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Experimental calibration of the ARA radio neutrino telescope with an electron beam in ice

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Askaryan Radio Array (ARA) is being built at the South Pole aiming for observing high energy cosmogenic neutrinos above 10 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. In the ARAcalTA experiment, we irradiated an ice target with 40 MeV electron beams using the Telescope Array Electron Light Source located in an radio quiet open-air environment to verify our understanding of the Askaryan emission and the detector responses used in the ARA experiment. Observed signals include two kind of backgrounds: transition radiations from the boundary between air and ice, and radio emissions from the sudden beam appearance. We measure coherences, polarizations and angular distributions of the radio signals to quantify each components in the observed signals. The recorded waveforms are then compared with simulation which includes all the calibration information obtained in a laboratory to verify the detector responses. The first observational results from ARAcalTA will be presented in the conference

Collaboration

ARA

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