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Properties of Magnetic Sublevel Coherences for Precision Measurements[1] IAIN CHAN, A. KUMARAKRISHNAN, Department of Physics and Astronomy, York University, Toronto, Ontario M3J1P3, Canada — We have developed a theoretical description of the evolution of ground state coherences between magnetic sublevels in Rb vapor in the presence of a magnetic field along an arbitrary direction. This formalism uses a rotation matrix approach to describe the evolution of coherences created by two traveling wave laser pulses with orthogonal polarizations. The effect of a magnetic field can be described as a time dependent rotation of the atomic system about the quantization axis. Predictions based on this approach are shown to agree with experiments. By using rate equations to model atomic coherences, it is also possible to predict the evolution of coherence grating echoes in a magnetic field. Echoes are realized by rephasing the coherences using a second set of traveling wave pulses. The two sets of traveling wave pulses are separated by t = T so that the effect of Doppler dephasing is eliminated at t = 2T resulting in the formation of an echo. Applications relating to precision measurements of atomic g factor ratios are considered.

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