BNL-68235-AB

Abstract submitted to the 17th International Conference on Magnet Technology (MT-17), Geneva, Switzerland, September 24-28, 2001

Design studies of superconducting cosθ magnets for a fast-pulsed synchrotron

M. Wilson, G. Moritz, G. Ganetis, A. K. Ghosh, A. Jain, J. Muratore, R. Thomas, P. Wanderer, W. Hassenzahl

Part of the GSI future project is an accelerator facility with two synchrotron rings in the same tunnel. The lower and upper rings have a rigidity of 100 and 200 Tm respectively. The upper ring will be equipped with superconducting cosθ magnets. The dipoles will be operated with fields up to 4 T and ramp rates up to 4 T/s and will be similar to the RHIC- dipoles.

The challenge in building such magnets is the high ramp rate. Induced coupling and persistent currents in the cable and the iron yoke will reduce the field quality and increase the ac losses. In order to keep these effects down to an acceptable level it is necessary to reduce coupling within the Rutherford cable by introducing a resistance between the strands. Experience shows however that such resistance might cause problems of current sharing during a fast current ramp. We have therefore adopted a cable with a central resistive core, which gives a high crossover resistance between strands, but a relatively low resistance between adjacent strands. Experimental cables of the RHIC type have been made with stainless steel and anodised titanium cores, using superconducting wires coated with tin-silver solder. Measurements will be presented of the crossover and adjacent resistance in these cables and also of their losses in changing fields. Based on these measurements, computations have been carried out for the dipole magnets to calculate the ac losses and multipole errors coming from coupling within the cable during a fast ramp.
This work has demonstrated the feasibility of using such magnets in a fast-pulsed synchrotron.