T 30: Gammaastronomie I

Zeit: Dienstag 16:30–18:35 Raum: Philo-HS7

Gruppenbericht T 30.1 Di 16:30 Philo-HS7

e-ASTROGAM - The Next Big Step in Gamma-ray Astrophysics at MeV to GeV Energies — •Uwe Oberlack — JGU Mainz — on behalf of the e-ASTROGAM Collaboration

e-ASTROGAM (enhanced-ASTROGAM) is a breakthrough Observatory space mission dedicated to the study of the non-thermal universe in the photon energy range from 0.3 MeV to 3 GeV. This Compton and pair telescope, proposed as ESA's M5 medium-size mission in the Cosmic Visions program, is composed of a Silicon tracker, a calorimeter, and an anticoincidence system. Based on advanced, space-proven detector technology, the mission provides unprecedented sensitivity, angular and energy resolution, combined with polarimetric capability. The lower energy limit can be pushed to energies as low as 150 keV for the tracker and to 30 keV for calorimetric detection. e-ASTROGAM will open a new window on the non-thermal Universe, making pioneering observations of the most powerful Galactic and extragalactic sources, elucidating the nature of their relativistic outflows and their effects on the surroundings. With a line sensitivity in the MeV energy range one to two orders of magnitude better than previous instruments, e-ASTROGAM will determine the origin of key isotopes fundamental for the understanding of supernova explosions and the chemical evolution of our Galaxy. With its high sensitivity and large field-of-view, the mission will provide unique data of significant interest to a broad astronomical community, complementary to future observatories covering lower and higher energy parts of the electromagnetic spectrum, gravitational waves, as well as astrophysical neutrinos.

T 30.2 Di 16:50 Philo-HS7

Possibilities and challenges of Very-Large Zenith-Angle Observations with MAGIC — •Juliane van Scherpenberg for the MAGIC-Collaboration — Max-Planck-Institut für Physik, München

The MAGIC Telescopes are a system of two Imaging Air Cherenkov Telescopes (IACTs) located at the Roque de los Muchachos observatory on the Canary Island of La Palma. MAGIC can observe very-high energy (VHE) gamma-rays from around 50 GeV to 50 TeV. Recently the feasibilty of performing observations at very large zenith angles (VLZA) has been investigated to extent observations up to the highest gamma-ray energy regime. However, measurements of this kind bear many challenges. The calibration of the atmosphere needs to be well understood as well as more technical restrictions concerning for example the quality of directional reconstruction at very high zenith angles. I will present the current efforts that are made to evaluate the possibilities and limits of VLZA observations with MAGIC and future IACTs.

T 30.3 Di 17:05 Philo-HS7

Analysis optimisation for >10 TeV ground-based very-high-energy gamma-ray astronomy — •Iryna Lypova, Stefan Ohm, David Berge, and Stefan Klepser — DESY, Zeuthen, Germany

The High Energy Stereoscopic System (H.E.S.S.) is an array of five Cherenkov telescopes located in Namibia. H.E.S.S. operates in the broad energy range between a few 10s of GeV to more than 50 TeV. Nominal analysis methods allow for the reconstruction of events with offsets up to 2.5 degrees: the field-of-view of the H.E.S.S. cameras. Especially at >10 TeV energies, events with larger offsets trigger the telescopes. An increase in the accessible offset range would hence result in significant improvement in the instrument sensitivity, especially at energies above 10 TeV, where source studies are limited by available photon statistics. An optimisation of the reconstruction and selection tools can increase the field of view and statistics at such high energies. An improved method that is capable of reconstructing events with offsets up to 4.5 degrees will be presented in this talk.

T 30.4 Di 17:20 Philo-HS7

FACT - Robotic Monitoring at TeV Energies — •Dominik Neise[1] and Maximilian Nöthe[2] for the FACT-Collaboration — [1]ETH Zürich, Zürich, Schweiz — [2]Technische Universität Dortmund, Dortmund, Deutschland

The FACT (First G-APD Cherenkov Telescope) can perform its scientific task of monitoring bright gamma-ray sources almost without any human interaction.

After first light in October 2011, FACT has been operated remotely since summer 2012. The need for manual interaction has been successively reduced to the point where FACT is now running robotic. In case of any problem, phone calls to experts are initiated automatically.

This automation results in high duty cycle as well as very fast reaction on flaring events. FACT is contributing to multi-wavelength and multi-messenger studies both as triggering and follow-up instrument. In follow-ups it can often provide unique information as - unlike other instruments - being able to observe during full moon. Based on an automatic quick-look analysis, the FACT collaboration sends automatically alerts to the multi-messenger network AMON and triggers target-of-opportunity (ToO) observations of satellites, as e.g. INTEGRAL, Swift, Astrosat, in the context of ToO proposals.

