



Contribution ID: 1454 Contribution code: WEPG24

Type: **Poster Presentation**

Online diagnostics of electron beam irradiation with minimally invasive screens and beam charge monitors

Wednesday, 22 May 2024 16:00 (2 hours)

In 2019, the annual number of cancer cases exceeded 100 million, resulting in 10 million deaths worldwide. Radiation therapy stands out as one of the most effective methods for cancer treatment. Electron beams in the 100 MeV range can reach even deep-seated tumors without the need for surgical intervention. Thanks to novel, high-gradient acceleration technologies, clinical facilities for high-energy electron-based irradiation are actively under development. However, the online dosimetry of the delivered dose remains a challenge. In this work, we present a simple and effective solution. We demonstrate that thin YAG screens permanently integrated into the layout of the beamline can be used to characterize the transverse beam distribution shot-to-shot during irradiation. When combined with beam charge monitors, it allows for the prediction of the dose delivered to the target. We benchmark this method against the standard dosimetry technique based on the irradiation of radiochromic films calibrated with an ion chamber.

Footnotes

Funding Agency

Paper preparation format

LaTeX

Region represented

Europe

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Session Classification: Wednesday Poster Session

Track Classification: MC6: Beam Instrumentation, Controls, Feedback, and Operational Aspects:
MC6.T03 Beam Diagnostics and Instrumentation