A compact slotted rectangular planar antenna with frequency reconfigurability

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***Abstract*— A frequency reconfigurable antenna for multi-standard wireless communication system is proposed in this letter. The loop antenna with partial ground and a center element with optimized dimension is presented. To obtain the frequency reconfigurability, two PIN diodes are put in the Top plane. The antenna presented is efficient in changing between four different bands of resonant frequency centered at 3.10, 4.17, 4.21, and 17.47 GHz with wide coverage area. CST microwave studio is used to simulate characteristics such as reflection coefficient, VSWR and bandwidth. The suggested antennas can be used in a wide range of wireless communication systems, including Wi-Fi, WLAN, WIMAX, UWB and satellite communication system.**

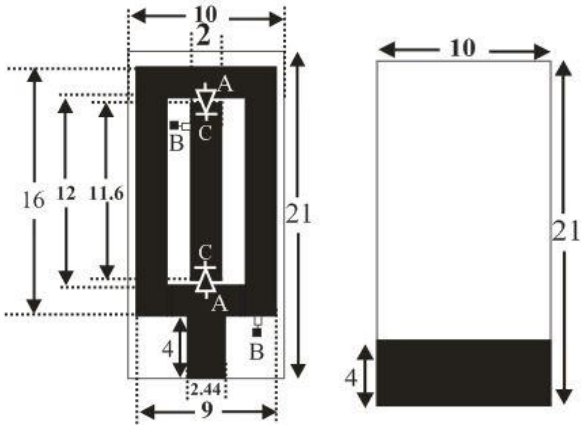
Keywords*— Loop antenna, frequency reconfigurable, CST, PIN diode

I. INTRODUCTION

Reconfigurable antennas have grown in popularity in recent years due to their capacity to adapt to changing environmental circumstances. When it comes to antennas, reconfigurability refers to the ability to change an individual radiator's essential working properties by change in electrical or mechanical specifications. The beam steering and beam shaping in an antenna array using only change in phase of signals between elements does not make the antenna "reconfigurable" because the antenna's structure is fixed [1]. In this instance, the core functioning features remain constant. To satisfy changing operational needs, reconfigurable antenna must be able to change at least anyone of its operating frequency, pattern or polarizations independently. However, both antenna and system designers face substantial problems in developing these antennas. These difficulties are to achieve the appropriate capability of antenna, and function integrity in order to achieve efficient and cost-effective solution. Four slots on a proximity-fed circular patch were controlled by PIN diodes and switched between the TM02 and perturbed TM02 to achieve reconfigurability [2]. The RF switches are inserted in the structure to produce the antenna's reconfiguration mechanism, by which the desired specifications are controlled [2-6]**.**Various switching technologies like RF switch, PIN diode, MEMS, and optical switches are used to achieve reconfigurability. RF PIN diodes are one of the most popular switches because of their advantages, which include low cost, a simple biasing circuit, and the ability to change the effective length of the antenna to achieve reconfigurability [7]. Another paper [8] demonstrated the reconfigurability of a loop antenna by employing a PIN diode to short the loop to ground at two separate places. PIN diodes can be used for switching to achieve frequency reconfigurability [9-13].

II. ANTENNA DESIGN

Proposed design of frequency reconfigurable planar microstrip antenna is shown in Fig.1. Rogers RT5880, with 2.2 dielectric constant and 0.0009 loss tangent is used as substrate. The substrate thickness is 0.787 mm and the overall dimension of antenna is 10 x 21 x 0.787 mm^3. A rectangular patch of 9 x 16 mm^2 with two parallel slots of dimension 1.5 x 12 mm^2 each and 2 mm separation is designed on the top side of the substrate and partial ground of 10 x 4 mm^2 is designed at the bottom side of substrate just beneath to feed line. A microstrip line, which characteristic impedance is of 50 Ω, is used to feed the signals to antenna.



(a). Radiating patch (b) Ground

Fig.1: Proposed frequency reconfigurable antenna design

The proposed antenna is looked like a rectangular loop antenna having width of 2 mm of side arms and it consists of a conducting element of 2 x 11.6 mm^2 dimension at the center. The conducting element at the center is separated by 1.5 mm from vertical arms and 0.3 mm from horizontal arms. Two planar and mesa beam lead PIN diodes