T 84: Gamma Astronomy II

Time: Thursday 16:15–17:45 Location: KS 00.005

T 84.1 Thu 16:15 KS 00.005

Enhancing SWGO Sensitivity to Galactic Center PeVatrons with GNNs — •Martin Schneider for the SWGO-Collaboration — ECAP, FAU Erlangen-Nürnberg

The Southern Wide-field Gamma-ray Observatory (SWGO) will provide continuous, wide-field monitoring of the Southern Hemisphere gamma-ray sky, offering unprecedented access to high-energy phenomena in the region around the Galactic Center. A central challenge for SWGO is achieving robust gamma/hadron separation to suppress the overwhelming cosmic-ray background, which is crucial for studies of diffuse emission and potential Galactic PeVatron activity. In this contribution, we present a new study demonstrating the advantages of Graph Neural Networks (GNNs) over traditional machine-learning classifiers. Using two years of simulated SWGO observations, we evaluate how improved background rejection from GNN-based models enhances the sensitivity to a spectral cutoff in the diffuse emission near the Galactic Center. Such sensitivity is essential for testing the PeVatron hypothesis and to disentagle the sources and processes shaping this region.

T 84.2 Thu 16:30 KS 00.005

Progress on the Medium-Sized Telescope Structure for the Cherenkov Telescope Array Observatory — •Bastian Hess for the MST Project-Collaboration — Institut für Astronomie und Astrophysik, Tübingen, Germany

The Cherenkov Telescope Array Observatory (CTAO) will consist of three different sizes of telescope categories: the small-sized telescopes (SSTs), medium-sized telescopes (MSTs), and large-sized telescopes (LSTs). Two MST pathfinder telescopes are currently in production and undergoing pre-assembly. They will be deployed at the CTAO southern site in Paranal, Chile. The MST reflector comprises 86 hexagonal mirror segments, each 1.2 m measured across flats. These mirrors are mounted to the optical support structure using high-precision motorized actuators that enable fine alignment to achieve and maintain optimal telescope optics. This contribution presents an overview of the manufacturing and testing progress of the MST structures, with particular emphasis on the performance and quality assurance of the active mirror control system and its components.

T 84.3 Thu 16:45 KS 00.005

Analysis of the PWNe in the Kookaburra Region with Fermi-LAT and H.E.S.S. — •Lukas Grosspietsch, Giovanni Cozzolongo, and Alison Mitchell for the H.E.S.S.-Collaboration — Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen 91052, Germany

The wings of the Kookaburra region host the two extended very-high-energy gamma-ray sources HESS J1420-607 and HESS J1418-609, forming a rare complex environment of two adjacent pulsar wind nebulae (PWNe) shaped by energetic pulsars and asymmetric ambient conditions. This makes the region a valuable target for studying particle acceleration, transport, and energy losses in evolved PWNe. In this work, we present an analysis of the region using a combination of recent and archival observations from the H.E.S.S. array together with Fermi-LAT data. Advanced background estimation and analysis techniques complement the upgraded H.E.S.S. system to enable a refined investigation of morphology and emission processes in the very-high-energy gamma-ray range. These findings aim to deepen our understanding of the interplay of pulsar-driven outflows and their surrounding medium in the Kookaburra complex.

T 84.4 Thu 17:00 KS 00.005

Analysis of the of the 2016 Flaring Period of 1ES1959+650 with the MAGIC Telescopes using the Database Driven Software autoMAGIC — •Justus Koczwara and Felix Wersig — TU Dortmund University, Dortmund, Germany

When entering the atmosphere, the high-energy gamma-rays interact with atoms and produce showers of high-energy charged particles that move faster than the speed of light in the air, emitting Cherenkov radiation. This effect enables us to observe the remnants of these interactions and reconstruct the energy and origin of a gamma ray from the optical image taken by a ground-based telescope. The MAGIC telescopes are a system of so-called Imaging Air Cherenkov Telescopes that have used this detection method since 2003, accumulating a large dataset over the years. As the standard way of analysing MAGIC telescope data includes various manual interventions, increasing the rate of potential error sources, and is very time-consuming, the database-driven software tool autoMAGIC was developed to automate the low-level analysis up to the community-standard data level 3. In the scope of this work, the strong flaring periods of the BL Lac blazar 1ES 1959+650 in 2016 were re-analyzed as a cross-check for a manual low-level analysis, performing the low-level analysis with autoMAGIC and a high-level analysis with Gammapy. The results from this analysis are then compared with the results of the manual analysis published in a paper by the MAGIC Collaboration to understand whether flare characteristics found in the manual analysis can be reproduced in the autoMAGIC analysis.

T 84.5 Thu 17:15 KS 00.005

Directional Search for Ultra-High-Energy Photons Using the SD-1500 Array of the Pierre Auger Observatory — •Tim Fehler, Marcus Niechciol, and Markus Risse for the Pierre Auger-Collaboration — Experimentelle Astroteilchenphysik, Center for Particle Physics Siegen, Universität Siegen

In addition to its capabilities for precise measurement of ultra-high-energy (UHE, $E > 10^{17}$ eV) cosmic rays through the observation of extensive air showers, the Pierre Auger Observatory offers the potential to effectively detect UHE photons. Their connection to UHE cosmic rays is manifold; constraints on their flux provide valuable hints on the elusive nature of the UHE cosmic rays. Contrary to charged cosmic rays, which are deflected by magnetic fields, UHE photons have the inherent advantage that their origin can be traced back directly, which promotes the search for directional excesses of photon-like events in the sky. This contribution details the full modular analysis pipeline for a new direction-dependent search for UHE photons, based on a novel photon-tagging approach using the paradigm of air-shower universality. With sole dependence on the SD-1500 array, given its 100% duty cycle, the full 19 years of Phase-I data will be available for analysis, providing unprecedented exposure to a potential UHE photon flux. Beyond the methodology, the contribution also covers the first preliminary application to data for final cross-checks.

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T 84.6 Thu 17:30 KS 00.005

Optical Light Curves of Classical Novae from H.E.S.S. Night-Sky Background Data — •Sayak Ghosh, Alison Mitchell, and Gerrit Roellinghoff for the H.E.S.S.-Collaboration — Friedrich-Alexander-Universität Erlangen-Nürnberg, Erlangen Centre for Astroparticle Physics, Nikolaus-Fiebiger-Str. 2, 91058 Erlangen, Germany

Imaging Atmospheric Cherenkov Telescopes (IACTs) are designed for very-high-energy gamma-ray astronomy, but their large mirror areas and fast cameras also record variations in the optical night-sky background (NSB). In this work, we explore the use of NSB data from the H.E.S.S. telescope array to extract relative optical light curves of classical novae.

We develop an analysis framework based on pixel-level NSB rates from the H.E.S.S. CT1-CT4 cameras. The approach accounts for instrumental and atmospheric effects and isolates time-dependent variations in the NSB signal. Corrected NSB values are combined over selected pixel regions and time intervals to construct relative optical light curves on intra-night and multi-night timescales.

We apply this to H.E.S.S. observations of classical novae, and we discuss variations and limitations of the method. This study shows that NSB data from H.E.S.S. can be used to investigate relative optical variability in bright transient sources, while clearly outlining the constraints of this approach.