This read me file describes the research data for

Lattice-enhanced Fano resonances from bound states in the continuum metasurfaces

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This research dataset should be interpreted and understood in the context of the corresponding manuscript, which has been published in Advanced Optical Materials with DOI: 10.1002/adom.201901572. All relevant information regarding the dataset, how it was obtained and its context is contained in the manuscript. The data corresponds to the data shown in the figures of the manuscript:

Figure 1. Fano resonances of different aluminum resonator configurations in terms of transmission amplitude. (a) Square configuration of end-coupled resonator arms and (b) side-coupled configuration with the resonating arms flipped. Simulations of the Fano resonance excitation allowed by asymmetry resulting from displacement of the gap by a distance d = 3 µm from the central (symmetric) position while maintaining overall dimensions of 40 µm $\times$ 40 µm, an arm width of 6 µm, a gap of g = 3 µm and a period of 70 µm.

Figure 2. Fano-metamaterial. (b) Simulated transmission amplitude of aluminum asymmetric split ring resonators with $P = 70$ µm period, $d = 1$ µm asymmetry and coupling distances of $g = 9,$ 5 and 3 µm.

Figure 3. Coupling resonances of aluminum split rings and lattice. Simulated and measured transmission amplitude of metamaterials with asymmetry $d = 3$ µm, coupling distance $g = 3$ µm and lattice periods from P = 75 to 122 µm.

Figure 4. Lattice-dependence of resonant metamaterial properties extracted from simulations. (a) Q factor and (b) figure of merit ($FoM = Q \times I$, with resonant transmission intensity change I) of the dipole and Fano resonances at different lattice periods of the aluminum metamaterial with asymmetry $d = 3$ µm and coupling distance $g = 3$ µm. (c) Transmission amplitude as a function of the metamaterial's period and frequency of the incident THz wave.

Figure 5. Excitation of bound metamaterial states in the continuum by symmetry breaking. Simulations are shown for metamaterial arrays with period P = 70 µm consisting of PEC resonators with different coupling distances of $g = 3,$ 5 and 9 µm. (a) Transmission amplitude spectra of symmetrically coupled resonators ($d = 0$ µm) as a function of angle of incidence in the xz-plane. Symmetry-protected BIC are shown by red arrows at normal incidence. (b) Transmission amplitude spectra of

QBIC excited by illumination of the symmetric structures with 2° angle of incidence or at normal incidence by introduction of a small structural asymmetry $d = 0.25$ μm.

Figure 6. Q factor of the simulated Fano resonance as a function of (a) angle of incidence θ, (b) asymmetry d and (c) period P. (a, b) The Q factor of PEC resonator arrays diverges to infinity when incidence angle and asymmetry both approach 0 as the resonance is protected by symmetry in this case. Results for aluminum resonator arrays with a coupling distance of $g = 3$ μm are shown for comparison. (c) Comparison between ideal PEC and realistic aluminum resonator arrays with asymmetry $d = 3$ μm and coupling distance $g = 3$ μm for different periods.

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