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PRAGUE (Proton Range Measurement Using Silicon Carbide): a detector to measure online the proton beam range with laser-driven proton beams

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Laser-driven proton beams are characterized by very high intensities per pulse with a very short duration, extremely high dose rates, and broad energy spectra. These specific features do not allow the use of the conventional dosimeters typically suggested by the international dosimetry protocols for conventional proton beams. Precise dosimetry for laser-accelerated protons is an ambitious task as well as a crucial prerequisite for successful radiobiological experiments. We will present the work done within the PRAGUE project funded by the H2020 in the framework of the MSCA-IF IV program and by the INFN. The main goal of PRAGUE was the design, simulation, realization, and characterization of a real-time depth-dose distribution detector system based on thin Silicon Carbide multilayers for conventional and laser-accelerated proton beams in the energy range between 30 MeV to 150 MeV. The detector developed was designed to work at the regime of extremely high dose rate beams and it allows the retrieval of real-time and shot-to-shot depth dose distributions with a high spatial resolution thanks to the development and use of a 10 μm, fully depleted 15x15 mm2 square SiC detector. A detector prototype was already realized, simulated, and tested with 30 and 70 MeV conventional proton beams. Potentially this newly developed detector could enable new detector technology capable of providing online information of dose delivered at a biological sample with a laser-driven proton beam.

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Footnotes

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