

Photonic quasi-crystal add-drop filter via coupling between surface waveguide modes and resonator modes

E. H. Khoo¹ and A. Q. Liu^{1†}

¹School of Electrical and Electronic Engineering,

Nanyang Technological University, Nanyang Avenue, Singapore 639798

†Corresponding author: eaqliu@ntu.edu.sg, Tel: (65) 6790-4336 Fax: (65) 6792-0415

It is highlighted that the waveguiding properties of surface modes in PC¹ can be used to open up new possibilities for design and operation of photonic structures for feeding and redistributing light. In this abstract, we show the application of photonic crystal (PC) surface mode for de-multiplexing wavelength. The crystal structure selected in this paper is a circular quasi periodic PC² with radius of $7a$, where a is the lattice constant in the centre line. Fig. 1 shows the schematic layout and working mechanism of the de-multiplexing device. The radii of the surface cells are $0.5r$, where r is the radius of the inner lattice cell. At the right angle axis of the circular surface waveguide, additional cells are placed near to couple light out from the circular quasi crystal. Each group of the coupling cells are tailor and optimized to emitted light for various wavelengths. Figs. 2 show the field patterns demonstrating the out-coupling at different normalized frequencies. It shows that only the frequency that matched perfectly with the particular group of cells is transmitted out. Fig. 3 shows the transmission spectrum at each group of the out coupling cell.

[1] A. I. Rahachou et al, "Waveguiding properties of surface states In photonic crystal," *JOSA B*, **23**, 1679 (2006).

[2] J. Zarbakhsh et al, "Arbitrary angle waveguiding applications of two-dimensional curvilinear-lattice photonic crystals," *APL*, **84**, 4687 (2004).

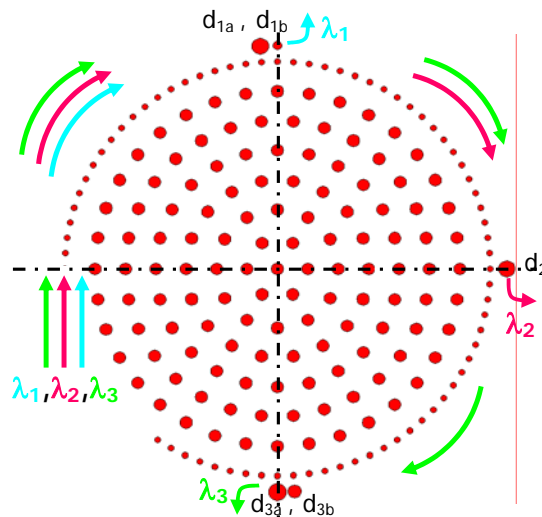


Fig. 1: Schematic layout of the de-multiplexing

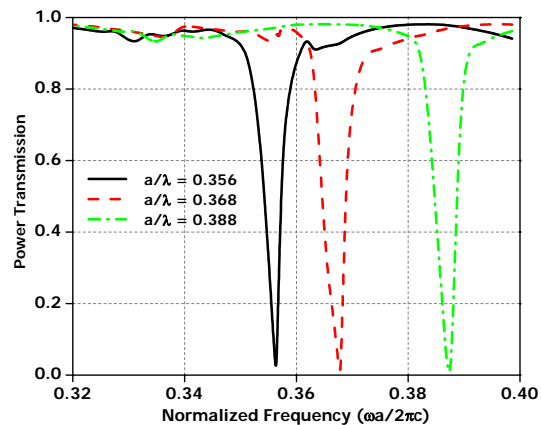


Fig. 3: Transmission spectrum for different wavelength input

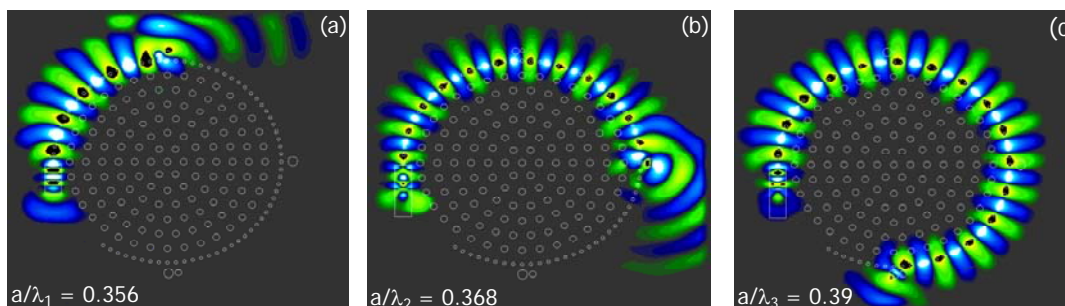


Fig. 2: Field pattern for different frequencies