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Plasmonic Properties of Metallic Nanoparticles: The Effects of Size Quantization EMILY TOWNSEND, GARNETT BRYANT, Joint Quantum Institute, National Institute of Standards and Technology — We use time-dependent density functional theory (TDDFT) to examine the plasmonic response of nanoparticles and nanoparticle systems. Treating the electrons quantum mechanically, we calculate response spectra and examine the time evolution of the charge density when nanoparticles are driven at resonant frequencies. We examine the resonant sub-modes of the plasmonic peak, identifying the dominant mode as the surface plasmon, and other modes as core plasmons that exist in the quantum limit. We investigate limits of this quantum behavior due to nanoparticle size, density, shell-filling, and, for multiple-nanoparticle systems, separation distance, to identify the transition from the quantum to classical limit.

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