

Verification Simulation Studies for FLASH therapy Ultra-High-Dose Rate (UHDR) Beams

lunedì 18 settembre 2023 17:45 (20 minuti)

The main results of the electron pulse and ultra-high-dose-rate (UHDR) parameter verification simulation studies are reported for the FLASH mode radiobiological treatment. There were reproduced the percentage depth dose (PDD) at energies: 5, 7, 15, 25, 50 and 100 MeV, to Poly-methyl-methacrylate (PMMA) and to water phantom vs the penetration depth. Additionally, the PDD transverse profile was simulated for the above energies and with various size applicators, delivering the beam to the phantom. Pencil mode beam size has been achieved with the optimum applicator geometry.

Simulations were, also, performed for various materials, PMMA, Al, Cu and Stainless Steel of the applicators, leading to the best material for the FLASH therapy. Beam distribution plots are presented vs the beam energy, the phantom material and applicator geometry.

The results show that the system can provide UHDR irradiation satisfying the FLASH requirements with very good performance in terms of the beam profile flatness for any size of the fields, depending, mainly, on the linear accelerator beam stability.

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Classifica Sessioni: WG5: Applications

Classificazione della track: WG5: Applications