T 83.9 Mi 18:45 KGI-HS 1199

**Longitudinalentwicklung primärer Photon-Schauer bei höchsten Energien*** — •Anita Nasseri, Karl-Heinz Kampert, Julian Rautenberg und Markus Risse — Bergische Universität Wuppertal, Gaußstr. 20, 42119 Wuppertal

Die Bestimmung des Primärflusses ultra-hochenergetischer Photonen ($E > 10^{18}$ eV) liefert wichtige Hinweise auf den Ursprung der kosmischen Strahlung. Zur experimentellen Identifizierung solcher Photonen ist eine genaue Kenntnis der Charakteristika photon-induzierter Luftschauer nötig. Mithilfe des Simulationsprogrammes CONEX [1] wurde die Abhängigkeit wichtiger Kenngrößen eines Luftschauers (Tiefe des Schauermaximums, Anzahl sekundärer Myonen) von den Primärparametern (Energie, Richtung) systematisch untersucht. Die Ergebnisse werden diskutiert und mit entsprechenden Werten für simulierte, hadron-induzierte Luftschauer verglichen.

[1] Bergmann et al., Astropart. Phys. 26 (2007) 420

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## T 84: Kosmische Strahlung IV

Zeit: Donnerstag 16:45–18:50 Raum: KGI-HS 1199

**Gruppenbericht** T 84.1 Do 16:45 KGI-HS 1199

**Lateral distribution, momentum spectrum and charge ratio of cosmic ray muons at a depth of 320 m.w.e. underground** — •Michael Schmelling[1], Claus Grupen[2], Nadir Omar Hashim[1,2], Steffen Luitz[3], Florin Maciuc[2], Arif Mailov[2], Anke-Susanne Mueller[4], Alois Putzer[5], Bertram Rensch[6], Heinz-Georg Sander[7], Sascha Schmeling[8], Rodica Tcaciuc[2], Horst Wachsmuth[8], Thomas Ziegler[9], and Kai Zuber[10] — [1]MPI for Nuclear Physics — [2]Uni Siegen — [3]SLAC — [4]Forschungszentrum Karlsruhe — [5]Uni Heidelberg — [6]erphi Electronics — [7]Uni Mainz — [8]CERN — [9]Princeton — [10]Uni Dortmund

The CosmoALEPH experiment at CERN has studied cosmic ray muons at a depth of 320 m.w.e. underground. The momentum spectrum up to energies of 3 TeV was measured with the ALEPH Time Projection Chamber. The lateral distribution was determined from coincidence rates between the ALEPH hadron calorimeter and scintillator stations located in the cavern and the LEP tunnel up to distances of 1 km. Final results are presented for the momentum spectrum and the charge ratio of vertical muons extrapolated to the surface, and for the underground lateral distribution in the form of a decoherence curve, which is sensitive to the chemical composition of primary cosmic rays. The data are compared to Monte Carlo simulations and measurements by other experiments.

T 84.2 Do 17:05 KGI-HS 1199

**Lateral Distribution of EAS-Muon Density and Pseudorapidity** — •Pawel Luczak[2], Kai Daumiller[1], Paul Doll[1], and Janusz Zabierowski[2] for the KASCADE-Grande-Collaboration — [1]Institut für Kernphysik, Forschungszentrum Karlsruhe, Postfach 3640, 76021 Karlsruhe — [2]Soltan Institute for Nuclear Studies, 90950 Lodz, Poland

The Muon-Tracking-Detector(MTD) in KASCADE-Grande allows to measure with high accuracy muon directions in EAS up to 700 m distance from the shower axis. According to simulations of showers initiated by primaries with energies $10^{16}$ -$10^{18}$ eV, nearly all muons reaching the observation level are subject of investigation. This is important when studying averaged quantities like muon production height and lateral distribution of muon density and muon pseudorapidity in view of comparisons between experimental data and simulations. Such comparisons allow to study the longitudinal shower development and the validity of hadronic interaction models used in EAS simulations based on CORSIKA, QGSJetII+FLUKA2002.4 model combination.

