New NMIS Capabilities

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NEW NMIS CAPABILITIES

- 10 input channels
- Pulse width analyses
- Multiple inputs per channel

10 INPUT CHANNELS

- The system can acquire data on 2 processor boards at the same time.
- Each board has its own clock (accurate to <30 ppm), which causes their times to drift apart during acquisition. Also, the boards' start of acquisition differs by +- 16 ns.
- Software corrects for these effects during acquisition, which allows cross-correlations between signals on different boards.

Pulse Width Analyses

- Previously NMIS measured the time that a pulse crossed a threshold while increasing in magnitude.
- Firmware has been modified to also measure the time that a pulse crosses the threshold while decreasing.
- This allows pulses to be sorted by width.
- Pulse height analyses is possible since height is related to width.

Multiple Inputs per Data Channel

- Imaging requires more data channels.
- All DT source pulses from a multi-pixel detector can be input to a single data channel and sorted by giving each pixel a unique pulse width.
- Imaging measurements will be performed with 4 alpha detector pixels (1, 3, 5, 7) into channel 1 on board 1, and 4 more detectors (2, 4, 6, 8) into channel 1 of board 2.
- "Light" sharing can result in 15 effective pixels for an 8-pixel alpha detector.
- Three transmission detectors can be input to a single data channel for far-subcritical fissile metal assemblies by assigning them unique pulse widths and different time delays.
- These imaging measurements will use 23 radiation detectors, 3 per input channel, with one shared.

Comparison of Monte Carlo Simulation Techniques for Photon Interrogation of Highly Enriched Uranium

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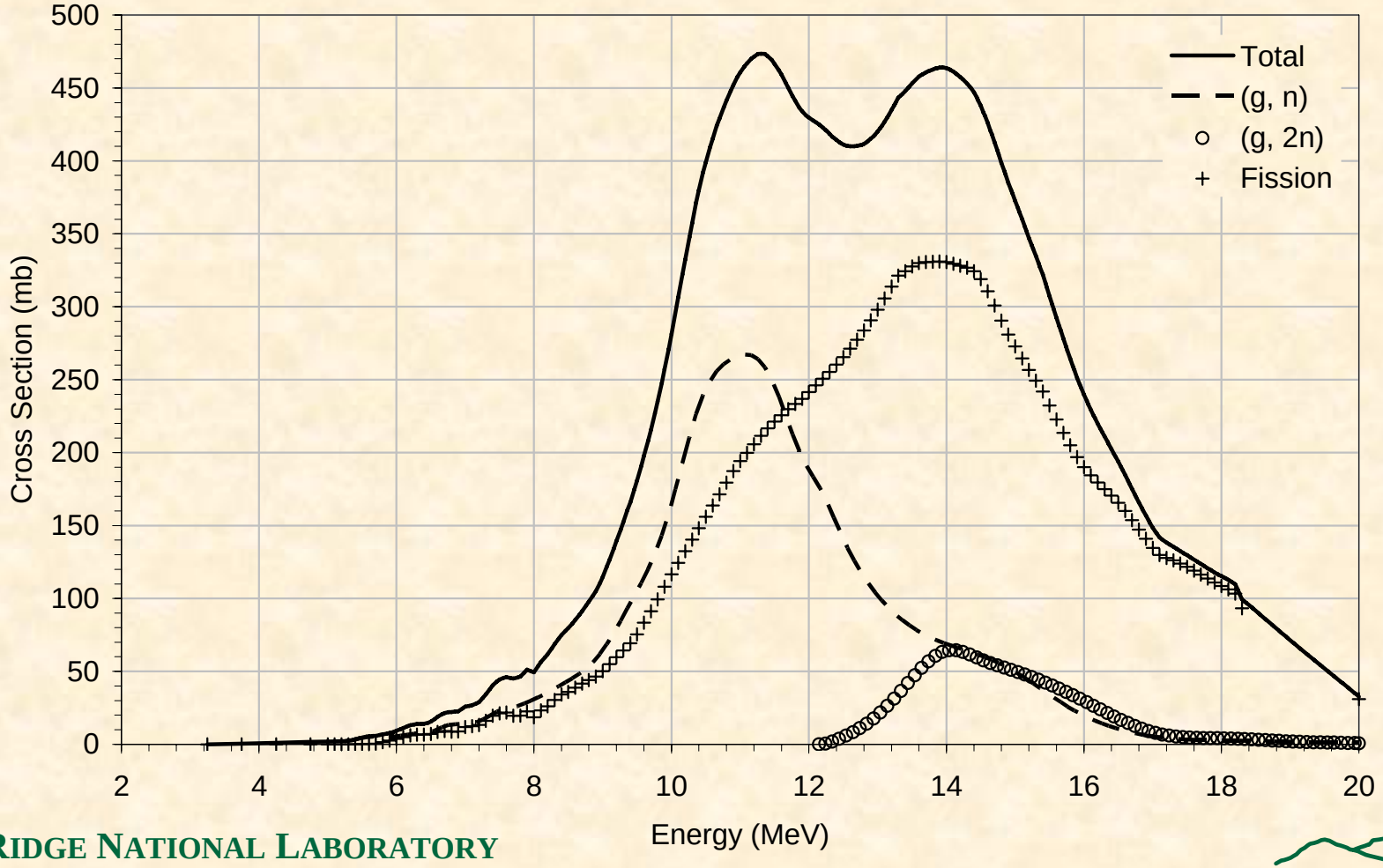
Objective

