

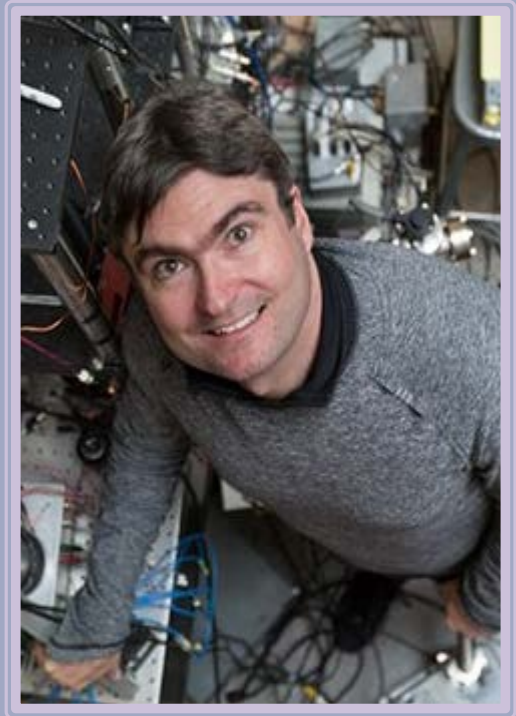
Harvard University
Department of Physics Colloquium

Monday, April 30, 2018 @ 4:15pm, Jefferson 250

Tea served @ 3:30pm, Jefferson 450

Measurement of the fine structure constant as test of the standard model

Measurements of the fine structure constant α use 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 report the most accurate measurement, $\alpha = 1/137.035999046(27)$, at 0.20 part-per-billion accuracy. Using multiphoton interactions (Bragg diffraction and Bloch oscillations), we demonstrate the largest phase (12 million radians) of any Ramsey-Bordé interferometer and control systematic effects at the 0.12 part-per-billion level. Comparison with Penning-trap measurements of the electron gyromagnetic anomaly $g-2$ via the Standard Model is now limited by the uncertainty in $g-2$; a 2.5-sigma tension rejects dark photons as the reason for the unexplained part of the muon's magnetic moment at 99% confidence level. Implications for dark sector candidates and electron substructure may be a sign of physics beyond the Standard Model that warrants further investigation.



*Professor Holger Mueller
University of California
Berkeley*

The Physics Monday Colloquium is supported by the Morris Loeb Lectureship Fund

For more information please go to <http://www.physics.harvard.edu>