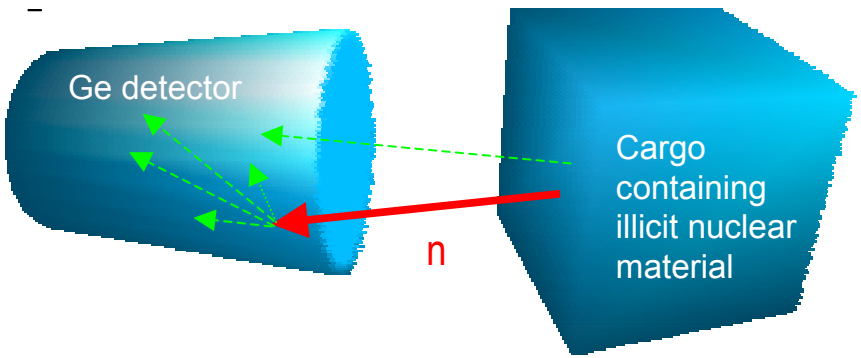
Gamma production data for Ge detector simulations

CSEWG-USNDP Meeting: Nuclear Data for Homeland Security, Nov 6, 2003

Unclassified

Detection of characteristic gamma-rays



Technical Principle

Radioactive materials emit characteristic gamma-rays that provide a 'finger-print' for identification of the material. Ge and GE(LI) detectors are best suited for the purpose because of their superior energy resolution. Recently portable Ge detectors have been developed.

Problem: Neutrons emitted from the nuclear material may interact with Ge to produce an avalanche of gamma-rays that will obscure gamma-rays of interest.

Objective

Develop monitoring system for scanning large cargoes in order to identify presence of illicit nuclear material through detection of characteristic gamma-rays. Extensive Monte Carlo calculations using evaluated nuclear data need to be performed to simulate detector response.

Problem: Evaluated **data for production of gammas** in the interaction of neutrons with Ge are not available and **need to be provided**. Such data are crucial for reliable Monte Carlo simulation.

Status

Preliminary evaluation for n+74Ge (including gamma-production spectra) has been prepared using EMPIRE-2.18.

Test MCNP calculations at LANL provided feedback regarding exclusive neutron spectra.

New algorithm for determination of the exclusive spectra has been developed for EMPIRE-2.19.

Complete evaluations for ^{70,72,73,74,76}Ge will be prepared with the 2.19 version of the EMPIRE code.

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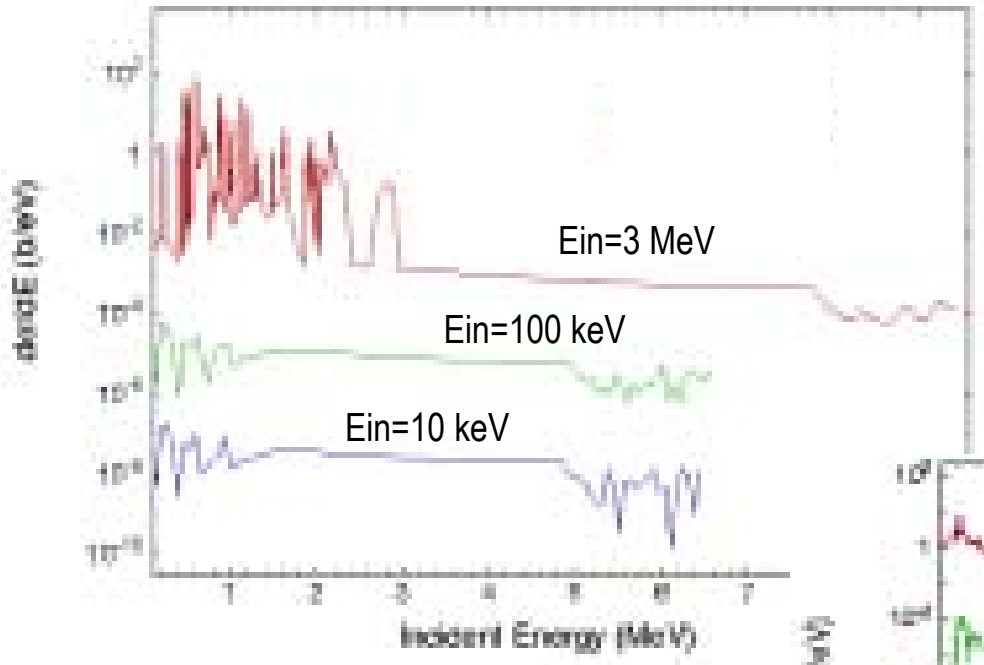
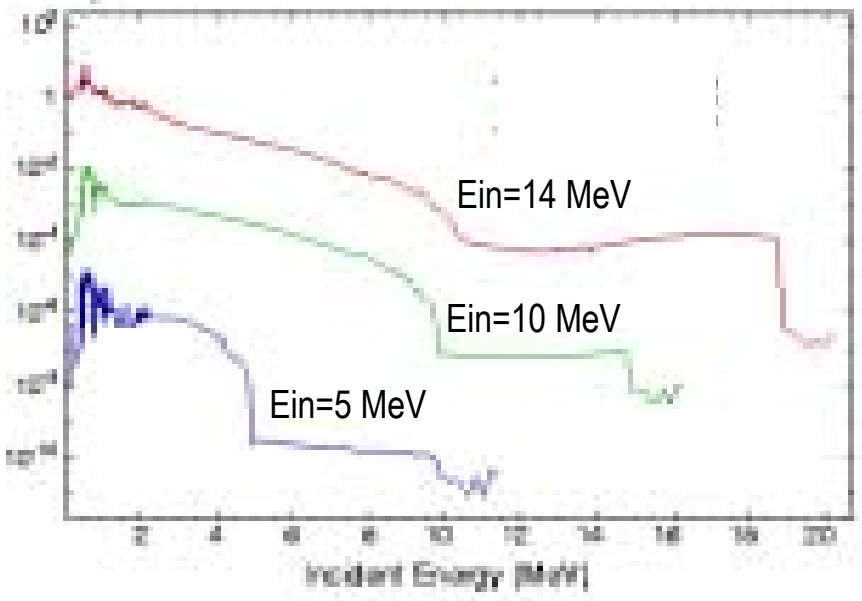


n + ^{74}Ge
gamma production spectra
calculated with EMPIRE-2.18



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