# INTERACTION BETWEEN AN ISOTROPIC NANOPARTICLE AND DRIFTING ELECTRONS IN A QUANTUM WELL

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S u m m a r y

A hybrid system composed of an isotropic nanoparticle and a semiconductor heterostructure with a quantum well has been considered. The nanoparticle is supposed to be polarizable in an external electric field. A theoretical model of the hybrid system is substantiated and formulated. Exact solutions of the model equations are obtained. The frequencies of charge oscillations in the hybrid system and their damping owing to the dipole–plasmon interaction are found, the damping mechanism being similar to that of Landau damping. The space-time behavior of concentration perturbations in the two-dimensional electron gas is analyzed, and the polarization oscillations of a nanoparticle are studied. The induced polarization of a nanoparticle at nonzero electron drift velocities is found to have a complicated dynamics. In particular, the polarization vector circulates along elliptic trajectories for two of three frequency dispersion branches. If the electric current flows through the quantum well due to an applied electric field, the damping of oscillations in the hybrid system is replaced by their growth in time, which corresponds to the electric instability of the system. New phenomena in hybrid systems can be used to excite the emission of nanoparticles by an electric current and to electrically stimulate the emission in the terahertz spectral range.