. Simulations have shown that ram-pressure stripping of galaxies and injection from AGNs leave observable traces in the metal distribution. Starbust events result in a high local metallicity, that is moving and mixing along with the ICM. The metal distribution in a cluster shows many stripes and blobs at the positions where the enrichment process has taken place, so the metal maps are the ideal diagnostic tools for galaxy and cluster evolution.

We present the first results of our ongoing work, in which we are studying the distribution of metals in a sample of 7 galaxy clusters through the analysis of observed metallicity maps.

Cosmology and the subgroups of gamma-ray bursts

Author : Attila Meszaros

Coauthors : Z. Bagoly, L.G. Balazs, I. Horvath and P. Veres

Abstract : There are three subgroups of the gamma-ray bursts (Horvath et al. astro-ph/1003.0632; ApJ, in press). They are defined with respect to the duration as short, intermediate and long ones. The short (Vavrek et al. 2008, MNRAS, 391, 1741) and the intermediate (Meszaros et al. 2000, ApJ, 539, 98) subgroups are dsitributed anisotropically on the sky. The consquence of these behaviour on the cosmology is discussed. It is shown that this behavior may cause the breakdown of the cosmological principle.

Composition Effects on Glass Shaping for X-Ray Space Telescopes

Author : Martin Mika

Spectroscopy of the stellar wind in the Cygnus X-1 system

Author : Ivica Miskovicova

Coauthors : M. Hanke, J. Wilms, M.A. Nowak, K. Pottschmidt and N.S. Schulz

Abstract : The luminosity of black holes is produced through the accretion of material from their companion stars. Depending on the mass of the donor star, accretion of the material falling onto the black hole through the inner Lagrange point of the system or accretion by the strong stellar wind can occur. Cygnus X-1 is high mass X-ray binary system, where the black hole is powered by accretion of the stellar wind of its supergiant companion star HDE226868. As the companion is close to filling its Roche lobe, the wind is not symmetric, but strongly focused towards the black hole. Chandra-HETGS observations allow for an investigation of this focused stellar wind, which is essential to understand the physics of the accretion flow. We compare observations at the prominent orbital phases of 0,0.2,0.5 and 0.75. These correspond to different lines of sights towards the source, allowing us to probe the structure and the dynamics of the wind.

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keV-TeV connection

Author : Filip Munz

Abstract : Updated look on VHE sources (measured by ground-based Cerenkov observatories and recently by Fermi satellite) that might also be reasonably exposed by INTEGRAL through its lifetime.

Search for TGF in INTEGRAL observations

Author : Alexei Pozanenko

Coauthors : P. Minaev, S. Molkov and S. Grebenev

Abstract : During CXB measurement by Earth occultation technique in early 2006 INTEGRAL observed the Earth in FOV of SPI and IBIS/ISGRI. Despite of high altitude elliptical orbit the INTEGRAL observatory could detect the Terrestrial Gamma-ray Flashes. We have searched for these events in SPI data and present a few candidates. We also discuss the rate of TGF and search strategy for short transient events in SPI and IBIS/ISGRI data.

Where is the third mode of bi-modal duration distribution?

Author : Alexei Pozanenko

Coauthors : P. Minaev and V. Loznikov

Abstract : Based on T_90 distributions of Gamma-ray bursts detected in different experiments (BAT/Swift, GRBM/BeppoSAX, BATSE/CGRO, SPI-ACS/INTEGRAL, PHEBUS/Granat and APEX/Phobos) we discuss the feasibility of a third mode of well known bi-modal distribution.

Potential for Science on Satellites of 1 kg

Author : Klaus Schilling

Abstract : The in orbit experiences of the two ico-satellite missions UWE-1 and -2 will be reported. The missions UWE-3 and -4 in implemetation stage will be outlined as well as planned formation flying activities. The potential for cooperations in providing payloads for pico-satellites will be discussed.

Metal enrichment of the intra-cluster medium

Author : Sabine Schindler

Abstract : We present X-ray observations of the metal distribution in clusters of galaxies. The metal distribution is very clumpy and inhomogeneous. With numerical simulations we study what processes are efficient to enrich the ICM with metals.

Searching for space debris elements with the "Pi of the Sky" system

Author : Marcin Sokolowski

Abstract : The main purpose of the "Pi of the Sky" system is an investigation of short timescale astrophysical phenomena (particularly gamma-ray bursts, optical transients and variable stars). However, the wide field, short exposures, full automatism of the system together with effective algorithms give good perspectives to effectively identify space debris elements. Such objects can be a great danger for space missions and should be continuously monitored and cataloged. The algorithms for identification of optical transients (OT) designed for the "Pi of the Sky" experiment allow to identify moving objects. The algorithm verifies each OT candidate against database of known objects, but is also able to automatically discover moving objects observed in images, but not present in this database. The data collected by the prototype in Las Campanas Observatory allowed to obtain a large sample of observations of moving objects. Some of these objects were identified as high-orbit geostationary satellites, which shows that it is possible to observe even distant satellites with small aperture photo lenses. The analysis of the sample is still going on. The preliminary results and algorithms for automatic identification of moving objects will be presented.

