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Surface Plasmon Induced Zero-Point Image Repulsion at the Nanoscale CHARLES CHERQUI, University of New Mexico / Los Alamos National Lab, DAVE DUNLAP, University of New Mexico, ANDREI PIRYATINSKI, Los Alamos National Lab — Quantum corrections to the classical image potential of a charge moving towards a metal surface has a long history of interest in physics. This has lead to some interesting effects, namely the existence of electron recoil at the surface of a planar interface. We present a new approach of dealing with the problem and in particular examine the correction to the classical image force for the case of a charge moving towards a metal sphere. We analyze the problem classically to show that this effect can be interpreted as the well known ponderomtive repulsive force for a charge in an fast oscillating field. Quantum mechanically the effect is present, even in the ground state of the parametrically displaced plasmon oscillator (i.e., plasmon coherent state). Based on this observation we propose a new type of field effect transistor based on a carbon nanotube-metal nanoparticle hybrid system.

Charles Cherqui
University of New Mexico / Los Alamos National Lab

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