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Calibration assessment of the PSI proton therapy Gantry 2 scanning system after 10 years of operation

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Sub-millimeter precision is a crucial criterion for beam delivery in proton therapy. Nowadays, most of the therapy systems use the Pencil Beam Scanning (PBS) technique where single beams with regulated amount of protons are delivered sequentially to different locations within the target. Beam energy defines the depth of the beam propagation and scanner magnets deflect the beam to the desired lateral position.

The PSI Gantry 2 was among the first gantries to use the PBS technique. It makes use of 250 MeV protons produced by a superconducting cyclotron and degraded to a required energy. The beam scanning is performed just before the last bending magnet producing a nearly parallel and well- focused beam over the full scan range at iso-center. We developed a calibration algorithm for the scanner magnets in order to achieve the desired position precision in the target. Based on beam position measurement with a strip ion chamber in the gantry nozzle, we parametrized the propagation of the beam to the target calculating the beam angle at different scan positions as well as gantry angles.

During 10 years of operation, the system proved to be very stable and no parametrization update was required. Nevertheless, recently we re-evaluated parameters obtained during the system commissioning. In this contribution, we describe the calibration process of scanning magnets with respect to beam position at the iso-center and show the stability of this implementation over the time.

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Footnotes

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Yes

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