Transmission of Light in Dense Cold Atomic Clouds

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Light-matter interaction in an ensemble of atomic scatterers is of great interest, as it can give rise to many collective effects in light scattering, such as superradiance, subradiance, and radiation trapping. Furthermore, in dense disordered samples, Anderson localization of light, which arises due to interference effects in multiple scattering of light, is of special interest. However, in dense atomic samples, the near-field atom interaction cannot be neglected and modifies the scattering properties of light. In our work, we study experimentally and numerically the coherent and incoherent transmission of light in dense, cold atomic clouds. Experimentally, we prepare our cold sample of strontium atoms in a magneto-optical trap (temperature of 1 µK). Furthermore, we transfer our cloud to a crossed optical dipole trap, which allows us to create a high-density sample of up to 10^{14} at./cm^3.