IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

AN INVESTIGATION OF RECONFIGURABLE ANTENNA TO DETERMINE THEIR RANGE OF USES

Dr. Rashmi Rekha
Faculty member, Dept. of physics, C. M. Science College,
L. N. M. University, Darbhanga, Bihar, India.

Abstract: Wireless systems are becoming more multifunctional as they develop. Users have the option of connecting various wireless services for a variety of purposes and at various times thanks to its multi-functionality. These systems need changeable antenna in addition to rapid electrical and adaptive signal processing in order to realize their full potential. To reduce the number of antennas required for the given system function, the reconfigurable antenna can simply be employed. They may be created to service locations that are considerably more complex. Some of these functions include the use of reconfigurable hardware to boost system longevity and usage as programmable control elements with feedback to decrease errors and noise, and improve security. Software defined radio, cognitive radio, multiple inputs - multiple output systems, and multifunction consumer electronics are examples of emerging uses. Each antenna is discovered to be powered by a particular application. There isn't a single ideal use that would lead to a super antenna that could satisfy every system's requirements. The antenna's adaptability would provide innovative solutions for overcoming these difficulties. While a single individual element's aperture would be tiny for communication sensing and security, satellite communication requires wider aperture antennas. In this research, the re-configurability of micro strip antennas has been examined. One of the most adaptable antenna types, micro strip antennas can be used both as a single element in small devices and in massive phased arrays. This study work has examined the properties of micro strip antennas in relation to their adaptability and potential uses.

***Index Terms* - Adaptability, versatility, and micro strip antennas.**

I. INTRODUCTION

Modern communication systems now frequently use reconfigurable antennas. Future wireless communication systems like LTE and 5G have many uses that are being introduced. There are many ways that antennas can be reconfigurable. Some of them might be made polarization, frequency, radiation, and pattern reconfigurable, as well as combinations of these. Wherever it is required for intelligence and more benefits of the systems in the applications, re-configurability can be made to achieve. To double system capacity and lessen multipath fading, polarization or switching-enabled reconfigurable antennas are used. Due to reflections from objects or any other obstacle, polarization of the receiving signal may change its direction and reduces the amplitude of circularly polarized wave. Antennas which are insensitive to the orientation of receiving and transmitting waves are best suited in such cases and reduce the polarization loss and enhance the signal strength. Micro strip based circularly polarized antennas offers advantage of being simple, light weight and low loss. Therefore, research activities related to the circularly polarized antennas have been continuously reported in the literature. Various designs of circularly polarized antenna have been reported earlier with single or dual feed mechanism [1-3]. Antenna with single feed mechanism has single circuitry compared to that with the dual feed. Usually a single feed micro strip patch antenna radiates linear polarization. The circular polarization can be obtained from the micro strip patch antenna by perturbing its shape or by inserting slot or by truncating its corners [4-6]. Such polarizations could also be achieved by truncating only one corner of the strip [7-8]. This method offers simplicity and reduced the number of switches in the structures. The aim of this work is to propose a compact reconfigurable antenna which can have freedom to switch independently over frequency more than one band. This will provide the basic step to advance towards realization of multifunctional reconfigurable antennas.

II. ANTENNA STRUCTURE AND DESIGN

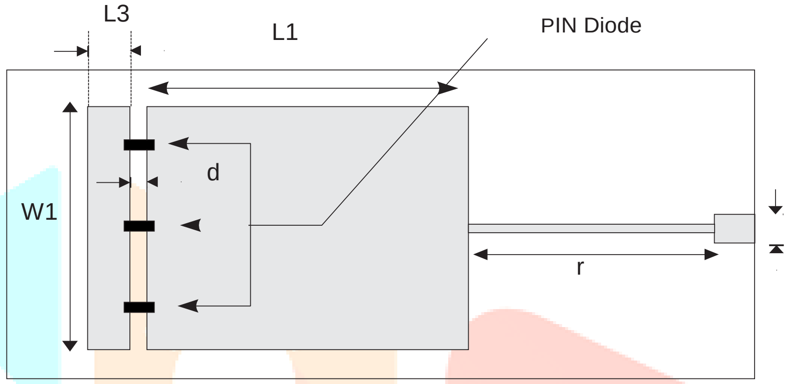

Figure-1: Design of reconfigurable micro strip antenna

The reconfigurable micro strip antenna is shown in Figure 1. The optimal dimensions of the proposed antenna are as given:
W_1= 40 *mm*, L_1= 35 *mm*, L_1= 80 *mm*, L_3 = 3*mm* and r = 24 *mm*. The gap between the square patch and rectangular conductor is designated as d = 0.8 *mm*, the total size of the antenna is 80 ×56mm^2
The resonant frequencies of the above structure can be tuned by changing the geometry of the antenna. To control the geometry of proposed antenna three PIN diodes are distributed into the gap between the patch and rectangular conductor. Inductor and capacitor of 100 nH and 100 pF are used respectively to improve the RF-DC signal isolation. The antenna is fabricated on low cost Teflon glass substrate with relative permittivity of 2.786 and thickness of 1.6 *mm*

