Micro strip dipole antenna for dual band applications

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Abstract : In this work, a micro strip antenna is designed and fabricated for dual band application at a low band (LB), 821.5 MHz, and at a high band (HB), 2.35 GHz. The design of this dual band micro strip antenna is done using the CST EM simulation tool. The simulated values of these two parameters (i.e. VSWR and RL) in LB are 1.194 and RL=-20.85dB, respectively. The same parameters in HB are 1.63,-13.68 dB respectively. Subsequently this design is fabricated and tested in laboratory yielding, LB, VSWR=2.02, with the corresponding return loss (RL) = -10.05dB, and the same for HB are 1.79, and -10.92 dB respectively. To achieve multiband operations multiple dipole arms for corresponding high frequency (HF) band of operation aligned at random angle on flip side. The fabricated antenna meets the targeted performance with achievable bandwidth of 7.5%. The simulated to fabricated VSWR value is within -69.5% for LB and -9.8% in HB, respectively. The simulated to the fabricated RL LB is 51.79% and -20.175% in HB respectively.

IndexTerms **- Multiband micro strip antenna, dual band antenna, VSWR, and return loss.**

I. INTRODUCTION

Until today's achievement in wireless communication system, the main key component such as antenna plays a vital role to meet the on demand requirement. The various researches are under process for utilizing this component for reaching advancements with miniaturized size. Various standards such as WLAN, UMTS, LTE, LTE-A, LORA, GSM, and 3G/4G are under use which makes individuals life ease of communication and business. In this line the type of internal antenna such as printed circuit board (PCB) antenna have a leading role, used for RF applications with both narrow and wideband of operations. These antenna has a high demand in the market because of ease of fabrication, testing and more over they are less expensive with high gain around 6-8dBi.

With respect to background of this work, Pengfei Wu [2] et al, the design comprising multiple frame printed dipoles was presented with triple band and dual-band characteristics presented, which offers lightweight, less cost, simple, and reliable for DCS, WLAN IEEE 802.11b/g, and WiMax applications. Kushmanda Saurav et al [3], the proposal of conventional printed dipole with CRLH unit cells to achieve multiband operation is introduced with identical and asymmetrical unit achieving dual and triple band. Viet-Anh Nguyen et al [4], a multi frame L-slot planar dipole loaded with a single micro strip line for multiband antenna systems is proposed supporting several band such as LTE of 1.7 ~ 1.8, 2.3 ~ 2.6GHz, WLAN bands of 2.4 ~2.5, 5.2 and 5.8GHz, WiMAX bands of 3 ~ 4 GHz. Xi-Wang Dai [5] et al, a vertically or horizontally polarized Omni directional antenna is proposed for multiple communication standards with achievable bandwidth of 17.4% (806- 960MHz) with VP element and an overlapping bandwidth of 35% (1880-2700 MHz) for the VP and HP elements. Rekha Sharma [6] et al, printed dipole antenna with CRLH unit cells for multiband operation suitable for WLAN/WiMAX applications is proposed.

II. MULTIBAND ANTENNA DESIGN

The multiband antenna design proposed meeting the specifications with schematic as shown in the figure 1, which consists of five arms with single high width arm covering low frequency band and corresponding four low width arm oriented at different angle covering high frequency wide band. Figure 2 depicts the dimensions corresponding to frequency bands of 775MHz – 895MHz, 1.85GHz-1.95GHz, 2GHz-2.1GHz, 2.3GHz-2.4GHz, 2.5GHz-2.6GHz.Figure 3 represents the fabricated dipole terminal antenna.

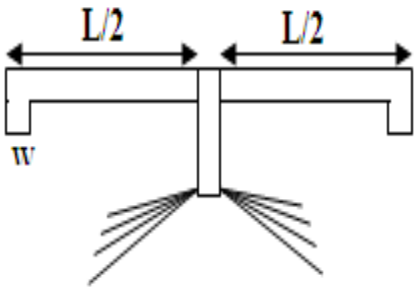


Figure 1: Schematic of multiband micro strip dipole

Operating frequency (GHz)	f_r (GHz)	λ_0	λ_d	L	W
0.775-0.895	0.835	359	171	85.6	8.6
1.85-1.95	1.9	158	75	38	3.8
2-2.1	2.05	146	70	35	3.5
2.3-2.4	2.35	128	61	30	3
2.5-2.6	2.55	118	56	28	2.8

Figure 2: Tabulation of antenna dimensions

Figure 3: Fabricated micro strip antenna

III. SIMULATED AND TESTED RESULT COMPARISON

The antenna designed is met with desired specifications with return loss to be -10.05dB with 51.79% accuracy and -10.92dB, with -20.175% accuracy for low and high band respectively as shown in Figure 4. VSWR achieved 2.02, 1.79 with -69.5% and -9.5% accuracy for low and high band respectively as shown in Figure 5, Gain around ~2dBi as shown in Figure 6.

