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Time-dependent coherent multiple light scattering in ultracold atomic ^{85}Rb S. BALIK, R. OLAVE, C.I. SUKENIK, M.D. HAVEY, Old Dominion University, Norfolk, VA, V.M. DATSYUK, D.V. KUPRIYANOV, I.M. SOKOLOV, State Polytechnic University, St. Petersburg, Russia — Multiple light scattering creates mesoscopic coherences in optically dense ultracold atomic gases. Considerable interest has been generated by the possibility that at high densities strong localization, in which coherences collapse into localized subradiant excitations, may occur. At lower density, the main observable is the coherent backscattering (CBS) effect. In CBS, the intensity of resonance radiation scattered from the sample shows enhancement in the nearly backwards direction. We report polarization and time dependent studies of light scattering from the F = 3 - F$'$ = 4 hyperfine transition in ultracold atomic ^{85}Rb. Studies include measurement of the time dependence of light scattered from the sample as a function of polarization and detuning from resonance excitation. Among other things, the measurements demonstrate frequency-dependent depolarization due to multiple scattering. The data is analyzed to obtain the long-lived decay modes of the sample, and also the fractional contribution of single scattering to the measured signals. Second, time dependent-simulations of the resonance CBS enhancement factor show the influence of time-separation of the emergence of light from different scattering orders. Supported by the National Science Foundation and NATO.

Mark Havey
Old Dominion University

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