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Wed-Mo-Po3.08-05 [57]: Simulation and experimental investigation on the critical current and AC losses of a hybrid superconducting fault current limiter with bias magnetic field during normal operation

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The level of fault current has been increases quickly with rapid growth of electric load in recent years. The capacity of conventional circuit breaker has been unable to meet the demand. The wide application of high temperature superconducting fault current limiters (HT SFCL) provides a new avenue for power protection. They use the electrical properties of HTS to instantaneously protect power grids which can not only reduce the capacity of the circuit breaker but also improve safety of power grids. This paper deals with a novel hybrid superconducting fault current limiter with bias magnetic field. This high temperature superconducting fault current limiter has a reactor with double-split symmetrical windings and a non-inductive high temperature superconducting (HTS) magnet which is in series to one branch of the reactor. The simulation model of the hybrid SFCL is established in Matlab/Simulink to investigate its performance in a power grid. An experimental system is set up with a unit of SFCL magnet immersed in the liquid nitrogen and a high speed Data Acquisition (DAQ) System of National Instruments (NI) based on LABVIEW. The characteristics of the critical current, AC losses for the non-inductive superconducting unit of SFCL are experimental investigated to verify the effectiveness of the hybrid SFCL and evaluate the technical feasibility.

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