The IceCube Detector

IceCube is a high-energy neutrino observatory currently under construction at the geographic South Pole. The full detector will be composed of 86 strings of 60 Digital Optical Modules (DOMs) each, deployed between 1500 and 2500m below the glacier surface. A six string Deep Core detector with higher quantum efficiency photomultipliers and closer DOM spacing in the lower detector will enhance sensitivity to low energy neutrinos. Muons passing through the detector emit Cherenkov light allowing reconstruction with <1° angular resolution in the full detector.

Point Source Search with the 40 String Configuration Detector

The discovery of a source of high-energy astrophysical neutrinos would be evidence of hadronic acceleration, and give insight on the origins of cosmic rays. To this end we have unbinned six months of 40-string data (July to December 2008) unblinded. The event selection has been pushed to a high-energy sample in the southern hemisphere, where the background for astrophysical neutrinos is from down-going atmospheric muons, as opposed to the north where the background is from atmospheric neutrinos. We find a spot with equal or greater significance than the most significant spot on this skymap in 61% of trials with scrambled right ascension.

We also tested a list of 39 a priori sources including the hottest spot from the IceCube 22-string all-sky analysis, we also found that 82% of scrambled trials have a source with higher significance than the most significant source in data.

The livetime of the final 40-string configuration data sample of IceCube will be approximately 390 days.

Time-Dependent Point Source Search with Fermi LAT Lightcurves

We are interested in using a multi-messenger approach to search for neutrino sources. Fermi data are interesting for IceCube because neutrino and gamma emissions can be correlated. If protons interact on matter or environmental features, air showers can produce atmospheric neutrinos. Muons passing through the detector emit Cherenkov light allowing reconstruction with <1° angular resolution in the full detector.

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References