

EOS: a demonstrator of hybrid optical neutrino detector technology

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Hybrid neutrino detectors utilize both Cherenkov and scintillation light, combining the lower energy threshold of pure scintillators with the enhanced direction resolution of water. These detectors offer improved performance capabilities for fundamental physics goals as well as applications such as nuclear nonproliferation. Benchtop-scale experiments have shown success in Cherenkov/scintillation separation. A tons-scale test is needed to extrapolate the performance to future large hybrid detectors like Theia, with a fiducial volume of tens of kT. Eos is a 20-ton detector with an approximately 4-ton fiducial volume under construction at UC Berkeley and Lawrence Berkeley National Laboratory. Featuring fast photomultiplier tubes (900 ps transit time spread), a novel water-based liquid scintillator (WbLS) target, and a first large-scale test of spectral sorting, Eos will be a test-bed for emerging technologies. Eos will deploy calibration sources to verify the optical models of WbLS and other liquid scintillators with slow light emission, and to support development of advanced techniques for reconstructing event energy, position, and direction in hybrid detectors. This will prove vital when extrapolating to the kT-scale. After achieving these goals, Eos can be moved near a nuclear reactor or into a particle test-beam to demonstrate neutrino event reconstruction or detailed event characterization with these novel detection technologies.

Poster prize

No

Given name

Leon

Surname

Pickard

First affiliation

UC Berkeley

Second affiliation

Institutional email

leonjamespickard@berkeley.edu

Gender

Male

Collaboration (if any)

Eos

Primary authors: PICKARD, Leon (UC Berkeley); KAPTANOGLU, Tanner (UC Berkeley)

Presenter: PICKARD, Leon (UC Berkeley)

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