- Verify the correlation measurement simulations performed by VNIIEF
- Simulated system consists of a highly enriched uranium (HEU) target interrogated with Bremsstrahlung photons at various energies
- Multiple shielding configurations also explored
  - Layered combinations of lead and borated polyethylene at varying thicknesses

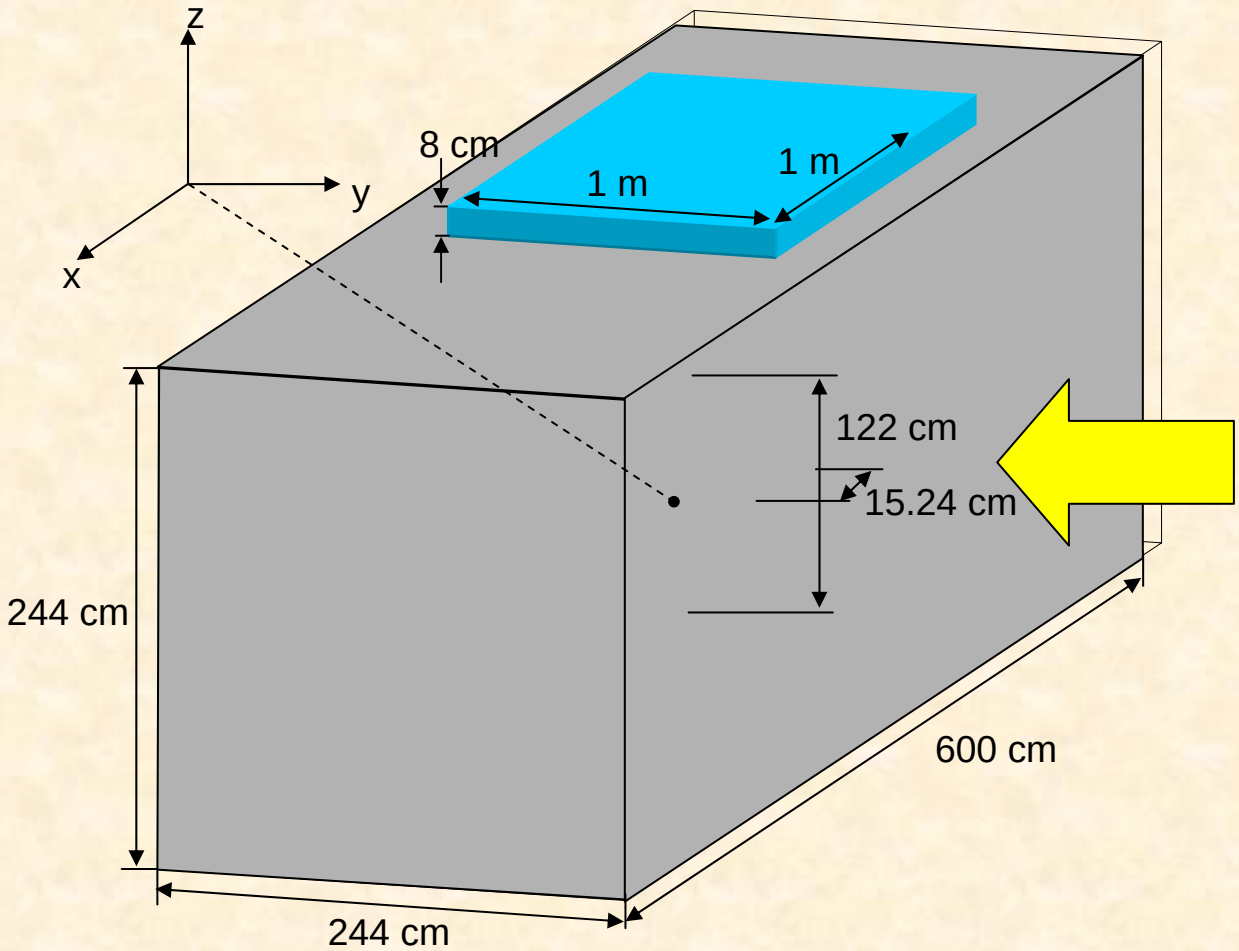
Background: VNIIEF Simulation Method

- The VNIIEF simulations utilized MCNP-PoliMi version 1.0 and involved a number of photonuclear physics assumptions
  - A homogenized fission source was assumed throughout the target volume given a fission rate from MCNPX
  - The delayed neutron source was also homogenized and assumed to be Maxwellian at a temperature of 0.4 MeV

Background:
U-235 Photonuclear Cross Sections



MCNP-PoliMi Model System Geometry



Source:
conical distribution with a 5° half-angle placed at y = 472 cm