INFO BOOK

INTEGRAL/BART WORKSHOP

2025

26 - 30 May

Žatec, Czech Republic

The open LaTeX template, AMCOS_booklet, used to as template for this booklet is available at

https://github.com/maximelucas/AMCOS_booklet

Prepared by Martin Urban for IBWS workshop

https://www.ibws.cz

Contents

INTEGRAL/BART Workshop

IBWS is a successful series of international workshops dedicated to all aspects of high-energy astrophysics and supporting ground-based experiments (e.g. robotic telescopes). Within this framework, the detailed programme reflects the scientific interests of the participants, as there are no invited talks, but contributions are submitted by the conference participants.

Originally, the IBWS (INTEGRAL/BART) workshops focused on the work of the High Energy Astrophysics group (at that time dominated by young research fellows and students) at the Astronomical Institute of the Academy of Sciences of the Czech Republic and relevant national and international collaborators in the field, with intensive student participation. In the early years, these activities focused on the ESA INTEGRAL satellite and related ground-based robotic telescopes, such as the small robotic telescope BART at the Ondrejov Observatory.

Today, the IBWS workshops promote regional collaboration in galactic and extragalactic high-energy astrophysics, both experimental and theoretical, with an emphasis on the interface between satellite projects and ground-based experiments (e.g. robotic telescopes). We continue to emphasise the broad participation and presentation of students and young researchers.

This year's held the 19th INTEGRAL/BART Workshop.

René Hudec

Organising committee

Veronika Maršíková	Rigaku Innovative Technologies Europe s.r.o.
Martin Urban	Czech Technical University in Prague
Ondřej Nentvich	Czech Technical University in Prague

Scientific committee

René Hudec	Astronomical Institute of the Czech Academy of Sciences & Czech Technical University in Prague
Martin Jelínek	Astronomical Institute of the Czech Academy of Sciences
Vladimir Karas	Astronomical Institute of the Czech Academy of Sciences
Thorsten Döhring	Technische Hochschule Aschaffenburg
Karl Mannheim	Universität Würzburg
Klaus Schilling	Zentrum für Telematik e.V.
Zsolt Bagoly	Eötvös University
Norbert Werner	Masaryk University
Thomas Siegert	Julius-Maximilians-Universität Würzburg

Partner Institutions and Sponsors

Topics

GRB Gamma-Ray Bursts & Robotic Telescopes

Gamma Ray Bursts studies with emphasis on follow-up observations by robotic telescopes. Transient astronomy in general, flaring, flashing and transient astrophysical objects and methods and techniques for their analyses including real-time image processing.

HEA High Energy Astrophysics

Both theoretical as well as observational (satellite-based as well as ground-based) aspects of high energy (X-ray and gamma-ray) and very high energy astrophysics, both galactic and extragalactic, gamma-ray bursts and time-domain astronomy.

SAT Small satellites for astrophysics & Instrumental session

All aspects of small satellites (pico, nano, micro, CubeSats), projects presentations, and scientific payloads for these satellites. Satellite projects for High Energy astrophysics in general. Rocket experiments. Ground-based support for satellite projects and high energy astrophysics – robotic telescopes, data analyses.

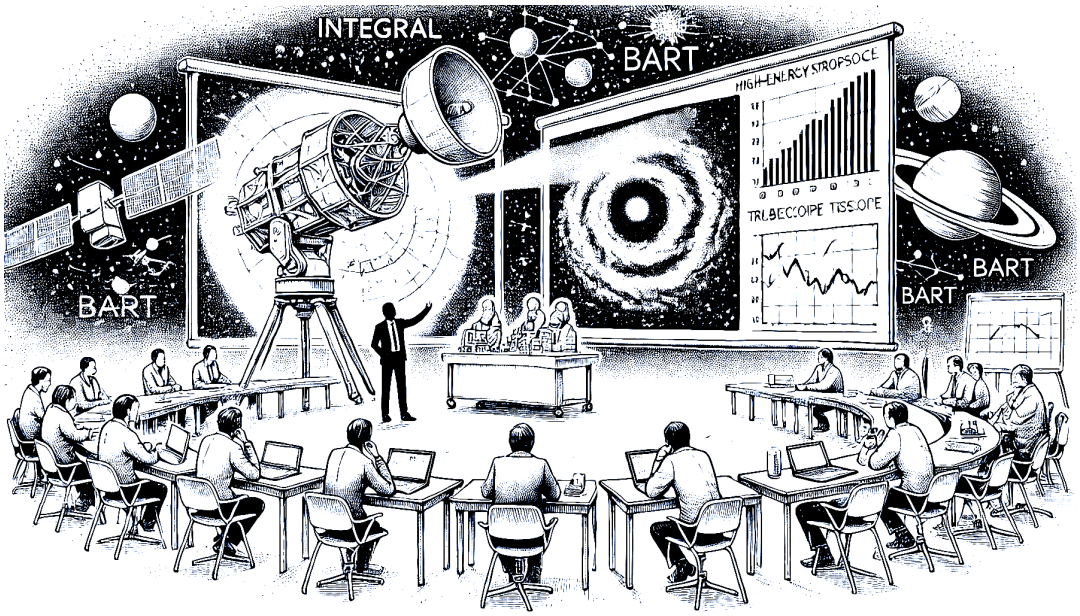
Icons

INV **Invited Lecture**  **Talk**  **Poster**

Time schedule

Monday, 26 May

14:00–14:20	**Registration**		
	Session chair: Rene Hudec		
14:30–14:35		**Rene Hudec**	Opening workshop and Welcome notes
14:35–14:45		**Pavel Pintr**	Deputy Mayor of Žatec
14:45–15:00		**Rene Hudec**	IBWS Intruduction and historical background
	Session chair: Robert Filgas		
15:00–15:50	**INV**	**Vladimír Dániel**	Maximizing GSD on CubeSat Platforms Using COTS Optics
15:50–16:10	**SAT**	**Vladimír Tichý**	Preliminary Optical Tests of Lobster Eye X-Ray Optics Prototype for Nanosatellite Missions Based on New Technology
16:10–17:30	**Coffee with Open discussion**		
18:00–22:00	**Welcome reception**		



Tuesday, 27 May

09:45–09:55	**Registration**		
10:00–11:30	**INV**	**Schilling Klaus**	The Future in Space : Smarter, Smaller and More Cooperative Satellites ?
11:30–11:55	**Coffee break**		

Session chair: Filip Münz

11:55–12:30	**SAT**	**Lucia Krivanekova**	ASTRABAX: Stratospheric radiation experiments in low-budget modular settings
12:30–12:55	**SAT**	**Alexander Bekeč**	Zwillink - Experimental inter-satellite communication and ranging payload for VZLUGEM mission
12:55–14:30	**Lunch**		

Session chair: Jakub Řípa

14:30–15:00	**SAT**	**Milan Malich**	Development of the miniaturized HardPix radiation monitor
15:00–15:20	**SAT**	**Robert Filgas**	Lunar water mapping using neutron spectrometer HardPix
15:20–15:40	**Coffee break**		

Session chair: Vladimír Dániel

15:40–16:05	**SAT**	**Filip Münz**	QUVIK - Ultraviolet telescope in new feathers
16:05–16:30	**SAT**	**Jakub Řípa**	GRB-detecting nanosatellites GRBAlpha and VZLUSAT-2

18:00–22:00	**Get-Together Dinner - see page 42**

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Wednesday, 28 May

09:00–09:10	**Registration**		
09:15–10:15	**INV**	**Racz Istvan**	Analysis of Swift XRT X-ray spectra: for estimating the intrinsic hydrogen content
10:15–10:35	**Coffee break**		

Session chair: Sergey Karpov

10:35–10:55	**GRB**	**Martin Jelínek**	From Precursor to Afterglow: The Complex Evolution of GRB 210312B
10:55–11:15	**GRB**	**Alžběta Maleňáková**	In search of the optical afterglow template: GRB240414A
11:15–11:35	**GRB**	**Felix Pfeifle**	FACT — Wide-Field Skymap Tool for Gamma-Ray Source Localization
11:35–13:00	**Lunch**		

Session chair: Martin Jelínek

13:00–13:30	**GRB**	**Jan Štrobl**	System for autonomous robotic telescopes RTS2 - current state and future perspectives
13:30–13:50	**GRB**	**Bohuslav Matouš**	Sand Hill Optical Telescope (SHOT) for Space Surveillance and Tracking observations
13:50–14:10	**GRB**	**Rene Hudec**	Feasibility study for application of digitized Henize Mt Wilson Michigan Southern Sky Halpha survey low dispersive spectral plates for searches for anomalous and highly redshifted objects
14:10–14:30	**Coffee break**		

Session chair: Karl Mannheim

14:30–15:00	**GRB**	**András Péter Joó**	The THESEUS Space Mission and the Infrared Telescope Calibration Unit
15:00–15:20	**GRB**	**Veres Kende**	Space-based detection and data analysis in practice: analysis and correction of Swift GRB data
15:20–15:40	**GRB**	**Istvan Racz**	Density estimation of the GRBs' redshift distribution
15:40–15:55	**Coffee break**		

Session chair: Rene Hudec

15:55–16:15		**Kateřina Stuchlíková**	AI in space
16:15–16:35		**Raj Laxmi Singh**	Introduction to the ELI and Experimental Opportunities in Laboratory Astrophysics

16:35	**End of day**

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Thursday, 29 May

09:00–09:10	**Registration**		
09:15–10:45	**INV**	**Siegert Thomas**	MeV astrophysics — INTEGRAL's heritage and COSI's future
10:45–11:05	**Coffee break**		

Session chair: Saurabh Mittal

11:05–11:25	**HEA**	**Laura Eisenberger**	Observations of the dark matter halo of the Andromeda Galaxy with INTEGRAL/SPI
11:25–11:45	**HEA**	**Niklas Bauer**	Al-26 from massive stars observed with INTEGRAL/SPI: towards fitting the Orion-Eridanus Superbubble
11:45–12:05	**HEA**	**Dimitris Tsatsis**	Observations of Jupiter with INTEGRAL/SPI
12:05–13:30	**Lunch**		

Session chair: Siegert Thomas

13:30–13:50	**HEA**	**Rudi Reinhardt**	Time-variability in the All-Sky 511 keV emission
13:50–14:10	**HEA**	**Áron Juhász**	Obscured Star Formation in the Dwarf Galaxy DDO 43? - A Comparative UV–IR Analysis
14:10–14:30	**HEA**	**Sergey Karpov**	Early identification of optical tidal disruption events with the Fink broker.

