



High dose-rate in-vivo irradiation with laser accelerated proton beams pilot study results and prerequisites

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Since the first demonstration of laser acceleration of intense proton bunches two decades ago applications of such compact laser accelerators in radiobiology and eventually radiation therapy have been discussed. Though such advanced accelerators are in principle well matched, so far insufficient reliability and control of beam parameters has prevented the further developing of this idea. The reliable generation of proton beams at energies exceeding 60 MeV [1] at repetition rate supporting laser parameters at the Dresden platform recently opened the door to systematic radiobiological studies of tumor response to the corresponding high dose rate irradiation (10^8 Gy/s) and individual pulse dose of up to 20 Gy, reviving the concept. Combined with pulsed magnet based energy selecting beam transport [2] and online dosimetry a first full scale in-vivo irradiation campaign was performed at the Draco laser at HZDR as a pilot study.

The talk will report on recent development of laser proton acceleration at DRACO PW in Dresden that enabled the pilot study as well as the details of this study itself.

[1] T. Ziegler, et al., Scientific Reports 10, 9118 (2020)

[2] F. Brack et al., Scientific Reports 11, 7338 (2021)