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Development of a Portable Tomographic Gamma Scanning System for Safeguards Application

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Characterization and verification of Nuclear Material (NM) are important activities for nuclear material accounting and control. In order to characterize or verify NM many factors have to be measured or estimated. These factors may include some bulk properties like material distribution, homogeneity, geometry and volume. Such information might not be detectable using the traditional gamma ray spectroscopy. Also, in some cases the measured item could not be easy opened. Tomographic gamma scanning is an important technique that could be effectively employed to overcome such difficulties.
The objective of this work is to develop a Portable Tomographic Gamma Scanning System for safeguards applications (PTGSS). The system is designed and developed in such away it could be easily installed and operate in field. It is consisted of a NaI (7x7 cm) gamma ray spectroscopy. The measured sample is scanned in 3D and rotates via three motors controlled by a predesigned computer code to reconstruct 3D image.
The reconstruction software code was developed using Visual Basic. Also, the reconstruction has been done using Filtered Back Projection (FBP) and Algebraic Reconstruction Technique (ART). The reconstructed images were validated using MCNP. Many factors affecting the reconstructed image have been studied analyzed, including scanning time, used γ-ray energy and collimator diameter.

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