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Fri-Mo-Po.01-06: Measurement and analysis of radial stress for no-insulated High Temperature superconducting pancake coils

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No-insulated high temperature superconducting (HTS) coils are widely favored for high engineering current density and self-protection properties. Radial stress is an important parameter for HTS coils, which is mainly the superposition of winding tension, electromagnetic load and thermal stress. Radial stress is related to the magnet transient behavior and the self-protection characteristics of HTS coils. The main reason is that the contact resistance is related to the radial stress. The greater the compressive stress, the smaller the contact resistivity. So the current at the hot spot will be more likely to shunt from the radial direction to avoid quench. In this review, we present experimental and theoretical analyses on the radial stress in a REBCO insert setup based on the contact resistance Rct. Firstly, the correspondence between the contact resistivity Rct of tapes and radial stress is tested and get in use of press machine. Then, an experimental insert coil is developed in which the voltage signal points are arranged. After that, the HTS pancake coil is excited. Referring to the current, the potential signal and the mutual inductance matrix, we can derive the experiments of the radial stress. Finally, the discrete-coupled model with turn-to-turn contacts, the discrete-sequential model and the block model are also implemented and compared against the measured radial stress.

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