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Title:Terahertz subwavelength filters based on a 2D lattice of metal wires

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Abstract:The filtering properties of a 2D square lattice made of metallic wires are investigated through the band structures and transmission spectra by the finite-difference time-domain method. All the results show that the transmission can be affected by factors such as wave polarization, incidence direction, and wire radius. It is found that the Γ -M direction and smaller radius of metal wires are preferable for a high-frequency-pass filter for TE waves, while the Γ -X direction and comparatively greater radius of metal wires are suitable for a low-frequency-pass and a wide stopband filter for TM waves. Band edges of the filters can be tuned by adjusting the radius of wires and lattice constant. The key features of the band structure and the corresponding transmission spectrum are strongly correlated. Our work demonstrates that detailed band maps can help understanding the transmission properties, which are essential for designing wave filters.

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