BLIN4: On-shot dosimetry setup for radiobiology studies on volumetric *in-vivo* samples with laser accelerated proton beams.

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Laser plasma-based accelerators promise to provide proton sources for radiobiological studies with extended possibilities compared to conventional accelerators due to short acceleration lengths, high pulse doses, high dose rates and the usage of compact magnets for beam guiding operated in pulsed mode. For the generation of radiobiological relevant proton energies, Petawatt (PW) class laser powers are required, which can be provided at the Helmholtz-Zentrum Dresden-Rossendorf (HZDR) by the DRACO laser system and the upcoming PENELOPE laser system. Both laser systems will be used to perform radiobiological *in-vivo* studies which require precise absolute dosimetry for three-dimensional depth-dose profiles on a millimeter scale. This presentation gives an overview of the dosimetry setup developed for radiobiological studies on volumetric samples consisting of a combination of several different detector types for on-shot dose measurement (ionization chambers, time-of-flight spectrometer), absolute calibration (radiochromic films) and spatial dose profile optimization (scintillators). Additionally, a recently developed detector system design based on scintillator emission tomography for the full reconstruction of an arbitrary proton depth dose profile generated by a single proton bunch will be presented. Details on the reconstruction of the 3D dose distribution inside the scintillator volume and the reverse calculation of the angularly resolved proton energy spectrum are discussed.

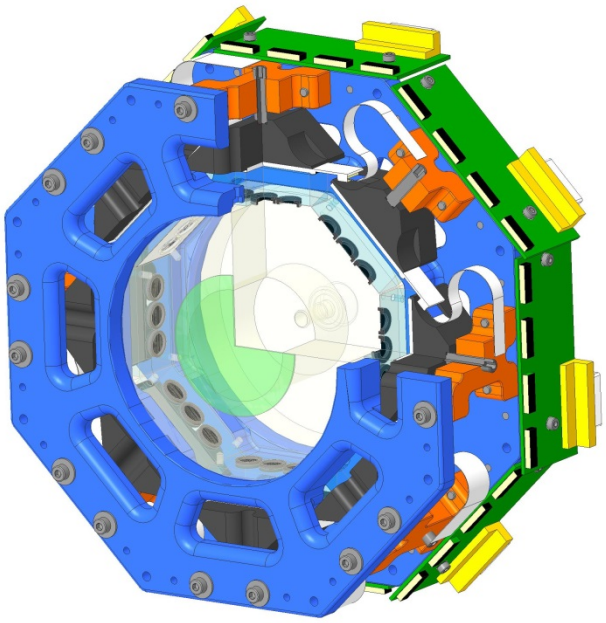

Figure 1: Design of the new online detector for angularly resolved reconstruction of proton energy spectra based on scintillator emission tomography.