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Ionization profile monitor for in-vivo dosimetry in medical accelerators

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In-vivo dosimetry is essential to deliver precise doses to patients in ion beam therapy. Real-time dose monitoring without disturbing the beam improves patient safety and treatment efficiency. It is critical for emerging treatment modalities like FLASH therapy due to the narrow dose tolerance. Existing real-time dosimetry devices are invasive to beam, necessitating a non-invasive dosimetry solution.

The gas-jet based beam profile monitor developed at the Cockcroft Institute (CI) is being studied for application in medical accelerator facilities. Recent measurements at the Dalton Cumbrian Facility, UK yielded promising results for beam monitoring at energies equivalent to medical beam. These studies have indicated the need to improve the gas-jet based Ionization Profile Monitor (IPM) to monitor dose in real time.

A new IPM detector system is under development at CI to reduce the monitor size and complexity, and increase its sensitivity, resulting in fast acquisition, paving the way for real-time in-vivo dose monitoring. This contribution presents the design of the optimized IPM and its working principle based on electrostatic field and particle trajectory simulations.

Footnotes

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