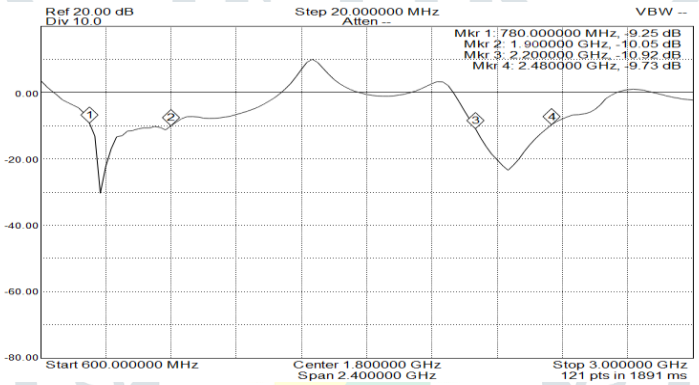


Figure 4: Return Loss

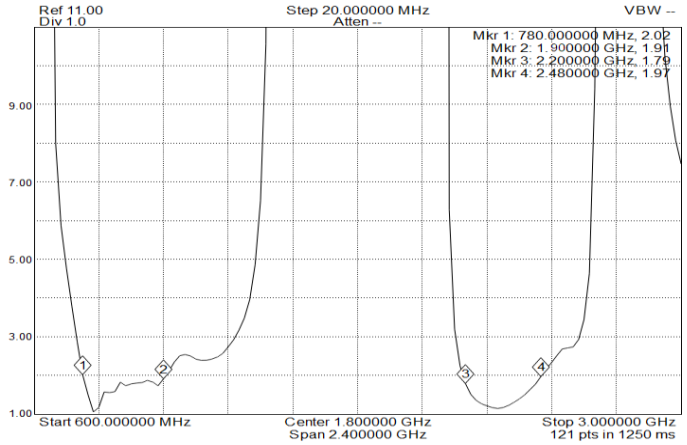
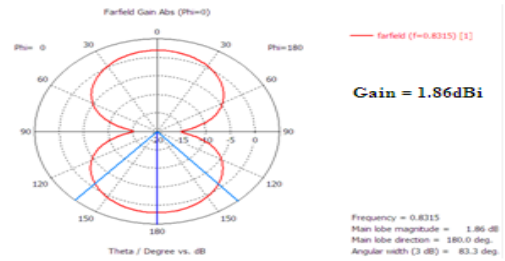
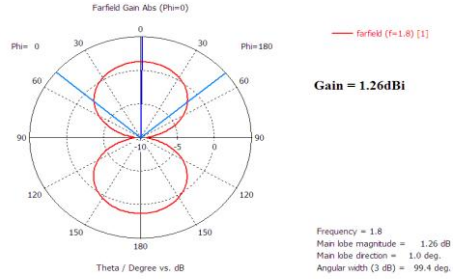


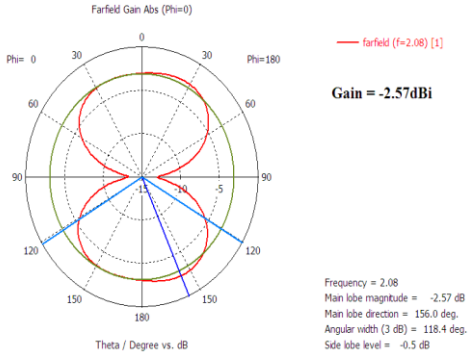
Figure 5: VSWR



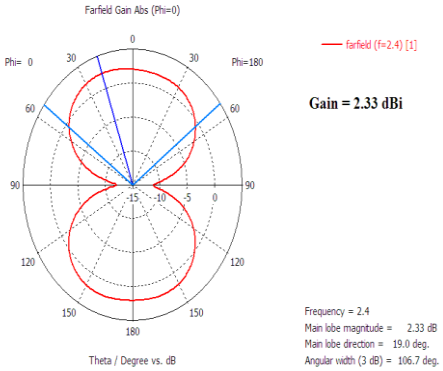
(a)



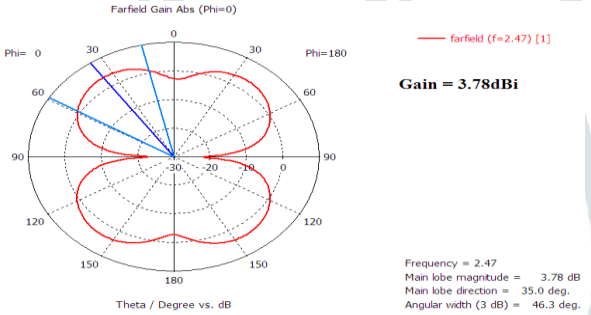
(b)



(c)



(d)



(e)

Figure 6: (a) Gain at 821.5 MHz (b) Gain at 1.8 GHz (c) Gain at 2.08 GHz (d) Gain at 2.33 GHz (e) Gain at 2.47 GHz

IV. CONCLUSION

The antenna designed and fabricated is operated at multiband with both narrow and wide band of operation meeting low and high frequency application achieving performance characteristics of highly accurate return loss, VSWR and Gain with compact size and high profile needs. In the further work number of bands can be increased with high range of applications with much lesser size as length is inversely proportional to frequency band of operation.

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