Abstract Submitted
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Towards a next-generation measurement of the fine structure constant[1] ZACHARY PAGEL, WEICHENG ZHONG, ANDREW NEELY, ERIC PLANZ, AINI XU, SPENCER KOFFORD, MADELINE BERNSTEIN, HOLGER MUELLER, University of California, Berkeley — We present the new Berkeley experiment for measuring the fine-structure constant (alpha) as a test of the Standard model. The current leading determination of alpha reached 0.2 ppb accuracy, and is in 2.5σ tension with the value of alpha determined from electron gyromagnetic anomaly experiments [1]. Our new experiment seeks an order of magnitude improvement in sensitivity and systematic uncertainty. By using a beam with a larger beam waist, systematic effects such as Guoy phase or effects from thermal motion of the atoms are minimized [2]. A new interferometer geometry will also be used that can cancel phase shifts from the gravity gradient and from diffraction phases [3,4]. In order to achieve high momentum transfer with a larger beam area, we will discuss progress towards a kW peak power pulsed laser system at 852nm. [1] R. H. Parker, C. Yu, W. Zhong, B. Estey, and H. Mueller, Science 360, 191 (2018). [2] C. Yu, W. Zhong, B. Estey, J. Kwan, R. H. Parker, and H. Mueller, Ann. Phys. 531, 1800346 (2019). [3] Z. Pagel, W. Zhong, R. H. Parker, C. T. Olund, N. Y. Yao, and H. Mueller, arXiv [physics.atom-Ph] (2019). [4] W. Zhong, R. H. Parker, Z. Pagel, C. Yu, and H. Mueller, arXiv [physics.atom-Ph] (2019).

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