Interaction of experts is necessary for those cases where webforms have to be filled manually to initiate ToO observations of other instruments. In the presentation, we will discuss the implementation of the robotic system and special caveats to be taken into account.

T 30.5 Di 17:35 Philo-HS7

FACT - Analysis of Photon-Stream Data of the Crab Nebula — •Kevin Sedlaczek[1] and Maximilian Nöthe[2] for the FACT-Collaboration — [1]Technische Universität Dortmund, Deutschland — [2]Technische Universität Dortmund, Deutschland

The First G-APD Cherenkov Telescope (FACT), located at the Observatorio del Roque de los Muchachos (La Palma, Canary Islands, Spain), is designed to detect cosmic gamma rays at energies around 1 TeV. It is the first full-size Imaging Atmospheric Cherenkov Telescope equipped with G-APD photon detectors. The events recorded by FACT can be represented in a format containing a list of arrival times of individual photons. This list is called the photon-stream and designed to suit high level physics analysis. The performance on physics analyses is still one of the open questions concerning this new representation. For this purpose, an analysis of the Crab Nebula is performed on the photon-stream data. The Crab Nebula is a well measured source of gamma rays and therefore predestinated for such a comparative analysis. First results from this ongoing work will be discussed.

T 30.6 Di 17:50 Philo-HS7

FACT – Public Gamma-Ray Crab-Nebula Observations and Simulation — •Maximilian Nöthe and Kai Arno Brügge for the FACT-Collaboration — Exp. Physik 5b, TU Dortmund, Otto-Hahn-Str. 4a, 44227 Dortmund, Deutschland

Pioneered 50 years ago, ground-based gamma-ray astronomy made a large step forward in the past decade. Still the instruments are run by collaborations as experiments instead of open observatories. The huge downside of this is that the data are private, preventing a lot of interesting studies being done by the astronomer's community. FACT, a gamma-ray telescope on Canary island La Palma, took the lead and publishes gamma-ray excess rates based on a quick-look-analysis of its observations in near real time.

Now FACT goes one step further towards modern astronomy and publishes a high quality Crab-Nebula observation sample recorded in 2013 together with simulations to the general public. Here, we present our Crab-Nebula sample and our simulation sample. We show where the data can be downloaded, and how it might be used. We encourage you to use our sample for education on either all or some of the following tasks: read-out calibration, signal extraction, air-shower feature generation, machine learning, gamma-ray source detection, or gamma-ray energy spectrum reconstruction.

T 30.7 Di 18:05 Philo-HS7

Development of novel back-coated, ultra-thin glass mirrors for Imaging Air Cherenkov Telescopes — •Juliane van Scherpenberg, Razmik Mirzoyan, and Masahiro Teshima for the MAGIC-Collaboration — Max-Planck-Institut für Physik, München

Imaging Air Cherenkov Telescopes (IACTs) have no protective domes and are constantly exposed to varying weather conditions at desert and/or high mountain conditions. The reflective surface of currently used mirrors in IACTs generally are made of about 100 nm thin layers of aluminum covered by a protective quartz layer. Constant exposure to wind, which can carry dust particles, to rain and large temperature variations damages these layers and can lead to a noticeable decrease in reflectivity over the timespan of a few years. Furthermore, it is practically impossible to clean the mirrors from dirt and dust without damaging their surface which further reduces their reflectivity. I will present the state of development of new back-coated, ultra-thin glass mirrors. They should be very resistant to external influences and easy to clean. We anticipate that such mirrors will have a constant reflectivity over a long time period that is comparable to the lifetime of IACTs themselves.

T 30.8 Di 18:20 Philo-HS7

A pointing solution for the medium size telescopes for the Cherenkov Telescope Array — •Domenico Tiziani and Christopher van Eldik — Erlangen Centre for Astroparticle Physics, Erlangen, Germany

One important calibration for each telescope of the Cherenkov Telescope Array (CTA) is the pointing. The pointing calibration guarantees a correct transformation of positions on the focal plane of the instrument to sky coordinates and therefore directly influences the directional reconstruction of cosmic gamma rays. The favoured approach for this calibration for the medium size telescopes (MST) uses an optical CCD-camera that is installed in a central position of the mirror dish of each telescope. This camera has a wide field of view and images the focal plane of the telescope and the night sky in parallel. In this talk precision studies and progress in the verification of this calibration method are presented. Results derived from simulations and from data taken in laboratory tests and at the prototype telescope in Berlin/Adlershof are shown.