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## Establishing Laser Accelerated Proton Beam Performance for Dose Controlled Irradiation Studies and Beyond

*Tuesday, 20 September 2022 18:00 (20 minutes)*

Applications of laser plasma accelerated proton beams in cancer therapy were discussed almost since the first demonstration of compact plasma accelerators. In-vitro studies to investigate the radiobiology of these intense particle bunches were performed, in particular with respect to dose rate related phenomena. With the recently reported FLASH effect, observed to reduce radiation toxicity in normal tissue, the field has regained significant interest as provision of high single pulse dose rate is inherent to plasma accelerators. Yet, for the translation to in-vivo studies laser accelerated protons not only lacked sufficient energy to penetrate the required volume but often reproducibility to ensure the provision of a dose distribution in a prescribed way. This presentation focuses on developments at the Petawatt laser DRACO at HZDR that enabled dose controlled irradiation of tumors in mice. Details on acceleration mechanisms and strategies to increase stability and energy well beyond the 60 MeV range are discussed –and expanded to recent explorations of the near critical density regime –as well as beam transport by means of a dedicated pulsed solenoid beamline to a secondary target together with online metrology and dosimetry.

F. Kroll, et al., Nature Physics 18, 316 (2022)

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