T 89: Gamma astronomy 4

Time: Thursday 16:00–18:00 Location: Geb. 30.22: kl. HS A

T 89.1 Thu 16:00 Geb. 30.22: kl. HS A

Group report: the future has more MAGIC! Highlights and prospects from the MAGIC Collaboration — •Giovanni Ceribella for the MAGIC-Collaboration — Max-Planck-Institut für Physik, Blotzmannstr. 8, 85748 Garching

Even more than twenty years after its first light, MAGIC keeps delivering cutting-edge science in the multifaceted field of very-high-energy gamma-ray astronomy (VHE). Located at the observatory of the Roque de Los Muchachos, at 2200m above sea level on the Canary island of La Palma (Spain), the two 17m-diameter imaging atmospheric Cherenkov telescopes have decisively contributed to the development of VHE astrophysics in the last two decades. While future perspectives are focusing more and more on the next generation telescopes of CTAO, the MAGIC telescopes still have compelling science cases, that motivated its participating institutions to extend the collaboration for five additional years (2029). In the talk I will review recent scientific highlights from MAGIC in galactic, extragalactic, and fundamental physics, present its novel technical developments, and discuss its future.

T 89.2 Thu 16:15 Geb. 30.22: kl. HS A

Status of the CTA Large-Sized Telescopes — •Martin Will for the CTA-Collaboration — Max-Planck-Institut für Physik

The Cherenkov Telescope Array (CTA) is the next-generation observatory for ground-based gamma-ray astronomy at very high energies. CTA will consist of two arrays, one in the northern hemisphere at the Roque de Los Muchachos Observatory on La Palma (Canary Islands, Spain) and one in the southern hemisphere at the Paranal Observatory in the Atacama Desert (Chile).

The Large-Sized Telescope (LST) is one of the three types of telescope in CTA. With a reflective surface diameter of 23 meter, LSTs are optimized to detect low-energy gamma rays in the range 20 GeV to 3 TeV. LST-1 in La Palma is close to finishing its commissioning phase, while construction has begun on the next three LSTs.

In this presentation, the status of the LSTs in the North and plans for the LSTs in the South will be shown.

T 89.3 Thu 16:30 Geb. 30.22: kl. HS A

LST Condition Monitor — •Felix Pfeifle, Karl Mannheim, and Marcel Vorbrugg for the CTA-Collaboration — Lehrstuhl für Astronomie, Universität Würzburg

The Large-Sized Telescope (LST) with a mirror diameter of 23 m is the largest of the telescope designs for the Cherenkov Telescope Array (CTA). While LST-1 is finishing commissioning, LST 2-4 are currently under construction for a timely completion of the full LST subarray in the Roque de los Muchachos Observatory (ORM) in La Palma.

The LSTs will be exposed to rapid pointing maneuvers during follow-up observations of gamma-ray bursts and gravitational wave events. The piezo-electrical acceleration sensors have been mounted on LST1 bogies, delivering data on mechanical accelerations used as a diagnostic tool to predict the bogies' health and safety. We analyzed data from the sensors searching for eigenfrequencies to set thresholds alerting in case of pathological responses. We outline the plan to implement a condition monitor system for the predictive maintenance of the LSTs and present preliminary results of our analyses.

T 89.4 Thu 16:45 Geb. 30.22: kl. HS A

Asimov Datasets for Gamma-ray Astronomy — •Stefan Fröse and Jan Lukas Schubert — TU Dortmund University, Dortmund, Germany

The hunt for dark matter is a very long-existing and still ongoing quest since the first evidence of its existence was uncovered by Fritz Zwicky and later by Vera Rubin investigating the rotation curves of galaxies. Today one of the most promising candidates for dark matter are weakly interacting massive particles (WIMPs). These particles can be detected indirectly by searching for their annihilation and decay products. Among other things, these products can cre- ate high-energy gamma rays detectable by Imaging Atmospheric Cherenkove Telescopes like MAGIC or CTA.

