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Rhombus Shaped Microstrip Antenna with Microstrip Line Feeding Technique for Wireless Application

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Abstract— This paper summarize the study of Rhombus shaped Microstrip Antenna (RMSA) with microstrip line feed, RMSA with meandering technique by applying with and without capacitive loading. The reference RMSA is designed to operate for 2.4GHz. The propose RMSA with meandering technique with capacitors gives a good size reduction and increase in bandwidth. The resonant frequency is shifted from 2.4GHz to 1.6GHz after applying capacitive loading with meandering technique. Thus there is a good size reduction of 66.46% compared to reference RMSA and improved overall bandwidth of 56MHz. The simulation is carried out by IE3D software and practical results are measured by Vector Network Analyzer (VNA) with model E5062A. The performance characteristic behaviours of simulated antenna results are in acceptable agreement with practical antennas.

Keywords— Rhombus shaped Microstrip antenna (RMSA), microstrip line, meandering and Bandwidth

I. INTRODUCTION

Microstrip antennas have sparked interest among researchers because of their attractive features like low profile, light weight, and conformal to mounting structures, but they have two most serious limitations, narrow bandwidth and low gain [1]. However, the major disadvantage associated with MSAs is their narrow bandwidth [2-3] which restricts their many useful applications. Numbers of studies have been reported in the literature for enhancing the bandwidth [4-7]. Variety of methods have been proposed to obtain dual band operation, such as by loading slits [8], using slots in the patch [9], loading the patch with shorting pins [10], using stacked patches [11] et al. But the antenna operating at more than two different bands of frequencies and their enhancement are found rare in the literature. Hence a RMSA with three slots on the radiating patch with capacitor technique has been used for constructing the proposed antennas useful for GPS and MMDS applications.

II. ANTENNA DESIGN

The reference or base Rhombus shaped microstrip antenna (RMSA) with microstrip line feeding is shown in figure 1. The antenna is designed by using substrate made up of glass epoxy having thickness of 1.6 mm. Optimized resonating frequency of the designed antenna which is operating at 2.4GHz. The designed antenna with length and width of a radiating patch is 29mmX29mm

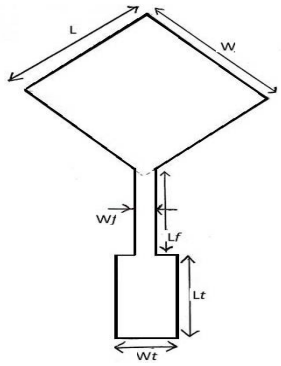

Fig 1. Rhombus shaped microstrip antenna with microstrip line feed.

The RMSA with patch dimension 29mmX29mm which is been placed above the substrate material of thickness 1.6mm whose dielectric permittivity 4.4 which is embedded with ground plane of dimension (57.4X78.45) mm^2. The optimized designed

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dimensions are summarized as follows: L=29mm, W=29mm, Lf=15.4mm, Wf=0.29mm, Lt=15.4mm and Wt=3.056mm. The microstrip feeding patch is connected through SMA connector. The fabricated top and bottom view of practical Rhombus shaped microstrip antenna with microstrip line feed shown in Figure.2.

a) Top view b) Bottom view

Fig 2. Fabricated RMSA with microstrip line feed

The Base shape RMSA is modified by inserting meandering three slots on the radiating patch as shown in fig 3. The length of slot1 and slot 3 is 21.478mm and width is 2mm. Slot 2 length is 28.638mm and width is 2mm respectively.

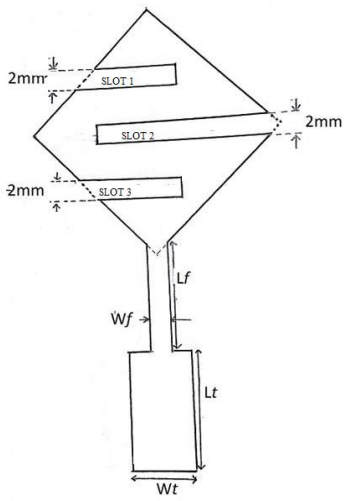

Fig 3. Three slots on radiating patch of RMSA with microstrip line feed.

