T 30: Cosmic rays 3

Time: Tuesday 16:00–17:45 Location: Geb. 20.30: 2.059

T 30.1 Tue 16:00 Geb. 20.30: 2.059

The IceCube Surface Array Enhancement and cosmic-ray observation with radio — •Megha Venugopal for the IceCube-Collaboration — Institute of Astroparticle Physics (IAP), Karlsruhe Institute of Technology, Germany

The IceCube Neutrino Observatory is a unique 3-dimensional detector at the South Pole with its surface cosmic-ray detector, IceTop and its in-ice volume neutrino detector. Primarily motivated by the rising snow accumulation on the surface component, a new configuration of detectors was planned to be set up along the existing 81 pairs of ice-filled Cherenkov tanks of IceTop. The upgrade termed as the Surface Array Enhancement (SAE) is set to consist of up to 30 stations with elevated 8 scintillators and 3 antennas per station. The current status of the SAE radio measurements with the 3 antennas of the single station at the South Pole is discussed. The updates for upcoming stations are also presented.

T 30.2 Tue 16:15 Geb. 20.30: 2.059

IceCube-Gen2 Surface Array: Science Case and Plans — •Frank Schröder for the IceCube-Collaboration — Karlsruher Institut für Technologie (KIT), Institut für Astroteilchenphysik — Bartol Research Institute, Department of Physics and Astronomy, University of Delaware

IceCube-Gen2 will be a next-generation extension of the IceCube Neutrino Observatory at the South Pole. In addition to a deep Optical Array and a Radio Array for PeV neutrino astronomy, IceCube-Gen2 will feature a Surface Array to enhance the neutrino science and to provide additional cosmic-ray science. The IceCube-Gen2 Surface Array will consist of elevated scintillation panels and radio antennas above the Optical Array and will detect cosmic-ray air showers in the PeV to EeV energy range. Compared to IceCube, the measurement accuracy at the surface will be enhanced due to the combination of radio and particle detection, and the aperture for surface-deep coincident events will be increased by about a factor of 30. This contribution will present the science case of the IceCube-Gen2 Surface Array and discuss the planned design recently published in the Technical Design Report: https://icecube-gen2.wisc.edu/science/publications/tdr/

T 30.3 Tue 16:30 Geb. 20.30: 2.059

First results with the Station 0 of the IceCube Surface Array Enhancement — •S. Shefali for the IceCube-Collaboration — Institut für Astroteilchenphysik, Karlsruher Institut für Technologie (KIT), Karlsruhe, Germany

The IceCube Neutrino Observatory is a multipurpose detector which includes a unique surface array, IceTop, highly instrumental for cosmic ray studies in addition to its capability of vetoing for astrophysical neutrino searches for the IceCube in-ice instrumentation. It consists of frozen water tanks equipped with photomultipliers instrumented to detect secondary particles like electrons, protons and muons from cosmic ray air showers of energies up to 1 EeV.

An enhancement of the surface array, with scintillation and radio detectors, in order to facilitate multi-component cosmic ray studies, as well as improving the IceTop detectors' calibration by accounting for the snow accumulation on them, has been ongoing. The existing prototype station was recently upgraded to the first working station of the enhancement, "Station 0". This contribution will discuss the upgrade, and the first air shower measurements conducted with this station.

T 30.4 Tue 16:45 Geb. 20.30: 2.059

Charge sign dependence of recurrent Forbush Decreases in 2016 — •Lisa Romaneehsen, Johannes Marquardt, and Bernd Heber — Christian-Albrechts-Universität zu Kiel, Germany

This study investigates the periodicities of cosmic rays attributed to corotating interaction regions (CIRs) using AMS-02 data from late 2016 to early 2017. These data enable the first-time examination of recurrent Forbush decrease amplitudes induced by CIRs, considering rigidity and charge sign dependence. The findings from the Lomb-Scargle algorithm and Superposed Epoch Analysis were compared. Results reveal that the rigidity dependence of proton decreases attributed to the northern coronal hole aligns with existing literature, while that of the southern coronal hole does not. The amplitude of the Helium modulation exceeds that of protons, in line with previous observations. For positrons statistical limitation prevent definitive conclusions. In comparison to the positively charged ions the modulation behavior of electrons can not be understood in the current paradigma of modulation by diffusion barriers.

T 30.5 Tue 17:00 Geb. 20.30: 2.059

Measurment of the cosmic ray electron and positron flux with AMS02 — •Yasaman Najafijozani — Gebäude: 4280 Raum28B203 Sammelbau Physik, Sommerfeldstr. 14, Turm 28 52074 Aachen

The Alpha Magnetic Spectrometer (AMS-02) on the International Space Station has been performing precision measurements of cosmic rays in the GeV to TeV energy range since 2011. The fluxes of electrons and positrons are potential probes of dark matter or new astrophysical phenomena. With AMS-02, electrons and positrons are identified by two independent subdetectors, a transition radiation detector and an electromagnetic calorimeter. I will present my cosmic-ray electron and positron flux analysis from 0.5 to 1000 GeV.

T 30.6 Tue 17:15 Geb. 20.30: 2.059

Measuring the Cosmic Ray Sun Shadow with IceCube* — •Niclas Krieger[1,2], Jonas Hellrung[1,2], Lukas Merten[1,2], Frederik Tenholt[1,2], and Julia Becker Tjus[1,2,3] for the IceCube-Collaboration — [1]Theoretical Physics IV, Plasma Astroparticle Physics, Faculty for Physics and Astronomy, Ruhr University Bochum, 44780 Bochum, Germany — [2]Ruhr Astroparticle and Plasma Physics Center (RAPP Center), Germany — [3]Department of Space, Earth and Environment, Chalmers University of Technology, 412 96 Gothenburg, Sweden

With the IceCube Neutrino Observatory atmospheric muons are detected that are produced when cosmic rays interact with the Earth's atmosphere. On their way to Earth, cosmic rays are blocked by the Sun and the Moon. While the Moon shadow serves as an absolute pointing calibration, the Sun shadow enables an indirect observation of the solar magnetic field. This combination of a turbulent and large-scale field deflects the charged cosmic rays and thus leaves its footprint in the cosmic ray flux. The method of measuring the shadows of these celestial objects will be explained here. Furthermore, it will be shown how these observations help to understand the solar magnetic field better. *Supported by DFG (SFB 1491) and BMBF

T 30.7 Tue 17:30 Geb. 20.30: 2.059

Twelve Years Observation of the Seasonal Variation of Atmospheric Neutrino Flux with IceCube — •Shuyang Deng, Jakob Böttcher, Hannah Erpenbeck, Tobias Kramer, and Christopher Wiebusch for the IceCube-Collaboration — III. Physikalisches Institut B RWTH Aachen University

High-energy atmospheric muon neutrinos are detected by IceCube with a high rate of almost a hundred thousand events per year. These neutrinos are produced in the hadronic development of air showers in the upper atmosphere. Their flux is expected to correlate with atmospheric properties such as temperature, and thus features a seasonal variation. In this talk, we present an updated measurement of the seasonal variation of the atmospheric muon neutrino flux, utilizing the 12-year neutrino sample (Northern Tracks) produced by the IceCube Neutrino Observatory. We correlate the measured neutrino rates with the atmospheric temperature profiles measured by satellites. The updated measurement yields results that are compatible with the previous studies, while confirming a tension between the theoretical predictions and experimental measurements with higher statistical significance. Further investigations on systematic effects show that the observation not only exhibits a weaker correlation compared to predictions, but also deviates from the expected linear relation between atmospheric neutrino flux and the atmospheric temperature.