Abstract Submitted
for the DAMOP06 Meeting of
The American Physical Society

Coherent control of weak light localization in ultracold atomic ^{87}Rb[1] R.G. OLAVE, M.D. HAVEY, Department of Physics, Old Dominion University, Norfolk, VA 23529, V.M. DATSYUK, D.V. KUPRIYANOV, I.M. SOKOLOV, Department of Theoretical Physics, State Polytechnic University, St.-Petersburg, Russia — We have an ongoing program of experimental and theoretical study of creation and manipulation of coherent photonic excitations in mesoscopic ultracold atomic ensembles. In one area, we are considering coherent control of weak localization of light. By exploiting the phenomenon of electromagnetically-induced transparency (EIT), the scattering and transmission properties of an atomic gas are modified, resulting for example in very small group velocity for light. In this paper, we describe similar effects which are used to manipulate mesoscopic coherences associated with weak localization of light in ultracold ^{87}Rb. Weak localization is an interferometric breakdown of classical radiative transport in atomic vapors, and may be studied through the coherent backscattering (CBS) effect in an ultracold atomic gas. We present results of Monte-Carlo simulations of wave propagation in realistic ultracold samples, based on elaboration of our earlier successful description of CBS in atomic gases. The results illustrate some of the basic effects and their connection with slow-light measurements in forward scattering. The basic measurement scheme and progress towards observing EIT-based control of diffuse electromagnetic waves in an ultracold atomic gas of ^{87}Rb is also described.

[1]Supported by the National Science Foundation and NATO.

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Date submitted: 26 Jan 2006

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