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Thu-Af-Po.03-08: Design, fabrication, and operation of proto-type miniature cylindrical YBCO bulk induction motor for cryogen pump

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Using a superconducting bulk into the rotor enables torque generation by inducing current through an external armature, similar to the principle of an induction motor, without the need for direct current application to the rotor. This topology can reduce rotor resistance losses compared to conventional induction motors due to the low resistance of the superconducting material. Moreover, this topology has been explored for applications in pumps with flowing liquid cryogenics, addressing the cooling of the superconducting rotor while simultaneously acting as the pump's motor.

In this paper, a feasibility study is presented on an induction motor with a YBCO bulk mounted on the rotor for a cryogen pump application. Based on the preliminary design, fabrication, and experimental result of a miniature cylindrical HTS bulk induction motor test in a liquid nitrogen environment, a scale-up design of a full-size YBCO bulk induction motor is presented.

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