Toward an effective use of laser-driven Very High Energy Electrons for radiotherapy: Recent experiments and simulations at INO-CNR

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The use of Very High Energy Electrons (VHEE) for radiotherapy is deserving a growing attention, due to the potential to provide doses/dose rates of interest for the FLASH radiotherapy. In this scenario, laser-driven electron acceleration is regarded as one of the most promising routes for the development of compact and reliable devices with the required parameters for a medical use. We report on recent experiments and simulations aimed at assessing dose deposition for deep seated tumors with laser-driven VHEEs.

In particular, using VHEE pencil beams driven by the 200TW laser system operating at the INO-CNR laboratory in Pisa (Italy), we demonstrated the feasibility of advanced irradiation schemes typical of current radiotherapy modalities. Absolute dosimetry was carried out, using both experimental data and Monte Carlo simulations. The measurements showed control of localized dose deposition and modulation, suitable to target volumes at depths 5-10 cm with mm resolution. Monte Carlo simulations provided additional data for further experiments and perspectives.