The fabricated top and bottom view of practical Rhombus shaped microstrip antenna with microstrip line feed shown in Figure 4.

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a) Top view b) Bottom view

Fig 4. Fabricated three slots on radiating patch of RMSA with microstrip line feed

The capacitor of 100pf is used to connect at the slot 2 and slot 3 as shown in figure 5.

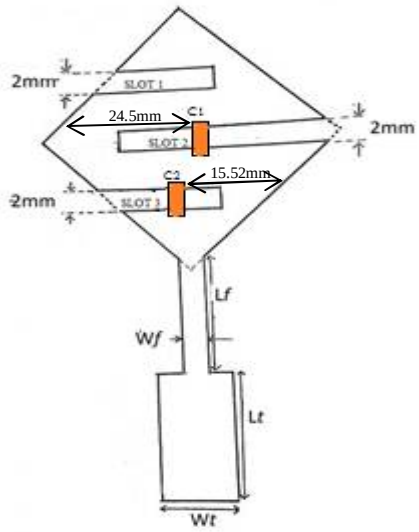
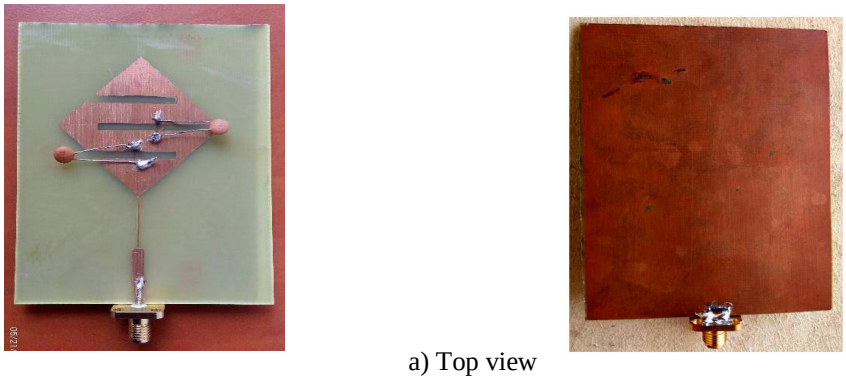


Fig 5. Three slots with capacitor on radiating patch of RMSA with microstrip line feed

The fabricated top and bottom view of practical Rhombus shaped microstrip antenna with microstrip line feed shown in Figure 6.



a) Top view b) Bottom view

Fig 6. Fabricated three slots with capacitor on radiating patch of RMSA with microstrip line feed

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III.RESULTS

The performance characteristic behaviour in terms of return loss of simulated and practical RMSA with microstrip line feed shown in Figure 7, the return loss and bandwidth values are summarized in table 1.

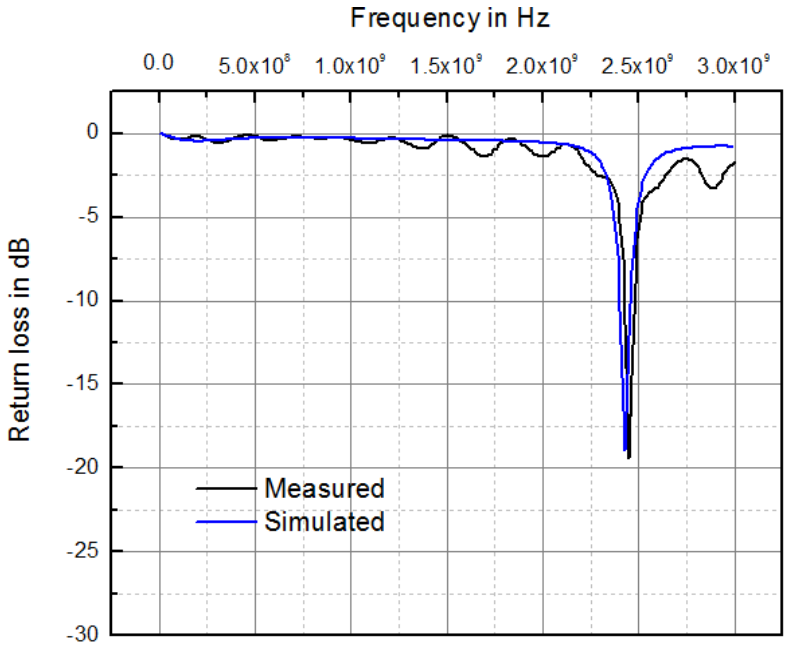

Fig 7. Return loss versus frequency of Rhombus shaped microstrip antenna with microstrip line feed.

