

Autore

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Titolo

Realization, characterization and perspectives of a UHDR/UHDP electron minibeam research platform

Relatori

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Riassunto

This thesis explores the potential of integrating mini-beam radiation therapy (MBRT) with ultra-high dose rate (UHDR) Flash irradiation, utilizing the advanced capabilities of the ElectronFlash accelerator at the Centro Pisano FLASH Radiotherapy (CPFR) in Pisa. Both techniques have demonstrated significant potential in sparing healthy tissues while maintaining tumor control. Mini-beam therapy employs spatially fractionated dose delivery, creating patterns of high and low radiation regions, whereas Flash therapy relies on ultra-rapid dose delivery, exploiting unique biological effects to minimize side effects. The combination of these modalities represents a promising strategy to enhance therapeutic outcomes while reducing collateral damage. By enabling independent variation of spatial and temporal parameters, this work provides a robust framework for future research into the synergistic mechanisms of these effects. Ultimately, it aims to inform the clinical translation of these cutting-edge techniques, advancing the development of safer, more effective radiotherapy protocols, including applications in emerging fields such as Very High Energy Electron (VHEE) therapy.