



Contribution ID: 1574 Contribution code: THPM094

Type: **Poster Presentation**

Increased dose rate for a proton therapy eye treatment nozzle on a medical gantry system using a diamond degrader

Thursday, 11 May 2023 16:30 (2 hours)

The IBA ProteusOne (P1) system is suitable to treat ocular tumors and achieves efficient dose conformity using state-of-the-art pencil beam scanning. Nevertheless, with the limited cyclotron current of the P1 system, clinically relevant (> 15 Gy/min) dose rates can barely be achieved in eye tumors treatment cases with the baseline configuration of the system due to the significantly high energy degradation required (from 230 to 70 MeV). One way to improve this dose rate is to modify the degrader to use a material causing a smaller emittance increase. In this work, we compare the performances of the P1 system in the context of eye tumors treatment when using Beryllium degrader on the one hand and Diamond degrader on the other. For the latter case, the optics is modified to reduce the losses along the beamline and ultimately increase the dose rate of the system while maintaining a symmetrical spot at the isocenter. Using Beam Delivery SIMulation, the dosimetric properties of the system are assessed and compared for the two configurations, and the differences in dose rate are quantified and discussed in detail.

Funding Agency

Footnotes

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Yes

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Session Classification: Thursday Poster Session

Track Classification: MC8: Applications of Accelerators, Technology Transfer and Industrial Relations and Outreach: MC8.U01: Medical Applications