T 93: Exp. Methods – Scint., HESS, Auger

Time: Wednesday 17:30–19:00 Location: POT/0351

T 93.1 Wed 17:30 POT/0351

Design of a detector irradiation facility in Mainz — •Daniela Fetzer, Michael Wurm, Kai Loo, and Arshak Jafar — Johannes Gutenberg-University Mainz

Detectors for low-energy particles (MeV) are often calibrated using gamma rays to induce electron-like signals. This contribution describes Monte Carlo simulation for a new experimental array to be set up at the Detector Irradiation Facility in the Center for Fundamental Physics in Mainz. It will use a DD-neutron generator, PE moderator and a nickel (neutron,gamma) converter to produce fairly high-energy gamma rays of 9 MeV. This allows a calibration for a far wider energy range than is accessible with standard radioactive sources.

In the planned experiment, different scintillator targets will be irradiated with neutrons and gammas. In a secondary detector array, the scattered particles will then be detected and their scattering angle and energy will be compared to the incident particles and their energy deposition in the target. This talk gives an overview of the proposed experiment and its current status.

T 93.2 Wed 17:45 POT/0351

Development of a spatial resolving scintillator readout system - "MIP-Cube" — •Philippe Bruder[2], Thomas Huber[1], and Andreas Haungs[1] — [1]Karlsruhe Institute of Technology, Institute for Astroparticle Physics, Karlsruhe, Germany — [2]Karlsruhe Institute of Technology, Institute for Particle Physics, Karlsruhe, Germany

High-energy muons from extensive air-showers, originated in the interaction between cosmic rays and the Earth's atmosphere, can propagate to Earth or even into low-noise facilities, like underground research laboratories and contribute to the noise level of experiments. By measuring the flux and spatial distribution of these muons, systematic background effects can be studied. For this purpose, a monitoring system based on a net of crossed 20 cm long and 5 cm wide plastic scintillator bars is in development. The foreseen scintillator system presented here will be readout by Hamamatsu 64-channel Silicon Photomultiplier (SiPM) arrays and are based on detectors developed for the surface instrumentation of the IceCube Neutrino Observatory. The baseline design provides a highly mobile detector system, with an adequate power supply and signal where focus will be given on a plug-and-play setup for variable measuring locations. The CAEN Co. Ltd Front-End units DT5202 or DT5203 as SiPM array readout and trigger electronic unit is one of the candidates. This contribution includes R&D efforts towards an appropriate data acquisition (DAQ) system, the foreseen detector design and the concept for front-end readout electronics.

T 93.3 Wed 18:00 POT/0351

Intensity Interferometry at H.E.S.S. - Introduction and first Results — •Andreas Zmija[1], Naomi Vogel[1], Gisela Anton[1], Stefan Funk[1], Alison Mitchell[1], Frederik Wohlleben[2], and Adrian Zink[1] — [1]Friedrich-Alexander-Universität Erlangen-Nürnberg, ECAP — [2]MPG Heidelberg

It has been less than a decade since astronomers rediscovered the concept of intensity interferometry, originally developed by Hanbury Brown & Twiss in the late 1950s, but state-of-the-art electronics have led to tremendous progress in recent years. The technique of correlating photon streams rather than interfering electromagnetic waves between telescopes is almost insensitive to atmospheric effects, and thus promises an increase in angular resolution in the optical regime by an order of magnitude. Since large light collection areas are preferred to optical quality mirrors, Imaging Atmospheric Cherenkov Telescopes are optimally suited for being equipped as intensity interferometer. In April 2022 we performed first photon correlation measurements with two of the H.E.S.S. Phase I telescopes during the moonlight break. We give a brief introduction into the method intensity interferometry, and present the first results of angular diameter measurements of the two stars Lambda Scorpii and Sigma Sagittarii.

T 93.4 Wed 18:15 POT/0351

Intensity Interferometry at H.E.S.S. - Technical Setup — •Naomi Vogel[1], Andreas Zmija[1], Gisela Anton[1], Stefan Funk[1], Alison Mitchell[1], Frederik Wohlleben[2], and Adrian Zink[1] — [1]Friedrich-Alexander-Universität Erlangen-Nürnberg, ECAP — [2]MPG Heidelberg

Intensity Interferometers are used to determine the angular diameter of stars. Imaging Atmospheric Cherenkov Telescopes are provided with technical setups to perform intensity interferometry (II) measurements. Our developed II setup was designed to be mounted to the lid of the Phase I H.E.S.S. telescopes in Namibia. It includes a 45 degree angled mirror and an optical path with a 2 nm interference filter leading to two photomultipliers whose photo currents are measured and then correlated. This enables us to handle high photon count rates. The data is then transferred via optical fibres to our workstation where the analysis is done after the measurements. The setup is equipped with motors in order to move each element individually which enables us to have a live pointing correction. In this contribution we will present the structure of our technical setup, how to include it between gamma ray observations and our future plans.

T 93.5 Wed 18:30 POT/0351

Trigger Concept for the Detection of Photon Air Showers with the AugerPrime Radio Detector* — •Jannis Pawlowsky for the Pierre Auger-Collaboration — Bergische Universität Wuppertal, Gaußstr. 20, 42119, Wuppertal, Germany

The Pierre Auger Observatory is the largest Cosmic Ray (CR) observatory with a size of $\approx 3000\,\mathrm{km}^2$. Its size makes it feasible to not only look for CRs but also for presumably rare primaries like photons at energies larger than 1 EeV. Strong upper limits on the diffuse photon flux have been set in the past using the Water Cherenkov Detector (WCD). Additionally, air showers with photon-like properties were detected. For these photon candidate events, however, an uncertainty remains regarding whether they are of photon origin or possibly misinterpreted hadrons. With the AugerPrime upgrade, the WCD is complemented by the Radio Detector (RD). The combination of both detectors yields new information about air showers and will improve primary identification. Here, inclined photon showers are of special interest. We will present a stand-alone RD trigger concept to detect photon air showers with negligible particle footprints. It will be shown that the trigger is compatible with given hardware limitations and the noise level at the Pierre Auger Observatory. The status and results of a first hardware implementation is discussed. We will quantify the trigger efficiency of photon air showers for different configurations of the trigger.

**Gefördert durch die BMBF Verbundforschung Astroteilchenphysik (Vorhaben 05A20PX1)*

T 93.6 Wed 18:45 POT/0351

Segmented scintillation tracking detector for space applications — •Roman Bergert, Hans-Georg Zaunick, and Kai-Thomas Brinkmann — II. Physics Institute Justus-Liebig-University Giessen

A 3D-resolving detector concept as a payload for an upcoming satellite mission, which is foreseen to reach a final medium earth orbit (MEO) and high radiation levels, is discussed. A precise measurement of fluences and dose rates of relativistic charged particles with energies above 100 MeV is targeted as the main goal of the concept. The determination of the momentum vector of charged particles combined with a precise timing of the events will be used to demonstrate the feasibility of the unprecedented experimental correlation between the primary particles events and triggered secondary particles in air showers on earth by a citizen science project (MuonPi muonpi.org). The steps to reach these goals and first concept results will be presented with a focus on the mechanical and electrical construction of the detector payload for deployment in space.