1D Line Current Model for Plasmonic Half-Wave Antennas: From Nanorods to Nanocarrots

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Abstract

Metallic nanorods constitute the plasmonic analogue to classical half-wave dipole antennas. These structures show spectral lines of distinctly different shapes in their optical extinction cross-section under near-normal plane wave illumination that are originated by the interaction of longitudinal surface plasmon resonances. In our previous works [1, 2], we have shown that plasmon resonances of odd mode parity present Fano interference in the scattering cross-section, resulting in asymmetric spectral lines. Contrarily, modes with even parity appear as symmetric Lorentzian lines. In order to describe the emergence of either constructive or destructive mode interference, we also proposed a semi-analytical 1D line current model that directly explains the mode-parity dependence of the Fano-like interference. Now, we extend our model to nanorods with variable geometrical cross-section so that it enables us to describe the optical response of recently reported asymmetric silver "nanocarrot" structures [3].

References

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