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Proton FLASH Irradiation Setup for Preclinical Studies at HZB

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The HZB cyclotron continues to provide protons for eye tumor treatment in collaboration with the Charité – Universitätsmedizin Berlin after 24 years and more than 4400 patients so far. With the perspective of broadening its research capabilities in the field of radiation therapy, intensive effort has been dedicated towards proton FLASH irradiation, which requires ultra-high dose rates or beam intensities.

By combining a fast and reliable switch-off mechanism, accurate dosimetry, and a double-scattering beam nozzle with a static 3D-printed range modulator, HZB is now able to deliver a dose rate above 150 Gy/s within a flat circular irradiation field of 18 mm diameter and a 27 mm spread-out Bragg peak with a distal fall-off of 1 mm in water. The reproducibility of the delivered dose meets the clinical acceptance criteria for a total irradiation time as low as 2.5 ms.

The first experiments with this setup were used on fibroblastic and sarcoma organoids. By adapting the design to a 35 mm lateral field and using optimal accelerator tuning to increase beam transmission, similar or even higher dose rates are expected, satisfying thus the FLASH conditions for eye-tumor treatment with protons.

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Footnotes

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Yes

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