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Characterization of decoherence in electromagnetically induced transparency for applications in storage of light[1] EDEN FIGUEROA, JUERGEN APPEL, University of Calgary, FRANK VEWINGER, University of Bonn, ALEXANDER LVOVSKY, University of Calgary — Electromagnetically-induced transparency (EIT) has many applications in quantum information, particularly in quantum memory for light [1]. These applications require understanding of the phenomena responsible for decoherence in such processes. Insight into this question can be gained by measuring the width of the EIT resonance as a function of the pump field intensity. We report characterization of EIT resonances in the D1 line of Rb 87 under various experimental conditions. The dependence of the EIT linewidth on the power of the control field was investigated, at various temperatures, for lambda level configurations associated with different hyperfine levels of the atomic ground state as well as magnetic sublevels of the same hyperfine level. Strictly linear behavior was observed in all cases. Our results were inconsistent with a widely accepted theory where population exchange between the ground levels is assumed to be the main decoherence mechanism [2]. We therefore formulated a new theory assuming pure dephasing (decay of off-diagonal matrix elements) as the new mechanism. Our data shows this theory to be in good agreement with our experiments. 1. D. F. Phillips, A. Fleischhauer, A. Mair, R. L. Walsworth, and M. D. Lukin, Phys. Rev. Lett. **86**, 783 (2001). 2. H. Lee, Y. Rostovtsev, C. J. Bednar, and A. Javan, Appl. Phys. B **76**, 33 (2003).

[1]NSERC,CFI,AIF,CIAR.

Eden Figueroa
University of Calgary

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