MODAL CHARACTERIZATION OF THE PLASMONIC SLOT WAVEGUIDE USING COMSOL MULTIPHYSICS

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Final Year Project Report Submitted in
Partial Fulfillment of the Requirements for the
Degree of Bachelor of Science (Hons.) Industrial Physics
In the Faculty of Applied Sciences
Universiti Teknologi MARA

JANUARY 2013

ACKNOWLEDGEMENT

Alhamdullilah, finally this report is done. Upon completion of this project, my gratitude to many parties which were involved in completing this report. I would like to express my highest appreciation to my supervisor Dr Mohd Hanapiah Mohd Yusoff for his guidance and support throughout this course. His brilliant ideas and comments regarding this project were helpful in order for me to complete the project and the thesis.

Special thanks to my friends for their support and encouragement, for their company when I was doing my project.

Lastly, to my dearest family for their loving understanding when I spent time on writing and typing instead of being with them.

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ABSTRACT

MODAL CHARACTERIZATION OF THE PLASMONIC SLOT WAVEGUIDE USING COMSOL MULTIPHYSIC

The modal characterization of the plasmonic slot waveguide is an investigation on the effects of slot gap in the electromagnetic wave's propagation in plasmonic slot waveguide. The structure of plasmonic slot waveguide is asymmetric. The simulation is done using COMSOL Multiphysics software. The simulation done is the 2D Perpendicular hybrid-mode wave application mode. The refractive index of silver taken is 0.54 and the absorption coefficient is10.8 at the wavelength of 1.55μm. The width of gap between silver is taken for several value of 25, 50, 75 and 100nm. The wavelength is varies from 1.53 to 1.61 μm. Then, the confinement factor is compared for the different wavelength and the different width of gap. Overall result shows that the confinement factor increased with increasing wavelength. The modal effective index is also found to be increase with increasing wavelength.

CHAPTER 1

INTRODUCTION

1.1 Background

In electronic devices, the material that used to carry out the data or the signal using electrical pulse is metal such as copper wires. The copper wire as in Figure 1.1 is widely used for some time until the discovering of light pulse to carry out the pulse.

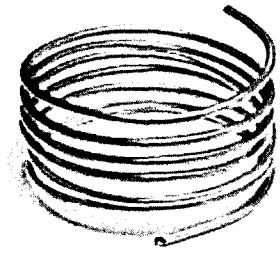

Figure 1.1: Copper wire [1]

The next generation of material used in carrying out the data or signal is optical fiber. The optical fiber is dielectric waveguide of cylindrical geometry with core and cladding of suitable material that have refractive index of the core much higher than refractive index of cladding. Figure 1.2 shows the core and cladding of Fiber optic. Fiber has the advantage of using light pulse to carry out the data that is faster, higher bandwidth and can travel to much longer distance compared to the metal wires. It also much smaller compared to metal wires. Although optical fiber is small, it is not small enough to be used in fabricated of semiconductor industry. [2]