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Title:Terahertz two-layer frequency selective surfaces with improved transmission characteristics

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Abstract:In this paper, a cascaded configuration for two-layer frequency selective surfaces (FSSs) at terahertz (THz) frequencies with improved filtering characteristics is realized for electrically thick substrates. At THz frequencies, the thicknesses of commercially available substrates are comparable to the free-space wavelength. As a result, the substrate plays a critical role in determining the transmission characteristics of THz multilayer FSS structures. Proper coupling method between FSS structures should be chosen to avoid unwanted substrate resonances or Fabry-Pérot resonances, which otherwise degrade the transmission characteristics of the cascaded FSS structure. In this paper, a cascaded structure to avoid multiple reflections within the substrate is presented and the same is used to realize two double-layered FSS structures to improve the transmission response. The transmission response is improved by introducing an extra transmission zero at a frequency location lower than the resonant frequency, thereby achieving high roll-off rate for the lower side of the stop band, and to suppress unwanted resonances, thereby increasing the rejection bandwidth of the filter. The proposed cascaded FSS structures were fabricated and tested using THz time-domain spectroscopy. Good agreement between simulations and experiments were obtained. © 2012 IEEE.

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Main heading:Substrates

Controlled terms:Cascade control systems - Frequency selective surfaces - Multilayers - Natural frequencies

Uncontrolled terms:Cascaded structure - Coupling methods - Filtering characteristic - Free-space wavelengths - Frequency selective surface (FSS) - Multiple reflections - Rejection bandwidth - Stop-bands - Terahertz - Terahertz frequencies - Thick substrates - THz filters - THz frequencies - THz time domain spectroscopy - Transmission characteristics - Transmission response -

Transmission zeros

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