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A High Bit Rate Half Adder Based on Square Lattice Photonic Crystal

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Abstract

In this paper an all-optical half adder is proposed that uses the concept of photonic band gap phenomenon of photonic crystal. The point and line defects are introduced in the perfect photonic crystal and the resonant characteristics are measured from output port for Gaussian modulated input signal. The parameter of photonic crystal is so selected that the bandgap of crystal lies near telecommunication wavelength centered at $\lambda = 1550$ nm. The structure is investigated using 2D FDTD method. In the absence

of any one input, the output is obtained above the threshold while in the presence or absence of both the input, the signal level at output is far below the threshold. The half adder performance of is measured using response time and contrast ratio. The contrast ratio for sum and carry port is 7.58 and 9.52 dB respectively and response time is as low as 1.8 ps. This half adder supports small footprint. The high Bit rate and small footprint of proposed structure makes the device useful for optical ICs.

Keywords

Photonic crystal FDTD Half adder

Bit rate Contrast ratio

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