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**Application of Nonresonant Optical Lattices for Advanced Plasma and Gas Remote Nonintrusive Diagnostics**

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In this talk recent theoretical and experimental results on the interaction of optical lattices with neutral gases will be reviewed. A novel concept for remote laser diagnostics of weakly-ionized plasma, gas and gas mixtures with nanoparticles will be presented It is based on creation of optical lattice produced by interference pattern of two non-resonant laser pulses. Small ($\sim 10^{-7} - 10^{-5}$) gas density perturbations are produced by interaction of interference laser field with induced dipoles of polarized atoms and molecules and form periodic perturbation of gas density and index of refraction – a Bragg lattice. A probing laser scatters coherently off the Bragg lattice and the scattered signal can be used for variety of diagnostic. For sufficiently large laser beam intensities, the optical potential can trap a large fraction of the gas (up to 30%). In this case, trapped fraction of gas can be accelerated or decelerated in a moving optical lattice. The process of transfer of energy and momentum from an optical potential to gas particles is analogous to collisionless nonlinear Landau damping of electrostatic potentials in plasmas. At elevated laser intensities the optical lattice has also led to the observation of collisionless Spectral Narrowing in Coherent Rayleigh Scattering of a room temperature gas.