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Orbital dynamics in magnetovortical matter

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We discuss Dirac fermions under the coexistent rotation and strong magnetic field called the magnetovortical matter. The partition function for this system is constructed based on thermodynamic stability and gauge invariance [1]. We show that the orbital contribution to bulk thermodynamics dominates over the conventional contribution from anomaly-related spin effects found in Ref. [2]. This orbital dominance manifests itself in the sign inversion of the induced charge and current, and can be tested experimentally as the flip of the angular momentum polarization when the magnetic field strength is increased.

[1] Kenji Fukushima, Koichi Hattori, Kazuya Mameda, Phys.Rev.Lett. 135 (2025) 1, 011601 [2409.18652 [hep-ph]]
[2] Koichi Hattori, Yi Yin, Phys.Rev.Lett. 117 (2016) 15, 152002 [1607.01513 [hep-th]]

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