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Radio Detection of Ultra High Energy Neutrinos

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Observation over the last 40 years of several dozen cosmic ray events with energies exceeding the Greisen-Zatsepin-Kuzmin (GZK) cutoff poses among the most intriguing and intractable problems in high energy astroparticle physics. This GZK process itself produces neutrinos that are strongly believed to be both spectrally and spatially correlated to high energy cosmic ray particles above 100 EeV. In the 1960's Askaryan predicted that the interaction of such high energy neutrinos would lead to coherent Cherenkov radiation due the spatially compact nature of such showers. In June 2006 Askaryan's predictions were verified for EeV showers in a 10 ton ice target at SLAC. A number of current and future experiments are now actively exploiting this radio detection method to search for the "guaranteed" flux of high energy neutrinos. The Antarctic Impulse Transient Antenna (ANITA) experiment, a long-duration balloon operating at an altitude of 37km, flew for over a month during Dec. 2006 - Jan. 2007 and a preliminary report on this flight will be presented. In the longer term, a large-scale terrestrial radio array opens the possibility to probe deep inelastic neutrino-nucleon scattering at center of mass energies well above those of any proposed future collider. Two prototype systems were deployed in Antarctica this austral summer, and RF surveys of salt domes continue as will be shown.

¹On behalf ANITA, ARIANNA, AURA and SaISA