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Safeguards Technology Development Program 1st Quarter FY 2018 Report

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Disclaimer

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WBS # – Project Title: 24.1.3.1 – Neutron Rodeo II

Lab – POC: LLNL – Dan Decman

Principal Investigator: Manoj K. Prasad

Summary Statement of Work: LLNL will evaluate the performance of a stilbene-based scintillation detector array for IAEA neutron multiplicity counting (NMC) applications. This effort will combine newly developed modeling methodologies and recently acquired high-efficiency stilbene detector units to quantitatively compare the prototype system performance with the conventional He-3 counters and liquid scintillator alternatives.

Major Highlights: Completed modeling of 32 fuel assemblies enclosed in a prototype neutron collar design using 30 Inrad stilbene detector cells (4" diameter x 2" depth). Completed construction of foam frame to house 10 existing Inrad stilbene detector cells and thereby implement one of the three panels in the prototype neutron collar design.

Progress

Task 1 – Modeling

LLNL prototype neutron collar design from the Neutron Rodeo I project of 2016 was modified to incorporate 30 Inrad stilbene detector cells (4" diameter x 2" depth). The 32 fuel assemblies agreed upon to study were modeled and simulated to generate list mode data using LLNL's MCNPX2.7e code. The list mode data was postprocessed using the Hansen-Richter stilbene quench function, an electron equivalent energy PSD threshold of 60 keVee, and corrected for neutron crosstalk between detector cells using LLNL developed modeling tools. The results of this analysis include singles and doubles rates that can be used to generate traditional calibration curves used by the IAEA.

Task 2 – Experiment

A foam frame was constructed, using a water jet cutting, to house 10 existing Inrad stilbene cells at LLNL. This implements one of the three panels of the prototype neutron collar design which will be used for making measurements on available SNM sources using a Struck data acquisition system used at LLNL and then compared with modeling.

Publications:

Issues: