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Gas jet dosimeter measurements at DCF for medical accelerator applications

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Achieving non-invasive in-vivo dosimetry is a critical objective in the field of ion beam therapy. The comprehensive real-time characterization of the ion beam is highly desirable to ensure the safety of patients, treatment precision, and the efficiency of the treatment facility. However, current methods have limitations in terms of the information they provide and can be invasive to the beam.

This contribution focuses on the development of a non-invasive, gas jet-based in-vivo dosimeter for use in treatment facilities. This technique relies on a non-disruptive interaction of a low-density supersonic gas jet curtain with the primary treatment beam. An existing gas jet monitor-based ionization profile monitor was modified and coupled with the accelerator beamline at the Dalton Cumbrian Facility (DCF), UK (United Kingdom). The aim of the test was to conduct proof-of-concept measurements for the profile and dosimetry of beams having characteristics similar to the medical treatment facilities. Measurements were carried out for proton and carbon beams of varied sizes, energies, and currents. The results obtained from these measurements demonstrated the feasibility of such a dosimeter and are instrumental for its improvement.

This contribution introduces the design of the adapted gas jet dosimeter, discusses the findings from the measurements, highlights the dosimetry challenges addressed and outlines the scope of improvement for an online non-invasive gas jet in-vivo dosimeter.

Footnotes

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