Field enhancement and resonance phenomena in complex three-dimensional nanoparticles: efficient computation using the source-model technique

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We present a semi-analytical method for computing the electromagnetic field in and around 3D nanoparticles (NP) of complex shape and demonstrate its power via concrete examples of plasmonic NPs that have nonsymmetrical shapes and surface areas with very small radii of curvature. In particular, we show the three axial resonances of a 3D cashew-nut and the broadband response of peanut-shell NPs. The method employs the source-model technique along with a newly developed intricate source distributing algorithm based on the surface curvature. The method is simple and can outperform finite-difference time domain and finite-element-based software tools in both its efficiency and accuracy.

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