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Accession number:13033181

Title:Low-loss ultra-high-Q dark mode plasmonic Fano metamaterials

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Source title:Optics Letters

Abbreviated source title:Opt. Lett. (USA)

Volume:37

Issue:16

Publication date:15 Aug. 2012

Pages:3366-8

Language:English

ISSN:0146-9592

CODEN:OPLEDP

Document type:Journal article (JA)

Publisher:Optical Society of America

Country of publication:USA

Material Identity Number:EV60-2012-006

Abstract:We experimentally demonstrate a planar terahertz Fano metamaterial with an ultrahigh quality (Q) factor of 227. This is achieved by the excitation of the nonradiative dark modes by introducing a tiny asymmetry in the metamaterial structure. The extremely sharp quadrupole and Fano resonances are excited at normal incidence for orthogonal polarizations of the electric field. In order to capture the narrow linewidth of the dark resonance modes, we perform high resolution terahertz time-domain measurements with a scan length of 200 picoseconds and frequency resolution of 5 GHz. These high-Q metamaterials can be used in ultrasensitive label-free terahertz sensing, dense photonic integration, and narrowband filtering.

Number of references:21

Inspec controlled terms:electron spin polarisation - metamaterials - photoemission - plasmonics - quadrupole interactions - spectral line breadth

Uncontrolled terms:plasmonic Fano metamaterials - low-loss ultra-high-Q dark mode metamaterials - planar terahertz Fano metamaterial - ultrahigh quality factor - nonradiative dark modes - tiny asymmetry - metamaterial structure - extremely sharp quadrupole resonance - Fano resonance - orthogonal polarizations - electric field - narrow linewidth - high resolution terahertz time-domain measurements - time 200 ps - frequency 5 GHz

Inspec classification codes:A4270 Optical materials - A7225 Spin polarized transport - A7320M Collective excitations (surface states) - A7960 Photoemission and photoelectron spectra (condensed matter) - B4110 Optical materials - B1305 Microwave materials

Numerical data indexing:frequency 5.0E+09 Hz;time 2.0E-10 s

Treatment:Experimental (EXP)

Discipline:Physics (A); Electrical/Electronic engineering (B)

DOI:10.1364/OL.37.003366

Database:Inspec

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