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# The Theia physics program and the Eos demonstrator

*Thursday, October 2, 2025 5:30 PM (25 minutes)*

Theia is a proposed large-scale neutrino detector with a novel liquid scintillator target and fast, spectrally-sensitive photon detectors, leveraging both the direction resolution of the Cherenkov signal and the remarkable energy resolution and low detection threshold of a scintillator detector. The Theia physics program spans low-energy neutrino physics, such as solar, geo, supernova burst, diffuse supernova, and a high-sensitivity search for neutrinoless double-beta decay that could reach into the normal hierarchy. Theia has recently received Gateway-0 approval at SNOLAB. Measurements of $\delta_{CP}$ and the neutrino mass hierarchy using high-energy neutrinos from the LBNF neutrino beam are also possible if located at SURF. Several technology demonstrators are evaluating the performance of relevant state-of-the-art technologies. In particular, the 20-tonne Eos detector based at Berkeley uses new 8"Hamamatsu 14688-100 PMTs, which have been measured to have a 450-ps transit-time spread, coupled with 12 dichroic light concentrators for photon spectral sorting. Data acquisition with a range of radioactive and picosecond-precision optical sources has been completed with a 4-tonne fiducial water target. Water-based scintillator is currently deployed for the second time. Eos will continue characterizing technologies at Berkeley, before a possible move to a neutrino source, which would enable a number of technical demonstrations, such as the ability to differentiate CC from ES interactions, as well as a physics program in cross section measurements and BSM searches.

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