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MCNP Calculation of Cherenkov Radiation for Dosimetry of Ultra-High Dose Rate FLASH Beams

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FLASH radiotherapy is an innovative treatment technique that delivers extremely high dose rates of radiation over a very short time, effectively destroying tumor cells while minimizing damage to healthy tissues. Cherenkov radiation, which is produced when high-speed electrons pass through a medium, could play a crucial role in dose distribution and real-time monitoring during FLASH radiotherapy. The objective of this study is to utilize MCNP (Monte Carlo N-Particle) calculations to model the generation and distribution of Cherenkov radiation and explore its potential application in real-time monitoring and dose assessment in FLASH radiotherapy. The MCNP calculation shows a strong correlation between the occurrence and distribution of Cherenkov radiation and the dose distribution in FLASH radiotherapy. These findings will suggest that Cherenkov radiation can be a valuable tool for real-time monitoring of the delivered dose, ensuring accurate and safe treatment. Furthermore, the study is anticipated to provide detailed guidelines for experimental validation and clinical implementation based on the simulation results. (This work was supported by the Dongnam Institute of Radiological & Medical Sciences (DIRAMS) grant funded by the Korea government (MSIT). (No. 50493-2024))

Paper submission Plan

Yes

Best Presentation

No

Contribution track

ICABU WG4. Applications of Particle Beams

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