Introduction and Motivation

- Emergency responders, inspectors and warfighters require a low-power, compact, light-weight, inexpensive and durable imager to be able to successfully locate sources of radiation
- To do this, we propose a system composed of stilbene bars coupled to silicon photomultipliers (SiPMs) to produce a dual-particle imager

Mission Relevance

One of the missions of the NNSA is to reduce the threat to national security posed by nuclear weapons proliferation or the illicit trafficking of nuclear materials. This proposed detector system would give those charged with the defense of our country a compact imager that has been shown to be capable of detecting and imaging special nuclear material (SNM).

Prototype

Imaging Techniques:
- Simple Back-Projection (SBP)
- List-Mode Maximum Likelihood Expectation Maximization (LM-MLEM)

Neutron Imaging

\[ \theta_{\text{FWHM}} = 9.5^\circ, \theta_{\text{FWHM}} = 20.3^\circ \]

\[ \varphi_{\text{FWHM}} = -2.6^\circ, \varphi_{\text{FWHM}} = 20.3^\circ \]

\[ \theta_{\text{FWHM}} = -0.9^\circ, \theta_{\text{FWHM}} = 9.5^\circ \]

\[ \varphi_{\text{FWHM}} = -2.6^\circ, \varphi_{\text{FWHM}} = 20.3^\circ \]

Gamma Imaging

\[ E = E_{\text{ToF}} + E_1 + \alpha \cos^2(\theta) - \frac{E_{\text{ToF}}}{g} \]

\[ E = E_{\text{ToF}} + E_1 + \alpha \cos^2(\theta) - \frac{E_{\text{ToF}}}{g} \]

Conclusion

This work demonstrates the functionality of the H2DPI as well as the necessity to be able to image both gamma-rays and neutrons for locating and identifying special nuclear material.