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Theoretical Motivation for measuring the muon EDM

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We consider possible beyond-the-Standard-Model (BSM) effects that can accommodate both the long-standing tension in the anomalous magnetic moment of the muon, $a_\mu=(g-2)_\mu/2$, as well as the emerging 2.5σ deviation in its electron counterpart, $a_e=(g-2)_e/2$. After performing an EFT analysis, we consider BSM physics realized above the electroweak scale and find that a simultaneous explanation becomes possible in models with chiral enhancement. However, this requires a decoupling of the muon and electron BSM sectors to avoid the strong constraints from $\mu\to e\gamma$. In particular, this decoupling implies that there is no reason to expect the muon electric dipole moment (EDM) d_μ to be correlated with the electron EDM d_e, avoiding the very stringent limits for the latter. While some of the parameter space for d_μ favored by a_μ could be tested at the $(g-2)_\mu$ experiments at Fermilab and J-PARC, a dedicated muon EDM experiment at PSI would be able to probe most of this region. In fact, only muon EDM experiments are capable to test the associated effective operator, giving strong motiations for such a measurement.

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