Silicon Wafer Shaping for Astronomical X-ray Optics: plastic vs. elastic deformation

Author : Jan Sik

Coauthors : R. Hudec and R. Lenhard

Abstract : Polished wafer from monocrystalline silicon available in semiconductor industry has thickness homogeneity of tenths of micrometer and surface roughness of tenths of nanometer. The possible utilization of silicon wafers for mirrors in astronomical X-ray optics is dependent on the possibility to precisely shape them without surface deterioration. One of the proposed solutions is lightweight optics based on self supporting wafers. We present comparison of two shaping methods: plastic deformation and the use of thin layers with intrinsic stress. Advantages and disadvantages of both methods are discussed.

BART & D50: recent status and events

Author : Jan Štrobl

Coauthors : Cyril Polášek, Martin Nekola, Martin Jelínek, Petr Kubánek, Vojtěch Šimon and René Hudec

Abstract : We will briefly introduce the actual configuration and recent status of two robotic telescopes - BART and D50, both operated, maintained and developed by HEA group in Ondřejov. Both telescopes are considered to be part of a ground segment of INTEGRAL and GAIA space missions. We will also lightly touch most significant observational successes in the last year.

Jost Buergi

Author : Claudia Wigger

Abstract : Jost Buergi (born 1552 Switzerland - 1632) was a clockmaker, a maker of astronomical instruments and a mathematician. During his time in Praha, he worked closely with Johannes Kepler.

Cyclotron lines

Author : Joern Wilms

Work on broad-band black holes spectra

Author : Joern Wilms

Improving photometry of the Pi of the Sky

Author : Aleksander Filip Zarnecki

Coauthors : for the Pi of the Sky collaboration

Abstract : After brief introduction to the Pi of the Sky project standard photometry method used in the data reduction will be described. After data quality cuts uncertainty of the single measurement is of the order of 0.018-0.024 magnitudo for stars 7-10m. With new calibration algorithm taking into account the spectral type of reference stars stability of the photometry algorithm can be significantly improved. Preliminary results from the BGInd variable are presented showing than uncertainty of the order of 0.013 can be obtained.

Gamma-Ray Bursts and their Precursors

Author : Róbert Andrássy

Abstract : Precursors are still a puzzle in the field of gamma-ray burst (GRB) astrophysics. The poster introduces a thesis focused on search for precursors, mainly in RHESSI GRB database. It also tries to summarize results of recent studies aimed at precursor observations by CGRO and Swift.

Analysis of spatially and time variable scientifical imaging systems

Author : Martin Blazek

Coauthors : Petr Pata and Elena Anisimova

Abstract : We refer about our effort to formulate the algorithms for the image signal processing with spatially and time variant Point-Spread Function (PSF) and inhomogenous noise of the real imaging systems. This project reflects the needs of the effective data processing from the systems with complicated PSF or important role of the noise, i.e. Wide-field cameras, low-resolution X-ray detectors with coded mask or precise astronomical telescopes (i.e. MAIA, BOOTES or INTEGRAL).

Timing analysis with INTEGRAL

Author : Victoria Grinberg

Coauthors : Ingo Kreykenbohm, Joern Wilms, Katja Pottschmidt, Marion Cadolle Bel, Jerome Rodrigues, Diana M. Marcu and Felix Fuerst

Abstract : INTEGRAL is one of the few instruments capable of detecting X-rays above 20 keV. It is therefore in principle well suited for studies of X-ray variability in this regime. Because INTEGRAL uses coded mask instruments for its imaging, the reconstruction of light curves of X-ray sources is highly non-trivial. We present results from the comparison of two commonly employed algorithms, which measure flux from mask deconvolution and from calculating the pixel illuminated fraction (ii_light). Both methods agree well for timescales above about 10s, the highest time resolution for which image reconstruction is possible. For higher time resolution, ii_light produces in meaningful results, although the overall variance of the lightcurves is not preserved.

Lobster-Eye X-ray Telescopes & Astrophysical Applications

Author : Rene Hudec

Coauthors : A. Inneman, L. Pina and V. Marsikova

Abstract : We refer on astronomical telescopes of Lobster-Eye Type, with emphasis on recent status of development, and astrophysical applications.

Low-cost optical all-sky monitor

Author : Rene Hudec

Coauthors : M. Krizek, M. Spurny, P. Pata and M. Rerabek

Abstract : We will refer on development and tests of a low-cost optical all-sky monitor based on a fish-eye lens and a digital camera. It represents an inexpensive device for easy duplication but still capable to detect brighter OTs of GRBs

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Technologies for Future Astronomical X-Ray Telescopes

Author : Rene Hudec

Coauthors : V. Marsikova, L. Pina, M. Skulinova, A. Inneman and M. Mika

Abstract : Technologies for future space X-ray telescopes such as IXO will be presented and discussed.

