particles enabling localized therapeutic effect. Given the complex radiation field produced by the interactions of neutrons with biological tissues, Monte Carlo (MC) simulations have a central role in the research and development of BNCT procedures and facilities, including the one planned in Caserta for the University "Luigi Vanvitelli" within the ANTHEM project. An overview on MC applications devoted to BNCT will be presented, with focus on two major research lines investigated by our research group: a) radiobiology and b) patient dosimetry. Simulations for dosimetry of cellular samples irradiated with particles of BNCT interest, supporting experimental radiobiology experiments at the CIRCE Tandem facility, will be described. A new dosimetric workflow for patient dosimetry based on anthropomorphic voxelized computational phantoms will be also presented, detailing the synergistic links between a) and b) in BNCT.

Optimisation of a SiC detection 2-dimensional matrix system for UHDR beams for FLASH therapy.

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The application of ultra-high dose rate (UHDR) beams, with rates surpassing 40 Gy/s, has attracted attention because of the FLASH effect. However, conventional detectors exhibit limitations, including saturation and non-linearity when exposed to UHDR conditions. A promising solution comes from SiC (silicon carbide) detectors, which have been developed also by the STLab start-up in partnership with the Catania Division of the National Institute for Nuclear Physics and University of Palermo. The DALÌ project aims to characterize a radiation detection system based on a first and never realized prototype of SiC detectors arranged in a two-dimensional matrix, optimized for QA in FLASH radiotherapy. The detectors' response was evaluated under the FLASH-RT regime through Monte Carlo simulations and computational analyses. The achievements accomplished include simulating dose distribution, optimizing the arrangement of detectors to improve dose reconstruction through mathematical methods and reducing associated costs. This work was partially funded by the European Union - Next Generation EU through Projects Mission 4 Component 2 Inv. 1.5 CUP B83C22003930001.

Toward the use of silicon-carbide–based detector for protontherapy microdosimetry.

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This study investigates the application of a silicon carbide (SiC)-based microdosimeter for use in proton therapy, leveraging the material's high radiation hardness, low leakage current, and stable charge collection efficiency. A custom-designed SiC p-n junction diode with a 10 μm epitaxial layer was fabricated and electrically characterized. Microdosimetric spectra were acquired under proton irradiation at energies of 30, 70 and 150 MeV at different