Performance of the ARIANNA Hexagonal Array

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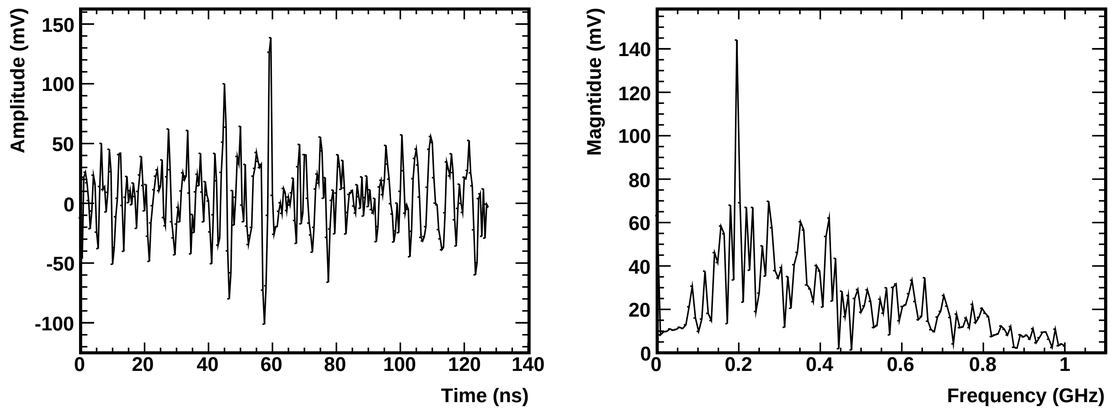
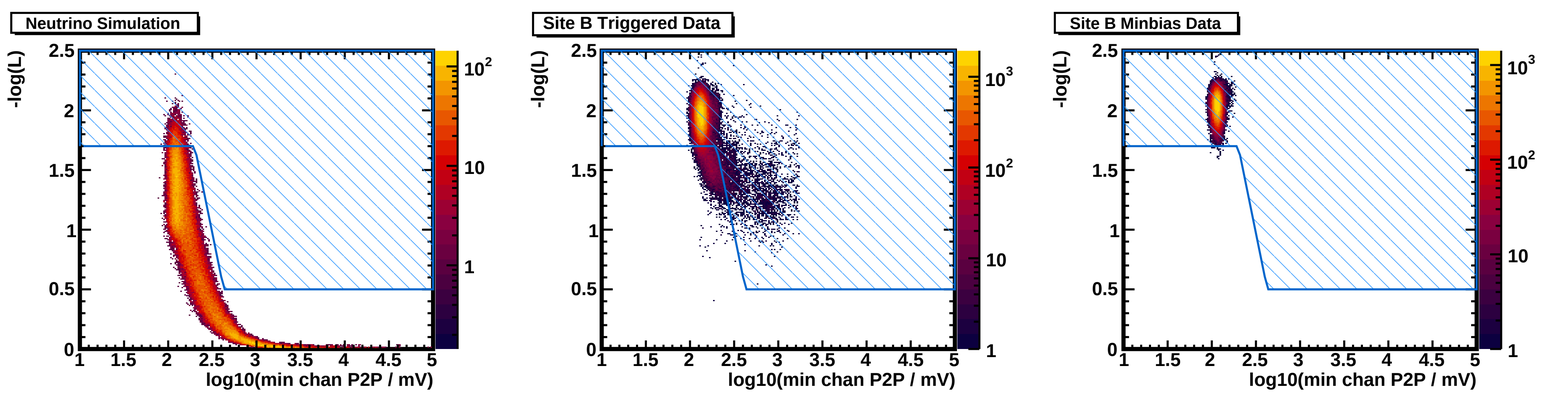
Neutrino Search

The 2014-2015 data will improve upon the current diffuse neutrino flux limit from the HRA. [1] Data from Site B has been analyzed in a search for neutrino-like signals.

Radio noise from detector electronics may be dominated by a single frequency, and are removed from the data set.

Example (right) from 2015-03-13 at 16:46:19 UTC.





A radio pulse direction is determined for each event using a planar wavefront.

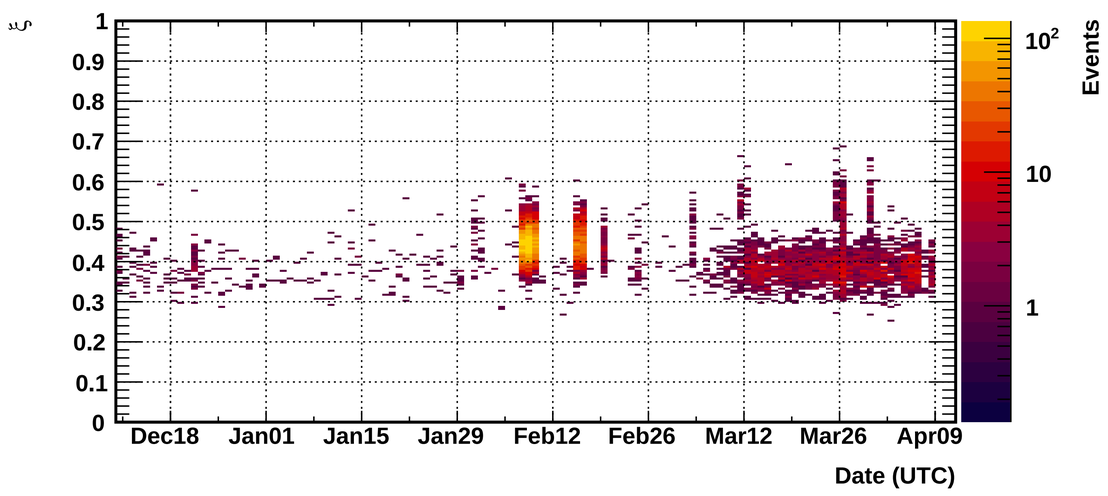
Events with a poor fit likelihood are rejected as thermal noise (the vast majority of the data).

