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Radiobiological studies with laser-driven protons at Bella PW[1]
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We established an experimental platform for the investigation of the radiobiological effects of laser-accelerated ions at the Bella PW laser. Stable few-MeV proton beams accelerated at peak laser intensities 2x10^{19} W cm^{-2} in the comparably large Bella PW laser focus exhibit reduced divergence at increased ion numbers and are hence ideally suited for subsequent capture and transport with an active plasma lens (APL). Combined with our high shot rate capability (0.2 Hz), thousands of shots at ultra-high dose rates (10^7 G/s), with a uniform dose distribution over a 1 cm diameter lateral area, could thus be delivered to biological cell samples, located in air, at 1.7 m distance from the laser-target interaction. The proton beamline was complemented by online (integrating current transformer and scintillator) and offline (radiochromic films) beam diagnostics for dosimetry. This assembly was used to investigate the differential sparing of healthy tissues versus the tumor response. This talk gives details on the proton beamline, dosimetry as well as cell irradiation results.

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