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

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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. © 2012 Optical Society of America.

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Main heading:Metamaterials

Controlled terms:Electric fields

Uncontrolled terms:Dark resonance - Fano resonances - Frequency resolutions - High resolution - Label free - Metamaterial structures - Narrow bands - Narrow-line width - Non-radiative - Normal incidence - Orthogonal polarizations - Photonic integrations - Picoseconds - Plasmonic - Quadrupoles - Quality factors - Tera Hertz - Terahertz sensing - Time domain measurement - Ultrasensitive

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