For the exclusion of different WIMP masses and annihilation or decay chan- nels, the sensitivity of the telescopes has to be known to sufficient precision. New methods for the calculation of upper limits based on the concept of the Asimov dataset[1], as already used by other high-energy experiments, are introduced and implemented in a new Python package called TITRATE. This package works as an extension to the already existing open-source analysis tool gammapy[2] and therefore will support any science products based on the Gamma Astro Data Formats (GADF)[3].

[1] https://doi.org/10.48550/arXiv.1007.1727
[2] https://doi.org/10.48550/arXiv.1709.01751
[3] https://doi.org/10.3390/universe7100374

T 89.5 Thu 17:00 Geb. 30.22: kl. HS A

Cherenkov Telescope Array SST Camera Status Update — •Frederik Wohlleben for the CTA-Collaboration — Max-Planck-Institut für Kernphysik, P.O. Box 103980, D 69029 Heidelberg, Germany

The Cherenkov Telescope Array (CTA) is a next generation instrument for gamma ray astronomy. Within CTA initially an alpha configuration of 42 small sized telescopes (SST) will cover the highest energy range of 5 to 300 TeV. The design of the SST camera is currently being finalized and its performance verified in lab tests. This talk will give a comprehensive overview over the current status and the most recent developments.

T 89.6 Thu 17:15 Geb. 30.22: kl. HS A

Finding the optimal trigger strategy for the SWGO — •Johannes Bennemann for the SWGO-Collaboration — Max-Planck-Institut für Kernphysik, Heidelberg, Germany

The Southern Wide-field Gamma-ray Observatory (SWGO) will be the first water-Cherenkov gamma-ray instrument in the Southern Hemisphere. It will consist of over 6000 water-Cherenkov detector units at an altitude of at least 4.4 km. An instrument of this size will be subject to constant bombardment with cosmic rays and thus produce a huge amount of data. This makes a sophisticated trigger strategy necessary to achieve the highest possible sensitivity whilst reducing the readout bandwidth. This talk will cover the simulation and optimization of trigger strategies for the SWGO.

T 89.7 Thu 17:30 Geb. 30.22: kl. HS A

Updates on the Lake Design for SWGO — •Hazal Goksu — Saupfercheckweg 1, 69117 Heidelberg

The lake concept is one of the detector design options considered for the Southern Wide-field Gamma-ray Observatory (SWGO), a next-generation high altitude gamma-ray observatory in the southern hemisphere that is made of an array of water Cherenkov detectors. SWGO, with its wide energy range, broad field of view, and large duty cycle, positioned in the southern hemisphere, will complement other planned and existing gamma-ray observatories. In the lake design, light-tight bladders, each housing one or more photosensors, filled with clean water, are deployed near the surface of a natural or artificial lake. Prototyping and testing for over two years have led to the first dual-layer prototype detector for SWGO that is currently in operation. In this contribution, we will give an update on the prototyping studies and simulations for the lake design option.

T 89.8 Thu 17:45 Geb. 30.22: kl. HS A

The Compton Spectrometer and Imager (COSI) — •Savitri Gallego — Johannes Gutenberg-Universität, Mainz,Germany

The Compton Spectrometer and Imager (COSI) is a gamma-ray telescope, selected by NASA as a Small Explorer satellite mission to be launched in 2027. COSI employs a novel Compton telescope, consisting of a compact array of cross-strip germanium detectors. Owing to its wide field-of-view and excellent energy resolution, COSI will achieve an unprecedented sensitivity in the 0.2-5 MeV energy band. In particular, it will improve narrow-line sensitivity by about one order of magnitude over existing searches, mapping the full sky uniformly with an energy-dependent angular resolution on the degree scale. The mission requirements enable four key science goals: the origin of Galactic positrons, nucleosynthesis in the Galaxy, polarization studies of accreting black holes, and multi-messenger astrophysics. In this talk, I will provide an overview of the instrumental design and science of COSI. I will present the current status of the project and the publicly-available data challenges released every year.