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IceVeto: A high energy extension for IceCube

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Neutrino Astronomy in the Southern Hemisphere: Study of a cosmic-ray veto for the IceCube neutrino observatory.

ICECUBE is the world's largest high-energy neutrino observatory, built at the South Pole.

The main backgrounds for extraterrestrial neutrino detection in ICECUBE are cosmic ray (CR) induced extensive air showers (EAS). One way to suppress these backgrounds in ICECUBE is to look at particles that have traversed the whole Earth, leaving not only astrophysical but also atmospheric neutrinos (AN). In the southern sky, the CR muon background dominates the neutrino spectrum because high-energy muons will penetrate the overburden of ice above the detector.

EAS can be detected with air shower arrays at the surface. Such an array can be used to veto the CR muons reaching the deep detector. In particular, such a veto detector can suppress even the AN background, preferably covering a large solid angle including the galactic plane.

This scenario motivates studies to determine the cost and physics potential of a veto extension, IceVeto.

Initial estimates indicate that such a veto detector would more than double the discovery potential of current point source analysis in the southern sky for far less than a tenth of the cost of IceCube. With the additional detector IceVeto, IceCube would be able to explore the galactic center and galactic plane for extraterrestrial neutrino detection.

We propose detailed simulation studies to show the potential and feasibility of IceVeto and to develop prototypes for detector constructions.

These studies can be largely done independently of tests at the South Pole, in particular because of the immense experience with detector systems such as IceCube and AUGER and the already existing infrastructure at the RWTH Aachen.

Due to my experience with IceCube and IceTop, specifically with veto techniques, I am coordinating the R&D activities of the IceCube Collaboration for surface extensions and an ideal candidate to lead a research group.

Summary

Extend IceCube for muon neutrino detection from the southern sky.

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