INTERNATIONAL JOURNAL OF ELECTRONICS AND COMMUNICATION ENGINEERING & TECHNOLOGY (IJECET)

ISSN 0976 – 6464(Print)
ISSN 0976 – 6472(Online)
Volume 5, Issue 9, September (2014), pp. 01-08
© IAEME: http://www.iaeme.com/IJECET.asp
Journal Impact Factor (2014): 7.2836 (Calculated by GISI)
www.jifactor.com

IJECET
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A WIDEBAND HYBRID PLASMONIC FRACTAL PATCH NANOANTENNA

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ABSTRACT

A proposed wideband plasmonic optical fractal patch antenna is presented for use in intra/inter chip optical interconnects.The suggested plasmonic optical fractal patch antenna covering 3 optical communication bands: *L-band (1565-1625nm), C-band (1530-1565nm), S-band (1460-1530nm)*, and most of *E-band (1360-1460nm)*.The proposed antenna has a promising future use in inter and intra chip optical communications to eliminate electrical interconnection limitations such as interconnect density, power consumption and also increasing data rate.The proposed antenna is a rectangular tree-shaped fractal based.The performance of this antenna has been calculated using full wave simulation CST Microwave software.The bandwidth is largely enhanced by the first and second iterations rectangular tree-shaped external cut brick. The impedance bandwidth ($S_{11} \leq -10\,dB$) of the second iteration is about 38.5 THz, which is about 4 times greater the bandwidth of initiator with a gain up to 7.5 dB and about 97% radiation efficiency throughout the operational bandwidth.

1. INTRODUCTION

The nanoantenna, also known the optical antenna it is similar to the conventional antenna in fact, it deals with electromagnetic waves except that nanoantenna operates in the Infrared (IR) frequency portion of the electromagnetic spectrum. Antenna dimensions are comparable to the operating wavelength so that in order to achieve resonance at IR frequencies antennas should be shrinking to the nanoscale dimension. Nanoantenna can be defined as a nanometer scale metallic structure which is capable of enhancing the optical radiation interaction with the matter [1].

At 1959 an imaginative paper entitled "There's Plenty of Room at the Bottom" was presented by Richard Feynman. He talked about the problem of manipulating materials on a nanoscale dimensions. This paper presented an inspired scientific ideas contributed to open researcher's eyes on the nanotechnology a few decades later. Feynman discussed the problem of manipulating material on the nanoscale. He wondered about the possibility of building nanoscale electric circuits and he also posed the question "is it possible to emit light from nanoantenna array, like we emit radio waves from an antenna array to beam the radio programs to Europe? Which is similar to beam the light out in a definite direction with highdirectivity" [2-3]. Due to the advances in nanotechnology, optical