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A Survey on Frequency Reconfigurable Antennas Using Passive element for ISM Band

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Abstract - Frequency reconfigurable antenna is the extensively utilized antenna in wireless communication applications which requires a change in operating frequencies and to switch from one channel into another without degrading its performance parameters. There are different ways like electrical, mechanical, optical and smart material loaded are used to attain frequency reconfiguration. In electrical reconfiguration method, reconfiguration is attained by using PIN diode, varactor diode and MEMS switch. In this paper, some of the frequency reconfigurable antennas which are tuned using PIN diode are reviewed. The antenna design, functionality, the attained reconfigurable frequency range and also its application are analyzed. The comparative study is also presented.

Keywords: frequency reconfiguration, electrical switching, PIN diode.

I. INTRODUCTION

The main constraint of wireless applications in recent years is efficient usage of available electromagnetic spectrum with little intrusion within neighboring channels [1]. For this, a miniaturized multifunctional antenna is required. This antenna has to perform wideband tuning deprived of weakening the antenna return loss, gain, and radiation pattern. In this situation reconfiguration property of the antenna is preferred. Antenna which has the capability to reconfigure certain characteristics such as frequency, polarization and pattern is known as reconfigurable antenna [2]. Depends on the application, multiple/combined reconfiguration also needed. Even though reconfigurable idea was introduced in 1930s, its real time application evolved from 1999 only [2]. After that due to the momentous improvement in micro strip patch antenna design, the rapid development and usage of reconfigurable antenna is happened.

With the help of switches like PIN diodes, varactor or MEMS, electrical reconfiguration is achieved [4]. By reconfiguring antenna structure with the use of these switches, distinction in the operating frequency is attained. The enactment of this type of a reconfigurable antenna with switching elements is easy and has earned loads of attention in research. The switches can be assimilated into the antenna design, to reduce the design complexity [4].

Only few nanoseconds are needed to get the antenna response if PIN diode is used [5]. The PIN diode switch is capable to do very fast switching and moderately high current handling. Its implementation and control is easy. Seclusion among DC signal and RF signal is easily achieved [6]. Designing a compact size frequency reconfigurable antenna with maintaining identical radiation patterns on entire

functional frequencies is the major task of the antenna designers [9].

Positioning the PIN diodes in appropriate places of the antenna structure helps to alter the antenna's operating frequency. In this paper the latest explorations accomplished in frequency reconfiguration using PIN diodes for wireless applications are reviewed and summarized.

II. LITERATURE REVIEW

Unidirectional, complementary antenna which has strip line as an electric dipole with a segmented loop which behaves equally an equivalent magnetic dipole is proposed in paper [5]. To achieve maximum radiation direction and impedance matching, an additional stub and slotted circular patch are used. This antenna is fabricated on 0.8mm thick FR4 single layer substrate. The dimension of the antenna is $0.296 \times 0.296 \times 0.0067 \lambda_0^3$. Fig.1 shows the antenna appearance. On the top layer of the substrate, the strip line is made and it is off-center fed through a coaxial probe by a gap, performing such as an electric dipole. On the backside of the substrate, loop which is uniformly prorated as four sections by means of periodical capacitive loading, in the form of interweaved coupling lines is printed. This capacitive loading is helped to maintain the loop current uniform, in-phase and makes the loop to radiate similar to a magnetic dipole. Circular patch with ring slot that has connected to the stub is helped to connect aforementioned loop with the exterior conductor of the coaxial cable. At the both ends of the strip line, two PIN diodes with two strips are placed correspondingly and at the same time another pair of PIN diode is placed among the neighboring segments of loop. Frequency reconfiguration between two frequencies 1.5 and 2.4 GHz is achieved by making these switches ON and OFF.

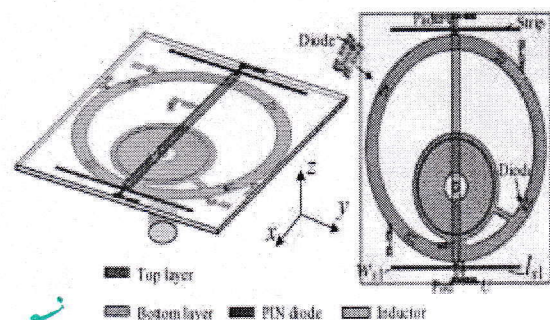


Fig. 1. Proposed antenna design [5]



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This is to certify that

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