Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Suppression of Landau Damping in Metal Nanostructures via Quantum Size Effect[1] XIAOGUANG LI, University of Tennessee-Knoxville, DI XIAO, Oak Ridge National Laboratory, ZHENYU ZHANG, Oak Ridge National Laboratory, University of Tennessee-Knoxville, University of Science and Technology of China — Using the matrix random phase approximation, we study the tunability of localized surface plasmon resonance in small metal nanostructures, where the Landau damping is the dominant dissipation channel and the intrinsic limit to plasmonics technique. We find that the linewidth of plasmon can be effectively suppressed due to the quantization of electron-hole pair energy in various highly confined geometries, where the strength of Landau damping oscillates as the scale of system. Moreover, beyond a classical surface scattering picture, the oscillatory effect can be illustrated with an electron-hole pair description, which can be used to understand many other properties of plasmon. Our results show the possibility to control the Landau damping and therefore should be able to stimulate more efforts on future plasmonics of small nanostructures.

[1]Supported by DMSE/BES of USDOE, USNSF and NNSF of China

Xiaoguang Li
University of Tennessee-Knoxville

Date submitted: 18 Nov 2010 Electronic form version 1.4