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Gearing up for the next generation of LFV experiments, via on-shell methods

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Lepton Flavor Violating (LFV) observables such as $\mu \rightarrow e\gamma$, $\mu \rightarrow 3e$ and $\mu N \rightarrow eN$ are among the best probes for new physics at the TeV scale. In the near future the bounds on these observables will improve by many orders of magnitude. In this work we use the SM EFT to understand the impact of these measurements. The precision reach on the measurement of these processes is such that the interpretation of the bounds requires an analysis of the dimension-six operator mixing up to the two-loop level. Using on-shell amplitude techniques, which make transparent many selection rules, we classify and calculate the different operator mixing chains. At the leading order, on-shell techniques allow to calculate anomalous dimensions of SM EFT operators from the product of tree-level amplitudes, even for two-loop renormalization group mixings. We illustrate the importance of our EFT approach in models with extra vector-like fermions.

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