



ID de la contribución : 1053

Tipo : Talk

LINrem, LINpass, NESTA: Neutron Dosimetry and Spectrometry Solutions for Hadron Therapy and High-Energy Neutron Fields.

jueves, 20 de noviembre de 2025 9:30 (15)

Introduction:

Neutron dosimetry still faces major challenges, especially in high-energy radiation fields found in facilities like particle accelerators and hadron therapy centers, where neutrons are generated as secondary particles. The difficulty intensifies in pulsed radiation structures, typical of advanced treatments like FLASH therapy or pulsed neutron field generated by Synchro-Cyclotron machine. Another critical issue is the limited portability of many active neutron dosimetry devices currently used in radioactive environments. To overcome these shortcomings, the Spanish initiative, the LINrem Project, aims to develop innovative solutions for neutron area dosimetry and spectrometry, addressing the key limitations that currently affect this field.

Materials and methods:

The **LINrem Project** consists of two patented active dosimeters: the LINrem, with sensitivity up to 10 MeV, and LINremext dosimeter, designed for an extended range [1,2,3]. Their innovative design enables their use in very high dose environments, in both continuous and pulsed radiation fields.

The **LINpass** is the LINrem passive version based on the ThermoLuminescent Detectors (TLD) enriched with Li6 and 7. The LINpass can provide solutions for areas where ionizing radiation is too high and active instruments saturate, such as in pulsed beam/FLASH therapy. Furthermore, it can be used for radiation protection purposes.

In the LINrem family there is also present a neutron spectrometer called **NESTA**: a Nested Neutron Spectrometry Array. It is composed of 16 matrixes with a response from thermal neutron until 10GeV. The innovative concept involves different blocks that nest one inside the other, making the device easy to transport. All these instruments were tested in presence of high-energy neutron reference fields (CERF at CERN). As regards the LINrem active ambient neutron dosimeters were employed to measure secondary neutrons generated in hadron therapy facilities under near-clinical conditions, IBA Proteus Plus and IBA Proteus One.

Results and Conclusions:

The LINrem dosimeters showed reliable performance in validation tests at reference facilities (within 10% deviation) and excellent agreement with commercial devices, such as WENDI-II, in hadron therapy environments. We present a summary of the project milestones, showcasing the key findings from validation and intercomparison exercises conducted under challenging conditions (fast, high-energy and pulsed neutrons).

References:

- [1] Ariel Tarifeño-Saldivia et al. "Ambient dosimetry in pulsed neutron fields with LINrem detectors". Radiation Physics and Chemistry, 2024, 224:112101.
- [2] Ariel Tarifeño-Saldivia and Francisco Calviño Tavares, 2024. "Neutron Dosimeter". European Patent Office EP4097510A1, US Patent Office US-12123991-B2, Japanese Patent Office JP7601420B2.
- [3] Ariel Tarifeño-Saldivia et al. "Calibration methodology for proportional counters applied to yield measurements of a neutron burst". Rev. Sci. Instrum. 85 (2014) 013502.

Abstract

Primary author(s) : BRUSASCO, Benedetta (UPC - Universitat Politècnica de Catalunya)

Co-author(s) : TARIFEÑO-SALDIVIA, Ariel (Instituto de Fisica Corpuscular (CSIC-UV)); CALVINO, Francisco (Universitat Politecnica de Catalunya); CORTES ROSSELL, Guillem (Universitat Politecnica de Catalunya. Dep. Física i Enginyeria Nuclear); DUCH GUILLEN, M. Amor (Institut de Tècniques Energètiques (INTE)); PALLÀS SOLÍS, Max (Universitat Politècnica de Catalunya (UPC)); MONT I GELI, Nil (Universitat Politècnica de Catalunya); DE BLAS DEL HOYO, Alfredo (UPC - Universitat Politècnica de Catalunya); GARCIA SANCHEZ, Roger (UPC - Universitat Politècnica de Catalunya); GALLEGO DIAZ, Eduardo Florentino (UPM- Universidad Politècnica de Madrid); GARCÍA FERNÁNDEZ, Gonzalo (UPM- Universidad Politècnica de Madrid)

Presenter(s) : BRUSASCO, Benedetta (UPC - Universitat Politècnica de Catalunya)

Clasificación de la sesión : Transferencia de Tecnología

Clasificación de temáticas : Transferencia Tecnología