

The Acoustic Module for the IceCube Upgrade

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The IceCube Neutrino Observatory will be upgraded with more than 700 additional optical sensor modules and new calibration devices. Improved calibration will enhance IceCube's physics capabilities both at low and high neutrino energies. An important ingredient for good angular resolution of the observatory is precise calibration of the positions of optical sensors. Ten acoustic modules, which are capable of receiving and transmitting acoustic signals, will be attached to the strings. These signals can additionally be detected by compact acoustic sensors inside some of the optical sensor modules. With this system we aim for calibration of the detectors' geometry with a precision better than 10 cm by means of trilateration of the arrival times of acoustic signals. This new method will allow for an improved and complementary geometry calibration with respect to previously used methods based on optical flashers and drill logging data. The longer attenuation length of sound compared to light makes the acoustic module a promising candidate for IceCube-Gen2, which may have optical sensors on strings with twice the current spacing. We present an overview of the technical design and tests of the system as well as analytical methods for determining the propagation times of the acoustic signals.

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Collaboration

IceCube

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