The performance characteristic behaviour in terms of return loss of simulated and practical Meandering RMSA with microstrip line feed shown in Figure 8, the return loss and bandwidth values are summarized in table 1.

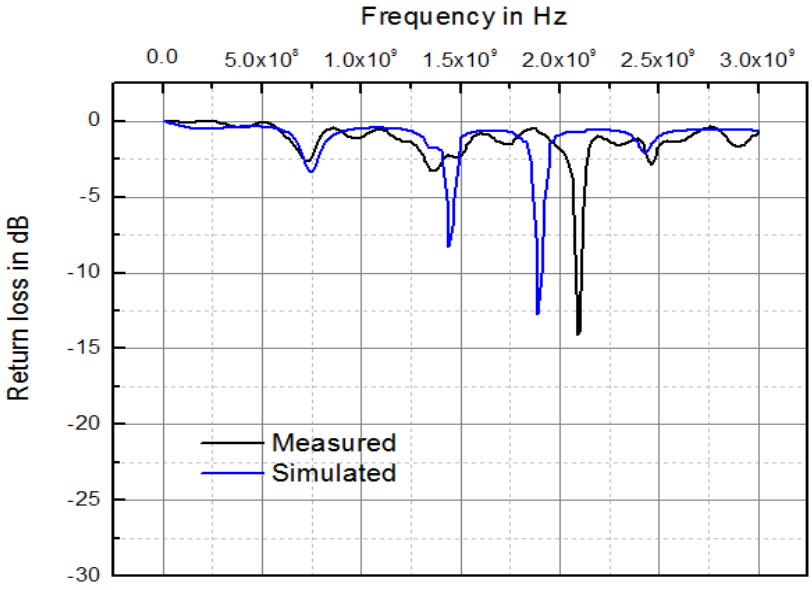

Fig 8. Return loss versus frequency of Meandering Rhombus shaped microstrip antenna with microstrip line feed

The return loss characteristic of simulated and practical Meandering rhombus shaped microstrip antenna which is loaded with two capacitors of 100Pf on slot 2 and slot3 as shown in Figure 9, the return loss and bandwidth values of antenna are summarized in table 1.

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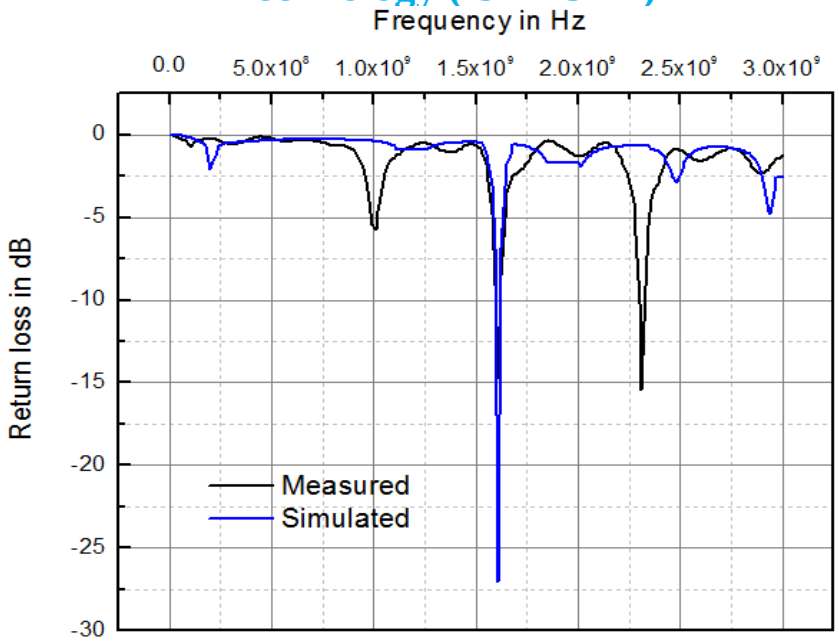

Fig 9. Return loss versus frequency of Meandering with capacitor on radiating patch Rhombus shaped microstrip antenna with microstrip line feed.