Investigation of High-Energy Sources on Archival Astronomical Plates

Author : Rene Hudec

Coauthors : V. Simon

Abstract : We refer on investigations and identifications of high-energy sources in optical light using astronomical archival plates. The plate archives enables very long-term analyzes covering up to 100 years.

Afterglow observations by BOOTES-1B

Author : Martin Jelinek

Abstract : A small presentation of the 30cm BOOTES-1B telescope.

Protection of Si wafers surfase during cutting

Author : Martina Landová

Coauthors : Martina Landová, Libor Švéda and, Veronika Maršíková

Abstract : In this experiment we cut the Si wafer for x-ray telescopes by laser beam into peaces of required size. During cutting and experiments we protect the Si wafer surface by polymeric foil. We investigate surfece of Si wafer by AFM and optical microscopy before use of polymer and after cutting.

Advanced processing of the images obtained from the wide-field astronomical optical systems

Author : Petr Pata

Coauthors : M. Řeřábek

Abstract : There are many various applications in astronomy which are using the WFC or UWFC (Ultra Wide-Field Camera) systems. UWFC systems frequently have so called SV (Space Variant) properties. Images obtained in UWFC systems are distorted by high order optical aberrations and objects on ultra wide-field images are very small. If we define the PSF (Point Spread Function) of optical system then we can use some suitable methods for restoration of original image. How to define the point spread function of LSI (Linear Space Invariant) and LSV (Linear Space Variant) systems is one of the most challenging questions of this paper.

New Image Compression Algorithm Based on Adaptive Wavelet Decompositon

Author : Petr Pata

Coauthors : J. Schindler

Abstract : This paper deals with a compression of image data in astronomy applications. Astronomical images are typical with their specific properties – high grayscale bit depth, size, noise occurrence and special processing algorithms. They belong to the class of scientific images. Their processing and compression is quite different from the classic approach to the processing of multimedia images. Database of images from BOOTES (Burst Observer and Optical Transient Exploring System) has been chosen as a source of the testing signal. BOOTES is a Czech – Spanish robotic telescope for observing of AGN (active galactic nuclei) and optical transient of GRB (gamma ray bursts) searching. There is discussed an approach based on analysis of statistical properties of image data in this paper. The statistical distribution of image functions in astronomical images from wide field and deep sky cameras is compared with Gaussian and Laplacean probability density function (pdf). The comparison of two irrelevancy reduction methods is presented from a scientific (astrometry and photometry) point of view. First one is based on a statistical approach to data compression and it is suggested from the Karhunen-Loève transform (KLT) with uniform quantization in spectral domain. Second technique is derived from wavelet decomposition with adaptive choosing of used mother wavelet.

Rising Indications for Three Gamma-Ray Burst Groups

Author : Jakub Ripa

Coauthors : David Huja, Attila Meszaros and Claudia Wigger

Abstract : Several papers have been written on the issue of gamma-ray burst groups (GRBs). We present a statistical study based on the durations and spectral hardnesses employing the data of the Swift and RHESSI satellites. Our results along with a comparison of different methods used in the elder studies highlight the rising number of evidences of a third GRB group.

Tests of Lobster Eye Optics for Possible Space Mission

Author : Vladimir Tichy

Coauthors : Marco Barbera, Alfonso Collura, Martin Hromcik, Rene Hudec, Adolf Inneman, Jiri Marsik, Ladislav Pina, Veronika Marsikova and Salvatore Varisco

Abstract : Prototype lobster eye optics module called P-25 manufactured in Rigaku Innovative Technologies Europe, s.r.o. is presented. This module has small mass and dimensions and it can be applied on micro- or nano-satellite. Results of its X-ray tests obtained using quasi parallel X-ray beam in National Institute for Astrophysics of University of Palermo are presented. The Field of view, the gain and the angular resolution of the named optics are estimated. Results are compared to simulations.

Use of piezoelements in future X-ray astronomy

Author : Peter Vanya

Coauthors : Rene Hudec and Martin Hromcik

Abstract : There are plans to build great orbital astronomical X-ray laboratories like IXO and Generation-X in next 10 years or so. Part of the research is expected to be done in the Czech Republic. The poster discusses the available piezoactuators suitable for the applications in active X-ray optics. The goal is the computer control of X-ray optical surfaces in order to achieve superior angular resolution.

MAIA - double-station video observation of the meteor

Author : Stanislav Vítek

Coauthors : Pavel Koten, Petr Páta and Karel Fliegel

Abstract : The double station observation of the meteors by means of sensitive image intensifier technique started at the Ondrejov Observatory 10 years ago. The sensitivity of such instrumentation allows detection of the meteors down to masses of fractions of gram. Moreover, video technique provides us with a time resolution of the meteor events.

Oral Contributions

I. Session on Science with INTEGRAL

II. Session on Robotic Telescopes

III. Session on IXO, X-Ray Telescopes and Picosatellites

IV. Session on GRBs

V. Session on High Energy Astrophysics

VI. Session on Related Science and Hot News

Posters