ST 7: Radiation Therapy

Time: Thursday 16:15–16:45 Location: KH 01.013

ST 7.1 Thu 16:15 KH 01.013

Investigation of the surface dose distribution of Ru-106 eye plaques using an innovative setup — •Johannes Wintz[1], Johannes Albrecht[2], and Dirk Flühs[1] — [1]Department of Radiotherapy, University Medicine Essen, Essen — [2]TU Dortmund University, Dortmund

Brachytherapy with ruthenium-106 applicators is an established method for treating eye tumours. Due to the manufacturing process, the surface dose distribution is not homogeneous and exhibits so-called hot and cold spots where the dose is higher or lower than at the centre of the eye plaque. According to the manufacturer's production specifications, relative dose deviations of up to ± 11% are permitted. For quality assurance, the dose profile is measured at 33 positions to ensure that this standard is met.
Within the project, measurements of the surface dose distribution are carried out using a bespoke measurement apparatus to determine the dose profile with higher resolution and analyse its influence on therapy. A new method using a plastic scintillator is employed, surrounded by air, which reduces the potential for Cherenkov radiation and thus provides more precise information about the activity on the eye plaque.
The structure of the new measurement system will be presented, along with initial results, which will be compared with the simulations and the manufacturer's specifications.

ST 7.2 Thu 16:30 KH 01.013

Tabletop setup for in-vitro cell irradiation with low energy electron bunches — •Julian Freier[1], Leon Brückner[1], Lukas Kuhlmann[2], Bastian Löhrl[1], Giulia Cramer[2], Christoph Bert[2], Luitpold Distel[2], and Peter Hommelhoff[1,3] — [1]Department Physik, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Erlangen, Germany — [2]Department of Radiation Oncology, Universitätsklinikum Erlangen, Erlangen, Germany — [3]Department Physik, Ludwig-Maximilians-Universität München (LMU), Munich, Germany

Low-energy electrons (LEE) in the keV range are expected to have a high relative biological effectiveness (RBE) and, due to their limited penetration depth, may enable highly localized cancer therapy [1]. This work presents an ultrafast pulsed electron source based on photoemission from arrays of gold needle tips [2], capable of delivering electron energies up to 50 keV. Human fibroblasts and tumor cell lines were irradiated with LEE and compared to X-ray exposure. DNA double-strand breaks, visualized through γH2AX staining, show a characteristic depth-dependent pattern under LEE irradiation. Colony formation assays are used to determine the RBE. The emerging results set the ground for further radiobiological assessments and for the development of future therapeutic strategies, particularly in combination with laser-accelerator-on-a-chip technology suitable for endoscopic applications [3]. Ref. [1] Tye, J., et al. R. Soc. Open Sci. 11.11 (2024): 240898. [2] Bruckner, Leon, et al. Nano Lett. 24.16 (2024): 5018-5023. [3] England, R. Joel, et al. Rev. Mod. Phys. 86.4 (2014): 1337-1389.