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NEST: The Noble Element Simulation Technique

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A comprehensive model for explaining the scintillation and electroluminescence yields, and pulse shapes, in liquid and gaseous noble elements will be presented which informs an exhaustive simulation code called NEST (Noble Element Simulation Technique). All available liquid xenon data on electron and nuclear recoils have been incorporated, and significant progress has been made on extending NEST's applicability to argon. Results will be shown from Geant4 implementations for 1- and 2-phase xenon and argon detectors. The quasi-empirical NEST approach can lead to a better understanding of detector calibrations and performance verification and aid in the design and optimization of future detectors for dark matter, neutrinos, or other applications, and assist in the data analysis stage of present detectors.

Summary

NEST is a both a powerful collection of models, and simulation computer code which implements said models. It has strong postdictive power, explaining XENON10 and ZEPLIN results, and has demonstrated incredible predictive power for more recent experiments like LUX and XENON100. It is already used or is under consideration by numerous dark matter experiments (LUX, XENON, PANDA-X, DEAP/CLEAN, DarkSide) and is being considered for LBNE.

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