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Title:Terahertz notch and low-pass filters based on band gaps properties by using metal slits in tapered parallel-plate waveguides

Authors:Lee, Eui Su (1); Lee, Sun-Goo (2); Kee, Chul-Sik (2); Jeon, Tae-In (1)

Author affiliation:(1) Division of Electrical and Electronics Engineering, Korea Maritime University, Busan 606-791, Korea, Republic of; (2) Nanophotonics Laboratory, Advanced Photonics Research Institute, GIST, Gwangju 500-712, Korea, Republic of; (3) Center for Subwavelength Optics, Korea, Republic of

Corresponding author:Lee, E.S.

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Abstract:We present a tunable notch filter having a wide terahertz (THz) frequency range and a low-pass filter (LPF) having a 0.78 THz cutoff frequency. Single slit and multiple slits are positioned at the center of air gaps in tapered parallel-plate waveguides (TPPWG) to obtain the notch filter and LPF, respectively. The notch filter has a dispersion-free and lowloss transverse magnetic (TM) mode. The Q factor was proved to be 138, and the resonant frequency is easily tunable by adjusting the air gaps between TPPWG. On the other hand, the cut off frequency of the LPF was determined using a Bragg stop band, which depends on slit period. The LPF has a transition width of 68 GHz at the cutoff frequency and a dynamic range of 35 dB at stop bands. In addition, the characteristics of such filters were analyzed using finite-difference time-domain (FDTD) simulations.

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