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Scintillator-based system for transversal dose profile reconstruction for clinical proton beams

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A fast and reliable system to measure transversal charged particles relative dose profiles is desirable in any hadrontherapy facility, being the basis for an accurate treatment quality assessment procedure. For this purpose, a system for the lateral dose profile reconstruction was developed at the Laboratori Nazionali del Sud of Italian Institute for Nuclear Physics (INFN-LNS, Catania, Italy); it consists of a plastic scintillator screen (50×50 mm², 1 mm in thickness), mounted perpendicularly to the beam axis and coupled with a highly sensitive cooled CCD camera (resolution 1928×1452 pixels) in a light-tight box. The real-time data acquisition, the quantitative analysis of the beam profiles and the calculation of the dosimetric-relevant parameters along both horizontal and vertical directions, were entirely performed using specific in-house software libraries, developed on the LabView platform (National Instruments, Austin, TX, USA).

We report about the characterisation of the system in terms of short-term stability and linearity with the beam dose-rate. An inter-comparison with other common quality control devices, able to perform transversal beam profiles reconstruction (radiochromic films, Lynx detector and Timepix detector) has been also carried with a 100 MeV proton beam at the Trento Institute for Fundamental Physics and Applications (TIFPA, Trento, Italy) and the results will be reported and discussed as well.

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