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An beam line setup for flash radiation therapy with focused electron beams at the Pitz facility at DESY in Zeuthen: basic concept and dosimetry simulations

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The aim of this work is to demonstrate the principal possibility to enhance the electron beam dose deposition in the depth of the sample for radiation therapy purposes. Trains of electron bunches of 22 MeV generated at PITZ are focused inside the sample using a dedicated fast deflector and a solenoid magnet. To explore the capabilities of the proposed setup, dose distributions are calculated for multiple electron bunches focused in a single point inside a water phantom. Electron beam focusing produces dose peaks with a tunable maximal dose depth which is interesting for healthy tissue sparing at the surface and enhancing treatment quality. The duration of the full bunch train is 1 ms. During this time interval, the FLASH effect could be efficiently triggered inside the irradiated target volume. Monte Carlo simulations based on the FLUKA code were performed to evaluate the depth dose curves distributions in a water phantom. Using the PITZ electron beam parameters, simulations have shown the possibility to produce a peak dose in water seven times higher than compared to the dose at the surface. Moreover, the RMS size homogeneous area around the maximal dose is approximately 25 mm.

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Footnotes

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Yes

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