15:30–22:00	**Social event - see page 43**

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Friday, 30 May

Session chair:

09:30–09:50	**HEA**	**Rene Hudec**	Feasibility study for application of Sonneberg Observatory digitized astrograph plates for searches for lost stars
09:50–10:20	**HEA**	**Vojtěch Šimon**	Observing the long-term activity of cosmic sources by a combination of X-ray monitors
10:20–10:35	**Coffee break**		

Session chair: Istvan Racz

10:35–10:55	**HEA**	**Patrik Ehrmann**	Modelling terrestrial gamma-ray flashes at the Zugspitze research station
10:55–11:15	**HEA**	**Patrick Günther**	Modeling of the relativistic acceleration and high-energy emission of test-particles in MHD jets
11:15–11:40	**HEA**	**Mika Gelowicz**	Calculation of Electron-Positron Pair Production by the Cosmic Photon Background as a Function of Redshift
11:40–11:55	**Coffee break**		

Session chair: Stofanova Lydia

11:55–12:15	**HEA**	**Saurabh Mittal**	Constraints on coupling between axion-like particles and electrons from preSupernovae stars
12:15–12:35	**HEA**	**Manja Zimmerer**	Determining the Contribution of Massive Stars and Classical Novae to the Radioactive Isotope 26 Al
12:35–12:55	**HEA**	**Istvan Racz**	Giants of the Universe: GRBs and the Cosmic Grid
12:55–13:00	**Break**		

13:00–13:15	**Siegert Thomas**	Concluding Remarks
13:15–13:30	**Rene Hudec**	Concluding Address

13:30	**Lunch**

13:30	**End of workshop**

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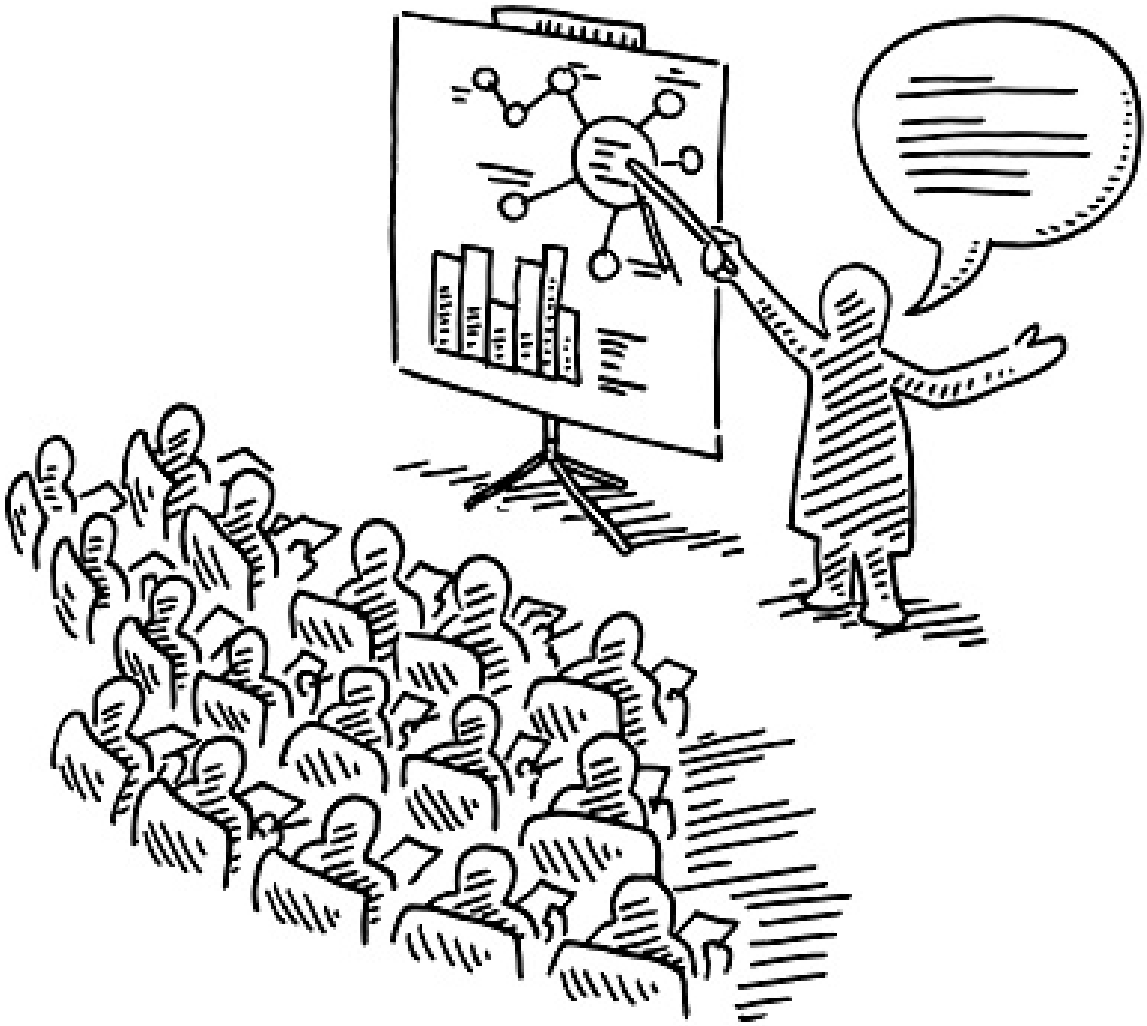
Invited lectures



IBWS

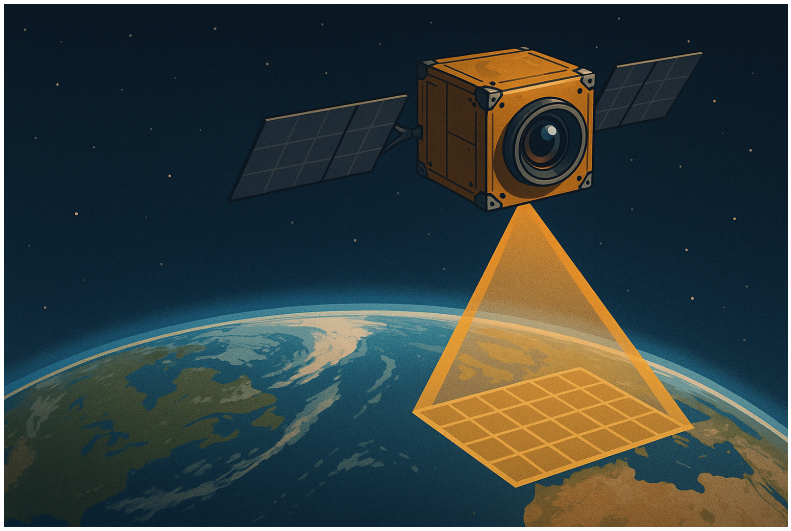
INVITED LECTURE

Maximising Ground Sampling Distance on CubeSat Platforms Using Commercially Available Optics

Vladimír Dániel

Czech Aerospace Research Centre
Czech Republic

This presentation focuses on achieving the maximum possible ground sampling distance (GSD) on CubeSat platforms by utilising commercially available (COTS) optical components. It will cover the theoretical influence of optical and sensor parameters on the resulting GSD, along with practical limitations imposed by the size, mass, and environmental conditions of small satellites. Real-world examples from the VZLUSAT-2 and SATurnin-1 missions will illustrate the selection process and adaptation of COTS optics for orbital use. The presentation will highlight the results achieved, the technical challenges encountered, and the key lessons learned — providing valuable insights for the design of future Earth observation CubeSat missions.



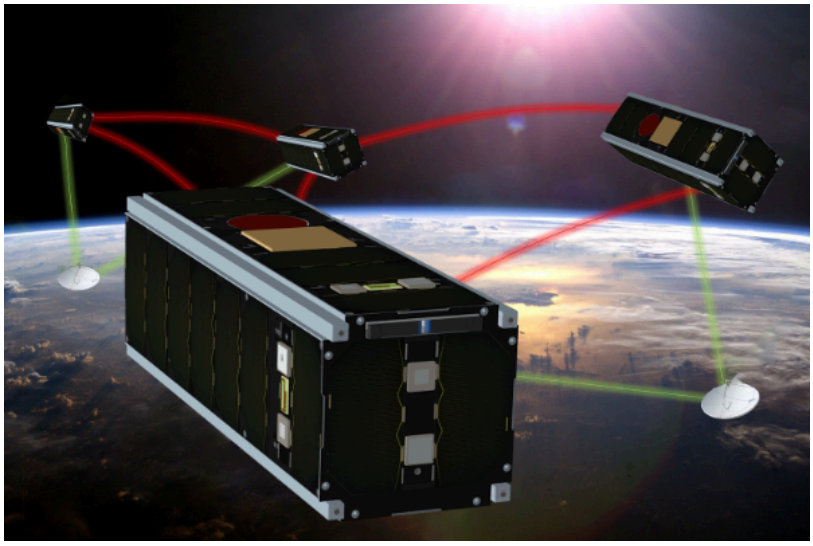
INVITED LECTURE

The Future in Space : Smarter, Smaller and More Cooperative Satellites?

