103
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Title:Coupling Schemes in Terahertz Planar Metamaterials
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Abstract:We present a review of the different coupling schemes in a planar array of terahertz metamaterials. The gap-to-gap near-field capacitive coupling between split-ring resonators in a unit cell leads to either blue shift or red shift of the fundamental inductive-capacitive (LC) resonance, depending on the position of the split gap. The inductive coupling is enhanced by decreasing the inter resonator distance resulting in strong blue shifts of the LC resonance. We observe the LC resonance tuning only when the split-ring resonators are in close proximity of each other; otherwise, they appear to be uncoupled. Conversely, the higher-order resonances are sensitive to the smallest change in the inter particle distance or split-ring resonator orientation and undergo tremendous resonance line reshaping giving rise to a sharp subradiant resonance mode which produces hot spots useful for sensing applications. Most of the coupling schemes in a metamaterial are based on a near-field effect, though there also exists a mechanism to couple the resonators through the excitation of lowest-order lattice mode which facilitates the long-range radiative or diffractive coupling in the split-ring resonator plane leading to resonance line narrowing of the fundamental as well as the higher order resonance modes.
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Uncontrolled terms:coupling schemes - terahertz planar metamaterials - gap-to-gap near-field capacitive coupling - split-ring resonators - unit cell - blue shift - red shift - fundamental inductive-capacitive resonance - split gap - inductive coupling - inter resonator distance - LC resonance tuning - higher-order resonances - inter particle distance - split-ring resonator orientation - resonance line reshaping - subradiant resonance mode - sensing applications - near-field effect - lowest-order lattice mode - long-range radiative coupling - diffractive coupling - split-ring resonator plane - resonance line narrowing - higher order resonance modes
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