SL No	Prototype Antenna	Resonant Frequency f_r (GHz)		Return Loss (dB)		Bandwidth (MHz)		Impedance (Ω)	
		Simul.	Pract.	Simul.	Pract.	Simul.	Pract.	Simul.	Pract.
1	Rhombus shaped microstrip antenna with microstrip line feeding	2.42	2.44	-19.3	-18.9	165.2	46.4	40.51	54.98
2	Rhombus shaped microstrip antenna with microstrip line feeding with three slot meandering	1.88	2.1	-12.1	-13.8	23.6	28.3	41.6	34.5
3	Rhombus shaped microstrip antenna with microstrip	1.8	1.6	-24.7	-13.8	112.6	24	50.6	34.5

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	line feeding with three slot meandering with capacitor	-	2.3	-	-15.4	-	52	-	40.2

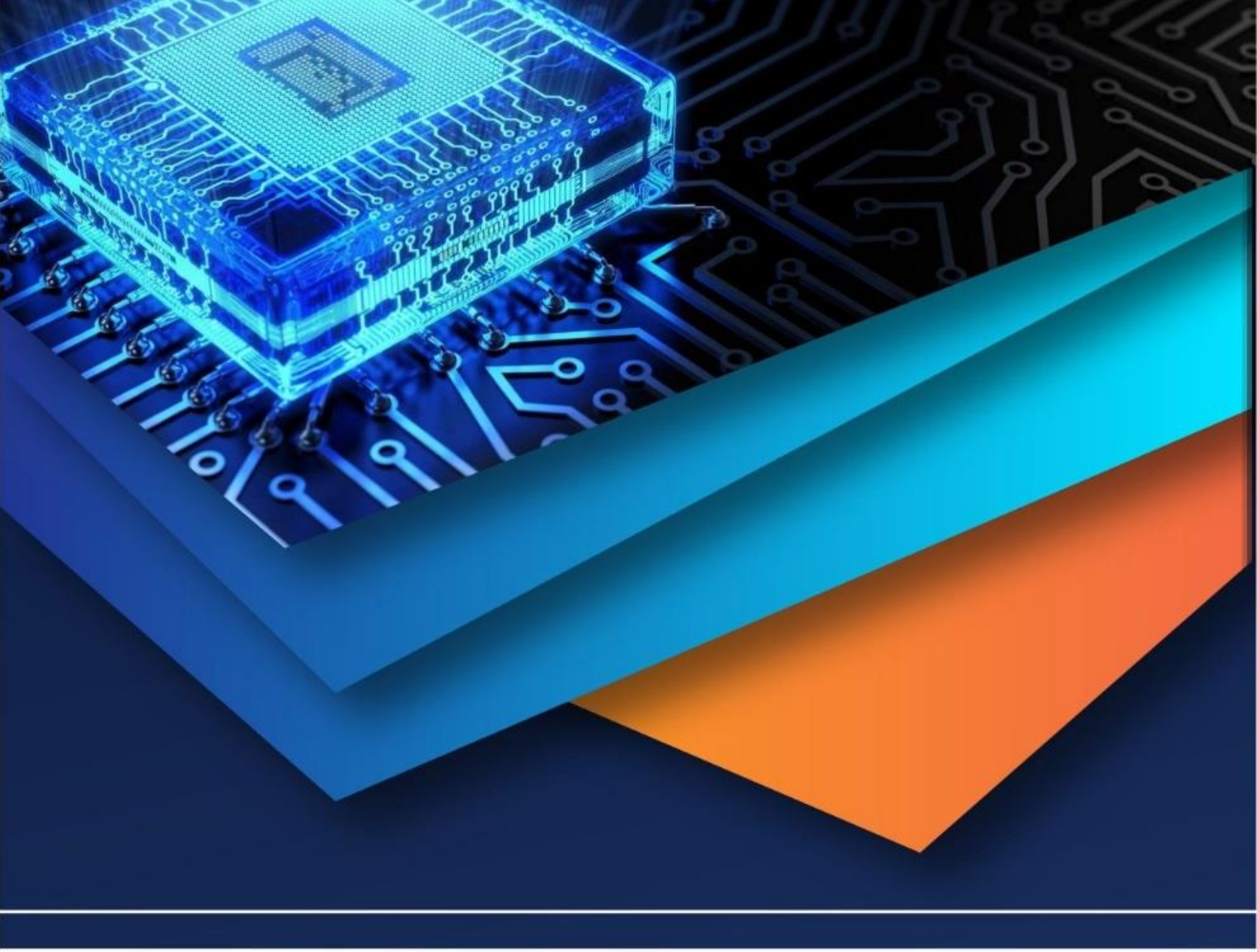
Table 1: Results of the proposed antenna

