International Journal of Electronics Engineering (ISSN: 0973-7383)
Volume 10 • Issue 1 pp. 106-109 Jan 2018-June 2018 www.csjournals.com

U-Slot Back fed Ground defected Two-Element Rectangular Microstrip Array Antenna

Nagraj Kulkarni,
Assistant Professor in Electronics, Government College, Kalaburgi, Karnataka, India

Abstract: In this paper a new design of U slot loaded back fed Two-element rectangular microstrip array antenna is presented for triple frequency operation. The antenna has a 3-Dimensional volume of 9 X 5 X 0.16 cm^3 and operates between the frequency range of 4.85 GHz to 9.9 GHz giving a maximum impedance bandwidth of 20.2 % with a peak gain of 4.88 dB. The frequency ratio of about 1.29 is achieved. The microstripline feed in addition with equal power divider method is used to excite the antenna. The commercially available low cost modified glass epoxy substrate material is used to fabricate the antenna. The design detail of the antenna is described. The experimental results are presented and discussed. This antenna may find applications for systems operating WLAN and lower X-band frequencies.

Key words: U-Slot, Two-Element back fed, Microstrip antenna array, gain.

1. INTRODUCTION

In todays scenario the microstrip antennas have gained the great place in wireless communication system because of their advent and challenging properties like ease of fabrication using printed circuit board technology process, low cost, compact size, and ease of integration with various planar circuit technologies, ruggedness, ease of installation. etc. In modern wireless communication application there is a need for a simple radiator with comparable bandwidth and dual and triple resonating bands to use the same antenna for transmit and receive process. In this paper the U-slot back fed two element rectangular microstrip array antenna incorporating a simple microstripline feed with equal power divider method is presented, which can radiate broad sided characteristics with linear polarization. This kind of antenna is rarely found in the literature.

2. ANTENNA DESIGN

The commercially available low cost modified glass epoxy substrate material of thickness h = 0.16 cm and relative permittivity of 4.2 is used to fabricate the U-Slot back fed two-element rectangular microstrip array antenna (USBFTERMSAA). The art work of proposed antennas is sketched using autoCAD-7 computer software to achieve better accuracy. The antennas are etched using the photolithography tmethod.

International Journal of Electronics Engineering (ISSN: 0973-7383)
Volume 10 • Issue 1 pp. 106-109 Jan 2018-June 2018 www.csjournals.com

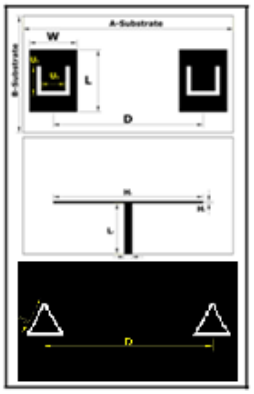

Figure -1: Geometry of USBFTERMSAA.

Figure 1 shows the geometry of USBFTERMSAA. The antenna has the radiating patch designed for the resonant frequency of 3.5 GHz, using the basic equations available in the literature [1-3]. The U-shaped slots of horizontal and vertical arm lengths U_H and U_V of 2 mm width which are 64.12 mm apart are placed on the radiating patch. Two equilateral triangle shaped slots of side 14.9 mm and 1 mm width are placed on the ground plane such that the centers of these slots coincide with center of the U-Shaped slots for better coupling. The microstripline feed of length L_f and width W_f is used to supply the microwave energy to the antenna. The equal power divider of length H_f and width H_t is used to feed the microwave power to the antenna elements at the center. A semi miniature-A (SMA) connector of 50**Ω** impedance is used at the tip of the microstripline to channelize the microwave power from Vector Network Analyzer. Figure 2 and Table 1 gives the photograph and design parameters of the USBFTERMSAA.

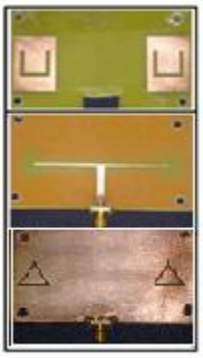

Figure-2: The photograph of USBFTERMSAA.

