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Improved limits on lepton-flavor-violating decays of light pseudoscalars via spin-dependent μ⟶e conversion in nuclei

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Lepton-flavor-violating decays of light pseudoscalars, $P = \pi^0, \eta, \eta' \to \mu e$, are stringently suppressed in the Standard Model up to tiny contributions from neutrino oscillations, so that their observation would be a clear indication for physics beyond the Standard Model. However, in effective field theory such decays proceed via axial-vector, pseudoscalar, or gluonic operators, which are, at the same time, probed in spin-dependent $\mu \to e$ conversion in nuclei. We derive master formulae that connect both processes in a model-independent way in terms of Wilson coefficients, and study the implications of current $\mu \to e$ limits in titanium for the $P \to \mu e$ decays. We find that these indirect limits surpass direct ones by many orders of magnitude.

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