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Design of a fast energy degrader for a compact superconducting gantry with large momentum acceptance

Recently, the superconducting gantry is gained more and more attentions due to the advantages on the reduction of the footprint and weight. Aiming at the light weight gantry beamline with a large momentum acceptance, we proposed a superconducting gantry scheme employing a fast degrader, combined-function AG-CCT magnets and downstream scanning nozzle. To reduce the secondary neutrons on the iso-center, a fast energy degrader is placed at the entrance of the gantry beamline, which requires the large momentum acceptance of the downstream combined function AG-CCT magnets. In this paper, we present the design result of a fast degrader system and carry out the detailed Monte Carlo simulation of the whole superconducting gantry beamline by importing the 3D magnetic field of the magnets. In addition, some clinical impacts with the large momentum deviation beam are also studied.

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