T 96: Kosmische Strahlung 6

Zeit: Dienstag 16:45–18:15 Raum: WIL-B321

T 96.1 Di 16:45 WIL-B321

Analyse der Ankunftsrichtungen ultra-hochenergetischer kosmischer Strahlung mittels Wavelets — •Markus Lauscher, Matthias Plum und Thomas Hebbeker für die Pierre-Auger-Kollaboration — III. Physikalisches Institut A, RWTH Aachen University

Das Pierre Auger Observatorium in der Provinz Mendoza in Argentinien hat eine instrumentalisierte Fläche von ca. 3000 km^2 und detektiert Ankunftsrichtungen und Energien ($E > 10^{18}$ eV) der kosmischen Strahlung. Als mögliche Quellszenarien kommen sowohl einzelne isolierte Objekte als auch großskalige Strukturen im Kosmos in Frage. Die Verteilung der Ankunftsrichtung ist erscheint zunächst isotrop, jedoch wird vermutet, dass bei hohen Energien eine Korrelation mit Beschleunigungskandidaten wie z.B. aktiven galaktischen Kernen (AGN) auftritt.

Eine Wavelet Analyse mit dem "Needlet" bietet nun die Möglichkeit mit einer sphärischen harmonischen Transformation in Kugelflächenfunktionen auf verschiedenen Größen-Skalen vorhandene Anisotropien (Quellen) sichtbar zu machen. Die Sensitiviät der Methode wird mit unterschiedlichen Quellszenarien auf verschiedenen Skalen getestet und die Signifikanz der Anisotropie wird mit Hilfe von Monte-Carlo Studien bestimmt.

T 96.2 Di 17:00 WIL-B321

Simulation of the Charge Ratio of Cosmic Ray Muons in Extensive Air Showers using CORSIKA — •Livingstone Ochilo[1,2], Nadir Hashim[2], and John Okumu[2] — [1]University of Siegen, Siegen, Germany — [2]Kenyatta University, Nairobi, Kenya

The interaction of primary cosmic rays in the atmosphere produces, among other particles, pions and kaons. They decay to muons, which form an important component of extensive air showers. The ratio of positively to negatively charged muons, called the muon charge ratio, provides important information about the cosmic ray interactions in the atmosphere. In this study, the theoretical hadronic interaction models in the cosmic ray simulation code CORSIKA have been used to study the charge ratio of cosmic ray muons simulated in extensive air showers. An East - West effect on the charge ratio of simulated cosmic ray muons is observed. It is more pronounced for inclined and low-energy muons (momentum less than 100 GeV/c and zenith angle greater than 80°). Experimental data from "MINOS Near" experiment gives similar results.

T 96.3 Di 17:15 WIL-B321

The CROME Experiment – Detector Setup and Calibration — •Radomír Šmída for the CROME-Collaboration — Karlsruhe Institute of Technology

The CROME experiment measures microwave radiation from air showers with several parabolic antennas, each equipped with a multiple-receiver camera operating in the extended C band (3.4–4.2 GHz). Data are taken in coincidence with cosmic-ray showers detected by the KASCADE-Grande experiment located at the Karlsruhe Institute of Technology (KIT). The overall experimental setup will be presented and different methods used for determining sensitivity, pointing, and time synchronization of the detectors will be discussed. It is shown that the CROME setup is well-suited for the detection of pulses of a few nanoseconds as expected from cosmic-ray showers. An overview of detected air shower events together with the expected noise signal rate will be presented.

T 96.4 Di 17:30 WIL-B321

The CROME Experiment – Event Properties and Interpretation — •Felix Werner for the CROME-Collaboration — Karlsruher Institut für Technologie

Microwave radiation from high-energy air showers has been observed in the C band with the CROME setup. The properties of the air showers with GHz signal will be presented in detail. Comparing Monte Carlo predictions for different emission processes with the CROME measurements, possible emission mechanisms will be discussed.

T 96.5 Di 17:45 WIL-B321

The CROME Experiment – Timing and Effective Aperture — •Martin Will für die CROME-Kollaboration — Karlsruher Institut für Technologie

The CROME experiment in Karlsruhe aims to measure the microwave emission of extended air showers. The setup consists of several parabolic reflector antennas that are equipped with detectors sensitive in the GHz range. The detector is located within the KASCADE-Grande cosmic ray detector. Every time a shower is detected by KASCADE-Grande, a trigger is sent to CROME and the data is read out. To calculate the expected time window of the signal in dependence on the shower geometry, the systematic uncertainties of the timing of the CROME detector and the trigger chain have to be studied. Furthermore, the effective area of the detector determines the sensitivity of the setup for showers crossing the field of view. Using the measurement uncertainties of the KASCADE-Grande array and the measured gain pattern of the CROME antennas, the effective area can be estimated for every shower geometry.

T 96.6 Di 18:00 WIL-B321

Calculation of molecular bremsstrahlung radiation and air shower plasma conditions for CROME — •Patrick Neunteufel, Ralph Engel, Radomir Smida, and Felix Werner — Karlsruher Institut für Technologie

The possibility of the detection of extensive air showers by observation of isotropic microwave radiation due to molecular bremsstrahlung has been proposed in 2008. Ionization electrons, forming a short-lived, tenuous plasma in the wake of the shower, interact with atmospheric neutrals and produce bremsstrahlung. Concurrent with first measurements of microwave radiation by the CROME experiment in Karlsruhe, an independent, theory based model for emission of isotropic bremsstrahlung emission has been developed. In this talk, the assumptions of the model for bremsstrahlung emission and the findings concerning the state of the plasma in an air shower will be discussed. The magnitude of the expected signal is calculated and compared to predictions made in the original proposal by Gorham et al. and to the observed GHz signals.