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Light scattering in dense and cold ^{87}Rb[1] KASIE J. HAGA, S.J. ROOF, S. BALIK, M.D. HAVEY, Old Dominion University Physics Department, Norfolk, VA, IGOR M. SOKOLOV, DIMITRIY V. KUPRIYANOV, Department of Theoretical Physics, State Polytechnic University, 195251, St.-Petersburg, Russia — Quantum optics in ultracold and high-density, but non quantum degenerate, atomic gases is a promising area of research. Studies of quantum hologram creation in optically dressed samples, enhanced molecule formation, and ultracold plasma physics in the strongly coupled regime are intriguing areas of current activity. Exploration of the role of spatial disorder on light propagation in such systems and disorder-mediated formation and manipulation of subradiant and superradiant configurations are topics of considerable interest. In this paper we present experimental results on light scattering in a cold and quite high density gas of ^{87}Rb atoms. The sample is prepared in an optical dipole trap, and has a peak density $\sim 6 \cdot 10^{13}$ atoms/cm^3 and a temperature $\sim 60\ \mu K$. Here the $F = 2 \rightarrow F' = 3$ nearly closed hyperfine transition is studied. We discuss two experimental geometries. In one, near-resonance radiation is directed towards the sample; the response is recorded as a function of time and frequency. In a second, the probe beam is overlapped with a far off resonance light shift laser, which reduces the optical depth through the central region of the sample, allowing for generation of a quasi one dimensional configuration.

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