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An Enhanced RMPA Bandwidth for C-Band Applications

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Abstract: *In this paper a novel configuration of dual slot based arraymicrostrip patch antennaof 32×46 mm² for C band application is simulated andanalyzed. Microstrip feed line location is optimized to get minimum return loss. Antenna characteristics were simulated using a Finite Integral Technique (FIT) based Computer Simulation Technology (CST). Antenna performance in term of return loss, radiationpattern and gain are analyzed. It is found that the antenna is resonant at 6GHzwith a return loss of -33dB and a stable radiation patterns. This antenna predict for successful satellite systems.*

Keywords: *C- band, RPAM, satellite, slotted, FIT.*

I. Introduction

In modern wireless communication systems, the demand for antennas of exceptional capabilities has dramatically increase [1]. Efficient, sufficiently high gain with multiband support antennas would be an idealistic solution [2]. In spite of these challenges, antenna design specifications are rarely relaxed. Thus, achieving the desired antenna's performance generally becomes difficult to cope within the continuous developments in the wireless communications industry [3]. Microstrip patch antennas, which have many advantages such as slim profile, ease of fabrication, low production cost, lightweight, and compatible with Monolithic Microwave Integrated Circuit (MMIC) design could be aFrontier [4]. However, microstrip antennas also suffer from inherent limitations such a narrow bandwidth, low efficiency, modest gain, low power-handling capacity, and extraneous radiation due to surface waves [5]. Several approaches were proposed to overcome these inherent limitations of conventional microstrip antennas including partial ground plain [6] andslotted patch [7].

II. Design configuration

Dual slotted based Array patch antenna is established with a partial ground plain. This array patch is attached to an FR4 substrate with ε_r=4.3 and loss tangent of=0.025. Also, a partial ground plane is optimized to get large bandwidth, also, a parametric study is perform to achieve the maximum bandwidth.Fig (1) illustrate the proposed antenna.

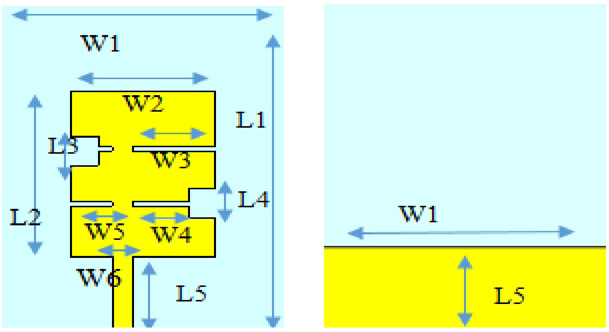


Figure (1) the dimensions, and layout of the proposed antenna.

Table 1: Antenna Dimension

Parameter	Length mm
W1	32
W2	16
W3	9.25
W4	5.25
W5	4.63
W6	2.14
L1	46
L2	23
L3	4
L4	4
L5	11.5

III. Result and Discussion

1.1 Return Loss

One of the main parametersin antenna analysis is the return loss or S_{11}in two port network. It measures the antenna's absorption of the fed power over the total power fed. A good antenna should indicate a return loss of less than -10 dB, which indicates that the antenna absorbs more than 90% of the fed power. So from Fig 2 and according to -10 dB level line it is obvious that the impedance bandwidth is ranging from 5.6GHz to 6.4GHz with resonant of 6.1 GHz.

