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Title: Engineering electromagnetic response of composite terahertz metamaterial with broken symmetry

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Abstract: We proposed and numerically investigated the influence of spatial symmetry on the terahertz frequency region response of composite planar metamaterials based on deformed split ring resonators. Compared with the original simple structures, the composite metamaterials with different spatial symmetries exhibited exotic electromagnetic properties. The electromagnetic response of a specific configuration with C4 symmetry was identical to the structure with simple lattice. Especially, for configurations with broken symmetry, very sharp Drude-like resonances with high quality factor were observed. The electric field and current distribution associated the resonances were analyzed for deep understanding of the underlying physical properties.