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Tue-Af-Po2.22-04 [78]: Study on Cooling and Over-current Characteristics of a Superconducting Magnet Using a Grooved Bobbin

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Despite the extensive research on a conduction cooling system, liquid helium (LHe) was still used as a cryogen to cool down the superconducting magnets due to the high-temperature deviation and mechanical vibration of this cooling system. However, in a quench event, the superconducting magnet that utilizes LHe may also exhibit temperature deviation within the magnet because the innermost turns were not exposed to LHe, resulting in slow heat dissipation. In this study, we proposed the use of a bobbin with grooves on its surface, thereby allowing the LHe to fill the grooves of the bobbin and to be the cooling channel. Cooling and over-current tests were facilitated to investigate the effects of the cooling channel on the thermal and electrical stabilities of the GdBCO magnet with regard to the width and depth of the groove. The experimental results were compared with the simulations that employ a finite element analysis method.

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