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#07-78 Characterization of a Special Nuclear Material fast identifier in respect to ANSI and IEC standards to be used for nuclear interdiction to detect the presence of threat items

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The increase of concerns in global nuclear security has led to the development of advanced systems for the measurement and identification of radioactive materials. Nowadays different radioisotope identification devices (RIIDs) are commercially available, aiming at deterring and combating the illicit trafficking of radioactive materials and their possible misuse in criminal acts, with catastrophic scenarios if used in public areas. For this reason, the most efficient and rapid instruments possible are highly required in homeland security applications in order to detect hidden radioactive materials and identify them, in case of alarm.
This paper describes the latest tests performed with Sniper-GN, a novel portable RIID. This instrument has been designed as a mobile backpack-based device for the detection and identification of both gamma and neutron sources, even multiple ones. Its singular feature is the capability to identify sources through the detection of neutrons, discriminating spontaneous fission sources (like 252Cf), gamma-n type sources (like AmBe and AmLi), and nuclear material containing plutonium or uranium, in different enrichment grade. The entire system is a rugged, battery-powered device, and it has been optimized to fit in a backpack, with a total weight smaller than 10 kg. It contains the detectors and all the electronics necessary for their operation and the consequent data processing.
The presence of only passive detection units considerably simplifies the system, if compared with the common methods of special nuclear materials investigation. Nevertheless, Sniper-GN has the capability of identifying neutron sources thanks to the novel specifically created algorithm, based on the simultaneous detection of fast neutrons and gamma rays coming from the target sources. Currently, this device is the only one in the market showing this unique feature. Several measurement campaigns have been carried out in different laboratories to test the device for the identification of nuclear material. In particular, plutonium and uranium sources as well as ^{252}Cf, Am-Be and Am-Li samples have been measured with 1 minute long identifications. Thanks to its novel algorithm, Sniper-GN has proved to outreach the requirements of international standards. In particular, plutonium samples have been identified up to 10 and 2.5 times the reference source-to-device distance, according to ANSI N42.34-2015, IEC62327:2017, and the more restrictive ANSI N42.43, respectively. Nuclear material has also been measured by applying different shielding materials (both lead shielding and neutron moderators) or gamma masking sources. With a novel patent-pending procedure, Sniper-GN is able to distinguish the different kinds of shielding scenarios surrounding the target source. It has succeeded when gamma spectroscopy has failed due to the presence of the shielding materials. For example, plutonium sources, shielded with 5 cm of lead and 5 cm of polyethylene, have been identified up to 5 times the reference distance for neutron sources (IEC62327:2017). Furthermore, Sniper-GN warns the user of the possible presence of gamma sources masking the nuclear material and provides prompt information regarding the enrichment grade of uranium or plutonium sources, with particular concern on weapon grade uranium and plutonium.

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