Atomic vapor spectroscopy on nanoscale: refraction enhancement towards vapor-guided light propagation

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Resonant interaction of laser radiation with an atomic alkali vapor have been used for a variety of applications ranging from optical magnetometry to testing of fundamentals of quantum physics. In particular, control and modification of atom-light interaction is possible by means of the usage of light confinement and through atom-surface interactions. So, the optical response of thermal vapors confined in a nanocell, with a large number of atoms close to the surface relative to atoms in the bulk, accounts for nonlocality induced by the motion of atoms and the loss of phase coherence due to their collisions with the surface.

We explore the possibility of realization of refractive index enhancement accompanied with low absorption in rubidium vapor in a nanocell. In particular, the goal is to experimentally realize a vapor-enhanced waveguide in the direction parallel to the windows of the nanocell.