Modified field enhancement and extinction by plasmonic nanowire dimers due to nonlocal response

We study the effect of nonlocal optical response on the optical properties of metallic nanowires, by numerically implementing the hydrodynamical Drude model for arbitrary nanowire geometries. We first demonstrate the accuracy of our frequency-domain finite-element implementation by benchmarking it in a wide frequency range against analytical results for the extinction cross section of a cylindrical plasmonic nanowire. Our main results concern more complex geometries, namely cylindrical and bow-tie nanowire dimers that can strongly enhance optical fields. For both types of dimers we find that nonlocal response can strongly affect both the field enhancement in between the dimers and their respective extinction cross sections. In particular, we give examples of blueshifted maximal field enhancements near hybridized plasmonic dimer resonances that are still large but nearly two times smaller than in the usual local-response description. For the same geometry at a fixed frequency, the field enhancement and cross section can also be significantly more enhanced in the nonlocal-response model.
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 4.04 SJR 2.58 SNIP 2.572
Web of Science (2011): Impact factor 3.587
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.906 SNIP 2.428
Web of Science (2010): Impact factor 3.753
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 3.039 SNIP 2.679
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 3.204 SNIP 2.423
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 3.284 SNIP 2.11
Web of Science (2007): Indexed yes
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 3.313 SNIP 2.336
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.819 SNIP 2.472
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 2.669 SNIP 2.217
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.745 SNIP 1.748
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.496 SNIP 1.42
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 0.98 SNIP 0.761
Web of Science (2000): Indexed yes
Scopus rating (1999): SJR 1.442 SNIP 0.843

Original language: English
Electronic versions:
663C1d01.pdf
DOIs:
10.1364/OE.20.004176

Bibliographical note
This paper was published in Optics Express and is made available as an electronic reprint with the permission of OSA. The paper can be found at the following URL on the OSA website: http://www.opticsinfobase.org/oe/abstract.cfm?uri=oe-20-4-4176. Systematic or multiple reproduction or distribution to multiple locations via electronic or other means is prohibited and is subject to penalties under law.

Source: dtu
Source-ID: n:oai:DTIC-ART:inspec/363195207::15322
Research output: Research - peer-review ; Journal article – Annual report year: 2012