Abstract Submitted
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Nucleon-level Effective Theory of Muon to Electron Conversion in the Nuclear Field[1] EVAN RULE, University of California, Berkeley — The coming decade promises exceptional experimental progress in tests of charged lepton flavor violation (CLFV), with branching ratio sensitivities for $\mu \to e$ conversion searches expected to improve by more than four orders of magnitude due to efforts at Fermilab (Mu2E) and J-PARC (COMET). To support this progress, significant theoretical advances are required in order to connect low-energy tests of $\mu \to e$ conversion to candidate UV theories of CLFV. Here we describe an effective theory of $\mu \to e$ conversion formulated at the non-relativistic nucleon level which represents the most general constraint that this process can place on the underlying CLFV operators and provides the foundation to match onto effective theories at higher scales. This formulation provides a clear factorization of the CLFV physics from the nuclear physics (in analogy with standard-model processes like β decay and μ capture), delineating what can and cannot be learned about CLFV operator coefficients from elastic $\mu \to e$ conversion. Using state-of-the-art shell model wave functions, we derive bounds on operator coefficients from existing $\mu \to e$ conversion and $\mu \to e\gamma$ results, and estimate the improvement in these bounds if Mu2e, COMET, and MEG II reach their design goals.

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