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Spectral and spatial shaping of a laser-accelerated proton beam for radiation biology applications

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Laser accelerated proton beams have an extremely high peak current and a total charge per shot in the order of nC. However, their wide divergence and continuous spectra make their application to target irradiation difficult. On the SAPHIR laser (LOA) we used a set of permanent magnet quadrupoles to focus the proton beam to a wide irradiation area for in vitro irradiation studies. Absolutely calibrated online dosimetry provides control on the stability of irradiation conditions. Our study represents a step forward in the practical use of laser-accelerated ion beams, and opens the way to the exploration of radiation biology at dose rates exceeding 10^8 Gy/s.

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