

New Technologies for Discovery IV: The 2018 CPAD Instrumentation Frontier Workshop

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Measurement of the fine structure constant as test of the Standard Model

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Measurements of the fine-structure constant α require methods from across subfields and are thus powerful tests of the consistency of theory and experiment in physics. Using the recoil frequency of cesium-133 atoms in a matter-wave interferometer, we recorded the most accurate measurement of the fine-structure constant to date: $\alpha = 1/137.035999046(27)$ at 0.20 parts per billion accuracy. Comparison with Penning trap measurements of the electron gyromagnetic anomaly $g_e - 2$ via the Standard Model of particle physics is now limited by the uncertainty in $g_e - 2$; a 2.5σ tension may be a sign of physics beyond the Standard Model that warrants further investigation. In particular, we will discuss implications for dark-sector candidates such as dark photons.

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