Contribution ID: **1135** Type: **Talk**

Prospects for neutrino-flavor physics with in-ice radio detectors

Tuesday 20 July 2021 13:18 (12 minutes)

The detection of the radio emission following a neutrino interaction in ice is a promising technique to obtain significant sensitivities to neutrinos with energies above 10 PeV. The detectable radio emission stems from particle showers in the ice. So far, detector simulations have considered only the radio emission from the primary interaction of the neutrino. We present how the simulation code NuRadioMC was extended to cover secondary interactions from muons and taus. Muons and taus, created by an interaction of the corresponding neutrino, can create several additional detectable showers during their propagation through the ice, which adds up to 25% to the effective volume of neutrino detectors. It provides a signature for the neutrino flavor and improves event reconstruction if multiple of these showers are detected. We simulated the signatures of secondary interactions for the RNO-G detector in Greenland and the proposed radio detector of IceCube-Gen2. We also find that the background of atmospheric muons from cosmic rays is non-negligible for in-ice arrays and that an air shower veto should be considered helpful for radio detectors.

Keywords

UHE neutrino;radio,Askaryan;NuRadioMC;flavor id;muon background;

Collaboration

other Collaboration

Subcategory

Theoretical Results

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Session Classification: Discussion

Track Classification: Scientific Field: NU | Neutrinos & Muons