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Measurement of secondary particle production in view of installation and calibration of a novel ion beam therapy monitoring system: Dose Profiler

Ion beam therapy is beneficial for the oncological patients diagnosed with selected cancer indications. This highly precise radiotherapy technique is particularly sensitive to patient positioning and anatomy variations in comparison with photon therapy, which implies research and development of dose monitoring techniques that enable on-line assessment of beam delivery accuracy. Mostly investigated reconstruction of beta+ emitter distributions with Positron Emission Tomography provides not satisfying results for clinical practice, therefore further possibilities such as prompt gamma and secondary charged particles and/or the information from all the aforementioned are considered as the optimal approach.

This contribution reports on data takings performed at HIT (Heidelberg, Germany) facility in order to measure the secondary particles produced by ^{12}C , ^4He and ^{16}O ion beams of therapeutic energy impinging on PMMA phantoms. The emission energy spectra and yields of secondary products, detection efficiency and the geometrical acceptance will be reviewed in order to assess the expected monitoring performances as a function of the dose delivered to the patient. A correlation between the secondary emission regions and Bragg Peak position will be shown. The role of those measurements in view of development of the new dose monitoring approach Dose Profiler will be presented.

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