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Quench Study on REBCO Coil for a HTS Sextupole Magnet

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We designed and fabricated a prototype high temperature superconducting(HTS) sextupole magnet for the chromaticity correction of an asymmetric-energy collider, named SuperKEKB. The HTS sextupole magnet consists of six two-layer-rectangular REBa₂Cu₃O_y(REBCO) coils, which are wound with a 4-mm-wide coated conductor and impregnated with the epoxy resin. In this study, we measured quench characteristics of the two-layer-rectangular REBCO coil in order to confirm the applicability of a detection method using the balance voltage. The detection threshold was proposed by using the relation of the detecting condition and the maximum quench temperature. We also developed a numerical simulation code to clarify quench behaviors and to confirm the reliability of the detection method for the sextupole magnet. As the result, no coil degradation and burnout were observed in the quench test with the voltage detection method. The relation between the detecting condition and the maximum quench temperature was successfully determined from the experimental and simulation results. We confirmed the validity of the simulation code by comparing with the experiments. Finally, we proposed a detecting condition for the sextupole magnet to keep the maximum quench temperature below a design value of 200 K.

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