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New challenges in nuclear material detection

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ABSTRACT

Even before the attacks of September 11, 2001 the International Safeguards community recognized the magnitude of the threat posed by illicit trafficking of nuclear materials and the need for enhanced physical protection. For the first time, separate sessions on illicit trafficking and physical protection of nuclear materials were included in the IAEA Safeguards Symposium. In the aftermath of September 11, it is clear that the magnitude of the problem and the urgency with which it must be addressed will be a significant driver for advanced nuclear materials detection technologies for years to come. Trafficking in nuclear material and other radioactive sources is a global concern. According to the IAEA Illicit Trafficking Database Programme, there have been confirmed cases in more than 40 countries and the number of cases per year have nearly doubled since 1996.

The challenge of combating nuclear terrorism also brings with it many opportunities for the development of new tools and new approaches. In addition to the traditional gamma-ray imaging, spectrometry and neutron interrogation, there is a need for smaller, smarter, more energy-efficient sensors and sensor systems for detecting and tracking threats. These systems go by many names - correlated sensor networks, wide-area tracking systems, sensor or network fabrics - but the concept behind them is the same. Take a number of wireless sensors and tie them together with a communications network, develop a scheme for fusing the data and make the system easy to deploy. This paper will present a brief survey of nuclear materials detection capability, and discuss some advances in research and development that are particularly suited for illicit trafficking, detection of shielded highly enriched uranium, and border security.