Nearfield Antineutrino Detector Optimization

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Abstract

Near field anti-neutrino detection is an emerging technology capable of monitoring reactor contents. The success of the Precision Oscillation and Spectrum Experiment (PROSPECT) and similar projects has led to a demand for in-field testing of the technology. The Mobile Antineutrino Demonstrator (MAD) group was formed to design a portable nearfield above ground antineutrino detection system. The preliminary MAD model was successfully simulated in the GEANT4-based toolkit Scint-G4. The need for mechanical realization led us to explore design choices based on electron/positron energy response, cosmic ray rejection, and IBD efficiency. Simulated results are currently being processed with the Data Analysis Framework Toolkit (DAFT), which is a modular framework for defining analyses of particle-detector-style time-ordered event data (or simulation). This work is running in parallel with data processing of the fully realized ROADSTR mobile antineutrino detector, which similarly uses Li-6-loaded plastic scintillators. ROADSTR will allow for a baseline comparison of simulated data and true detection events to create a higher-fidelity MAD model. In Figure 1, a demonstration of the MAD model is shown.

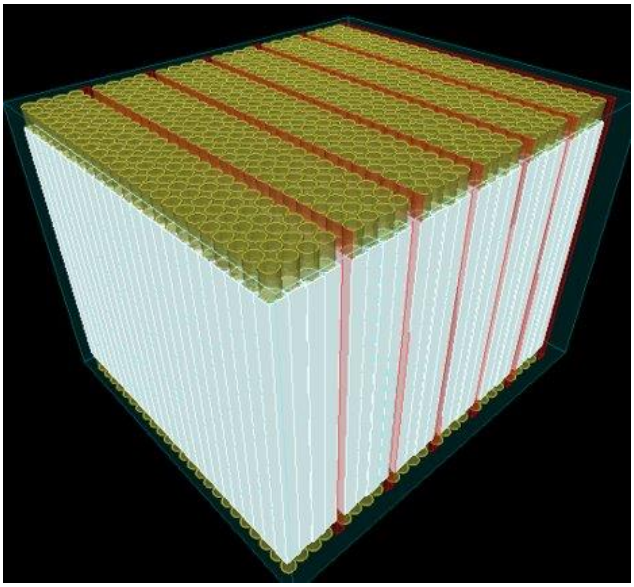

Figure 1: 24X24 Scintillators with Mechanical Features for the MAD Detection System