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Experimental constraint on axion-like particle coupling over seven orders of magnitude in mass DANIEL PALKEN, TANYA ROUSSY, WILLIAM CAIRNCROSS, BENJAMIN BRUBAKER, DANIEL GRESH, MATT GRAU, KEVIN COSSEL, KIA BOON NG, YUVAL SHAGAM, YAN ZHOU, JILA, NIST, and University of Colorado, Boulder, VICTOR FLAMBAUM, University of New South Wales and Johannes Gutenberg University of Mainz, JUN YE, ERIC CORNELL, JILA, NIST, and University of Colorado, Boulder — Axion-like particles (ALPs) present a well-motivated solution to the unresolved problem of dark matter. If ALPs are present and saturate the local dark matter density, existing data from the JILA electron electric dipole moment (eEDM) experiment [1] may contain their imprint via the mechanism of an oscillating scalar-pseudoscalar nucleon-electron coupling. In this talk, we quantify the effect of ALP dark matter on the JILA eEDM signal, accounting for the stochastic fluctuations in the ALP dark matter field in two distinct regimes: when the ALP coherence time is much greater than the measurement time, and when the two timescales are comparable to one another [2]. Using a Bayesian hypothesis testing framework, we report a constraint on the presence of ALP dark matter over the 10^{-22}-10^{-15} eV mass range. \[1] W. B. Cairncross *et al.*, "Precision Measurement of the Electron's Electric Dipole Moment Using Trapped Molecular Ions", Phys. Rev. Lett. **119**, 153001 (2017).2] G. P. Centers *et al.*, "Stochastic fluctuations of bosonic dark matter," arXiv preprint arXiv:1905.13650 (2019).

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