T 61: Kosmische Strahlung III

Zeit: Mittwoch 16:00–18:25 Raum: S13

Gruppenbericht T 61.1 Mi 16:00 S13

Recent Results from the KASCADE-Grande Data Analysis — •Donghwa Kang for the KASCADE-Grande-Collaboration — Karlsruher Institut für Technologie, Karlsruhe, Germany

KASCADE and its extension KASCADE-Grande finished data taking in 2013 to measure individual air showers of cosmic rays with energies from 100 TeV up to 1 EeV. The experiment was completely dismantled in 2013 though, the data analysis is still in progress. Recently, we investigated the validity of the new hadronic interaction model SIBYLL 2.3c. We also published a new result of a search for large-scale anisotropies performed with the KASCADE-Grande data. Investigation of the attenuation length of the muon content of very-high energy air showers in the atmosphere is also updated with the predictions of the SIBYLL 2.3 interaction model. We investigated, in addition, the muon content of EAS and compared them to all post-LHC interaction models. In this contribution, these recent results from KASCADE-Grande will be discussed. An update of the internet-based data center of KCDC offering the original scientific data from KASCADE-Grande to the public will be briefly discussed as well.

Gruppenbericht T 61.2 Mi 16:20 S13

The Pierre Auger Observatory - Recent Results and Perspectives — •Thomas Bretz — RWTH Aachen, III. Physikalisches Institut A, Germany

The Pierre Auger Observatory covering an area of 3000 km^2 in Argentina is the world largest surface detector for the observation of extensive air-showers. It comprises 1660 individual water-Cherenkov detectors and is complemented by 27 telescopes recording fluorescence light emitted in the atmosphere.

Sensitive to energies >300 PeV at the ankle and cut-off region, significant discoveries to today's knowledge about ultra-high energy cosmic-rays were made: a precise measurement of the spectrum, the measurement of the chemical composition, results on fundamental shower physics, and the detection of a large-scale anisotropy above 4 EeV. Upper limits have been provided for the contribution from gamma-rays, the flux from the direction of the first gravitational wave events, the search for magnetic monopols and the search for EeV neutrinos.

Exciting future discovery potential on the hunt for the origin of cosmic rays lays in the observed evidence for a correlation between the recorded arrival direction above 40 EeV with starburst galaxies examined by Fermi-LAT.

With the successfull radio detection for extended air showers and the applicability of SiPMs in scintillator detectors, important technological development have been made. With AugerPrime, the on-going upgrade of the detector, a new era in the sensitivity for ultra-high energy cosmic-rays will start soon.

T 61.3 Mi 16:40 S13

Updates on AugerPrime Engineering Array Analyses * — •Sonja Schröder — Bergische Universität Wuppertal, Gaußstraße 20, 42119 Wuppertal

The AugerPrime upgrade of the Pierre Auger Observatory in Argentina will enhance the precision of composition measurements of the primary particles that create extensive air showers. This is achieved by separating the electromagnetic and muonic components of the particle shower with the help of Surface Scintillator Detectors (SSD) placed on top of the already existing Surface Detector (SD) stations. This talk concerns the analysis of the data quality for the SSD Engineering Array stations. The long-term stability of the data, as well as parameters such as timing resolution, signal amplitudes and temperature effects of the detectors will be discussed. A focus point will be the data from a triplet of stations in immediate vicinity of each other, which are located in a more densely instrumented region of the array, where the spacing of SD stations is reduced from 1500 m to 433 m. This lowers the energy threshold to $\approx 10^{16.5}$ eV, yielding 10 times higher statistics as compared to the regular array.

** Gefördert durch die BMBF Verbundforschung Astroteilchenphysik (Vorhaben 05A17PX1).*

T 61.4 Mi 16:55 S13

Search for ultra-high energy photons with the AugerPrime upgrade of the Pierre Auger Observatory — •Paulo Ferreira, Thomas Bretz, Adrianna García, Thomas Hebbeker, Julian Kemp, Tobias Pan, and Christine Peters — III. Physikalisches Institut A, RWTH Aachen University

The Pierre Auger Observatory, located in the Argentinian Pampa, is the world's largest experiment for the detection of ultra-high energy extensive air showers. For such, it uses a surface array of 1660 water Cherenkov detectors and 27 fluorescence telescopes. Among other studies, it has been used to search for photon-induced showers at energies above 1 EeV. Analyzing the photon flux is crucial to understand the flux suppression of cosmic rays above 50 EeV. Until now, no photon-induced shower has been confirmed by the Pierre Auger Collaboration. Even if these studies allow for the best upper limits for the photon flux at the ultra-high energy, they are limited by the current discrimination power between photon and hadron induced showers. As part of the recent upgrade of the Pierre Auger Observatory, called AugerPrime, an additional scintillator detector will be installed on top of each water Cherenkov station. Thereby, a more precise measurement of the number of muons is aimed at, which will increase the sensitivity to photons significantly. As such, this analysis focus on studying the increase in discrimination power that will be reached with AugerPrime.

