

# Performance of the D-Egg optical sensor for the IceCube-Upgrade

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New optical sensors called the “D-Egg” have been developed for cost-effective instrumentation for the IceCube Upgrade. With two 8-inch high QE photomultipliers, they offer increased effective photocathode area while retaining as much of the successful IceCube Digital Optical Module (DOM) design as possible. Mass production of D-Eggs has started in 2020. By the end of 2021, there will be 310 D-Eggs produced with 288 deployed in the IceCube Upgrade. The D-Egg readout system uses advanced technologies in electronics and computing power. Each of the two PMT signals is digitized using ultra-low-power 14-bit ADCs with a sampling frequency of 250-MSPS, enabling seamless and lossless event recording from single-photon signals to signals exceeding 200pe within 10ns, as well as flexible event triggering. In this paper, we report the single photon detection performance as well as the multiple photon recording capability of D-Eggs from the mass production line which have been evaluated with the built-in DAQ system.

## Keywords

Optical sensor; photodetection, neutrino

## Collaboration

IceCube

## other Collaboration

## Subcategory

Experimental Methods & Instrumentation

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