

Design of a Robust Fiber Optic Communications System for Future IceCube Detectors

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In this work we discuss ongoing development of a hybrid fiber optic/electrical data and timing infrastructure for the future IceCube Gen2 detector. The IceCube Neutrino Observatory is a kilometer-scale detector operating with 86 strings of modules. These modules communicate and transfer time stamps utilizing a custom protocol to mitigate the challenges of multi-kilometer cables such as signal attenuation, crosstalk and power delivery. Moving past the limitations of a copper-based backbone will enable larger future IceCube detectors with sub-nanosecond timing and approximately six times IceCube's current per-sensor throughput to accommodate innovative future modules. To this end, the upcoming IceCube Upgrade offers an opportunity to deploy a pathfinder for the new fiber optic infrastructure, called the Fiber Test System. This design draws on experience from AMANDA and IceCube and incorporates recently matured technologies such as ruggedized fibers and White Rabbit timing to deliver robust and high-performance data and timing transfer.

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Collaboration

IceCube

other Collaboration

Subcategory

Experimental Methods & Instrumentation

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