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Experimental Verification of Beam Position and Size Determination Using Scattered Charged Particles for Real Time Quality Assurance in Proton Hadrontherapy

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We present the experimental verification of the Interaction Vertex Imaging technique for the reconstruction of the position and size of a proton beam for hadrontherapy. The results presented demonstrate the feasibility and attractiveness of this technique using protons scattered at large angles and emerging from the phantom, in terms of both event rate and reconstruction accuracy. The results obtained on data with 126 and 200 MeV clinical treatment proton beams agree well with the simulation predictions by a dedicated Geant4 program, providing validation for this application. The reconstruction technique, its performance and the instrumentation requirements are discussed in details, in view of a potential application to real-time quality assurance in proton hadrontherapy. The extension of this technique to hadrontherapy with carbon beams, the optimization of the detector system and the perspectives for the application of novel semiconductor pixel sensors will be discussed.

Collaboration

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