Axionlike Particles and Lepton-Flavor Violation

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Axionlike Particles (ALPs) appear in many well-motivated extensions of the Standard Model. Their leptonflavor violating couplings can be probed in exotic muon and tau decays. When ALPs are produced resonantly, the sensitivity of three-body decays such as $\mu \to 3e$ and $\tau \to 3\mu$ exceeds that of radiative decays like $\mu \to e\gamma$ and $\tau \to \mu\gamma$ by multiple orders of magnitude. The opposite is true for regions, where resonant ALP-production is not possible, therefore searches for both processes are highly complementary. We discuss constraints from various types of experiments on ALPs with a single dominant lepton-flavour violating coupling and loop-induced photon coupling. We also take constraints from non-decay experiments such as muonium-antimuonium oscillations, electron EDM, and $(g - 2)_{\mu}$ into account.

Keywords: Axionlike Particles, Lepton-Flavor Violation, Muon Decays, Tau Decays

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