Klaus Schilling

Center for Telematics (ZfT)
Germany

A paradigm change in spacecraft engineering can currently be observed: from traditional multi-functional, large spacecraft towards robust systems of networked, cooperating, distributed very small satellites. Similar trends emerged in computer systems since 1970, where the large mainframe computers were replaced by today's smart phones, networked via Internet to form the basis for cloud computing. In addition, modern miniaturization technologies support production of robust, cost-efficient small satellites with increasing performance in terms of their control capabilities. The deficits of miniaturization are to be compensated by advanced control, redundancy management and operations software. Those principles for future multi-satellite systems will be illustrated by examples of current formations of nano-satellites as cooperating sensor networks in space for application fields like Earth observation, navigation and astronomy.



IBWS

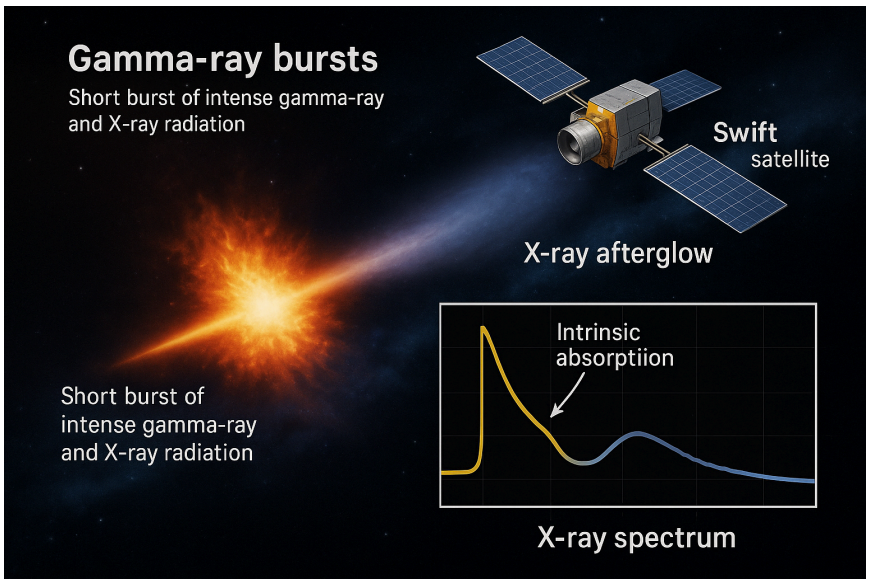
INVITED LECTURE

Analysis of Swift XRT X-ray spectra: for estimating the intrinsic hydrogen content

Rácz István

University of Public Service
Hungary

Gamma-ray bursts (GRBs) are the highest-energy explosions in the universe, emitting short bursts of intense gamma-ray and X-ray radiation. The Swift satellite's rapid response capability allows it to locate bursts instantly with the BAT detector and then start observing the X-ray afterglow within minutes with the XRT instrument. By analysing the XRT spectra, we can measure not only the afterglow emission itself, but also the absorption effects in the intrinsic environment (progenitor environment, interstellar material). The extra absorption in the X-ray spectra can be used to estimate the intrinsic hydrogen column density (NHint), which provides information on the amount and ionisation state of the matter surrounding the GRB. NHint typically appears as an additional absorption component above the Galactic absorption in the spectral fit. Measurements based on Swift/XRT data provide important support for understanding the formation environment of GRBs and the physics of the early afterglow. The analysis of these parameters will also contribute to the identification of progenitors of GRBs (e.g. high-mass stars) and to the study of the interstellar material of high-redshift galaxies.



IBWS

INVITED LECTURE

MeV astrophysics — INTEGRAL's heritage and COSI's future

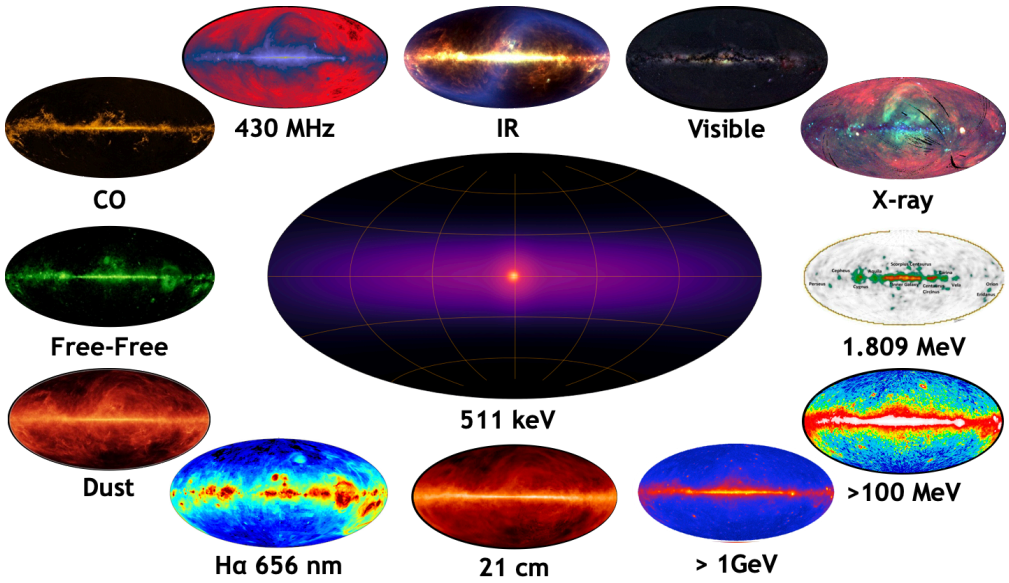
Thomas Siegert

Julius-Maximilians-Universität Würzburg
Germany

The soft gamma-ray range of MeV photons is notoriously difficult to analyse and interpret owing to strong instrumental background and large systematic uncertainties. Alas, measurements in this 'MeV gap' have a huge potential towards solving many of the great questions in astrophysics and cosmology.

For more then two decades, the spectrometer aboard the INTEGRAL satellite, SPI, is detecting photons from 0.02 to 8 MeV with its high-purity germanium detectors for the study of accreting compact objects, pulsars, massive star groups, and supernovae and their remnants, among others. Especially the gamma-ray lines from excited nuclei and positron annihilation serve as an invaluable messenger for stellar evolution, Galactic dynamics and feedback, cosmic-ray acceleration and propagation, as well as the dark matter phenomenon.

In this lecture, I will summarise how MeV observations work, what INTEGRAL has achieved during its 22-yr mission, and what will be possible with the next generation MeV telescope, COSI, the Compton Spectrometer and Imager, which NASA slated for launch in 2027.



Al-26 from massive stars observed with INTEGRAL/SPI: towards fitting the Orion-Eridanus Superbubble

HEA

Niklas Bauer
University of wuerzburg, Germany

The 1.8 MeV γ-ray line of the Milky Way shows the abundance of 26Al in the Galaxy and ongoing nucleosynthesis. We aim to model the Orion-Eridanus superbubble and fit it to INTEGRAL/SPI data. We also examine the Cygnus-, Orion-Eridanus- and the Scorpius-Centaurus-region regarding the 1.8 MeV line flux to confirm current superbubble, star forming and distribution models in the local interstellar medium. We calculate the emissivity profile for the the Orion-Eridanus superbubble and the resulting flux of 1.8 MeV photons via line-of-sight integration. The geometry we use follows two possible ellipsoidal models of the superbubble, that result from Kompaneets fitting. The resulting maps are then compared to the INTEGRAL/SPI data to evaluate the models. We find significant emission in 1.8 MeV from Cygnus, ScoCen and Orion with 10.0, 5.3 and 3.6 sigma.

Modelling terrestrial gamma-ray flashes at the Zugspitze research station

HEA

Patrik Ehrmann
University of Wuerzburg, Germany

Terrestrial Gamma ray Flashes (TGFs) are bursts of high-energy gamma rays in the sub-millisecond range which coincide with lightning discharges. The gamma rays measured from TGFs originate from processes like bremsstrahlung, nuclear excitation, and pair production and annihilation, reaching energies of up to several MeV. To better understand the mechanism of lightnings in general and TGFs in particular we aim to both simulate and measure the expected gamma rays. For this purpose, we model the environment of the Umweltforschungsstation Schneefernerhaus at the Zugspitze mountain (Germany) using Monte Carlo simulations. Using MEGAlib (GEANT4), we simulate the detector response and the surrounding environment, including atmospheric effects. These simulations will help to specify the conditions under which TGFs can be effectively detected and contribute to the broader understanding of high-energy atmospheric physics.

HEA

Observations of the dark matter halo of the Andromeda Galaxy with INTEGRAL/SPI

Laura Eisenberger
University of Würzburg, Germany

The Andromeda galaxy (M31) is a promising target for the indirect search of dark matter (DM) due to its proximity and expected massive DM halo. It functions as test case for a Milky Way (MW) like galaxy as the isotropic emission from the MW halo itself cannot be detected with a coded mask telescope like INTEGRAL/SPI. MeV data can put strong limits on DM models from the MeV up to the TeV mass range since weakly interacting massive particles also produce a significant flux of secondary MeV photons from inverse Compton scattering and positron annihilation. We use the spectrum obtained from observations of M31 with SPI in order to constrain different DM models. From the 511 keV emission from positron annihilation, we estimate the pair production rate in M31 to put a lower mass limit on thermal DM. We take the uncertainty of the DM distribution into account by considering different density profiles and substructure boosting.

