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## Advancements in Particle Analysis Procedures and their Application to the Characterization of Reference Materials for Safeguards

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Two approaches may be employed in the preparation of Reference Materials (RMs) for use in micro analytical techniques: placement of characterized micro artefacts in bulk materials and characterization of certain classes of individual particles in existing materials. In November 2013, a collaborative project was launched with the aim of adding information about such individual particles in existing RMs. The motivation behind this project was to investigate and characterize micro-artefacts present in certain commercially available RM, making them available and fit for use in safeguards and several other nuclear applications. The implementation and development of new techniques for particle characterization in bulk materials are also part of this project.

The strategy for that approach includes the following steps:

1. Sample preparation:

Dispersion of particles on stubs and planchets by an in-house shock-wave device.

2. Particle-of-Interest identification and characterization:

a. Fission Track (FT) route:

Mosaic imaging of detectors containing FT stars;

Applying automatic pattern recognition and localization of FT stars in detectors;

Using Laser Micro-Dissection (LMD) for retrieval of individual particles;

Preparation of sampled particles for SEM observation and other analytical techniques.

b. Alpha Track (AT) route:

Direct particle identification and localization using position sensitive detectors (instrumental auto-radiography).

c. The advanced SEM route:

Integration of analytical SEM techniques for characterization of individual particles of interest: EDS, mass spectrometry, FIB, micro-Raman.

Preliminary results of the ongoing efforts will be reported. Utilization of these hyphenated techniques and instruments represents an innovative approach to particle characterization for Safeguards applications.

### Country or International Organization

IAEA, Israel

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