International Journal of Electronics Engineering (ISSN: 0973-7383)
Volume 10 • Issue 1 pp. 106-109 Jan 2018-June 2018 www.csjournals.com

Table-1 Design details of USBFTERMSAA (mm)

Parameter	Dimension	Parameter	Dimension
A-Substrate	90	S	14.9
B-Substrate	50		
W	26.6	D	64.12
L	20.4	L_f	21.84
H_t	0.74	W_f	3.2
H_f	64.12	U_H	10.3
		U_V	12.6

3. RESULTS AND DISCUSSION

Vector Network Analyzer is used to measure the experimental return loss of USBFTERMSAA.

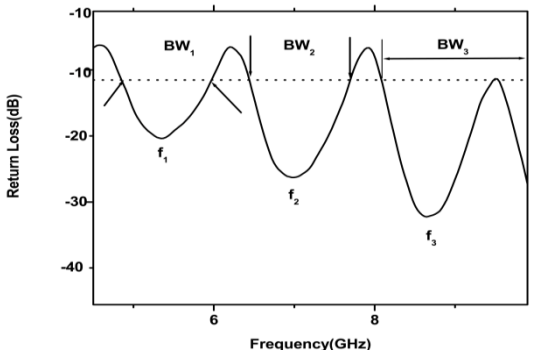

Figure-3: Variation of return loss versus frequency of USBFTERMSAA.

Figure 3 shows the variation of return loss versus frequency of USBFTERMSAA. It is clear from this figure that, the antenna resonates for triple resonating modes f_1, f_2 and f_3 with their respective bandwidths BW_1=20.2 %(5.94-4.85 GHz), BW_2 =18.1 %(7.7-6.43 GHz) and BW_3 = 11.76 % (9.9-8.8 GHz). The first resonating mode is due to the fundamental frequency of the antenna and the second and third modes are due to the combined effect of U-shaped slots on the radiating patch and the presence of S-shaped slots on the ground plane. Also, the antenna gives the frequency ratio f_2/f_1 of about 1.29 which indicates the tuning property of the antenna.

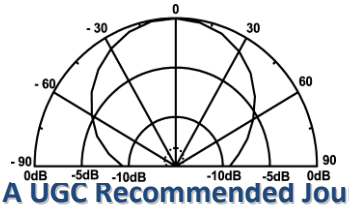

Figure-4: Radiation pattern of USBFTERMSAA

The far field co-polar and cross-polar radiation patterns of the proposed antenna is measured in its operating band is shown in Fig. 4 The peak gain of USBFTERMSAA is measured in its operating frequency is found to be 4.88 dB.

4. CONCLUSION

From this evaluation of the antenna it is concluded that, USBFTERMSAA operates for triple frequencies between 4.85 GHz to 9.9 GHz giving a maximum impedance bandwidth of 20.2 % with a peak gain of 4.88 dB. The antenna exhibits linearly polarized and broadside radiation characteristics. The proposed antenna uses low cost modified glass epoxy substrate material with simple design and fabrication. This antenna may find applications for systems operating in WLAN and lower X-band frequencies.

REFERENCES

1. Girish Kumar and K. P. Ray, "Broadband microstri Antennas", Artech House, Boston, London, 2003.

2. Ang, B.K, and B.K Chung, " A wideband microstrip patch antenna for 5-6 GHz wireless communication," *Progress In Electromagnetic Research PIER* 75,397-407,2007.

3. Bahl, I. J. and P. Bhartia, "Microstrip Antennas", Artech house, New Delhi, 1980.

Dr. Nagraj Kulkarni received his M.Sc, M.Phil and Ph.D degree in Applied Electronics from Gulbarga University, Kalaburgi in the year 1995,1996 and 2014 respectively. He is working as a Assistant Professor in the Department of Electronics Government College(Autonomous) Kalaburgi. He is an active researcher in the field of Microwave Electronics with special emphasis to Microstrip Antennas.