

## Study of Superconducting Fault Current Limiter Model with AC Circuit-breaker

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**Abstract** - The electric circuit and physical model of superconducting fault current limiter with a circuit-breaker (SFCLCB) are designed and studied. The nonlinear resistor (superconducting coil) is connected in series with the switching device. The purpose of this device is to limit a fault current up to a permissible level and to switch it off at the first current passing through zero value. The circuit is found to limit the current amplitude in SFCLCB by factor about 5-7 without destruction of the HTS tape. The 2G HTS tape with a critical current 270 A is used as a superconducting nonlinear resistor whereas the high-speed vacuum circuit-breaker is used as a switching device. To study current limiting properties of the HTS tape, the test has been carried out in ac circuit with a current amplitude up to 4700 A. The circuit is found to limit the current amplitude in SFCLCB by factor about 5-7 without destruction of the HTS tape. A current limiting operation of this circuit is simulated taking into account the temperature dependent non-linear resistance of the HTS tape. An influence of the coil design on recovery time of the superconducting tape immersed in liquid nitrogen is studied using an oscillatory test circuit with the oscillation period near 20 ms at the maximum voltage up to 3 kV. The coils with flat bifilar winding have been tested for various winding density of the HTS tape. The tape temperature rise in the current limiting mode is estimated. Results of these estimations are well correlated with our experimental data.

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