Design of an extremely high-Q in-plane-type photonic-crystal channel-drop filter for the DWDM applications

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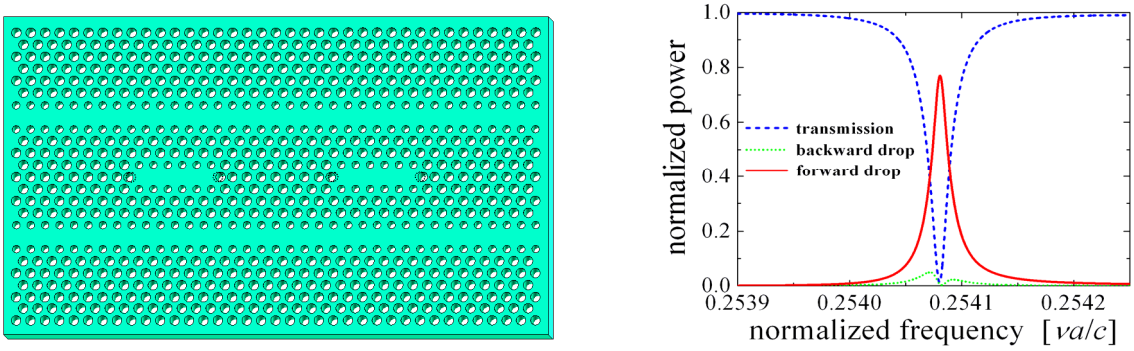
In-plane-type channel-drop filters have been designed or demonstrated based on the two-dimensional (2D) photonic-crystal (PhC) [1, 2] and the 2D PhC slab [3-5] structures.

In this presentation, we show that the design of the in-plane-type channel-drop filter based on the 2D PhC slab structure from the modification of the previous design [5] by three-dimensional finite-difference time-domain (FDTD) simulation has been greatly improved. The Q factor of the filter has been calculated around to be 13,300 and the forward-drop power spectrum has been obtained to be almost symmetric Lorentzian, which would be fairly adequate for dense wavelength division multiplexing (DWDM) applications. Over than 77 % of the incident power at the input port has been transferred to the forward-drop port, and the transmitted and the backward-drop powers have been reduced below –18 dB and –22 dB, respectively, at the center frequency. We have shown that the improved design of the extremely high-Q in-plane-type channel-drop filter based on the 2D PhC slab structure has the possibility of the realization as a DWDM add-drop multiplexer when the nano-photonic integrated-circuit fabrication technology is fully developed.



(a) (b)

Fig. 1. (a) Schematic of an in-plane-type channel-drop filter based on the 2D PhC slab structure. (b) Frequency responses of the designed channel-drop filter.

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