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Superconducting magnets for medical applications at PSI

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The use of proton therapy for cancer treatment shows a growing trend, since the radiation dose delivered to the target volume is maximized and the dose to the surrounding healthy tissues is minimized. To direct the proton beam from all directions to the tumor in the patient, the last part of the beam transport and scanning system are mounted on a rotatable gantry.
In this work a design of a superconducting bending magnet section for future compact iso-centric gantries is presented. The section consists of three combined function magnets: two dipole, quadrupole and sextupole magnets and a combined quadrupole and sextupole magnet. All the winding packs are based on racetrack coils to keep the manufacturing as easy as possible.
The coils will be wound with Nb3Sn Rutherford cables. Following the choice of a suitable superconducting strand, we report the calculation of the AC losses during the energy sweeps, the expected temperature margin both during a transient and in steady state and the design of the cooling system as well as of the mechanical support structure. Some considerations about the quench protection scheme are also presented.

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