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Sat-Mo-Po.07-05: Thermal properties of Block-type dipole superconducting magnets wound using REBCO cables with defects and specified thermal and electrical interface properties

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Quench and protection in superconducting magnets wound using REBCO cables is important for high energy particle accelerators. Quite large minimum quench energy (MQE) and quite low normal zone propagation (NZP) velocity has led to an interest in electrically non-insulation coils. We analyzed numerically, using a Finite Element Method (FEM), the performance of REBCO cable containing various structural defects. We focused on effects of the defects on heating and thermal runaway of the magnets. Defects are possible in any HTS cable, originating from the tape manufacture, or during cabling, or in service. The influence of electrical and thermal contact resistances was included. The impact of thermal boundary conditions was also quite important, and these block dipoles were assumed to be epoxy impregnated, such that helium cooling (pool boiling) was only present on the magnet surface. This led to more rapid thermal runaway as compared to systems with more direct cooling contact. To model the REBCO superconducting material we used its measured power law E-J curve. Heat disturbances of different size, intensity and duration have been analyzed from the viewpoint of the magnet quench and stability.

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