Contribution ID: **1037** Type: **Poster**

# Capabilities of the ARIANNA Neutrino Pointing Resolution, with Implications for Future Ultra-high Energy Neutrino Astronomy

*Wednesday 14 July 2021 13:18 (12 minutes)*

We describe a radio-frequency polarization measurement by the ARIANNA surface station using a residual hole from the South Pole Ice Core (SPICEcore) Project. Radio pulses were emitted from a transmitter located down to 1.7 km below the snow surface. After deconvolving the raw signals for the detector response and attenuation from propagation through the ice, the signal pulses show no significant distortion and agree with a reference measurement of the emitter made in an anechoic chamber. The direction to transmitted radio pulse was measured with an angular resolution of 0.37 degree [statistical error]. For polarization, the statistical error of the polarization vector is depth dependent and below 1 degree. In addition, a slow systematic error as a function of depth is 2.7 degrees. Neither the direction or polarization measurement show a significant offset as a function of depth relative to expectation.

We also report the on the results of a simulation study of the ARIANNA neutrino direction and energy resolution. The software tool NuRadioMC was used to reconstruct the polarization and viewing angle to determine the neutrino direction. Multiple models of Askaryan radiation and detector sites along with a range of neutrino energies were tested. The neutrino space angle resolution was determined to be below 3 degrees, which is comparable to the systematic polarization uncertainty. Therefore it is expected that the polarization resolution, which is the dominant contribution to the neutrino space angle resolution, will be improved in future studies by determining and eliminating systematic effects. Finally, the fractional neutrino energy resolution is reported at 0.25, which is below the inelasticity limit.

## Keywords

Askaryan; UHE neutrinos; ice radio detection, polarization, angular resolution

## Collaboration

other (fill field below)

## other Collaboration

ARIANNA

## Subcategory

Experimental Results

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**Session Classification:** Discussion

**Track Classification:** Scientific Field: NU | Neutrinos & Muons