HTS Tapes Cooled by Liquid Nitrogen at Overloading Conditions

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Abstract—For HTS electro - technical devices the overload currents due to faults in grids are the operational reality. Overloads are the working modes for fault current limiters as well. In this work we model the overload conditions in different HTS 1-G and 2-G tapes experimentally by use of the rectangular current pulses with different amplitudes and durations. Voltages and temperatures along tested samples have been measured. These experiments permitted us to follow the change of heat developments during overloads due to the difference of cooling regimes in the liquid nitrogen. Measuring of characteristic times of a heat development in different regimes provides the data about possible surviving times of HTS devices and bearable current overloads. We also studied the influence on heat developments of different shunting or reinforcing methods of HTS tapes. The data obtained can be used to analyze overload conditions at HTS power cables and HTS resistive FCL.

Index Terms — Heating development, High-temperature superconductors, Overload conditions

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