T 84.3 Do 17:20 KGI-HS 1199

**The azimuthal asymmetry of particle lateral density in EAS in the range of observation of KASCADE-Grande** — •Octavian Sima[1], Heinigerd Rebel[2], Claudia Morariu[1], Christian Manailescu[1], Gabriel Toma[3], and Andreas Haungs[2] — [1]Department of Physics, University of Bucharest, Romania — [2]Institut für Kernphysik, Forschungszentrum Karlsruhe — [3]National Institute of Physics and Nuclear Engineering, Bucharest, Romania

The reconstruction of high-energy air showers (EAS) on the basis of ground level particle detectors is based on the characteristics of observables like particle lateral density (PLD), arrival time signals etc. Lateral densities, inferred from detector data, are usually parameterized by applying various lateral distribution functions (LDF). Typical LDFs anticipate azimuthal symmetry of PLD around the shower axis. The deviations from symmetry are important in the case of arrays like Grande, which only sample a small part of the azimuthal dependence.

In this contribution we discuss the origin of the asymmetry, its magnitude and propose procedures to incorporate it in the shower reconstruction. Geometric and attenuation effects (for inclined showers) and the earth magnetic field contribute to the asymmetry. The azimuth dependence of the energy deposit per particle does not impact on the real PLD, but affects the reconstructed PLD. Based on studies of CORSIKA simulations we propose procedures for minimizing the effects of the azimuthal asymmetry of PLD in shower reconstruction.

T 84.4 Do 17:35 KGI-HS 1199

**Investigations of the S(500) distribution for extensive air showers detected with the KASCADE-Grande array** — •Gabriel Toma for the KASCADE-Grande-Collaboration — National Institute for Physics and Nuclear Engineering - Horia Hulubei, Bucharest ,Romania

Previous EAS investigations have shown that the particle density becomes independent of the primary mass at certain distances from the shower core and can be used as an estimator for the primary energy. In the context of the KASCADE-Grande experiment, the particular distance at which this effect takes place is around 500 m, hence the notation S(500). It has been shown that S(500) has a primary energy-like spectrum. We present results of further investigations in this direction. A correction function can be derived from the S(500) attenuation with the EAS angle of incidence thus allowing us to build an all event S(500) spectrum. Previously, the study relied on a three parameter Linsley parameterization for the lateral particle density distribution. Further tests have been performed now using a similar Linsley form in which one of the shape parameters has been considered fixed.

T 84.5 Do 17:50 KGI-HS 1199

**Analysis of the muon spectra for inclined air showers measured with the KASCADE-Grande experiment** — •Juan Carlos Arteaga-Velazquez for the KASCADE-Grande-Collaboration — Institut für Experimentelle Kernphysik, Universität Karlsruhe, 76128 Karlsruhe, Germany

The solving of the mystery of the second knee in the cosmic ray spectrum is one of the main objectives of the KASCADE-Grande observatory. KASCADE-Grande is a ground array composed of different subsystems of detectors that, as a whole, allows to study simultaneously the electromagnetic and penetrating component of cosmic ray air showers in the energy range between 100 TeV and 1 EeV. Vertical showers (with zenith angles below $40^o$) are studied in detail at KASCADE-Grande. Now, the analyses are being extended to higher zenith angles as a way to study the muon content of air showers and to increase the statistics of the experiment.

In this talk, the muon spectra reconstructed for vertical and inclined air showers measured by the KASCADE-Grande observatory are presented and also confronted with Monte Carlos simulations based on the hadronic interaction models QGSJET II and EPOS. In addition, the result of the analysis of the observed spectra with the "constant intensity cut method" is shown. This method was applied in a first attempt to understand the origin of a systematic discrepancy found between the predicted and measured muon spectra, which increases with the zenith angle.

T 84.6 Do 18:05 KGI-HS 1199

**Rekonstruktion geneigter Luftschauer mit simulierten Karten der lokalen Myondichte** — •Hans Dembinski, Thomas Hebbeker und Matthias Leuthold — III. Physikalisches Institut A, RWTH Aachen

Das Pierre Auger Observatorium in Malargüe, Argentinien, vermisst hochenergetische kosmische Strahlung oberhalb von $10^{18}$ eV. Für die