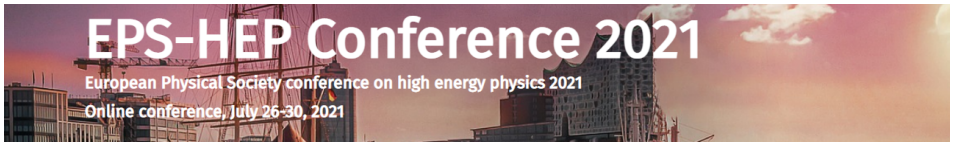

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Enhancement of the IceCube surface instrumentation by a hybrid radio and scintillation detector array

The IceCube Neutrino Observatory is a cubic kilometer scale detector deployed in the antarctic ice, capable of detecting neutrinos of energies ranging from aprox 10 GeV to PeV and above. In addition to being a powerful neutrino observatory, IceCube is extensively involved in cosmic ray physics. The surface array of IceCube, IceTop, consisting of frozen water tanks equipped with photomultipliers, detects secondary particles like electrons, protons and muons from cosmic ray showers of energies up to 1 EeV. In addition, it is also used to function as a veto for the astrophysical neutrino searches and calibration detector for the IceCube in-ice instrumentation. Despite its great success, the snow
accumulation on these surface detectors, contributes to energy uncertainty in the detected signals, and consequently, the shower reconstruction. Moreover, more detailed measurements are needed to understand the astrophysics of the high-energy cosmic-ray sky. Enhancing IceTop with a hybrid array of scintillation detectors and radio antennas will improve cosmic ray detection with IceCube. A lower threshold for air shower measurements, more efficient veto capabilities, a separation of electromagnetic and muonic components due to different detection principles, along with improved calibration by a compensation of the snow accumulation, are expected to be achieved with this enhancement.
Following the success of the first prototype station consisting of three radio antennas and eight scintillation detectors deployed at the South Pole in 2018, the production of detectors for 32 stations is ongoing. The deployment status, calibration methods, and science goals of the enhancement will be discussed in this contribution.

Collaboration / Activity

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