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Effective theory predictions for $\mu \to e$ conversion

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The forthcoming Mu2e and COMET experiments will search for electrons produced via the neutrinoless conversion of muons captured onto the atomic nucleus ^{27}Al, improving existing limits on charged lepton flavor violation (CLFV) by roughly four orders of magnitude and probing new physics at scales in excess of 10,000 TeV. Many proposed extensions of the standard model give rise to observable CLFV. If a positive signal is observed at Mu2e/COMET, a follow-up program of $\mu \to e$ conversion experiments with different target nuclei can be used to further constrain the form of the new physics.

Connecting the results of these experiments, which are performed at relatively low energies, to candidate UV theories formulated at very high energies is a significant theoretical challenge. We describe a tower of effective field theories that bridges this gap, providing a complete description of $\mu \to e$ conversion and allowing one to predict experimental rates for arbitrary UV theories. A crucial set of inputs to this framework are the numerical values of form factors describing the nonperturbative matching between quarks and nucleons.

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