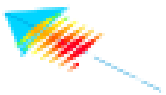

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Neutrino direction resolution of the ARIANNA detector, with Implications for future ultra-high energy neutrino astronomy

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High-energy neutrinos with energies above a few 10^{16} eV can be measured efficiently with in-ice radio detectors which is explored successfully in the ARIANNA test-bed detector, an array of shallow radio detector stations. Here, we demonstrate the neutrino pointing capabilities of a shallow radio station. Using the residual hole from the South Pole Ice Core Project, radio pulses were emitted from a transmitter located up to 1.7 km below the snow surface. By measuring these signals with an ARIANNA surface station, the angular and polarization reconstruction abilities are quantified, which are required to measure the direction of the neutrino. The direction to the transmitted radio pulse was measured with an angular resolution of 0.37°. For polarization, the statistical error of the polarization vector was measured to 1° with a slow systematic variation as a function of depth of 2.7°. We also report on the results of a simulation study using NuRadioMC to determine the statistical uncertainty at low signal strengths. Using a global fit to the recorded voltage traces of the 5 antennas of a shallow station, we find a neutrino space angle resolution of below 3° of all triggered events.

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