



LIPS Session 13

Physics Committee, Dosimetry Committee

Wednesday, October 21, 08:00–09:30

Session Title

Understanding Your Measurements: Practical Guide to Uncertainty Quantification

Chairpersons

Anna Sarnelli (Meldola, Italy)

Andrew Fenwick (Teddington, United Kingdom)

Programme

- 08:00–08:20 **Ana Denis-Bacelar** (Teddington, United Kingdom): Measurement Traceability in Nuclear Medicine: What It Is, Why It Matters and When It Is Needed
- 08:20–08:45 **Sunay Rodriguez Perez** (Mol, Belgium): Accurate Activity Measurements with Radionuclide Calibrators and Gamma Counters
- 08:45–09:10 **Johan Ruben Gustafsson** (Lund, Sweden): Activity, Activity Concentration, and Absorbed Dose: Uncertainty in Image-Based Dosimetry
- 09:10–09:30 **James Scuffham** (Guildford, United Kingdom): Navigating Compliance and Clinical Implementation: The UK MPACE Accreditation Experience

Educational Objectives

1. To understand the principles of measurement traceability and uncertainty quantification, and to recognise their needs for reliable measurements in nuclear medicine.
2. To identify and quantify the main sources of uncertainty in measurements with radionuclide calibrators, gamma counters, and image-based activity and absorbed dose estimates.
3. To apply best practices for uncertainty reporting and compliance in clinical and research environments, including accreditation and regulatory frameworks such as MPACE.

Summary

Accurate and traceable measurements are fundamental to quantitative nuclear medicine, particularly in the context of emerging theranostic applications. However, measurement uncertainty is often poorly understood, underestimated, or inconsistently reported in clinical practice. This session provides a practical overview of uncertainty quantification across the nuclear medicine measurement chain.

The session begins with an introduction to measurement traceability, explaining its meaning, relevance, and limitations. It then addresses uncertainty sources in activity measurements using radionuclide calibrators and gamma counters, highlighting practical strategies to improve accuracy and comparability across centres.

Building on these foundations, the session explores how uncertainties propagate through image-based activity quantification and absorbed dose calculations, and how they can impact clinical interpretation and treatment planning. Finally, real-world experience from the UK MPACE accreditation programme illustrates how uncertainty management can be successfully implemented within clinical workflows while meeting regulatory and quality assurance requirements.



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Key Words

Measurement Uncertainty; Traceability; Activity Measurement; Image Quantification;
Image-Based Dosimetry; Quality Assurance; Accreditation