

Executive Summary

Performance studies for a next-generation optical sensor for IceCube-Gen2

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About this contribution

- We are developing new optical sensors (# of installation will be $O(10,000)$) for IceCube-Gen2.
- To meet requirements, the Long Optical Module (LOM), made of an elongated pressure vessel and 16 or 18 four inch PMTs, is now being considered.
- This contribution introduces the measurement of photo-collection capability of a UV-transparent silicone structure, called a *gel pad*, used in the LOM. In addition, we show the resultant improvement of effective area with respect to the optical module of IceCube-Gen1.

What is interesting?

- To enlarge the effective photo-sensitive area of optical modules, we plan to use a gel pad scheme, where UV-transparent optical silicone, casted as a conical shape, is used for photo coupling.
- This unique structure enlarges the effective area of the LOM, but complicates the assembly procedure. To evaluate the validity of this scheme, we measured photon collection capability by experiment.

What we have done and what the result was.

- By injecting a parallel beam to PMT with and without a gel pad, we compared the obtained number of photoelectrons. We could confirm the improvement was 68%, which is consistent with 75% estimated by Geant4-based optical photon simulation.
- By implementing the tentative geometry of the LOM in Geant4 simulation, we evaluated the effective area of new optical modules. The effective area of the LOM will be more than three times higher than that of Gen-1 optical modules.