HEA

Calculation of Electron-Positron Pair Production by the Cosmic Photon Background as a Function of Redshift

Mika Gelowicz
University of Würzburg, Germany

The Cosmic Photon Background (CPB) is the isotropic radiation across the entire electromagnetic spectrum, ranging from radio to very high energy gamma rays. Interactions of the CPB with itself are expected to produce positrons via pair-production. The local rate at redshift z=0 is on the order of 2.0×10^{-36} s-1cm-3, which translates into a local pair production rate of 1.3×10^{47} s-1 until 200 Mpc. However, the CPB evolves with time, as its components – such as stars, AGNs, and the Cosmic Microwave Background – vary with redshift. We calculate the CPB spectrum as a function of redshift by taking into account the relative luminosity of each contribution source type. The corresponding pair production rate rises sharply from the local value to 1.8×10^{-31} s-1cm-3 at redshift 2.7, after which the pair production rate decreases again. This leads to a total pair production rate of 7.4×10^{54} s-1 until redshift 5. This may make a measureable contribution to the Cosmic Gamma-Ray Background if all the positrons produced also annihilate.

Modeling of the relativistic acceleration and high-energy emission of test-particles in MHD jets

HEA

Patrick Günther
Universität Würzburg, Germany

Observations of Active Galactic Nuclei show broad-band emission across the whole electromagnetic spectrum and variability on all observed timescales. The high-energy emission consists of synchrotron and self-compton emission produced by a non-thermal population of plasma. To model the acceleration of this plasma, fluid-dynamical MHD simulations of the thermal bulk need to be extended by a time-dependent transport equation for the relativistic particles. We solve a Fokker-Planck-type equation by means of stochastic differential equations, including effects such as diffusive shock acceleration and stochastic acceleration. Using a hybrid MHD-kinetic approach, we aim to study the effect of the multiple shocks with varying strengths and obliquities on the resulting non-thermal particle distributions in MHD jet simulations. The time-dependency of the simulation makes the extraction of light curves at any wavelengths possible.

Feasibility study for application of Sonneberg Observatory digitized astrograph plates for searches for lost stars

HEA

Rene Hudec
ASU AV CR & CVUT, Czech Republic

We report the results of the feasibility study of the application of digitized Sonneberg Observatory astrograph plates in modern astrophysics with emphasis on searches for lost stars. The project aims to propose a possible solution for finding the abnormal phenomenon "lost stars" in images of fields in the sky. It entails the strategic method of finding lost stars using modern technology and software. The procedure is summarized by comparing historical images against more recent ones, containing the same field in the sky, and looking for differences in the brightness of stars. By doing so, it can be determined if a star has been lost. From implementing this, on real images of the sky and the complexity and richness of the variability phenomena, it is evident that really lost stars are difficult to verify. Due to the noisy characteristics of images of the sky, and above mentioned richness of the variability among star images, it is not so trivial to determine if a star is lost or not. This project advances the understanding of lost stars by creating a more efficient way of determining- If a star is lost. The main goal of this study was, however, more general, namely, to confirm the feasibility of the use of digitized Sonneberg Observatory astrograph plates for modern astrophysical research

Obscured Star Formation in the Dwarf Galaxy DDO 43? - A Comparative UV–IR Analysis

HEA

Áron Juhász
Independent researcher, Hungary

The nearby irregular dwarf galaxy DDO 43 offers a valuable opportunity to study star formation processes across multiple wavelengths. In this study, we compared GALEX ultraviolet and WISE near-infrared (W1, W2) imaging, focusing particularly on wavelength-dependent morphological variations and the possible presence of obscured star-forming regions.

Our primary aim was to explore how the contrast between UV and IR emission may reflect the internal structural complexity and asymmetry of the galaxy. This multiwavelength approach resulted in a set of new questions and perspectives regarding the star formation history and the morphological evolution of this isolated dwarf galaxy, highlighting areas for future investigation.

Early identification of optical tidal disruption events with the Fink broker.

HEA

Sergey Karpov
Institute of Physics, Czech Academy of Sciences, Czech Republic

Detecting Tidal Disruption Events (TDEs) candidates early is essential for follow-up observations at peak brightness, enabling confirmation of their nature and a deeper understanding of their complex multi-wavelength behavior. TDEs are rare events, and their detection is one of the key goals of large ground optical facilities, such as the Zwicky Transient Facility (ZTF) and the upcoming Vera C. Rubin Observatory. However, managing their vast alert streams requires automated pipelines that identify the nature of the detected events. We introduce a module developed within the Fink alert broker, designed to enable the early identification of TDEs observed by ZTF. A first step consists in the automatic selection of light curves compatible with a rising transient scenario. It is followed by a tailored feature extraction based on a multi-band fit of the rising part of the light curves. It enables the computation of physically-motivated features, such as temperature and rise time, which are essential to distinguish TDEs from other long-lasting transients. Finally, a machine learning classifiers trained on a sample of high quality TDEs to distinguish similar events, with and without additional features related to the distance to host galaxy. Despite the challenge offered by the sparse and highly imbalanced training dataset, the classifiers provides reasonably completeness and purity metrics.

The talk describes the training of the classifier on archival data, implementation of the module inside Fink broker that reports the candidates in nearly real time, and presents several promising candidates identified during the development, as well as the perspectives of adaptation of this approach for the upcoming Rubin Observatory' Legacy Survey of Space and Time data stream.

Constraints on coupling between axion-like particles and electrons from preSupernovae stars

HEA

Saurabh Mittal
University of Wuerzburg, Germany

We present a gamma-ray search for axion-like particles (ALPs) from a sample of 18 nearby preSupernovae stars, using data from the INTEGRAL observatory. ALPs can be thermally produced in stellar interiors and subsequently convert into high-energy photons in the Galactic magnetic field, potentially producing a gamma-ray signature in the direction of the star. We analyze data from SPI, extending previous efforts beyond the hard X-ray regime into the 20 keV to 2 MeV gamma-ray band. We derive upper limits on the product g_aγ $\times$ g_ae, as a function of the ALP mass (m_a), and find it to be in the range (0.15 - 8) $\times$ 10^{-25} GeV^{-1}, where (g_aγ) is the ALP-photon coupling constant and (g_ae) is the ALP-electron coupling constant, by performing a combined maximum likelihood analysis across our star sample. This result is valid for m_a 10^{-11} eV and a uniform Galactic magnetic field B_T = 1.4 microG, depending on the stellar model and time to core collapse. These constraints improve upon previous limits from NuSTAR by an order of magnitude over the same ALP mass range.

Giants of the Universe: GRBs and the Cosmic Grid

HEA

Istvan Racz
University of Public Service, Hungary

This presentation explores the cosmic giant structures revealed by gamma-ray bursts (GRBs), which are among the most energetic phenomena in the Universe. The spatial distribution of GRBs enables the identification of massive cosmic walls and superclusters, revealing patterns that challenge the assumptions of the standard cosmological model, particularly the cosmological principle of homogeneity. We focus on the Hercules-Corona Borealis Great Wall, whose extent is significantly larger than previously thought. New data suggests the wall may span a redshift range of 0.33 to 2.43. GRB clustering is a valuable tool for probing the cosmic large-scale structure, complementing galaxy and quasar observations. This presentation demonstrates how GRBs help us understand the Universe's greatest mysteries.

HEA

Analysis of Swift XRT X-ray spectra: for estimating the intrinsic hydrogen content

Istvan Racz
University of Public Service, Hungary

INV

Gamma-ray bursts (GRBs) are the highest-energy explosions in the universe, emitting short bursts of intense gamma-ray and X-ray radiation. The Swift satellite's rapid response capability allows it to locate bursts instantly with the BAT detector and then start observing the X-ray afterglow within minutes with the XRT instrument. By analysing the XRT spectra, we can measure not only the afterglow emission itself, but also the absorption effects in the intrinsic environment (progenitor environment, interstellar material). The extra absorption in the X-ray spectra can be used to estimate the intrinsic hydrogen column density (NHint), which provides information on the amount and ionisation state of the matter surrounding the GRB. NHint typically appears as an additional absorption component above the Galactic absorption in the spectral fit. Measurements based on Swift/XRT data provide important support for understanding the formation environment of GRBs and the physics of the early afterglow. The analysis of these parameters will also contribute to the identification of progenitors of GRBs (e.g. high-mass stars) and to the study of the interstellar material of high-redshift galaxies.

HEA

Time-variability in the All-Sky 511 keV emission

Rudi Reinhardt
University of Wuerzburg, Germany

The interactions of low-energy cosmic rays with asteroids might lead to a measureable variable foreground emission within our Solar system. Siegert (2024) modeled the spatial distribution of all relevant asteroid populations, including the Main Belt Asteroids, Jovian and Neptunian Trojans, as well as the Kuiper Belt to determine their density profiles and calculate their appearances by line-of-sight integrations. The signal is expected to vary in time due to the relative motion of Earth and the asteroids. In addition the Solar cycle will enhance and suppress the signal on an 11 yr timescale. In this work we are using INTEGRAL/SPI data to search for this time-variable foreground albedo in both, the 511 keV line and the ortho-Positronium (oPs) spectrum. We are using 20 yr of data, including high-latitude observations, and covering almost two orbits of Jupiter and its trojans around the Sun, giving us the best opportunity to search for such a signal. Because the signals are expected to vary in time, a standard analysis is not possible for which reason, we split the dataset into monthly parts to calculate the expected responses and recombine them for a global fit. Since the Galaxy is bright in the bulge at 511 keV, we can determine its variability on a two year timescale, which allows us to constrain the possible contributions from all asteroid families.

