

Session title: **Working together for the public: challenges for verification of nuclear activities**

When?

Friday, February 19, 2010: 8:30 AM – 10:00 AM

Where?

Room 1A (San Diego Convention Center)

How To Find the Needle in a Hay Stack: Tracing the History of a Nuclear Installation

Klaus Lützenkirchen , JRC Institute for Transuranium Elements, Karlsruhe, Germany

Environmental Sampling (ES) and subsequent analysis techniques are powerful tools to verify declared nuclear activities, as well as to assist in the detection of undeclared nuclear activities and facilities. ES is based on the collection of dust material by swiping surfaces in or around nuclear sites, e.g., facilities for the enrichment of uranium. This dust reflects the activities carried out at the site and may contain uranium particles with an isotopic composition characteristic for the process in the facility. Therefore, the isotopic composition of the particles can be considered to be a fingerprint of a nuclear plant or production process. Mass spectrometry and microscopy techniques will be described which are employed for the analysis of particles that may contain nuclear material. Apart from the isotopic composition other quantities such as the element distribution in a particle, its shape or chemical composition can be studied. The aim is to move towards nuclear forensics investigations on particles similar to the ones already carried out on bulk nuclear material.

Analytical Challenges in Detecting Undeclared Nuclear Activities

Ian D. Hutcheon , Lawrence Livermore National Laboratory, Livermore, CA

Fingerprints and forensic analysis have played critical roles in criminal law enforcement for more than 100 years. In the relatively new field of "nuclear forensics" – which focuses on determining the nature and origin of illicit nuclear materials – methods are required to characterize material properties with high sensitivity and accuracy. Just as with human fingerprinting, measurements of radio- and stable isotope abundances, trace element impurities, molecular form, "age" and physical parameters such as density and shape or grain size can be assembled to create a nuclear fingerprint or signature of a specific nuclear facility. In environmental samples these nuclear signatures provide a powerful approach to identify and categorize materials indicative of undeclared nuclear activities. Ensuring the accuracy of nuclear fingerprinting requires the development and application of sophisticated mass spectrometers, electron microscopes and radiation detectors capable of characterizing materials across samples of great diversity and size; environmental samples range over 13 orders of magnitude in mass, with U and Pu contents and Pu/U ratios varying by more than a factor of 108. The analytical challenges posed by environmental sampling for nuclear safeguards are substantial and are best addressed through expanded international cooperation in instrumentation and standardization.

The Role of the Nuclear Watchdog: A Responsibility for Monitoring Nuclear Safeguards

Diane Fischer , International Atomic Energy Agency, Vienna, Austria

Safeguards are a set of activities by which the International Atomic Energy Agency (IAEA) verifies a State is living up to its international undertakings not to use nuclear programs for nuclear weapons purposes. IAEA verification helps to provide assurance that nuclear material is not diverted or misused in order to assemble nuclear weapons and that no items required to be declared under safeguards are undeclared. The safeguards system comprises an extensive set of technical measures. Environmental Sampling (ES) is one of the most powerful verification techniques used by safeguards inspectors IAEA and the European Safeguards Office (ESO) for the detection of undeclared nuclear activities. Environmental samples are analyzed to detect (unavoidable) traces in the environment originating from technological activities. ES has been routinely applied for about 15 years and is recognised as a sensitive and reliable tool for the verification of the absence of undeclared nuclear activities. Effective IAEA safeguards remain the cornerstone of the world's nuclear non-proliferation regime aimed at stemming the spread of nuclear weapons and moving towards nuclear disarmament.