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# Magnet technology and design of superconducting magnets for heavy ion gantry for hadron therapy

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Various initiatives in Europe have bene launched to study superconducting magnets for a rotatable gantry suitable for delivery up to 440 MeV/A carbon ions for hadron therapy. One initiative is led by INFN inside an agreement with CERN, CNAO and MedAustron aiming at designing and manufacturing a strongly curved costheta dipole (Rbending = 1.6 m) rated for 4 T central field and a ramp rate of 0.15-0.4 T/s. Here we explore the suitability of dipole technology derived from HEP collider (use of Nb-Ti Rutherford cable, classical shell type for the coils, use of collar/yoke for force containment, etc⋯) for a rotatable gantry that poses severe conditions on the thermal design (conduction cooled coils). A second one, is in the frame of the European program H2020-HITRIplus-WP8, aimed at exploring the feasibility of using the novel Canted Cosine Theta (CCT) concept to produce a superconducting dipole with similar characteristics. The scope is to design and built one or two prototypes with Nb-Ti rope, to see if this route could be a viable alternative. Finally in the European collaboration H2020-I.FAST-WP8 we are exploring both CCT in combined function design (dipole + quadrupole, in Nb-Ti) and the use of HTS (REBCO tapes) with CCT dipole layout, pursuing the design manufacture of a small prototypes with European Industry. If HTS will be found successful, it will be a great benefit for the cryogenic design of the magnet system.

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## Footnotes

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