Introduction to the Extreme Light Infrastructure (ELI) and Experimental Opportunities in Laboratory Astrophysics

HEA

Raj Laxmi Singh
Extreme Light Infrastructure ERIC, Czech Republic

The Extreme Light Infrastructure (ELI) is a research facility with the world's largest and most advanced collection of high-power lasers. ELI enables multi-disciplinary science with a broad range of research applications and provides access to world-class high-power, high-repetition-rate laser systems for a broad range of research in physical, chemical, materials, and medical sciences. ELI operates as a single multi-site organisation with complementary facilities. One unique advantage of high-power lasers is their ability to reproduce astrophysical phenomena under controlled laboratory conditions. At ELI, the Plasma Physics Platform (P3) provides a dedicated environment for conducting experiments in the field of laboratory astrophysics.

Observations of Jupiter with INTEGRAL/SPI

HEA

Dimitris Tsatsis
University of Wuerzburg, Germany

The Cosmic Gamma-ray Background (CGB), particularly in the MeV energy range, remains one of the least understood components of the cosmic background radiation due to limitations in current observational technologies. Here we present an indirect method for studying the MeV CGB by analyzing the gamma-ray emission resulting from its interaction with Jupiter's atmosphere. For this we utilize data from the SPI spectrometer aboard INTEGRAL, which has serendipitously observed Jupiter over a span of 22 years. We focus on the analysis of Jupiter's gamma-ray albedo and treat it as a moving point source, which is a non-standard method. We performed Monte Carlo simulations to model the atmospheric response of Jupiter to cosmic photons. We present preliminary results by setting upper limits to the flux detected from Jupiter, while also validating our data analysis approach through comparison with known gamma-ray sources. The simulation results provide a reliable expectation for the flux and spectral shape of the reflected gamma-ray spectrum from Jupiter's surface. Cosmic-ray interactions with Jupiter's atmosphere are expected to dominate the total signal, which has to be modeled for different modulation potentials owing to the solar cycle. In addition, MeV observations of Jupiter and other planets in the Solar system can enhance the expectations because the CGB reflection would only change as a function of distance, whereas the cosmic-ray induced albedo changes on an 11 yr time scale.

Determining the Contribution of Massive Stars and Classical Novae to the Radioactive Isotope 26 Al

Manja Zimmerer
JMU Würzburg, Germany

The production of the 26 Al isotope is usually associated with massive stars and ejected in their winds and supernovae. Because of its short lifetime we are able to track the recently produced 26 Al and can therefore use it as a messenger of ongoing nucleosynthesis and star formation in the Milky Way. Recent results from 26 Al measurements suggest a star formation rate (SFR) of 8 Msun/year [Siegert et al., 2023], which is not consistent with other literature values. Classical novae are also believed to produce a considerable amount of 26 Al, which, if large enough, would decrease the SFR from the correlation of 26 Al with massive stars. We aim to determine the 26 Al mass as a function of Galactocentric radius and compare it with a 2D Galactic Chemical Evolution (GCE) model [Vasini et al., 2025] to estimate the contribution of massive stars and classical novae. We are using 20 yr of INTEGRAL/SPI observations of the decay gamma-ray line at 1. 8 MeV to test different assumptions on the radial structure of 26 Al. This work is currently in progresss – we will present the methodology, the GCE model, and how the data analysis will be performed. Results can be expected around the time of the workshop.

Observing the long-term activity of cosmic sources by a combination of X-ray monitors

Vojtěch Šimon
Astronomical Institute ASCR, Czech Republic

We show that combining the observations (1-day bins) of various X-ray monitors with different energy bands onboard different satellites is helpful for investigating the features of the long-term activity of X-ray binaries. Combinations of data from MAXI/ISS and BAT/Swift enable the investigation of long-term activity at energies between 2 keV and 50 keV. 1-day binning is sufficient for resolving the typical features of activity. Combinations of the data from these monitors reveal significant structural changes in the emitting regions that occur during these features. This combination of X-ray monitors has the scientific potential to investigate the role of various physical mechanisms on long timescales. A series of X-ray monitors is necessary to obtain long-term light curves (e.g., outbursts, state transitions) in a broad energy range. Big satellites are needed to obtain detailed observations (spectra, rapid variations) both in a broad energy range and in specific and essential phases of activity.

Feasibility study for application of digitized Henize Mt Wilson Michigan Southern Sky Halpha survey low dispersive spectral plates for searches for anomalous and highly redshifted objects

GRB

Rene Hudec
ASU AV CR & CVUT, Czech Republic

The goal of this study is to confirm the feasibility of use of digitized low dispersive Mt Wilson Michigan Southern Sky Halpha survey astronomical photographic plates for modern astrophysical research. The detection of highly redshifted objects, such as early galaxies and quasars, is fundamental to understanding the universe's evolution and its large-scale structure. Archival low-dispersion spectroscopy (LDS) plates, though lacking modern metadata, represent a rich but underutilized resource for identifying such objects. This report presents a computational method for analyzing LDS plates to detect peculiar compact, non-dispersed features, hypothesized to correspond to objects with peculiar spectra, e.g. high-redshift sources. By focusing on local- ized objects with peculiar spectra limited to very narrow spectral coverage rather than typical elongated spectra, the methodology circumvents the challenges posed by incomplete plate information. The proposed approach employs image process- ing algorithms to identify candidates, marking them directly on the original plates for further study. Preliminary results suggest the potential of this method in uncov- ering scientifically valuable insights from historical observational data. This work highlights the role of computational techniques in repurposing archival materials for modern astrophysical research.

GRB

From Precursor to Afterglow: The Complex Evolution of GRB 210312B

Martin Jelínek
Astronomicky ustav AVCR, Ondrejov, Czech Republic

Long Gamma-Ray Bursts (GRBs) are characterized by a brief gamma-ray flash followed by a longer-lasting multi-wavelength afterglow. While the basic mechanism is largely understood, the early afterglow evolution often shows complex features that provide crucial insights into the transition between prompt and afterglow phases. We present a detailed analysis of GRB 210312B, detected by INTEGRAL, which exhibits both a precursor and a complex optical afterglow evolution. Through careful modeling using Markov Chain Monte Carlo methods, we disentangle the contributions of reverse and forward shock emission. Our analysis reveals a gamma-ray precursor 17 s before the main pulse, with a significantly softer spectrum (hardness ratio 0.37 ± 0.12 versus 1.9 ± 0.4). The optical afterglow shows a reverse shock peak at $76.0\_{-5.1}^{+4.4}$ s characterized by steep rise ($\alpha\_RS,1 = -4.1\_{-2.3}^{+1.6}$) and decay ($\alpha\_RS,2 = 4.0\_{-1.5}^{+2.1}$), followed by forward shock emission with a broad hydrodynamic peak around 150 s. The subsequent plateau phase exhibits complex structure before settling into a final power law decay consistent with an electron distribution index $p = 2.36\_{-0.15}^{+0.18}$. The negligible host extinction ($A\_V, \mathrm{host} = -0.073\_{-0.078}^{+0.100}$) suggests we are observing the intrinsic afterglow spectrum. The host system consists of two luminous ($M\_B \sim -21.7$) components separated by 11.5 kpc at $z = 1.069$, possibly representing an interacting galaxy pair. GRB 210312B provides a rare opportunity to study the prompt-to-afterglow transition in detail. The consistency between reverse and forward shock components supports our physical interpretation despite the lack of X-ray coverage.

The THESEUS Space Mission and the Infrared Telescope Calibration Unit

GRB

András Péter Joó
University of Debrecen, Faculty of Science and Technology, Hungary

The Transient High-Energy Sky and Early Universe Surveyor (THESEUS) is a proposed space mission, currently undergoing a Phase A study by ESA as an M7 mission candidate. Its primary goal is to utilise Gamma-Ray Bursts (GRBs) to probe the early Universe, while also significantly advancing multimessenger and time-domain astrophysics. THESEUS is specifically designed to harness high-redshift GRBs as powerful tools for studying population III stars, cosmic reionisation, and the evolution of star formation and metallicity up to the cosmic dawn. In addition, the mission will offer valuable capabilities for detecting electromagnetic counterparts to gravitational wave events and for monitoring a wide range of X-ray and gamma-ray transients. To achieve these ambitious scientific goals, THESEUS will integrate wide-band X-ray and gamma-ray monitors with an on-board near-infrared telescope (IRT), enabling arcsecond-scale localisation and redshift determination of the NIR counterparts. Our team at the University of Debrecen, in collaboration with the space engineering company Admatis, is responsible for the concept development of the IRT Calibration Unit. The purpose of this unit is to ensure accurate calibration of the NIR detector throughout the mission's four-year nominal lifetime — and potentially beyond. It will be the second of its class, utilising space-qualified LEDs as illumination sources. We present an overview of the THESEUS mission and introduce the key challenges in designing the Calibration Unit: achieving an unprecedented level of spatial uniformity in illuminating the detector; ensuring high temporal stability and long-term durability; and selecting suitable LED sources along with developing a robust space qualification procedure.

Space-based detection and data analysis in practice: analysis and correction of Swift GRB data

GRB

Veres Kende
Ludovika University of Public Survice, Hungary

Our work focuses on the analysis and correction of gamma-ray burst (GRB) data, with particular emphasis on the NASA GCN (Gamma-ray Coordinates Network) database and the Swift space telescope observations. The research has involved a comprehensive analysis of GCN reports, the systematisation of the Swift GRB table data and the correction of redshift values. I contacted the NASA GCN team to gain access to the limited data and made suggestions for the restoration of unavailable sub-sites. I then compared the GCN data with the Johannes Greiner BIG Table database. During the comparison I found that the BIG Table contained inaccurate data in some cases, which highlighted the importance of data revision. The results of this study highlight the shortcomings of the GRB redshift data, which is of concern as these data are crucial for determining the cosmological distance of GRBs.

