Nanoplasmonic Multi Band/Multi Functional Devices Using MIM Waveguide

Abstract: Plasmonics is a rapidly evolving subfield of nanophotonics that deals with the interaction of light with surface plasmons, which are collective oscillations that occur at the interface between metal and insulator. Plasmonics meet a demand for optical interconnects which are small enough to coexist with nanoscale electronic circuits. This research mainly focused on the process of developing dual band plasmonic devices from the concept of nanoscale wireless links, with specific emphasis on synthesizing data from numerical simulation into an accurate, predictive understanding of nanoscale optical phenomena.

The realization of nanoscale wireless links requires miniaturized transmitter and receivers. A wireless link operating at single band has limited applications in future due the increased demand of multiple functions using the same system. Thus, we require multiband wireless links to accommodate more than one standards and functions. When multiple functions have to be performed; the single band system will become very complex and power hungry. Multi-band systems can be implemented by parallel, switchable or concurrent configurations. The parallel or switchable configuration suffers from the drawback of bulky circuitry and switching delay in the operation. The concurrent multiband front end provides different standard compatibility with a single circuitry only; hence reduces the circuit size and the power consumption. So far there is no attempt by researchers across the globe to implement this concept in photonic integrated circuits. Probably due to the fact that most of the photonic integrated circuits are developed by using optical waveguides.

Although, nanoscale wireless link concept was proposed in 2010; realization of this concept requires individual building blocks and their systematic design methodology. This portion is still not available in the literature. Therefore, there is a strong need to address this issue i.e. design of building blocks for nanoscale wireless links so that in future this concept can be realized. Keeping this research gap in mind, the research reported in this work has been devoted to design and analysis of MIM plasmonic waveguide based integrated circuits for future multifunctional photonic systems.

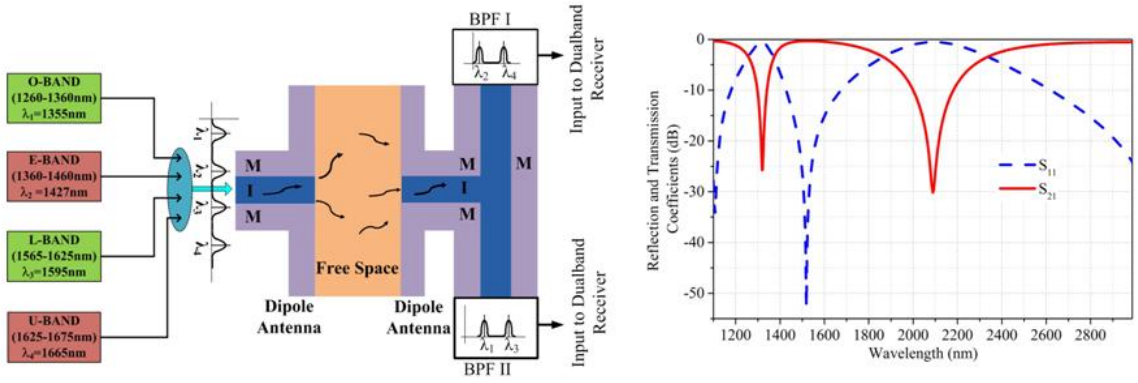


Fig. (a) Concept of Nanoscale Wireless Link (b) Multiband Filter characteristics