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A GHz-Bandwidth Readout and Trigger System for the Eos Hybrid Neutrino Detector

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Eos is a hybrid neutrino detector constructed to demonstrate reconstruction techniques that leverage both Cherenkov and scintillation light. Eos is currently filled with 4-tons of water-based liquid scintillator, and employs 200 fast 8" PMTs (R14688-100) with transit time spreads of 1 ns (FWHM) and risetimes of 2.2 ns, as well as 12 spectral sorting dichroicon PMTs to isolate Cherenkov light. To preserve the integrity of these fast signals, a custom GHz bandwidth readout and trigger system was designed: 17 custom front end boards provide high voltage to PMTs and discriminate their signals; 3 custom analog summing boards provide further discrimination; and a custom trigger board with an FPGA performs synchronous trigger logic. This talk will provide an in depth overview of the Eos readout and trigger system, which was primarily designed at the University of Pennsylvania and modeled after SNO+. An example michel electron trigger used in Eos will also be discussed.

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