

Magnetic and Thermal Sizing of a Quadrupolar Superferric Magnet

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Abstract— This paper presents the magnetic and thermal sizing of the prototype of an YBCO quadrupolar superferric magnet (QSM) for high gradient magnetic field. The design of an optimal polar piece is first addressed. Simpler 2D models are used to find design level details on the magnetic field spectra. Next, the heat transfer problem is solved. The heat leakage from the ambient is a menace to the QSM superconductive operation, and radiation heat transfer plays a major role. 2D models are not an option therefore a 3D geometry imported from the CAD design of the prototype is used as computational domain. The numerical simulation results evidence the heat transfer paths within the structure, and they are used in sizing the magnet.