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Toward effective applications of laser-driven VHEE in radiotherapy: dosimetry, multiple-field irradiation and intensity-modulated fields

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Laser WakeField Acceleration allows electron bunches with energy in the range of several tens to hundreds of MeV to be delivered by compact, table-top devices, thus holding the promise for a possible widespread deployment of such machines into medium scale clinical environments. This has spurred the study of the properties of the so-called very high energy electrons (VHEE) which could be beneficial in the field of radiotherapy, possibly paving the way to novel treatment protocols. In particular, numerical simulations have mostly been employed to study the dosimetric features of VHEE in advanced, complex irradiation geometries.
Here we present the results of a recent experimental campaign, carried out at the Intense Laser Irradiation Laboratory of the CNR-INO in Pisa, Italy, aimed at assessing the possible enhancement of the dose deposition pattern using a multiple-field irradiation with isocentric technique. The capability to get 2D intensity-modulated irradiation fields were also investigated, which would allow an even better dose deposition tailoring. Issues related to the electron bunch features and dosimetry will also be discussed. Results of both the experimental campaign and numerical (Monte Carlo) simulations will be presented.

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