

Abstract Submitted
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High-precision measurements of the ^{87}Rb D -line tune-out wavelength ADAM FALLON, ROBERT LEONARD, CHARLES SACKETT, Univ of Virginia — We report a measurement of a light wavelength at which the ac electric polarizability equals zero for ^{87}Rb atoms in the $F = 2$ ground hyperfine state. The experiment uses a condensate interferometer to find this tune-out wavelength for the scalar polarizability, which lies at 790.032388(32) nm. Our result can be used to determine the ratio of matrix elements $|\langle 5P_{3/2} || d || 5S_{1/2} \rangle / \langle 5P_{1/2} || d || 5S_{1/2} \rangle|^2 = 1.99221(3)$, a 100-fold improvement over previous experimental values. We discuss techniques for accurate determination and control of light polarization as well as progress on measurements of the vector polarizability between the $D1$ and $D2$ spectral lines. Measurements of tune-out wavelengths and the vector polarizability between multiple lines allows separation of individual contributions to the polarizability from higher-lying states and the core up to ratios of matrix elements. Accurate knowledge of these ratios should serve useful as a theoretical benchmark and in atomic parity violation experiments.

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