GRB

In search of the optical afterglow template: GRB240414A

Alžběta Maleňáková
Astronomical Institute of the Czech Academy of Sciences, Czech Republic

Nearly six decades after their first detection, gamma-ray bursts (GRBs) continue to present significant astrophysical mysteries. While considerable progress has been made in understanding their general mechanisms, our knowledge of early optical afterglow physics remains limited due to insufficient observational data during these critical initial phases.

The archive maintained by the High Energy Astrophysics group at the Astronomical Institute in Ondřejov houses valuable observational data collected over the years, offering a possible opportunity to develop more comprehensive templates for early afterglow behavior. By analyzing patterns across multiple events, our research aims to establish robust models that can better characterize the complex evolution of early optical emission.

This presentation provides a concise historical overview of GRB discovery and physics, followed by a detailed examination of the optical light curve of GRB240414A.

GRB

Sand Hill Optical Telescope (SHOT) for Space Surveillance and Tracking observations

Bohuslav Matouš
Observatory and Planetarium Teplice, Czech Republic

Sand Hill Optical Telescope (SHOT) is an optical sensor dedicated mainly for Space Surveillance and Tracking (SST) activities. The SHOT sensor is operated by the Teplice Observatory that is located 80 km north of Prague, Czech Republic. SHOT sensor is designed in a manner allowing observations of all SST targets ranging from fast satellites on LEO, through geostationary satellites to near-Earth objects. The commanding SW allows autonomous operation of the SHOT sensor. It is capable to get an observation request, observe the object, process the acquired images and upload the results during the night automatically. The precise astrometry results allowed it to participate on several ESA projects and became a part of EU SST network. The paper describes the hardware and software setup of the sensor in detail as well as the observation process and the key difficulties.

FACT — Wide-Field Skymap Tool for Gamma-Ray Source Localization

GRB

Felix Pfeifle
Uni Würzburg, Germany

This work introduces a Python-based tool developed for generating two-dimensional sky maps from FACT Cherenkov telescope data, with the goal of identifying and characterizing gamma-ray sources at uncertain or unknown positions. While FACT primarily monitors known sources, it also responds to alerts from other experiments such as IceCube. These external alerts often come with large positional uncertainties, requiring a wide-field analysis rather than a simple point source check at the Multi-messenger event alert coordinates. The tool transforms the reconstructed positions of gamma-ray events in camera coordinates to ICRS coordinates, applies θ^2 cuts, estimates background using wobble-mode OFF regions, and calculates significance via the Li & Ma method. A 2D Gaussian fit to excess maps provides γ-PSF measurements, enabling accurate source localization and supporting multi-messenger follow-up efforts

Density estimation of the GRBs' redshift distribution

GRB

Istvan Racz
University of Public Service, Hungary

As of August 31st, 2022, positions and spectroscopic redshifts were available for 542 GRBs. The inherently low number of these observations constitutes a low-count distribution, which presents a significant challenge for determining the radial distribution. To address this, we have investigated the effectiveness of various density estimation techniques. We have applied several reconstruction methods, such as kernel density estimation (KDE) and related non-parametric approaches, to determine the radial (redshift) distribution from the observed events' data. Extensive Monte Carlo (MC) simulations were conducted for three model distributions to test the performance of these methods. The reconstructed distributions were compared to the model distributions using Integrated Squared Error (ISE) and Kullback-Leibler divergence to identify the most efficient method for this number of observations. Based on these simulations, we determined the optimal parameters, which were then used to estimate the radial distribution from the GRB redshift data. The resulting star formation rate estimates derived from this distribution are also discussed briefly.

GRB

System for autonomous robotic telescopes RTS2 - current state and future perspectives

Jan Štrobl
ASÚ AV ČR, Czech Republic

This presentation examines RTS2 (Remote Telescope System, 2nd Version), an open-source software platform that enables fully autonomous operation of astronomical observatories. We will discuss the evolution of RTS2 throughout its history and highlight the various observatories worldwide that have implemented this system. The talk will explore RTS2's fundamental philosophy and non-centralized architecture, which provides resilience and flexibility through its distributed daemon structure. We will analyze the system's core strengths, including its robustness, adaptability, and comprehensive approach to observatory automation. The presentation will also address current limitations and challenges encountered in practical deployments. Finally, we will outline perspectives for future development and potential enhancements to maintain RTS2's relevance in modern astronomical research. This overview aims to foster discussion about next-generation autonomous observatory systems and collaborative opportunities for improvement within the astronomical community.

Zwillink - Experimental inter-satellite communication and ranging payload for VZLUGEM mission

SAT

Alexander Bekeč
VZLU AEROSPACE, a.s., Czech Republic

Zwillink is an experimental inter-satellite communication and ranging payload, currently developed for the rendezvous and proximity operations mission VZLUGEM. Based on the off-the-shelf transceiver SX1280 by Semtech, the payload nominally operates at the frequencies from 2.20 to 2.29 GHz and it utilises low-power LoRa modulation and GFSK modulation for communication. Thanks to the built-in ranging engine of the transceiver, it is able to measure the relative distance between satellites during approach. The presentation outlines the design and testing of the payload, including proposed methods for calibration of ranging, and preliminary ranging results achieved with the payload during the early developement stages.

Maximizing GSD on CubeSat Platforms Using COTS Optics

SAT

Vladimír Dániel
VZLU AEROSPACE, Czech Republic

INV

This presentation focuses on achieving the maximum possible ground sampling distance (GSD) on CubeSat platforms by utilizing commercially available (COTS) optical components. It will cover the theoretical influence of optical and sensor parameters on the resulting GSD, along with practical limitations imposed by the size, mass, and environmental conditions of small satellites. Real-world examples from the VZLUSAT-2 and SATurnin-1 missions will illustrate the selection process and adaptation of COTS optics for orbital use. The presentation will highlight the results achieved, the technical challenges encountered, and the key lessons learned — providing valuable insights for the design of future Earth observation CubeSat missions.

SAT

Lunar water mapping using neutron spectrometer HardPix

Robert Filgas
IEAP Czech Technical University in Prague, Czech Republic

A current renaissance of lunar exploration enables to search for lunar water deposits directly on the surface of the Moon with small robotic rovers. Institute of Experimental and Applied Physics, Czech Technical University in Prague (IEAP CTU) developed a miniature Timepix3-based detector Neutron HardPix capable of mapping the water deposits using non-invasive detection of neutrons created underground by cosmic rays and thermalized by hydrogen. Neutron HardPix is based on the miniature (<0.1 U, 120 g) radiation monitor HardPix launched into space in 2023 and 2025. The talk will present principles of lunar water mapping using neutron flux measurements and expected scientific performance of Neutron HardPix onboard the planned ESA exploration mission to be launched in 2028.

SAT

ASTRABAX: Stratospheric radiation experiments in low-budget modular settings

Lucia Krivanekova
University of Applied Sciences Aschaffenburg, Germany

The project ASTRABAX ("Aschaffenburg Stratospheric Balloon Experiment") investigates the radiation exposures in the upper atmosphere. We present a modular approach to accommodate the numerous setups under the weight restriction of light unmanned free stratospheric balloon. The multimodal platform's experiments assess solar ultraviolet spectra and cosmic ray dosimetry, irradiation of biological cells and biomaterials, together with flight parameters. Recently, two flights have been conducted to test the feasibility and connectivity of different building blocks in a temperature-controlled gondola, and to characterize the stratospheric radiation environment. Natural radiation experiments are of relevance for cancer research and space medicine, as well as for the technical development of satellite materials. The compartmental setup allows flexibility to address current research questions with low expenditure in costs, manpower and technology expertise. In addition, the easy implementation is suitable for educational purposes of students in the fields of astronomy, astrobiology, and material research.

Development of the miniaturized HardPix radiation monitor

SAT

Milan Malich
IEAP CTU, Czech Republic

Radiation monitors are undergoing an evolution of miniaturization, low-power and cost. This allows the use of radiation monitors on smaller satellites or balloon experiments, but also on complex missions such as the search for water on the moon. The presentation will demonstrate the development of a small universal HardPix radiation detector based on the Timepix3 pixel detectors with on-board processing in IEAP CTU. Requirements analysis, modular architecture design for a wide range of applications and space missions. Component selection with respect to extreme environment durability, size, power consumption, price and availability. Qualification campaign flow, practical problems and their solution during the qualification campaign. Implementation of advanced algorithms (AI) for on-board data processing.

QUVIK - Ultraviolet telescope in new feathers

SAT

Filip Münz
Masaryk University, Faculty of Science, Czech Republic

As a part of Czech Ambitious Missions, project of the QUVIK telescope is transiting from requirement definition to contractualy binding phase. We will describe its current performance predictions, trade-offs considered and synergies previewed. Masaryk University is leading the Science Team, who will define the most interesting targets in the UV band, but we also have to implement criteria for follow-up of Targets of opportunity. MU contribution to the success of the mission will be also a preparation of an image processing pipeline and a comprehensive archive open to wide public - our initial concept will be discussed here. We hope to gain important insights in the problematic ultraviolet sky thanks to a survey of ULTRASAT mission that is planned to be launched next year. QUVIK is aiming to be ready for flight before end of the decade to get to the orbit prior to the next major UV mission UVEX.

SAT

The Future in Space : Smarter, Smaller and More Cooperative Satellites ?

Klaus Schilling
Zentrum für Telematik, Germany

INV

A paradigm change in spacecraft engineering can currently be observed: traditional multi-functional, large spacecraft are complemented by robust systems of networked, cooperating, distributed very small satellites. In particular in Earth observation innovative technologies are emerging, based on self-organizing sensor networks in orbit. Similar trends for distributed systems emerged in information systems since 1970, where the large mainframe computers were complemented by today's smart phones, networked via Internet to form the basis for cloud data distribution. In addition, modern miniaturization technologies support production of robust, cost-efficient small satellites with increasing performance in terms of their control capabilities. The deficits of miniaturization are to be compensated by advanced control, redundancy management and operations software. Those principles for future multi-satellite systems will be illustrated by examples of current formations of nano-satellites as cooperating sensor networks in space taking advantage of multi-perspective views, in particular for application fields in Earth observation. Here the specific example mission CloudCT, composed of 10 small satellites to characterize the interior of clouds by computed tomography methods will be discussed in more detail.

