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Improved measurements of the absolute wavelength shifting efficiency of Tetraphenyl Butadiene

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A key enabling technology for many liquid noble gas (LNG) detectors is the use of the common wavelength shifting medium Tetraphenyl Butadiene (TPB). TPB thin films are used to shift ultraviolet scintillation light into the visible spectrum for detection and event reconstruction. The effective wavelength shifting efficiency and emission spectrum of TPB have been previously measured down to 120 nm. Improved precision in this measurement would allow a better understanding of LNG detectors, resulting in improved sensitivity; measurements to lower wavelengths, closer to 80nm, would allow construction of LNG scintillator detectors with lighter elements (Ne, He) to target light mass WIMPs.

This work focuses on developing a microphysical optical model of TPB in order to extract out the true quantum efficiency. The current status and preliminary results of the absolute wavelength shifting efficiency measurements in the range of 45 to 250 nm will be presented.

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