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Observation of radio emissions from an electron beam using an ice target

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Askaryan Radio Array (ARA) is being built at the South Pole aiming for observing high energy cosmogenic neutrinos above 50 PeV. The ARA detector identifies the radio emissions from the excess charge in a particle shower induced by a neutrino interaction. Such a radio emission was first predicted by Askaryan in 1962 and experimentally confirmed by Saltzberg et al. using the SLAC accelerator in 2000. We also performed a similar experiment using 40 MeV electron beams of the Telescope Array Electron Light Source to verify our understanding of the Askaryan emission and the detector responses used in the ARA experiment. Clear coherent polarized radio signals were observed with an ice target. The coherences, the polarizations and the angular distributions of the radio signals were measured to characterize them. We also performed a detailed simulation to understand the radio emissions. We found that the observed radio signals are consistent with simulation, meaning that our understanding of the radio emissions and the detector responses are within the systematic uncertainties of the ARACalTA experiment. The final results of the experiment will be presented in the conference.

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