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Cosmic-Ray Physics in the PeV to EeV Energy Range with the IceCube-Gen2 Surface Array

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IceCube-Gen2 is a proposed neutrino observatory at the South Pole that will build on the success of IceCube and will also serve as a unique detector for cosmic-ray air showers.
Analogous to the IceTop surface array over IceCube's deep optical detector, IceCube-Gen2 will also feature a surface array above an optical array deep in the ice. As improvement over IceTop, the IceCube-Gen2 surface array will be comprised of elevated detectors to avoid snow coverage, and will combine two types of detectors: scintillation panels that measure air-shower particles on ground and enable a low detection threshold, which is important to serve as a veto for selecting downgoing neutrino candidates; and radio antennas which increase the measurement accuracy for air showers by providing a calorimetric measurement of the electromagnetic shower component and its depth of maximum, X_{max}. As another major advantage, the eight times larger surface area combined with a larger field of view will provide a 30-fold increase for the aperture of surface-deep coincident events. With these improvements in statistics and measurement accuracy, IceCube-Gen2 will thus make unique contributions to the particle physics and astrophysics of Galactic cosmic rays in the PeV to EeV energy range, including the search for PeV photon sources. This proceeding will summarize the technical design and science case enabled by the IceCube-Gen2 Surface Array.

Collaboration(s)

IceCube-Gen2

Author: SCHROEDER, Frank (Bartol Research Institute, Department of Physics and Astronomy, University of Delaware; and Institute for Astroparticle Physics, Karlsruhe Institute of Technology)

Presenter: SCHROEDER, Frank (Bartol Research Institute, Department of Physics and Astronomy, University of Delaware; and Institute for Astroparticle Physics, Karlsruhe Institute of Technology)

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