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Minibeam Radiation Therapy (MBRT) is a radiotherapy technique based on the spatial modulation of the dose using a series of narrow beamlets and it is under investigation in several centers for preclinical research. A Monte Carlo GPU-based platform based on version 11.6 CUDA code for the dose evaluation in MBRT was realized and validated through a comparison with TOPAS code. We evaluated the dose maps and the Peak to Valley Dose Ratio (PVDR) of the transverse dose profile as a function of depth in the phantom. The dose distribution in a 2×2 cm^2 water cube was measured with or without the presence of a multi-slit collimator. Finally, a mouse phantom was used to study the dosimetry in the tumor and the surrounding healthy tissues. The two codes are comparable in terms of dose value and PVDR, with a maximum discrepancy of 1% in the case of a beam with 10^{11} primary photons with a time reduction of 10^2.

Commissioning of the carbon ion pencil beam algorithm in RayStation 2024A.

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This study presents the commissioning of the carbon ion pencil beam (cPB) dose calculation algorithm v7.0 in RayStation 2024A at MedAustron. Improvements over the previous version (v3.0) include the RaShi-Airgap model, Trichrome model, and nuclear interaction correction for enhanced dose accuracy. Commissioning covered 1D/2D calibration, spot profiles, and 3D dose delivery for various geometries and clinical plans. RBE-weighted dose was assessed using LEM-I and MKM models. Absolute dose at R80% showed good agreement across energies, with minor range underestimation (0.1 mm). Spot FWHM differences were within ±0.2 mm. Global dose differences ($\langle \Delta_G \rangle$) stayed within ±2% for targets and ±3% for clinical plans, with improved results for beams using RaShi. RBE comparisons between versions showed differences < 0.5 Gy for head and neck and < 1.0 Gy for other sites. The updated algorithm improves accuracy and was successfully implemented, enhancing treatment planning in particle therapy. This work was partially funded by the European Union - Next Generation EU through Projects Mission 4 Component 2 Inv. 1.5 CUP B83C22003930001.

Investigation of the temporal structure of conventional and UHDRE beams using a-Si:H detector, on behalf of Haspide and Pandora Collaboration.

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For real-time monitoring in FLASH radiotherapy, this research investigates the application of an innovative nip diode matrix, based on hydrogenated amorphous silicon (a-Si:H), for the temporal characterization of Ultra-High-Dose-Rate Electron (UHDRE) beams. The detector,