



International Conference on Radioactive Waste Management: Solutions for a  
Sustainable Future

1-5 November 2021, Vienna, Austria

Contribution ID: 114

Type: POSTER

## Non-destructive material characterization of radioactive waste packages with QUANTOM®

During the last decades, the nuclear and non-nuclear industry has produced a considerable amount of low (LLW) and intermediate level (ILW) radioactive waste. Though the waste form and streams might be different, such radioactive waste must be safely disposed in a final repository under the same strict waste acceptance requirements (e.g. the radiological and material characterization) defined by national licensing and supervisory authorities. Material characterization remains an indispensable criterion to prevent pollution of the ground water with toxic materials. Nowadays material description stays very challenging for waste producers, especially for legacy waste. It can be performed on the basis of existing documentation or, if the documentation is insufficient (e.g. legacy waste), on further destructive or non-destructive analysis. Destructive analysis is not favored as operating personal is exposed to radiation, the waste volume is increased, it is very time-consuming and generates high costs. Therefore non-destructive methods are to be preferred.

Here, we present an innovative non-destructive technology called QUANTOM® (QUantitative ANALysis of TOxic and non-toxic Materials) based on Prompt and Delayed Gamma Neutron Activation Analysis (P&DGNAA). This technology is able to identify, verify and quantify the amount of hazardous and non-hazardous substances in waste packages such as 200-l radioactive drums. The technology can also be applied for larger volumes. The first prototype of QUANTOM® is already in operation and the results of the validation phase will be presented for the first time.

The main benefits of QUANTOM® are summarized below:

- Non-destructive multi-element analysis with high sensitivity (ppm-range) of the entire matrix
- Fast measurement process (2h-4h per waste drum) with high measurement precision
- No repackaging and no increase of waste volume
- Reduction of costs (min. 50% per waste drum) compared to destructive analysis processes
- Minimizing the transportation of radioactive waste drums and radiation exposure of the operation staff.

The joint project QUANTOM is being funded by the German Federal Ministry of Education and Research under grant number 15S9406A / B / C. The responsibility for the content of this publication lies with the project partners.

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**Session Classification:** Solutions for Specific Wastes

**Track Classification:** 3. Solutions for Specific Wastes