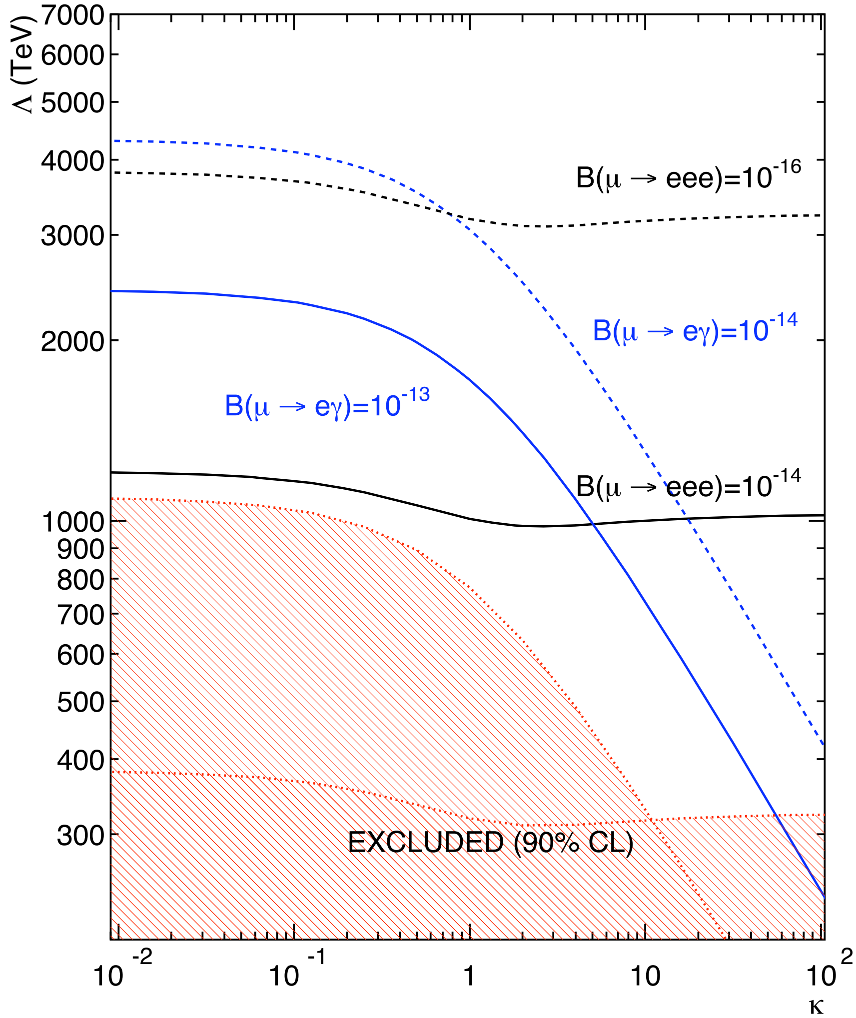

Figure 3: Sensitivity of a $\mu \to eee$ experiment that is sensitive to branching ratios 10^{-14} and 10^{-16}, and of a $\mu \to e\gamma$ search that is sensitive to a branching ratio of 10^{-13} and 10^{-14}, to the new physics scale Λ as a function of κ, as defined in Eq. (3). Also depicted is the currently excluded region of this parameter space.

κ and Λ if Eq. (3) describes CLFV), studies of electromagnetic properties of charged leptons ($g-2$, electric dipole moments), precision studies of neutrino processes (including oscillations), and, of course, "direct" searches for new, heavy degrees of freedom (Tevatron, LHC). Valuable information, including the nature and chirality of the effective operators that mediate CLFV, can be obtained by observing $\mu \to e$ conversion in different nuclei [14, 29, 30] or by studying the kinematical distribution of the final-state electrons in $\mu \to eee$ (see [14] and references therein).

Before moving on to specific new physics scenarios, it is illustrative to compare, as model-independently as possible, new physics that mediates CLFV and the new physics that may have manifested itself in precision measurements of the muon anomalous magnetic moment. In a nutshell, the world's most precise measurement of the $g-2$ of the muon disagrees with the world's best Standard Model estimate for this observable at the 3.6σ level (for an updated overview see [1], and references therein). New, heavy physics contributions to the muon $g-2$ are captured by the following effective Lagrangian:

$$\mathcal{L}_{g-2} \supset \frac{m_\mu}{\Lambda^2}\bar{\mu}_R\sigma_{\mu\nu}\mu_L F^{\mu\nu} + h.c.\,. \tag{4}$$