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M2Po3B-07: Force Measurements for Axial Superconducting Magnetic Bearing

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Non-contact bearings are required in many applications where friction losses can be excessive. An option for realization of non-contact bearings with superconductors and permanent magnets exists. The bearings are expected to provide stiffness in the radial and axial direction. The present paper explores axial superconducting magnetic bearings (SMB). The axial SMB leverages the Meissner effect where in the magnetic field is expelled by the superconductor providing levitation. The impurities present in the permanent magnets are the reason for flux trapping which lends stability to the interaction of superconductor and permanent magnets. Thus, resulting in stiffness and force in axial direction. The paper presents the experimental set-up designed for conducting the force measurements. The paper also analyzes the measurement results while considering the temperature variation as well as field and zero field cooling conditions. The lift is impacted by the speed of rotation of the suspended rotor. The paper also characterizes the lift and rotational losses a function of the speed of rotation. A mathematical derivation of lift and losses is obtained and verified.

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