Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Plasmons and The Electromagnetic Response of Nanowires[1] RODRIGO ARIAS, ALEJANDRO JARA, Universidad de Chile, DOUGLAS MILLS, University of California, Irvine — We present a theory of the nature of plasmons in nanowires, along with the response of such systems to a spatially uniform applied electric field in the plane perpendicular to the symmetry axis of the wire. We confine our analysis to the electrostatic limit, and to modes with infinite wavelength parallel to the wire's symmetry axis. Thus we focus on the limit where the linear dimensions of the cross section are small compared to the wavelength of incoming radiation. We derive integral equations that involve only the electrostatic potential on the boundary of a wire of arbitrary cross section. The formalism leads to a complete description of the potential as well as the lines of electric field in the system. The homogeneous versions of these equations allows one to find the plasmon eigenfrequencies and eigenfunctions, whereas the inhomogeneous equations allow one to generate the response of the nanowire to a spatially uniform applied field. We present numerical studies of the plasmon normal modes and electromagnetic response of nanowires of rectangular cross section, and comparisons to experiments and other calculations.

[1]D. L. M. was supported by the U. S. NSF, CHE-0802913, A. J. and R. E. A. by FONDECYT No. 1085028 (Chile) and by the Millenium Science Nucleus "Basic and Applied Magnetism" No. P06-022-F (Chile).

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Date submitted: 29 Dec 2009 Electronic form version 1.4