# Seminar

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# Institute for Plasma Research

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| **Title:** | Study of Three Different Problems Related to Nuclear Security |
| **Speaker:** | Dr. Akanchha<br>Indian Institute of Technology, Kanpur |
| **Date:** | 26th September 2025 (Friday) |
| **Time:** | 10:30 AM |
| **Venue:** | Seminar Hall, IPR |

## Abstract

Nuclear security is essential to protect nuclear materials and facilities from theft, sabotage, and misuse. This work advances the field through three interconnected studies focused on protection, detection, and identification of special nuclear materials (SNMs).

First, the effectiveness of Physical Protection Systems (PPS) in nuclear facilities is evaluated using the Estimation of Adversary Sequence Interruption (EASI) model. The probabilistic analysis provides a measure of the probability of interruption (PI) by an adversary, highlighting system vulnerabilities and opportunities for improvement.

Second, a cost-effective Radiation Portal Monitor (RPM) is developed to detect SNMs during cargo transit. The system employs sodium iodide (NaI(Tl)) detectors and an in-house developed multichannel analyzer for reliable identification of isotopes such as Uranium, Thorium, and Plutonium.

Finally, the study applies muon tomography for scanning shielded nuclear materials. A two-point scattering method combined with the Algebraic Reconstruction Technique (ART) enhances imaging resolution, offering advantages over conventional approaches.

By combining PPS evaluation, practical detection design, and advanced imaging methods, this research contributes to strengthening nuclear safeguards and reducing risks associated with unauthorized use of SNMs.