III. SIMULATION AND EXPERIMENTAL RESULTS

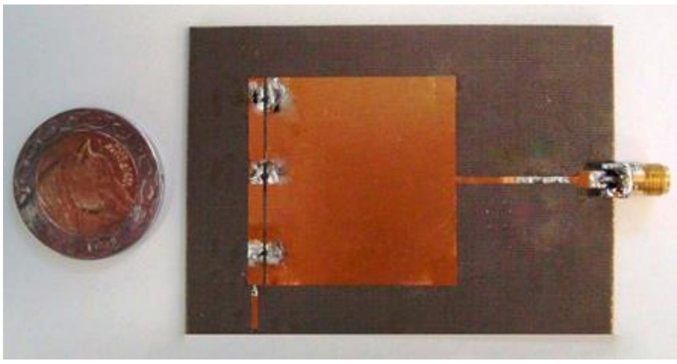

Figure-2: A photograph of the realized antenna

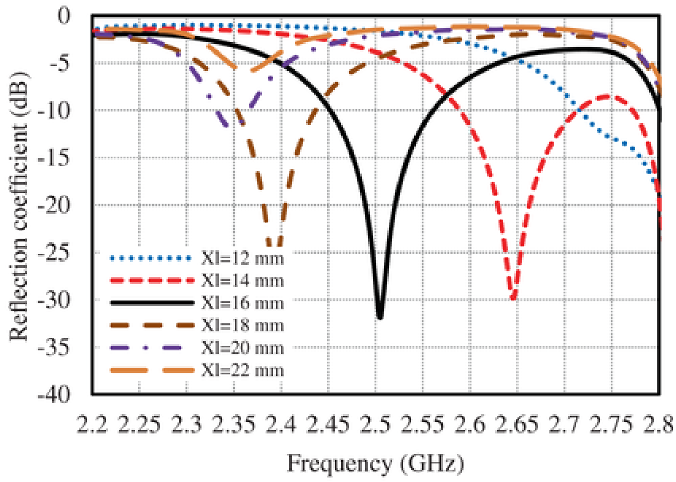

Figure-3: The simulated power reflection coefficient

Utilizing the commercially available IE3D program from Zeeland, simulations are carried out. In order to account for the non-ideal behavior of the diodes, the Pin-diode was modeled by the RF equivalent circuit. Using an Agilent 8719ES Vector Network analyzer
(VNA), the return loss was measured. Figure 2 displays a picture of the finished antenna. In Figure 3, the simulated power reflection coefficient is displayed.

We can observe that the power reflection co-efficient is -19 dB at 2.2 GHz (on state) and 32.5 dB at 2.45 GHz (off state). The antenna operating bandwidths, defined by a 10 dB return loss, are 30 MHz (2.18 GHz to 2.21 GHz) and 40 MHz (2.43 GHz to 2.47 GHz) corresponding to an impedance bandwidth of1.36% and 1.63% with respect to the appropriate resonant frequencies of and 2.45 GHz.

Obviously, the two bandwidths achieved provide sufficient bandwidths for the ISM (2400 MHz to 2483.5 MHz) and the UMTS/IMT- 2000(2170 MHz to 2200 MHz) bands.

IV. CONCLUSION

This research introduces a frequency-configurable micro strip patch antenna that can operate at two frequencies. By adjusting the effective length of the antenna radiator, which is managed by PIN-diode switches, the resonance frequency may be modified. The antenna's simulated and measured parameters are presented, and it is shown that the frequency tuning has no sensory impact on the radiation patterns. The proposed antenna has a sufficiently high gain and a radiation pattern resembling a table monopole, making it reliable and ideal for use in wireless communication systems.

REFERENCES

[1] S. Onat, L. Alatan, S. Demir, “Design of triple band reconfigurable micro strip antenna employing RFMEMS switches” APS International Symposium, IEEE, Vol. 2, pp.1812-1815, 20-25June2004.

[2] D. Peroulis, K. Sharabandi, L. P. B. Katehi, “Design of Reconfigurable Slot antennas” IEEE transactions on antennas and propagation, IEEE, Vol. 53, No 2, pp.645-654,2February2005.

[3] N. Behdad, K. Sarabandi, “Dual-band re-configurable antenna with a very wide tunability range” IEEE transactions on antennas and propagation , IEEE,vol.54,No2,pp.409-416,Feb.2006.

[4] B. A. Cetiner, H. Jafarkhani, Hui Jae Yoo, Jiang-YuanQian, A. Grau, F. De Flaviis, “Multifunctional re-configurable MEMS integrated antennas for adaptive MIMO systems”, Communications Magazine, IEEE,Vol42,No12,pp.62-70,December2004.

[5] A. H. M. ZahirulAlam, Md. RafiqulIslam, “Re-configurable patch antenna by RF MEMS switches”, Inter-national Symposium on Mechatronics and its Applications, IEEE, 2009.

[6] A. W. M. Lee, S. K. Kagan, M. Wong, R. S. Singh, E. R. Brown, “Measurement and FEM modeling of a re-configurable patch antenna for use in the wideband gap-filler satellite system” APS Symposium, IEEE, Vol. 1, pp.379-382,22-27June2003.

[7] S. Liu, M. Lee, C. Jung, G.P. Li, F. Flaviis, “A Frequency Reconfigurable Circularly Polarized Patch

Antenna by Integrating MEMS Switches", APS International Symposium, IEEE, Vol. 2A, pp. 413-416.

[8] H. Kimouche, A. Mansoul, "A compact re-configurable single/dual band antenna for wireless communications", Antennas and Propagation (EUCAP), Proceedings of the 5th European Conference on, pp.393-396, 11-15 April 2011.

Dr. Rashmi Rekha is working as a faculty member (Guest lecturer) in the department of physics in the C. M. Science College, Darbhanga. This is a constituent college of Lalit Narayan Mithila University, Darbhanga, Bihar. She has worked as a guest faculty in Government Polytechnic College, Darbhanga. Her research articles are published in the reputed journals and magazines. She is gold medalist in M. Sc. (Physics) and awarded her Ph.D. degree in year 2016 by Lalit Narayan Mithila University, Darbhanga, Bihar.