Abstract Submitted
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GSNP Student Poster Competition Winner: Beyond the Laser Coherence Limit: Improving Frequency Ratio Measurements in Search of New Physics[1] ETHAN CLEMENTS, MAY KIM, NIST Boulder/CU Boulder, KAIFENG CUI, NIST Boulder/Argonne National Lab, AARON HANKIN, SAMUEL BREWER, DAVID LEIBRANDT, NIST Boulder/CU Boulder, DAVID HUME, NIST Boulder — Proposals that resolve outstanding problems in physics such as the nature of dark matter and dark energy could be supported by observing variations in fundamental constants [1]. Recent experiments have placed constraints on these variations using optical atomic clocks [2,3], however, tighter bounds can be made by reducing the statistical uncertainty of the frequency ratios between atoms sensitive to this new physics. Often, the measurement stability is limited by the coherence time of the local oscillator used to interrogate these systems, affecting how well these frequency ratios can be measured. This poster will present experimental demonstrations of two techniques, correlation [4,5] and differential spectroscopy [6]. These techniques utilize differential measurements which avoid or correct deviations in the local oscillator phase. As a result, these techniques can be used to probe beyond the coherence time of the local oscillator, facilitating further constraints on new physical models. [1] A. Arvanitaki et al., PRD, 91.1, 015015, 2015 [2] B. M. Roberts et al., arXiv:1907.02661, 2019 [3] M.S. Safronova et al., RMP, 90, 025008 [4] M. Chwalla et al., APB, 89, 483, 2007 [5] C.W. Chou et al., PRL, 106, 160801, 2011 [6] D. Hume et al., PRA 93.3, 032138, 2016

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