Abstract Submitted
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Ultrahigh-Precision Measurement of the n = 2 Triplet P Fine Structure of Atomic Helium Using Frequency-Offset Separated Oscillatory Fields[1] K. KATO, T. D. G. SKINNER, E. A. HESSELS, York University — The 2^3P_1-to-2^3P_2 fine structure interval in atomic helium is measured [1] to a precision of 25 Hz using the frequency-offset separated oscillatory fields (FOSOF) technique [2]. A beam of metastable helium atoms is produced in a liquid-nitrogen-cooled DC-discharge source, and is intensified using a two-dimensional magneto-optical trap. Atoms in the 2^3S state are optically pumped into m=+1 prior to entering the main experiment region. These atoms are excited to the 2^3P_1 (m=+1) state by a pulse of linearly polarized 1083-nm laser light. The 2^3P_1-to-2^3P_2 transition is driven by two time-separated microwave fields (at slightly offset frequencies). 447-nm and 1532-nm laser pulses excite atoms in the 2^3P_2 state up to the 18P Rydberg state, and the Rydberg atoms are Stark-ionized and counted. This background-free ion detection method is only sensitive to the atoms that experience a complete FOSOF sequence, eliminating the major systematic effects of previous experiments [3]. The excellent signal-to-noise ratio allowed for thorough investigation of systematic effects. [1] K Kato, TDG Skinner, EA Hessels PRL 121, 143002 (2018) [2] A Vutha, EA Hessels, PRA 92, 052505 (2015) [3] JS Borbely, et al, PRA 79, 060503 (2009)

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Eric Hessels
York University

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