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The Dichroicon: Spectral Photon Sorting For Large-Scale Cherenkov and Scintillation Detectors

Large-scale monolithic water and scintillator neutrino detectors have, for decades, successfully used photons to detect neutrino interactions. Liquid scintillator detectors, due to their high light yields, have far better energy and position resolutions than achievable in a water Cherenkov detector. The most notable advantage of a water Cherenkov detector is the excellent direction reconstruction, which is not possible with isotropic scintillation light. Ideally, one would like to design a detector with both the advantages of the scintillation light as well as direction reconstruction. Future large-scale scintillation experiments like THEIA plan to detect both Cherenkov and scintillation light as a way of providing a very broad range of physics with a single detector. I will present a novel approach for discriminating Cherenkov from scintillation light, by building a Winston cone from dichroic filters. With this 'dichroicon'we expect to be able to sort photons by their wavelength and achieve scintillation and Cherenkov separation in a liquid scintillator or WbLS based detector. Bench-top results demonstrating this new technology will be presented.

Primary author: KAPTANOGLU, Tanner (University of Pennsylvania)

Presenter: KAPTANOGLU, Tanner (University of Pennsylvania)