

Application of Superconducting Fault Current Limiter to Protection of High Temperature Superconducting Conductor

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Considering the economic and operational importance, high temperature superconducting (HTS) cable must be safe from unexpected events such as fault current. Superconducting fault current limiter (SFCL) has been expected to be a prospective protecting method for HTS devices such as HTS cable. However, in this study, we investigated the electrical behavior of HTS conductor in transient state and possibility of SFCL application as a basis study for the protection of HTS power machines. Even though the applied current is over the critical current of HTS conductor, Joule heat do not increase abruptly so that the conductor is able to keep superconducting state, not reaching up to critical temperature. However, in case of being over the critical temperature, SFCL should limit the current to prevent the HTS conductor being damaged. For the experiments, HTS conductor having the critical current of 57 A and resistive type SFCL fabricated using YBCO thick film based on sapphire were used. Based on the over-current characteristics of the HTS tape, we attempted to limit the current below a safe range using SFCL and resistor. SFCL and resistor were connected in parallel, and the resistor was adjusted, considering the capacity of SFCL. As a result, the capacity of SFCL was dependent on the over-current characteristics of HTS conductor and could be controlled using resistor connected in parallel.

keywords : HTS conductor, SFCL, over-current, quench protection