

ABSTRACT

HAND-HELD RADIO-ISOTOPE DETECTION AND IDENTIFICATION INSTRUMENT

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An instrument combining an array of Cadmium-Zinc-Telluride (CZT) detectors, a NaI scintillator, and two ^3He neutron detectors has been constructed. The instrument uses the CZT array to identify radioactive materials. As an example of this application, the 3σ Minimum Detectable Activity for the 375 keV peak of ^{239}Pu is less than 1 gram at a distance of 20 cm for a 100-second counting time. The 2 x 2 NaI scintillator has a dual purpose. First, it is used to supplement the CZT array for identification of high-energy gammas, such as those from ^{60}Co . Second, the principle use of the NaI scintillator is to help search for radioactive material and to find a suitable measurement location on a suspect package for the CZT-based isotope-identification measurement. This detector also produces energy-corrected exposure-rate data. The ^3He neutron detectors provide an additional conformation of the presence of some plutonium isotopes. The neutron sensitivity is 90 counts per second at 20 cm from a moderated ^{252}Cf neutron source.

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