Abstract Submitted
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**Decoherence in Ramsey Spectroscopy Due to Magnetic Field Gradients**[1] FRANK NARDUCCI, Naval Air Systems Command, ARVIND SRINIVASAN, St. Mary's College of Maryland, JON P. DAVIS, AMPAC, MATTHIAS ZIMMERMANN, MAXIM EFREMOV, Universitat Ulm, ERNST RASEL, Leibnitz Universitat, WOLFGANG SCHLEICH, Universitat Ulm — Ramsey or spin-echo spectroscopy techniques are often used to interferometrically probe systems. Most experiments use the the 'clock transition to suppress the sensitivity to magnetic fields. Magnetic Raman transitions will behave the same way as the clock transition, apart from a dependence of the resonance frequency on the value of the field for perfectly static and uniform magnetic fields. However, our current experiments require the presence of a magnetic field gradient. The magnetic field gradient causes a loss of contrast in the interference pattern in two ways. Due to the gradient and the spatial extend of the cloud, the resonance frequency of the transition differs between atoms such that they do not receive perfect $\pi/2$ pulses. Proper frequency chirping of the Raman fields can restored the peak Raman amplitude. Secondly, the precession rate differs between different atoms, which is not reversible by standard spin echo techniques. This dephasing can be interpreted as a result of the non-closure of the interferometer. A properly closed interferometer, such as the one we demonstrate with a four pulse sequence will restore the contrast. We apply our results to our experiments on the measurement of the $T^3$ contribution to the phase of the interferometer.

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