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The Askaryan Radio Array

One of the most tantalizing questions in astronomy and astrophysics, namely the origin and the evolution of the cosmic accelerators that produce the highest energy (UHE) cosmic rays, may be best addressed through the observation of UHE cosmogenic neutrinos. At high energies (above 10^16 eV), neutrinos could be most efficiently detected in dense, radio frequency (RF) transparent media via the Askaryan effect. Building on the expertise gained by the RICE, AURA and ANITA experiments in the use of this technique in cold Antarctic ice, and the infrastructure developed in the construction of the IceCube optical Cherenkov observatory, we are currently developing an antenna array known as ARA (The Askaryan Radio Array) to be installed in boreholes extending 200 m below the surface of the ice near the geographic South Pole. The unprecedented scale of ARA, which will cover a fiducial area of 80 square kilometers, was chosen to ensure the detection of the flux of neutrinos "guaranteed" by the observation of the GZK cutoff by HiRes and the Pierre Auger Observatory. The first components of ARA are planned for installation during the austral summer of 2011-2012. Within 3 years of commencing operation, the full ARA will exceed the sensitivity of any other instrument in the 0.1-10 EeV energy range by an order of magnitude. The primary goal of the ARA array is to establish the absolute cosmogenic neutrino flux through a modest number of events. Such an observatory would also provide an unique probe of long baseline high energy neutrino interactions unattainable with any man-made neutrino beam.

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