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(57) Abstract :
ABSTRACT The present disclosure introduces a design and simulation of 2d photonic crystal based all-optical logic gates for high-speed optical processors 100. It utilizes a photonic crystal structure 102 formed by a square lattice of air holes in a silicon substrate, with waveguides 104 created through line defects. This structure facilitates the implementation of logic functions, such as AND, OR, and NOT, through phase changes in optical signals. The system operates efficiently at the standard telecommunication wavelength of 1.55 µm, demonstrating high contrast ratios (26.06 dB for AND, 24.4 dB for OR, and 35.1 dB for NOT) without requiring optical amplifiers. The invention offers a compact design with ultra-small dimensions (100 µm²), optimizing both material and performance efficiency. This invention provides a simplified yet high-performance system for next-generation optical processors. Reference Fig 1

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