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Quantum control of electromagnetically induced transparency by optical phase H. LI, Texas A&M University, J.P. DAVIS, Naval Air Systems Command, V.A. SAUTENKOV, Y.V. ROSTOVTSEV, G.R. WELCH, Texas A&M University, F.A. NARDUCCI, Naval Air Systems Command, M.O. SCULLY, Texas A&M University — Coherence in a three-level atomic medium can be created by two resonant optical fields. In this case the optical and atomic phases are locked and absorption of the medium decreases. This effect is well known as electromagnetically induced transparency (EIT). Recently F. A. Narducci with co-workers has suggested a quantum control of the transparency by changing phase of the optical field. In this paper we report results of experimental study of EIT dynamic in Rubidium atomic vapor. The optical phase of one of the optical fields is changed as a step function by electro-optical phase modulator. We have observed very fast variation of the transmission with a rise time of the order of inverse Rabi frequency at nanosecond scale. Variation of the transmission is proportional to the phase change and it can be comparable with amplitude of the EIT resonance. The transmission restores to the original EIT level slowly with the ground state relaxation rate(microsecond scale). We have confirmed that it is possible to control EIT by the optical phase. These results open a way to build up fast optical modulates and switches based on EIT.

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