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**Nuclear Materials Identification System (NMIS)
With Gamma Spectrometry for Attributes of Pu,
HEU, and Detection of HE and Chemical Agents**

**Y-12
National
Security
Complex**

**J. T. Mihalcz
J. K. Mattingly
J. A. Mullens
John S. Neal**

**Nuclear Materials Management and
Storage Program Office**

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NMIS PLUS GAMMA SPECTROSCOPY FOR ATTRIBUTES OF HEU, PU, AND HE DETECTION

J. T. Mihalczo, J. K. Mattingly, J. S. Neal, and J. A. Mullens

Oak Ridge National Laboratory

P. O .Box 2008

Oak Ridge, Tennessee 37831-6010

A combined Nuclear Materials Identification System (NMIS)-gamma ray spectrometry system can be used passively to obtain the following attributes of Pu: presence, fissile mass, 240/239 ratio, and metal vs. oxide. This system can also be used with a small, portable, DT neutron generator to measure the attributes of highly enriched uranium (HEU): presence, fissile mass, enrichment, metal vs. oxide; and detect the presence of high explosives (HE). For the passive system, time-dependent coincidence distributions can be used for the presence, fissile mass, metal vs. oxide for Pu, and gamma-ray spectrometry can be used for 239/240 ratio and presence. So presence can be confirmed by two methods. For the active system with a DT neutron generator, all four attributes for both Pu and HEU can be determined from various features of the time-dependent coincidence distribution measurements for both Pu and HEU. Active gamma ray spectrometry would also give presence and 240/239 ratio for Pu, enrichment for HEU, and metal vs. oxide for both. Active gamma ray spectrometry would determine the presence of HE . The various features of time-dependent coincidence distributions and gamma ray spectrometry that determine these attributes are discussed with some examples from previous determinations.