ID: **O3.2-267**   Type: **Oral**

# of FRL08: metrological connection between simulation/experimental and utilization of AI tools for coincidence matrix analysis.

FRL08 operates a system for very low-level measurement of fission products, named Gamma3. In addition to classical gamma spectrometry, it can operate in coincidence mode by. The low probability of coincidence events is compensated by high signal-to-noise ratio and much lower detection limits, facilitating the qualitative and quantitative characterisations of samples with a large number of fission products. However, challenges arise when calculating coincidence efficiencies, which are necessary for quantifying activities and when analyzing of coincidence matrices, which are computationally intensive objects.

This work proposes an approach using Monte Carlo simulations to calculate detection efficiencies for coincidence measurements and construct a database for an artificial intelligence tool. To ensure the metrological connection between the experiment and the simulation, the digital models have first been validated for direct spectrometry using radioactive sources.

For the qualitative approach, AI tool is in development to analyze β/γ and γ/γ matrices. In terms of quantification, the coincidence detection efficiencies are retrieved from simulated spectra with the Region Of Interest (ROI) method and are applied to the experimental results. The hybrid approach and AI tool were tested on fresh fission product samples and provided results that are encouraging for further research in this direction.

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Session Classification: O3.2 Radionuclide Technologies and Applications

Track Classification: Theme 3. Monitoring and On-Site Inspection Technologies and Techniques: T3.2 Radionuclide Technologies and Applications