

Nuclear Security Capacity Building at the Centre for Applied Radiation Science and Technology (CARST)

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1. Background and Objectives

South Africa's New Nuclear Build Programme demands Human Resource and Infrastructure capacity building for training nuclear scientists in Nuclear Security and nuclear forensics research.

In this paper we give an overview of recent activities at the Centre for Applied Radiation Sciences and Technology (CARST) aimed at human and infrastructural capacity building to ensure Security of our acquired Eldorado 78 Co-60 Source. Secondly CARST is introducing a PhD Programme that will provide training of scientists in various fields including Nuclear Security and Nuclear Forensic as part of our Capacity building.

The latest progress, developments and weaknesses are highlighted.

2. Methodological Approach

2.1. PhD Programme for Capacity building in Nuclear Security

- Developing PhD Programme in Applied Radiation Science and Technology (ARST) for Faculty training in Nuclear Security.
- Developing teaching material for MSc- and Certificate- for training Postgraduates.
- CARST collaboration with IAEA on its Support for Nuclear Security Education Programme

2.2. The IAEA CN-218 Conference

1. Information exchange in Nuclear Forensics Capacity Building
 - 1.1. Awareness, training and exercises
 - 1.2. Research and development
 - 1.3. Education and development of expertise;As a sub-field of Nuclear Security, CARST seeks to be a Training Centre for the three bulleted sub-topics above.

3. Expected Results/Outcomes

3.1. Research and Training Project

- The Center will offer training to Faculty and research Students
- on crime scene inspection to determine any nuclear activity.
 - Sample collection and analysis in the Laboratory.
 - attribution of material to origin, analysis for isotopic signatures
 - **Currently two staff members are being trained under the Partnership for Nuclear Security (NPS) Project at CARST.**
 - Installation of Physical protection system of the Eldorado Co-60 source is at an early stage. See Fig 1 and Fig 2.

The following are the expected Project outcomes:

Short term:

- i. Faculty members trained under the faculty development Programme to offer the MSc and Certificate Curricula in Nuclear Security and PPS.
- ii. Launch of PhD training Programme to commence in January 2015.

Long Term:

Sustainable training to Postgraduate in nuclear security, nuclear forensics, and providing the exceptional skills needed by South Africa's nuclear industry.

Who will benefit:

- i. Three PhD's graduates specializing in nuclear security will be produced starting in January 2018. At least ten MSc students should be produced as from end of 2015.
- ii. Customs, Police and Emergency Response Officers in Government.

3.2. Weaknesses

Need access to samples from demo crime scene for forensics studies.

Need Registration as one of the Nuclear Forensics Laboratories in South Africa.

Experimental Equipment and Results

Available at CARST are on-site inspection equipment for alpha, beta and gamma radiation using the Inspector 1000 (Canberra), Environmental Monitoring of atmosphere on site using the Eco-Gamma monitor (Canberra) and the Alpha Guard. The HPGe Detector (Canberra), ICP-MS Quadruple from Perkin Elmer NexION 300q) isotope ratio mass spectrometry will be used for the categorization at the nuclear forensics laboratory, and GC-MS Spectrometry system. Expected results are shown in Fig 1 below.

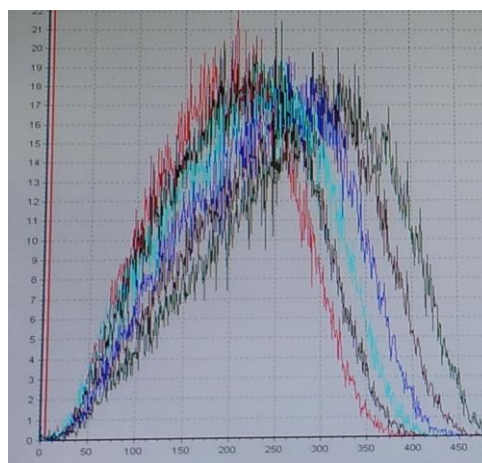


Fig. 1. Sample spectrum from LSC at CASRT facility



Fig. 2. Perkin Elmer LSC spectrum for possible nuclear forensics research and training

4. Conclusions and Acknowledgements

CARST is well equipped and has well-structured Programme for Capacity building (training of staff and Postgraduate students) in Nuclear security. It is capable of undertaking nuclear forensics analysis of crime scene samples.

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