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High Contrast Ratio Based All-Optical OR and NOR Plasmonic Logic Gate Operating at E Band



Mainka, Shivani Sharma, Rukhsar Zafar, Mohammad Hossein Mahdieh, Ghanshyam Singh and Mohammad Salim

Abstract In this paper, we have proposed an all-optical OR and NOR logic gates which is based on Plasmonics metal–insulator–metal (MIM) waveguide. MIM waveguide has the inherent feature to confine light far beyond diffraction limit. Therefore, the structure can be designed with miniaturized size. The performance of the device (gate) is measured by a quantifying parameter which is known as contrast ratio. The proposed NOR logic gate offers a contrast ratio of 12.36 dB for Boolean logic gates of output. The proposed structure opens a solution for future all-optical computing. The optical logic gates are investigated using finite-difference time-domain method.

Keywords Metal–insulator–metal waveguide · Finite-difference time-domain method · Contrast ratio · All-optical logic gates · Surface plasmon polaritons

1 Introduction

Nowadays, optical computing attracted the future optical communication system [1]; in order to build it all-optical flexible signal processing device is needed. Optical logical gates [2, 3] are considered as vital elements in the network as it can perform data encoding and decoding, switching operations, etc. Photonic logical gates are the promising implementation in the real-time optical processing and communica-

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