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Design study on the quench protection system for the HTS magnet based on the I-V characteristics measured in the temperature range of 40-83K.

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High T_c superconductor (HTS) is one of the candidates to evolve the magnet technology as it is superior to low T_c superconductor (LTS) in terms of the critical current density, critical magnetic field, and critical temperature. Replacement of the LTS magnet with the HTS one is however still challenging because it is quite difficult to predict the quench behavior due to its slow normal zone propagation velocity. In order to collect data so as to design the protection scheme of the HTS-based magnet, we conducted measurements of the current-voltage (IV) curves with a short sample of the REBCO tape at the International Research Center for Nuclear Material Science of Tohoku University. In this experiment, the sample is cooled by means of the conduction-cooling method with a variable temperature insert, and exposed to the magnetic field that the superconducting solenoid generates. In this way, the IV characteristics are measured in the temperature range of 40-83K at various applied fields up to 15T. All the data obtained in this measurement are then implemented to a stand-alone quench simulation to estimate conditions in which the HTS magnet quenches. In this report, we present the quench protection system that is designed using the simulation tool described above.

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