

LiquidO: Exploring the properties of opaque liquid scintillators

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Liquid scintillation has been a standard means of particle detection for decades; typically, through the use of a transparent medium containing molecules which transfer the kinetic energy of incoming particles into photon emissions through deexcitation, allowing the energy of the particle to be measured. An example of these liquids is the solvent LAB and the fluor PPO, as used in SNO+.

The question explored here is: what if one were to take this scintillating mixture, and add some PRS, a surfactant, along with a few droplets of water in order to make it opaque –from faintly milky to very cloudy? What are the light collection properties of such liquids that would have an application in the new LiquidO detection technique? Throughout the summer this is what I have explored.

Many samples were made by adding various concentrations of PRS to the standard of LAB and PPO, along with different amounts of water droplets. These samples were then exposed to a Cesium-137 source in thin layers of scintillator, as well as thicker layers, while being attached to a PMT in a dark box in order to capture the light. Maestro was then used to compare the various sample's ability to capture the light.

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