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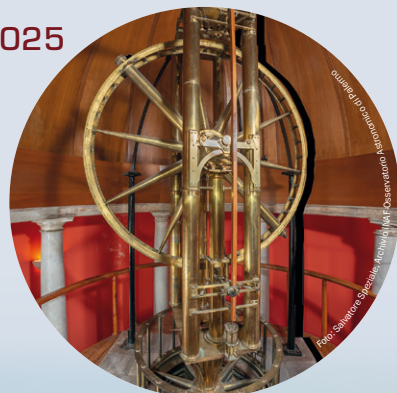
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Università  
degli Studi  
di Palermo



INTERNATIONAL YEAR OF  
Quantum Science  
and Technology



Polo Didattico del Campus dell'Università di Palermo



**A cura di Barbara Alzani, Marco Bellacosa e Giovanna Bianchi Bazzi**  
**Redazione dei testi a cura di Barbara Ancarani e Marco Bellacosa**  
**Progetto grafico a cura di Simona Oleandri**

**Società Italiana di Fisica**

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depths in water. The performance of the SiC detector was evaluated against established microdosimeters including a silicon-based MicroPlus probe and a single-crystal diamond device. Monte Carlo simulations were employed to assess the water-equivalent thickness of the SiC detector and to validate the measured spectra. Key microdosimetric quantities, such as frequency-mean and dose-mean lineal energy, were extracted to estimate the linear energy transfer (LET) and the relative biological effectiveness. The measured spectra revealed depth-dependent trends in agreement with expected LET variations and the microdosimetric parameters derived from SiC data were consistent with both reference detectors and simulations.

● **Microdosimetric spectra evaluation for proton minibeam radiotherapy through Monte Carlo Geant4 simulations.**

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*In vivo/vitro* experiments carried out using the proton minibeam radiotherapy technique show a potential advantage in sparing healthy tissue over conventional radiotherapy. Within the INFN MIRO (Minibeam RadiOtherapy) project, we investigated the beam-quality variation along the beam pattern to assess correlations between the physical dosimetric parameters characterizing the beam and the radiobiological outcome. The Geant4 advanced example exp-microdosimetry was used to run Monte Carlo simulations of dose distributions in a water phantom with various collimator designs. A silicon microdosimeter inside the phantom records energy deposition within the detector's active layer to study the variation in the peak and valley regions. This first study reveals distinct variations in the frequency-mean lineal energy across different positions within the beam profile, suggesting new radiobiological effects to investigate. The resulting estimates serve as a foundation for calculating the relative biological effectiveness used in radiobiological models. This work was partially funded by the European Union - Next Generation EU through Projects Mission 4 Component 2 Inv. 1.5 CUP B83C22003930001.

● **A GPU accelerated Monte Carlo tool for investigations on preclinical minibeam radiation therapy.**

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