SAT

MeV astrophysics — INTEGRAL's heritage and COSI's future

Thomas Siegert
JMU Würzburg, Germany

INV

The soft gamma-ray range of MeV photons is notoriously difficult to analyse and interpret owing to strong instrumental background and large systematic uncertainties. Alas, measurements in this 'MeV gap' have a huge potential towards solving many of the great questions in astrophysics and cosmology. For more then two decades, the spectrometer aboard the INTEGRAL satellite, SPI, is detecting photons from 0.02 to 8 MeV with its high-purity germanium detectors for the study of accreting compact objects, pulsars, massive star groups, and supernovae and their remnants, among others. Especially the gamma-ray lines from excited nuclei and positron annihilation serve as an invaluable messenger for stellar evolution, Galactic dynamics and feedback, cosmic-ray acceleration and propagation, as well as the dark matter phenomenon. In this lecture, I will summarise how MeV observations work, what INTEGRAL has achieved during its 22-yr mission, and what will be possible with the next generation MeV telescope, COSI, the Compton Spectrometer and Imager, which NASA slated for launch in 2027.

AI in space

SAT

Kateřina Stuchlíková
Huld s.r.o, Czech Republic

While usage of AI in ground applications started a long time ago and now is „fully“ established, the usage in space has been a bit slowed (following the more conservative approach which European regulatory players usually follows). However, even with the slow start, there is rapid growth. Huld company was one of the first pioneers in this field when talking about “AI in space” – meaning the space part of space. The rationale behind investing in AI was not just to “have AI”. But it was more driven by a need. First real example is Hera mission – deep space mission with small communication window, which can play major role in a catastrophic scenario. But what about if you could predict some failure and act before it happens? Seems like sci-fi, but it is becoming reality. Another interesting example from the section of catastrophic failure could be the dependency on GNSS (GPS mainly) systems. It is hard to image, but almost every device nowadays has some position system and, in most cases, also uses this information for its processing. While loosing navigation signal when looking for a pizza place does not seem devastating, but loosing synchronization over country’s power distribution grip leading to complete blackout is serious. Huld developed a device which can protect your device from position signal attacks, including AI which can detect and mitigate even complex spoofing attacks.

Preliminary Optical Tests of Lobster Eye X-Ray Optics Prototype for Nanosatellite Missions Based on New Technology

SAT

Vladimír Tichý
Czech Technical University in Prague, Faculty of Electrical Engineering, Czech Republic

Results of optical tests of Schmidt lobster eye prototype module based on a new technology are presented. The technological concept offers precise assembly of optical mirrors, which is the key aspect to obtain sharp focal image. The prototype is designed for X-ray energies about 1keV. Dimensions and focal length of the prototype are chosen to allow boarding on CubeSat class Satellite. The module was tested on optical bench using visible light using LED as source , which is possible because glass plates coated with gold are used as mirrors. Images are acquired using Canon EOS 50D camera. The setup allows measurements in off-axis positions of the optics. FWHM and field of view are measured and compared to calculated values.

SAT

GRB-detecting nanosatellites GRBAlpha and VZLUSAT-2

Jakub Řípa
Masaryk University, Czech Republic

Results from GRBAlpha and VZLUSAT-2 nanosatellites, which carry gamma-ray detectors on board for monitoring transients, will be presented. GRBAlpha is a 1U CubeSat launched in March 2021 and it has operated on a 550-350 km altitude sun-synchronous polar orbit (SSO) for more than 4 years and it is expected to deorbit at the end of May 2025. VZLUSAT-2 is a 3U CubeSat launched in January 2022 and it also operates on SSO at a similar altitude for more than 3 years. So far, both missions have detected about 360 gamma-ray transients, including over 180 long and short gamma-ray bursts (GRBs), soft-gamma repeaters and solar flares, including the most intense GRB ever recorded GRB 221009A and exceptionally bright GRB 230307A. The onboard gamma-ray detectors are based on CsI(Tl) scintillator readout by silicon photomultipliers (SiPMs). SiPMs are known to be prone to radiation damage. With the increasing popularity of SiPMs among new spaceborne missions, especially on CubeSats, it is of paramount importance to characterise their performance in the space environment. Therefore, we will also report the in-orbit aging of SiPMs at SSO over three years, which in duration is unique. We have demonstrated that SiPMs can be used in the low Earth environment on a scientific mission lasting beyond three years and gamma-ray detectors on nanosatellites can routinely detect GRBs.

IBWS Intruduction and historical background

OTH

Rene Hudec
ASU AV CR & CVUT, Czech Republic

Originally, the IBWS (INTEGRAL/BART) workshops focused on the work of High energy astrophysics group (at that dime dominated by young research fellows and students) in Astronomical Institute of the Academy of Sciences of the Czech Republic and relevant national and international collaborators from the field, with intensive student participation. During the early years, these activities were focussed on the ESA INTEGRAL satellite and on the related ground-based robotic telescopes, e.g. the small robotic BART telescope at the Ondrejov Observatory. Nowadays, the IBWS workshops promote regional collaboration in galactic and extragalactic high-energy astrophysics, both experimental as well as theoretical, with an emphasis on the interface between satellite projects and ground-based experiments (e.g. robotic telescopes). We continue our emphasis on wide participation and presentations of students and young research fellows.

Concluding Remarks

OTH

Thomas Siegert
Julius-Maximilians-Universität Würzburg, Germany

Concluding Address

OTH

Rene Hudec
ASU AV CR & CVUT, Czech Republic

I will give conclusing address for the IBWS (INTEGRAL/BART) workshops focused on the work of High energy astrophysics group (at that dime dominated by young research fellows and students) in Astronomical Institute of the Academy of Sciences of the Czech Republic and relevant national and international collaborators from the field, with intensive student participation. During the early years, these activities were focussed on the ESA INTEGRAL satellite and on the related ground-based robotic telescopes, e.g. the small robotic BART telescope at the Ondrejov Observatory. Nowadays, the IBWS workshops promote regional collaboration in galactic and extragalactic high-energy astrophysics, both experimental as well as theoretical, with an emphasis on the interface between satellite projects and ground-based experiments (e.g. robotic telescopes). We continue our emphasis on wide participation and presentations of students and young research fellows.

List of Participants

Niklas Bauer	Germany
Alexander Bekeč	Czech Republic
Vladimír Dániel	Czech Republic
Patrik Ehrmann	Germany
Laura Eisenberger	Germany
Robert Filgas	Czech Republic
Mika Gelowicz	Germany
Patrick Günther	Germany
Rene Hudec	Czech Republic
Adolf Inneman	Czech Republic
Martin Jelínek	Czech Republic
András Péter Joó	Hungary
Áron Juhász	Hungary
Sergey Karpov	Czech Republic
Veres Kende	Hungary
Lucia Krivanekova	Germany
Alžběta Maleňáková	Czech Republic
Milan Malich	Czech Republic
Karl Mannheim	Germany
Veronika Maršíková	Czech Republic
Bohuslav Matouš	Czech Republic
Saurabh Mittal	Germany
Zdeněk Moravec	Czech Republic
Filip Münz	Czech Republic
Ondrej Nentvich	Czech Republic
Richard Pavlica	Czech Republic

Felix Pfeifle	Germany
Istvan Racz	Hungary
Rudi Reinhardt	Germany
Maroš Roman	Czech Republic
Lydia Stofanova	Czech Republic
Klaus Schilling	Germany
Thomas Siegert	Germany
Raj Laxmi Singh	Czech Republic
Kateřina Stuchlíková	Czech Republic
Vladimír Tichý	Czech Republic
Dimitris Tsatsis	Germany
Martin Urban	Czech Republic
Manja Zimmerer	Germany
Jakub Řípa	Czech Republic
Vojtěch Šimon	Czech Republic
Jan Štrobl	Czech Republic

Useful Information

Emergencies

There are several important numbers:

112 The Single European Emergency Call Number
158 Police of the Czech Republic
155 Emergency medical services
150 Fire and rescue service of the Czech Republic

In case you are in an emergency situation or witness such a situation and do not know where exactly you are, report your **location** using the **six-digit number** on the nearest street **lighting pole** to the emergency services.

