Contribution ID: **16** Type: **Oral contribution**

# Neutron dosimetry in particle therapy facilities: status of the LINrem project

*Wednesday 10 May 2023 09:55 (20 minutes)*

Neutrons are a highly penetrating type of radiation that can contribute significantly to the total absorbed dose in the human body. As a result, monitoring neutron dose rates is crucial in various facilities to minimize the risk of harm to workers, patients, and the public. Commercial portable neutron detectors, also known as ambient neutron dosimeters, are typically used for this purpose. However, there are concerns about the reliability of these detectors, particularly in modern facilities that produce radiation fields with high-energy contributions (E>20MeV) or complex time structures. This issue is especially relevant in medical facilities, such as proton therapy centers, where high-energy neutrons of up to 250 MeV are produced as secondary stray radiation. Furthermore, the International Commission on Radiation Units and Measurements (ICRU) recently recommended alternative definitions for operational quantities currently used for radiation protection, which will directly impact the expected performance of neutron dosimeters for energies lower than 100 eV and higher than 50 MeV. To address these concerns, the LINrem project was launched in 2018 to provide solutions that meet the new requirements for energy sensitivity and time resolution in neutron dosimetry. The project focuses on medical applications, as well as other types of facilities that require reliable neutron dosimetry. In this work, we review the technical challenges for active and time-resolved neutron dosimetry in particle therapy. We also present the status of the LINrem project and the latest experimental results in particle therapy facilities. Finally, we discuss the prospects for new development.

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**Session Classification:** M1: Applied Research