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Models for the Muon EDM

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Electric dipole moments (EDMs) of elementary particles are powerful probes of physics beyond the Standard Model with CP violation. The reported discrepancy in the muon anomalous magnetic moment motivates us to explore to what extent new physics with CP violation to address the discrepancy is probed by ongoing and projected searches for the muon EDM. In this talk, we discuss two benchmark models. The first model is a CP-violating two-Higgs-doublet model where the muon exclusively couples to one Higgs doublet. Since contributions to flavor violating processes as well as the electron EDM are suppressed, the muon EDM becomes an essential probe of the model. Our result shows that some viable parameter space leads to the muon EDM probed by the projected PSI experiment. The second is a model of dark matter (DM) that can explain the muon g−2 anomaly. The model contains a DM fermion and new scalars whose exclusive interactions with the muon radiatively generate the observed muon mass. Constraints from DM direct and indirect detection experiments as well as collider searches are safely evaded. The model parameter space that gives the observed DM abundance and explains the muon g−2 anomaly leads to the muon EDM that can be probed by the PSI experiment. Another viable parameter space even achieves a value of the muon EDM reachable by the ongoing Fermilab muon g−2 experiment and the future J-PARC experiment.

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