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Title:Ultra-broad and sharp-transition bandpass terahertz filters by hybridizing multiple resonances mode in monolithic metamaterials
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Abstract:We present three monolithic metamaterial-based THz bandpass filters, the skewed circular slot rings, meandered slots and Jerusalem cross slots, to fit in the THz gap. These THz bandpass filters are comprised of a metal-dielectric-metal (MDM) structure that supports multiple resonances of electric dipole, magnetic dipole, and standing-wave-like modes. By exciting and further hybridizing these individual resonance modes, we demonstrate excellent performance of broad bandwidth and sharp band edge transition beyond conventional bandpass filters. By further employing our ad hoc Genetic Algorithm (GA) and Periodic Method of Moments (PMM) to optimize our designs, we achieve an ultra-broad 3dB fractional bandwidth and sharp band-edge transition up to 82.2% and 58.3 dB/octave, respectively, benefiting the practical applications such as material recognition in security systems, imaging, and absorbers.
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