

Dynamics of Rotating Superconducting Magnetic Bearings in Ring Spinning

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Abstract — A superconducting magnetic bearing (SMB) consisting of a stationary superconductor in a ring-shaped flow-through cryostat and a rotating permanent magnetic (PM) ring is investigated as potential twist element in the textile technological process of ring spinning. Since the dynamic behavior of the rotating PM influences the yarn as well as the stability of spinning process, these factors are studied in this paper considering the acting forces of the yarn on the PM-ring, its vibration modes and the resulting oscillation amplitudes.

For the assessment of a safe field cooling distance during the operation of the rotating SMB in a ring spinning machine, a correct calculation of the resonance magnification is particularly important. Therefore, the decay constant δ of the damped oscillation was measured as a function of the field cooling distance (FCD) and the displacement. The observed increase of the decay constant δ with the initial lateral displacement and decreasing FCD is discussed in correlation to the number of depinned flux lines.

Keywords (Index Terms) — Levitation, superconducting magnetic bearing, spinning, textile technology, Yttrium barium copper oxide.