APR06-2005-000050

Abstract for an Invited Paper
for the APR06 Meeting of
the American Physical Society

Ultra-High Energy Cosmic Neutrinos

DAVID SALTZBERG, UCLA Dept. of Physics and Astronomy

Astrophysical processes appear to produce particles with energies of at least 10^{19-20} eV. Yet extra-galactic astronomy appears to be limited for photons with energies above 10^{14} eV due to absorption. Neutrino astronomy offers the possibility to perform extra-galactic astronomy to these energies and beyond without an absorption cutoff. In addition, the interactions of ultra-high energy (UHE) neutrinos of cosmic origin with local matter may reveal exotic new physics processes that are unavailable to modern accelerators. UHE neutrino telescopes based on optical detection techniques that are currently operating and under construction will soon have apertures on the scale of 10 km^3-sr with excellent thresholds. Radio and acoustic detection techniques have been demonstrated in laboratory experiments and are being used to instrument apertures from 10 to to $10,000$ km^3-sr for neutrinos with energies above 10^{16} eV. Neutrino telescopes based on radio detection include the RICE detectors placed on the Amanda strings at the South Pole. The GLUE antennas pointed at the Moon have set limits on the neutrino intensity at higher energies. The best sensitivity at the highest energies comes from the FORTE satellite which looked for interactions in Greenland ice. The upcoming ANITA long-duration balloon flights over Antarctica will be sensitive to neutrinos produced by the interactions of cosmic rays with the cosmic microwave background radiation. Using the acoustic technique, the SAUND collaboration recently performed a UHE neutrino search using hydrophones in the deep sea near the Bahamas. Investigations for even larger apertures include several other detection possibilities, including placing radio and acoustic sensors in large underground salt formations. The acoustic technique may find promise in solid media currently under investigation. The neutrino sensitivity of current and proposed telescopes based on optical, radio, acoustic techniques will be compared for both specific models and in a model-independent fashion.