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DUAL BAND, DUAL SLANT POLARIZED MICROSTRIP PATCH ARRAY ANTENNA

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Abstract

A design proposed to enhance the performance of a microstrip patch antenna is presented in this paper. The proposed antenna is designed to operate at two different frequencies 3.4/4.8 GHz and at dual slant polarizations of 45° and -45°. Designed and simulated results are compared and presented.

Keywords: Microstrip patch antenna, dual band, dual slant polarization.

1. Introduction

Recent years have seen the enormous expansion of telecommunication services where antennas play a vital role in the communication link. Microstrip patch antennas are very attractive, because they are low profile, inexpensive and easy to fabricate. There are several ways to enhance the performance of a microstrip patch antenna. Antennas that can resonate at multiple frequencies and antennas capable of operating in dual polarizations are becoming increasingly popular. There are different methods to design dual frequency antennas. Antennas can be excited at two different frequencies by introducing slots of varied shapes in a rectangular patch antenna [1]. Dual polarization in a rectangular patch antenna can be obtained by using dual feed [2]. There are also methods proposed to obtain dual frequency, dual polarization by using multilayer patches [3]. This paper uses the design of broadband dual-polarization microstrip antenna with inset-feed and a slant at the desired location [4]. The antenna is single layer and employs the corporate feed technique. The main objective of this work was to extend the operation of the antenna to work at two frequencies. The two frequencies 3.4/4.8 GHz can be used for defense application.

This paper presents a method by which the antenna resonates at two frequencies by offsetting the position of the feed point so that it excites two different lengths viz. both the length and the width of the patch. The antenna is designed as a 1 x 2 array in order to exploit the advantages of an array antenna [5]. An array antenna can be fed in two ways: series feed or corporate feed.

This paper uses the corporate feed technique that is general and versatile. This type of feed provides more control of the feed of each element. The design was simulated using CST Microwave Studio 2009.

2. Antenna Geometry

A. Transmission Line Model and calculation of parameters

It is very easy to analyze a rectangular patch antenna by the transmission line model or the cavity model [5]. The dimension of the rectangular patch antenna is designed for a frequency of 4.8 GHz using the transmission line model. The patch is etched on a dielectric substrate of dielectric constant 4.4 and thickness 1.6mm. The patch is designed with an inset feed. The length of the inset is calculated according to equations in [5]. The length and width of the rectangular patch is L=14.4mm and W=19mm. The length of the inset l_o = 5.2 mm.

B. Design and placement of patch elements

The rectangular patch was simulated using CST and the patch elements were located at a slant of 45° and -45°.Without offset of the feed the antenna would resonate at 4.8 GHz. This implies that dual polarization of the patch is only obtained at one frequency. The 50 ohm impedance of the width is also found and the feed is offset to excite the mode along the width too. Thus dual slant polarization is obtained at two frequencies. .1 shows the design of 1 x 2 array that can operate at two frequencies with dual slant polarizations.

III. Simulation Results

The designed patch was simulated and iterated to obtain the results shown in Table 1. The simulated results of S11 are shown in. 2 The S11 has to be further improved to obtain better results.

IV. Conclusion

Thus a simple design for a microstrip antenna was proposed to operate at dual frequencies and with dual slant polarizations. This antenna can provide a significant enhancement in the performance of an antenna.

References

1. S. Gai, Y.-C. Jiao, Y.-B. Yang, C.-Y. Li, and J.-G. Gong, “Design of a novel microstrip-fed dual-band slot antenna for WLAN applications,” Progress In Electromagnetics Research Letters, Vol. 13, 75-81, 2010.
2. Johan Granholm, “Dual polarization stacked microstrip patch antenna array with very low cross polarization,” ieee transactions on antennas and propogation, vol. 49, no. 10 october 2001.
3. Reuven Shavit, “Design of a new dual-frequency dual-polarization microstrip element,” ieee transactions on antennas and propagation, vol. 51, no. 7, july 2003.

4. M.S,R Mohd Shah, M.K.Suaidi, M.Z.A. Abdul Aziz, M.F. Abd.Kadir, M.K.A. Rahim"Dual polarization microstrip patch array antenna for WLAN application," Antennas and Propagation, 2009. EuCAP 2009. 3rd European Conference 23-27 March 2009.
5. Yong-shuai Zheng, Shaco-jun Fang "Dual-Band Rectangular Patch Antenna with a Pair of L -Shaped Slots for WLAN Application" IEEE International Symposium on Microwave, Antenna, Propagation and EMC Technologies for Wireless Communications Proceedings 2005.
6. S. K. Padhi, N. C. Karmakar, Sr., C. L. Law, and S. Aditya, Sr "A Dual Polarized Aperture Coupled Circular Patch Antenna Using a C-Shaped Coupling Slot" IEEE transactions on antennas and propagation, vol. 51,pp 12, December 2003.
7. Constantine A.Balanis, "Antenna Theory," Second Edition,Wiley student edition pp: 740 - 775.