

The IceCube Neutrino Observatory: Detector Status and Designs for the Future

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The IceCube Neutrino Observatory is a cubic-kilometer-scale neutrino detector and cosmic ray air shower array at the geographic South Pole. The detector consists of over 5400 digital optical modules (DOMs), with 98.5% of modules still taking data. High detector uptime and a real-time Iridium satellite link have helped to facilitate recent astrophysical neutrino discoveries. Prototype air shower detectors have recently been installed, exploring the enhancement of the IceTop surface array with scintillators, radio antennas, and air Cherenkov telescopes. Furthermore, electronics and mechanical designs are well underway for the next stage of the experiment, the IceCube Upgrade, consisting of seven new detector strings at the core of the current array. Several improvements are planned for the Upgrade, including DOMs with larger photocathode area and segmented sensors; improved timing and communications protocols; in-DOM waveform feature extraction; and new precision calibration devices. We will present the status of detector development for the Upgrade as well as plans for a next-generation neutrino facility at the South Pole, IceCube-Gen2.

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