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Low Speed Rotating Characteristics of 20 kW Class High Temperature Superconducting Induction/Synchronous Motor

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Our project research group has proposed a High Temperature Superconducting Induction Synchronous Motor (HTS-ISM) for the next generation transportation equipment, such as ships, trains, buses, and automobiles. The basic structure of the proposed HTS-ISM is as same as that of the traditional squirrel-cage induction motor. The difference is replacing the rotor (secondary) windings to the HTS windings. The application of HTS materials in this motor has a lot of advantages compared with the traditional ones. The target of our research is the overload characteristics of the HTS-ISM in low speed rotating mode. The 20 kW class prototype HTS-ISM was cooling in liquid nitrogen at temperature of 77 K. Through changing the excitation conditions of the HTS-ISM, we succeed in driving the motor in low speed rotating mode (< 600 rpm). Moreover, we can increase the voltage gradually from rated synchronous power to make HTS-ISM rotate in an overload mode within a pretty short time. The overload characteristics of this HTS-ISM can be analyzed by this experiment. We are succeed in achieving the overload slip power at 19.4 kW, the torque at 341 Nm, with the HTS-ISM at 53 V and 20 Hz (Synchronous speed Ns: 600 rpm), which exhibits the overload characteristics of the HTS-ISM in low speed rotating mode. These results show a promising candidate for the practical realization which promote the development of the next generation transportation HTS-ISM system. A presentation will be made based on the experimental results in the following MT-25 conference.
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