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A dual-PMT optical module (D-Egg) for IceCube-Gen2

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The next upgrade of IceCube Neutrino observatory (IceCube-Gen2) enhances the detection capability of neutrinos with a few hundred TeV energies or greater by the increased instrumented volume in the glacier ice. Enhancement of the optical sensor performance in detecting ultra-violet photons can be a key factor for IceCube-Gen2 to achieve a higher sensitivity as more Cherenkov lights are expected in the short wavelengths. We have developed an optical module housing two 8" photo-multiplies (PMTs) in an UV transparent oval shaped glass. The two high-QE PMTs are installed in a way facing both up and down so that the resultant angular acceptance is more uniform. This uniformity of optical acceptance further improves the downward-going event detection and background veto efficiency compared to the current IceCube optical sensors. In addition, the improvements on UV transmittance of the housing glass and the inner gel lead to an improvement of the photon detection efficiency by a factor of four at wavelengths shorter than 340 nm.

Here, the initial performance of the first prototype module of D-EGG is reported. We also present simulation studies of the IceCube-Gen2 performance with the new dual-PMT modules.

Collaboration

IceCube

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342

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