For larger amplitude signals, a stronger fit is required. Only events outside the blue shaded region (left) survive.

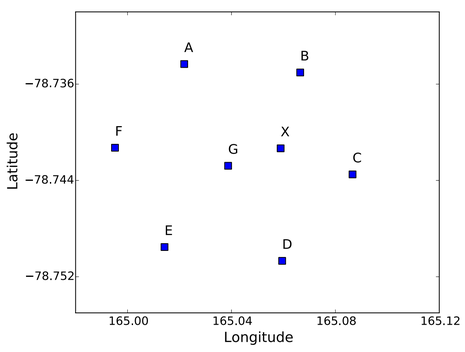
Events that do not contain a neutrino-like waveform in at least one antenna are rejected as non-thermal background.

Most non-thermal background data is recorded during storms with high winds.

No neutrino candidate events are found in data taken at Site B. Of simulated neutrino signals that trigger the station, 85.4% survive all cuts.



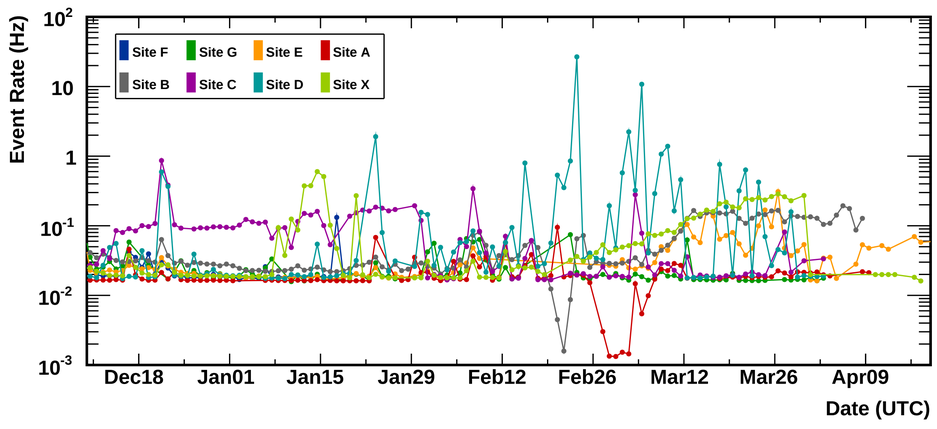
2014-2015 Season



Installation of the array on the Ross Ice Shelf is complete.

Each station records RF data from about 50MHz to 1GHz.

Galactic and solar radio emission has been observed. [2]

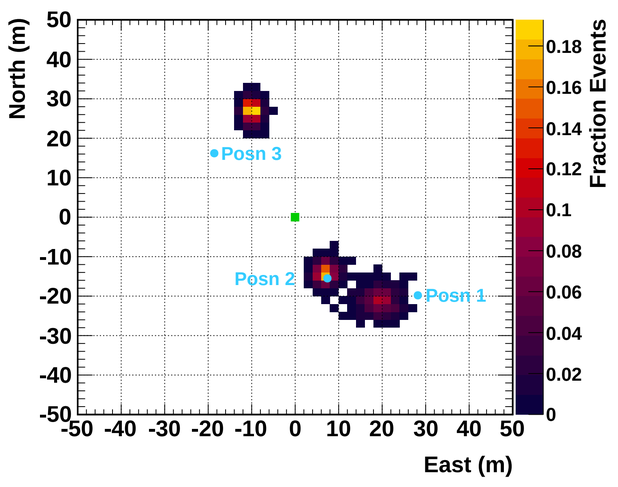


Stations took data with low rates until the loss of solar power. The typical trigger: a 4σ bipolar pulse on 2 of 4 antennas.

Rate variations are mainly due to the cooling of station electronics and are always well below data acquisition limits.

Successful tests of data transfer over satellite communications were conducted on two stations (using reduced data rates).

Signal Direction



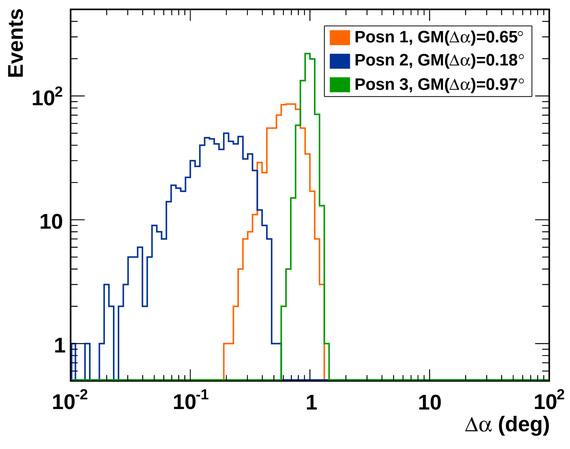
Radio pulse direction determined from time correlation between parallel antennas.

Calibration pulses transmitted downward from ice surface. Pulses reflect off the sea surface underneath the ice.

"Posn 1-3" mark the pulse emission locations on the ice surface at Site G.

Better than 1 degree resolution observed for pulse direction.

Neutrino direction resolution currently under study.



[1] S.W. Barwick et al., Astro. Part. Phys. 70 (2015) 12-26
[2] A. Nelles and C. Persichilli for the ARIANNA Collaboration, PoS(ICRC2015) 1087. See poster on board 274.