Internet connection

SSID:
PASS:

Events

- **Welcome reception**
  - Monday
  - 18:00–22:00 **Hospůdka u Nás** - see page 42
- **Get-Together Dinner**
  - Tuesday
  - 18:00 – 22:00 **Hotel Černý Orel** - see page 42
- **Social event**
  - Thursday
  - see page 43
  - 15:30 **Guided tour of the Hop Museum Žatec** - see page 42
  - 17:30 – 22:00 **Event dinner** - see page 42

Kapucínský klášter

třída Obránců míru 299

- IBWS venue
- Social dinner

Hospůdka U Nás

Fügnerova 1053

- Welcome dinner
- Lunches

Hotel Černý Orel

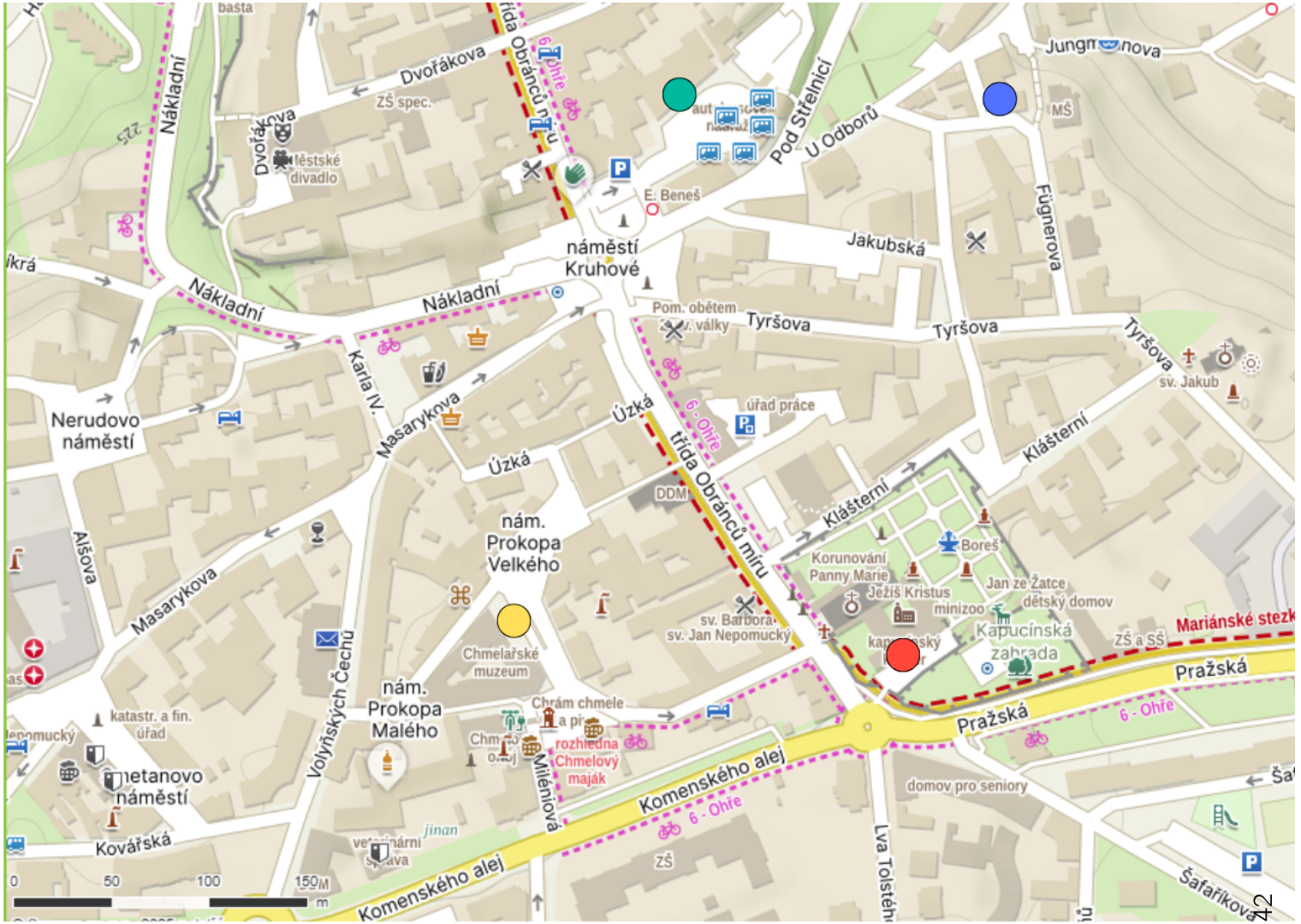
náměstí Kruhové 233

- Accommodation
- Get-Together Dinner

Hop Museum

nám. Prokopa Velkého 1952

- Guided tour



Hop Museum

Thursday, 29 May	
15:15	**Meeting place:** In front of the entrance to the Kapucínský klášter (*conference venue*)
15:30 - 17:00	Hop Museum
17:30 - 22:00	Conference dinner in the basement of the Capuchin Monastery

The Hop Museum in Žatec is the largest exhibition of its kind in the world. On an area of 4 000 m^2, it presents the development of hop growing from the early Middle Ages to the present day. In addition to the museum's interesting collections, you will get to know the building itself, which is a technical monument and an example of industrial purpose-built architecture from the end of the 19th century in a city famous for the highest quality hops in the world.

You will learn why the best hops in the world are harvested in the Žatec region and why they have had to protect themselves from low-quality imitations since the Middle Ages.

You will be interested in period photographs and written documents about hop growing and beer brewing. You will also find interesting tools, mechanisation equipment and historical machines.

Source: www.chmelarskemuzeum.cz

Lunch Menu

(Hospůdka u Nás)

Please choose your preferred lunch combination and report / write it down at the registration desk no later than 14:00 on the previous day.

Tuesday

A Chicken broth with rice
B Cabbage soup

1. 120 g Beef Chilli con carne, served with fries / rice / bread
2. 120 g Roast pork, bread dumplings, cabbage
3. 120 g Chicken steak on green beans with bacon, fries / rice
4. 120 g Fried broccoli, boiled potatoes, tartar sauce
5. 250 g Buckwheat salad with sun-dried tomatoes and roasted mushrooms, toast

Wednesday

A Beef broth with egg drop
B Creamy dill soup ("Kulajda")

1. 120 g Pork pieces with mushrooms, bread dumplings / rice
2. 120 g Baked meatloaf, mashed potatoes
3. 120 g Chicken steak with spicy vegetables, fries / rice
4. 250 g Vegetable salad with a selection of fried cheeses and herb dressing, toast
5. 300 g Potato rolls filled with poppy seeds, topped with plums

Thursday

A Beef broth with dumplings
B French onion soup with croutons

1. 300 g Potato dumplings stuffed with smoked meat, cabbage, roasted onion
2. 120 g Smoked meat, sour lentils with roasted onion, pickled cucumber
3. 120 g Fried pork / chicken schnitzel, boiled potatoes
4. 300 g Spaghetti Bolognese, cheese
5. 250 g Vegetable salad with a selection of fried fish / tofu and dill dressing, toast

Friday

A Smoked meat soup with barley
B Tripe soup

1. 100 g Beef sirloin in cream sauce, bread dumplings
2. 150 g Pork neck steak, mashed / fried potatoes
3. 120 g Chicken strips in red curry with vegetables and coconut milk, fries / rice
4. 100 g Grilled trout fillet, boiled potatoes, Breton-style vegetables, herb sauce
5. 300 g Greek salad, toast

Special Issue

(Martin Jelinek)

We are pleased to announce that the proceedings of the International Beamed-power Workshop Series (IBWS) 2025 held in Žatec will be published as a special issue of Astronomische Nachrichten, one of the oldest astronomical journals. This publication opportunity offers conference participants the chance to have their research formally documented and widely disseminated within the astrophysical community.

Important Dates
Conference dates: 26-30. May 2025 Manuscript submission deadline: 23. June 2025 (three weeks after the conference)

Submission Process
All conference participants presenting original research are invited to submit their manuscripts for consideration in the special issue. Papers should follow the standard format for Astronomische Nachrichten publications and should represent a substantial contribution to one of the following areas:

High Energy Astrophysics: Theoretical and observational aspects of X-ray and gamma-ray astrophysics, both galactic and extragalactic sources, and time-domain astronomy

Gamma-Ray Bursts & Robotic Telescopes: GRB studies with emphasis on follow-up observations, transient astronomy, flaring objects, and methods for their analyses including real-time image processing

Small Satellites & Instrumentation: Projects involving small satellites (pico, nano, micro, CubeSats), scientific payloads, rocket experiments, and ground-based support for satellite projects in high energy astrophysics

Manuscript Templates
Manuscript templates will be made available on this website shortly. These will conform to the Astronomische Nachrichten requirements. In the meantime, authors may consult the general author guidelines on the Astronomische Nachrichten website.

Review Process
All submitted manuscripts will undergo a single-referee peer review process to ensure scientific quality and relevance:

Each submission will be assigned to an independent referee with expertise in the relevant field The editorial board, consisting of the special issue editor and associate editor(s), will also review all submissions Final publication decisions will be based on both referee recommendations and editorial assessment Authors may be asked to make revisions based on referee comments before final acceptance

Publication Timeline
Referee process: July-August 2025 Revision period (if needed): September-October 2025
Expected publication date: November-December 2025

Questions
For any questions regarding the special issue, please contact the special issue editor

Martin Jelínek
martin.jelinek@asu.cas.cz

A Few Final Words. . .

We sincerely hope that this booklet has served you well — whether as a compass to navigate the depths of the programme, a cheat sheet for the occasional name-forgetting moment, or just a reminder of where you're supposed to be after the coffee break.

As IBWS 2025 gets underway, we wish you a conference full of engaging talks, curious questions, spontaneous collaborations, and just the right amount of caffeine.

Whether you are here to discuss satellite and robotic telescopes, hard X-rays or simply to enjoy a good conversation over a pint of Žatec beer at the evening events, we hope you find inspiration - both scientific and social.

Thank you for being part of this gathering. And remember: even the best science sometimes begins with "**What if...?**" over dinner.

Enjoy the conference, and may your data always be noise-free!

— *The IBWS 2025 Organising Team*

Notes

For all those who made it this far — congratulations!
You have officially reached the end of the conference book.

This space is reserved for your reflections, annotations, sudden insights, or that promising idea sparked during a discussion over the coffee break but you haven't told anyone about yet.

Whatever you write here — whether it's a new hypothesis, a note about an unexpected collaboration or simply a way of keeping track of what intrigued you most — it may one day become part of your next great paper or project, or at least help you remember someone's name.

We hope these pages prove useful.

Who knows - perhaps what you jot down here will evolve into something that makes its way into a future abstract . . . or even a keynote.

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INTEGRAL/BART workshop

26 - 30 May 2025

Žatec, Czech Republic

ibws.cz