CST Project

Design of plasmonic splitters/routers in 3D metal-insulator-metal waveguides

Project introduction:

To make photonic systems be compatible with the integrated circuits, we need to keep reducing the size of the photonic waveguides and the associated devices. One of the most promising ways to guide light at a subwavelength scale is to utilize a surface plasmon polariton (SPP) at the interface of a noble metal and a dielectric [1]. Many SPP-based structures have been proposed and analyzed, in which the metal-insulator-metal shows the promising value of utilization due to its ability to confine light to deep subwavelength scale [2].

Tasks and goals:

This project will numerically design and analyze plasmonic splitters/routers based on three-dimensional metal-insulator-metal waveguides. The major goal is to achieve efficient routing functions with a nanoscale device. The design will be guided by planer waveguide theories and verified by numerical simulations. Propagation loss will be considered during the optimization process. The project will be executed using commercial software CST Microwave Studio, with some aided programming work (Matlab) and is scheduled for one semester.

Requirements:

1. Prior knowledge (undergraduate level) of Optics/Electromagnetic fields.
2. Basic Matlab programming skills.

References:

[1]. D. K. Gramotnev and S. Bozhevolnyi, “Plasmonics beyond the diffraction limit”, Nature photonics, 4 (2010).
[2]. J. A. Dionne, L. A. Sweatlock, and H. A. Atwater, “Plasmon slot waveguides: Towards chip-scale propagation with subwavelength-scale localization”, Phys. Rev. B, 73, 035407 (2006).