T 61.5 Mi 17:10 S13

A new end-to-end calibration of the Fluorescence Detector of the Pierre Auger Observatory — Jan Berens[1], Kai Daumiller[2], Joachim Debatin[2], Hermann-Josef Mathes[2], •Eric Mayotte[1], Alexander Menshikov[2], and Julian Rautenberg[1] — [1]Bergische Universität Wuppertal, Gaußstraße 20, 42119 Wuppertal* — [2]Karlsruher Institut für Technologie, Hermann-von-Helmholtz-Platz 1, 76344 Eggenstein-Leopoldshafen

The Fluorescence Telescopes are crucial to the science goals of the Pierre Auger Observatory. Currently, to ensure the accuracy of their measurements, a relative calibration of each telescope is performed nightly. To improve upon this established calibration, as well as to improve the time-dependent end-to-end calibration of each telescope's optics and camera, a new absolute calibration process has been developed. The core of the technique consists of scanning a calibrated UV Lambertian light source across the aperture of each telescope and reading out the response of the PMT camera. The camera response is then compared to the simulated end-to-end optical performance of the instrumentation given the known source properties in order to provide an absolute calibration of each telescope. This talk will give a brief overview of the method and its status as well as progress on the absolute calibration of the light source. Preliminary results including fluorescence telescope response and light source characteristics will also be presented. *Gefördert durch die BMBF Verbundforschung Astroteilchenphysik(Vorhaben 05A17PX1/05A17VK1).

T 61.6 Mi 17:25 S13

Observation of air showers with the IceAct 7 pixel demonstrator in coincidence with IceCube and IceTop — •Erik Ganster, Jan Auffenberg, Pascal Backes, Thomas Bretz, Johannes Buscher, Maurice Günder, Martin Rongen, Merlin Schaufel, and Christopher Wiebusch for the IceCube-Collaboration — III. Physikalisches Institut, RWTH Aachen University

The IceAct Imaging Air Cherenkov Telescopes are proposed surface detectors extending the IceCube Neutrino Observatory. By observing Cherenkov light in the atmosphere with an SiPM based camera, IceAct is capable of detecting cosmic ray air showers in coincidence with IceCube and its surface detector IceTop. These observations can improve the measurement of the composition of cosmic rays, they allow for the calibration of the angular resolution and efficiency of IceCube and IceTop, and potentially can be used to to veto atmospheric muons and neutrinos, which are a background in cosmic neutrino searches. In December 2015, a 7-pixel demonstrator telescope was installed at the South Pole and had been operated in coincidence with IceCube during the years 2016 and 2017. We present results of the analysis of air-showers measured coincidentally with IceAct, IceCube, and IceTop.

T 61.7 Mi 17:40 S13

Cosmic Ray Composition With Combined Particle and Radio Measurements * — •Marvin Gottowik — Bergische Universität

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A hybrid detection of extensive air showers by the associated radio emission and particle density at ground shows significant potential for mass composition measurements. The radio signal is sensitive only to the electromagnetic component of the air shower, while the particle detector at zenith angles larger than 60° performs an almost pure measurement of the muonic component as the electromagnetic shower dies out in the atmosphere. The combination of both types of data is sensitive to mass composition and may be even superior to the classical depth of shower maximum approach.

Within the next years the surface detector stations of the Pierre Auger Observatory will be equipped with an additional radio antenna to detect the radio emission of extensive air showers together with the direct measurement of the particles. The horizontal exposure of the radio upgrade will be complementary to the vertical scintillator upgrade and increase the exposure for composition analyses.

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T 61.8 Mi 17:55 S13

Contracting Alignment Patterns in the arrival directions of Ultra High Energy Cosmic Rays induced in the Galactic Magnetic Field — •Marcus Wirtz, Martin Erdmann, Lukas Geiger, David Schmidt, and Martin Urban — III. Physikalisches Institut A, RWTH Aachen University, Deutschland

We present a novel approach to search for origins of ultra-high energy cosmic rays. In a simultaneous fit to all observed cosmic rays we use a data driven galactic magnetic field model as a mass spectrometer and adapt the nuclear charges such that their extragalactic arrival directions are concentrated in as few directions as possible. During the fit the nuclear charges are constraint by the individual energy and shower depth measurements. We show in a simulated astrophysical scenario that source directions can be reconstructed even within a substantial isotropic background and without exact knowledge of the galactic magnetic field.

T 61.9 Mi 18:10 S13

Large Acceptance Analysis of Electrons and Positrons with AMS-02 — •Fabian Machate — 1. Physikalisches Institut B, RWTH Aachen University

The Alpha Magnetic Spectrometer (AMS-02) on the International Space Station performs precision measurements of cosmic rays in the GeV to TeV energy range. The published analyses of the electron and positron fluxes rely on the electromagnetic calorimeter (ECAL) for energy measurements and background rejection. The geometrical acceptance for the conventional analyses is restricted by the weight limitations for the calorimeter.

A new analysis method using information from the Transition Radiation Detector (TRD) and Tracker will be presented, with particular emphasis on background rejection with the TRD. This analysis has a significantly larger geometrical acceptance and can increase the statistics by a factor of up to ~ 4.