Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Collective Plasmon-Molecule Excitations in Nanojunctions: Quantum Consideration[1] ALEXANDER WHITE, University of California San Diego, BORIS FAINBERG, Holon Institute of Technology, MICHAEL GALPERIN, University of California San Diego — We use a pseudoparticle nonequilibrium Green function approach to study the coupling between plasmons and molecular excitons in nonequilibrium molecular junctions. This method is shown to be especially convenient for the calculation of the plasmon absorption spectrum of hybrid plasmon-exciton systems where coherent electron and energy transfer processes and strong system interactions play an important role. The formalism treats the intramolecular interactions and plasmon-exciton coupling exactly, going beyond the standard tool of molecular electronics - the nonequilibrium Green function. We demonstrate the sensitivity of the molecule-plasmon Fano resonance to junction bias, Coulomb repulsion, and intramolecular exciton coupling. We also compare our prediction for non-linear optical effects to previous mean-field equilibrium studies of isolated hybrid plasmon-exciton systems, and demonstrate the advantage of our approach. This study opens a way to deal with strongly interacting plasmon-exciton systems in nonequilibrium molecular devices.

[1]We gratefully acknowledge support by the Department of Energy (M.G., Early Career Award, DE-SC0006422) and the US-Israel Binational Science Foundation (B.D.F. and M.G., grant no. 2008282).

Alexander White
University of California San Diego

Date submitted: 25 Oct 2012 Electronic form version 1.4