



Contribution ID: 100

Type: Oral

## Australia's Experience in the ITWG Galaxy Serpent NNFL Table Top Exercise

*Wednesday, 9 July 2014 16:50 (20 minutes)*

Australian Nuclear Science and Technology Organisation (ANSTO) National Security Research Program staff participated in the International Technical Working Group on Nuclear Forensics (ITWG) Galaxy Serpent National Nuclear Forensics Library (NNFL) Table Top Exercise. We established a "Virgo Galaxy" NNFL using three isotopic datasets (named Anthea-PWR, Atlas-BWR and Enceladus-BWR), compared an unknown (Clio) with the NNFL (using Microsoft Excel and Multivariate Analysis) and determined that the Clio material was unlikely to have originated from our Galaxy. The exercise provided valuable lessons in the process of establishing an NNFL. In summary we found the following.

- An NNFL can be readily generated using common software (such as Microsoft Excel). (e.g. excel)
- If available, multivariate analysis (MVA) techniques can provide additional insight to Excel analysis.
- Use of common units (SI) would aid communication and conversations between stakeholders (e.g. between different professional groups such as nuclear engineers and the forensics community; and between trusted partner countries).
- In this study we were advised that the data set for each sample at a given time was the average smeared set of values for an entire reactor core. We compared these reference data sets with data sets for discrete pellets. In a real scenario, the data in an NNFL would be data from discrete pellets but would include positional and operational information. Consequently it may be more difficult to make definitive findings in the real world.
- The experimental results from this study showed that the "unknown" was unlikely to have come from any of the reactors included in the Virgo Galaxy NNFL.

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**Session Classification:** Technical Session 3G