IV. CONCLUSIONS

The RMSA with strip line feeding imposed by meandering capacitive loading technique is implemented. The Base antenna which is operates at 2.4GHz with a bandwidth of 46.4MHz. The Base antenna with meandering operates at 2.1GHz with a bandwidth of 28.3MHz.The meandered antenna with capacitive loading which operates under dual band of frequencies 1.6GHz and 2.31GHz with a bandwidth of 24MHz and 32MHz respectively. The simulation results are good agreement with the measured results. The Reference antenna will covers half of the Bluetooth application band. Meandering RMSA covers MMDS (Multichannel multipoint distribution services) application. The Meandering with capacitor RMSA covers GPS application.

REFERENCES

[1] Kumar, G. and K. P. Ray, Broadband Microstrip Antenna, Artech House, US, 2003.
[2] I. J. Bahl and P. Bhartia, Microstrip Antennas, Artech House, MA, 1981.
[3] D. M. Pozar, “Microstrip antennas,” Proceedings of the IEEE, vol. 80, no. 1, p. 79, 1992.
[4] H. F. Pues and A. R. V. D. Capelle, “An impedance matching technique for increasing the bandwidth of microstrip antennas,” IEEE Trans. on Antennas & Propag, vol. 37, no. 11, pp. 1345- 1354, 1989.
[5] K. Oh, B. Kim, and J. Choi, “Design of dual and wideband aperture stacked patch antenna with double-sided notches,” Electronic Letters, vol. 40, no. 11, pp. 643-645, 2004.
[6] J. Y. Sze and K. L. Wong, “Slotted rectangular microstrip antenna for bandwidth enhancement,” IEEE Trans. Antennas Propag, vol. 48, no.8, pp. 1149-1152, 2000.
[7] G. Kumar and K. C. Gupta, “Broad-Band microstrip Antennas using additional resonators gap-coupled to the radiating edges,” IEEE Trans .on Antennas and Propag., vol. 32, issue 12, pp. 1375-1379, 1984.
[8] Q. Q. Wang, B. Z. Wang, and J. He, “Wideband and dual- band design of a printed dipole antenna,” IEEE Antennas Wireless Propag. Letters, vol. 7, pp. 1-4, 2008.
[9] Y. X. Guo, K. M. Luk, and K. F. Lee, “Dual band slot-loaded short-circuited patch antenna,” Electron Letters (UK), vol. 36, no. 4, pp. 289-291, 2000.
[10] S. C. Pan and K. L. Wang, “Dual frequency triangular microstrip antenna with a shorting pin,” IEEE Trans Antennas Propag., vol. 45, no. 12, pp. 1889-1891, 2002.
[11] K. Oh, B. Kim, and J. Choi, “Design of dual and wideband aperture stacked patch antenna with double-sided notches,” Electron Letters (UK), vol. 40, no. 11, pp. 643-645, 2004.



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