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Cherenkov Separation in Slow Scintillators

Separation of Cherenkov and scintillation signal for electron events extending below 1MeV is demonstrated on a bench top scale. This is achieved using highly efficient slow fluors, with linear alkylbenzene (LAB) as the primary solvent, to create liquid scintillator solutions with rise times of several ns or more and decay times of tens of ns. Such mixtures show a clear timing separation between the Cherenkov and scintillation signal, allowing directional information to be extracted from the event while maintaining a high light yield. This could have significant consequences for the development of large-scale liquid scintillation detectors, potentially providing good directional information about elastic scattering neutrino events down to low energies. Such information could be particularly useful in the removal of backgrounds from studies of solar neutrinos, neutrinoless double beta decay, supernovae neutrinos and reactor anti-neutrinos, amongst others.

Mini-abstract

Directional Cherenkov information extracted from sub-MeV electrons in slow liquid scintillator.

Experiment/Collaboration

SNO+

Primary author: Ms PATON, Josephine (University of Oxford)

Presenter: Ms PATON, Josephine (University of Oxford)

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