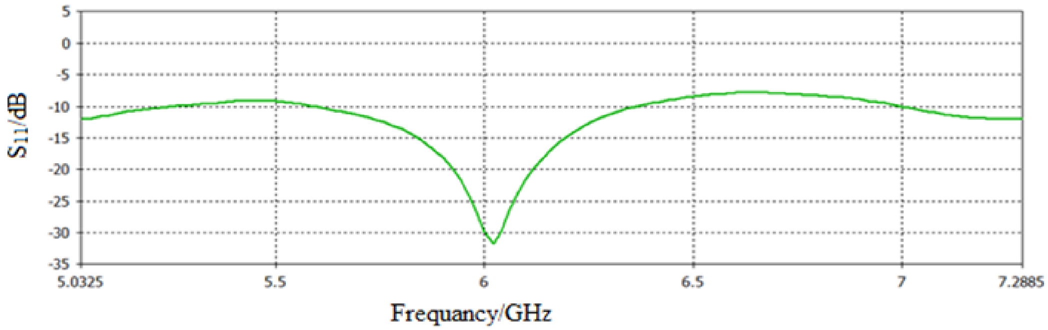
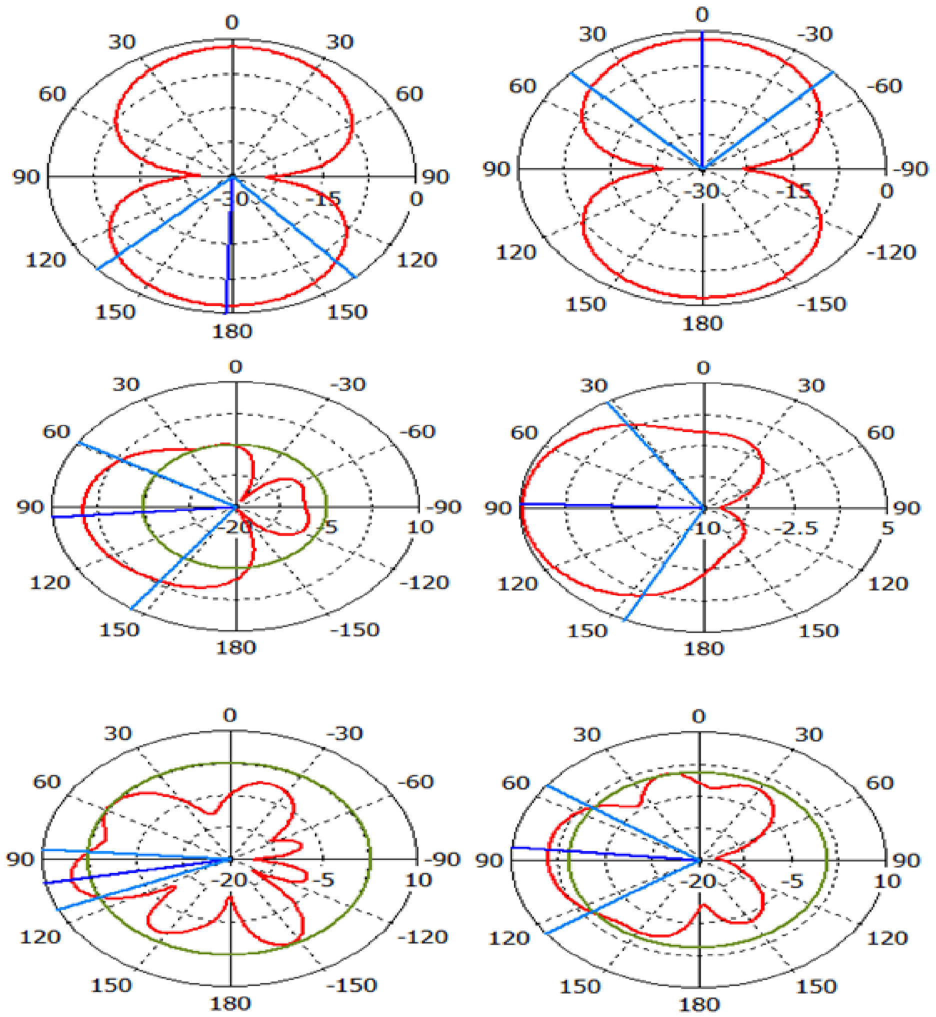


Figure (2) the numerical results, S_{11}, for the antenna. Radiation Pattern.

1.2 Radiation Pattern

Another main parameter in antenna analysis is the radiation pattern since it is determines the distribution of radiated energy in space. Fig (3) illustrate the radiation pattern for different frequencies including resonant frequency.



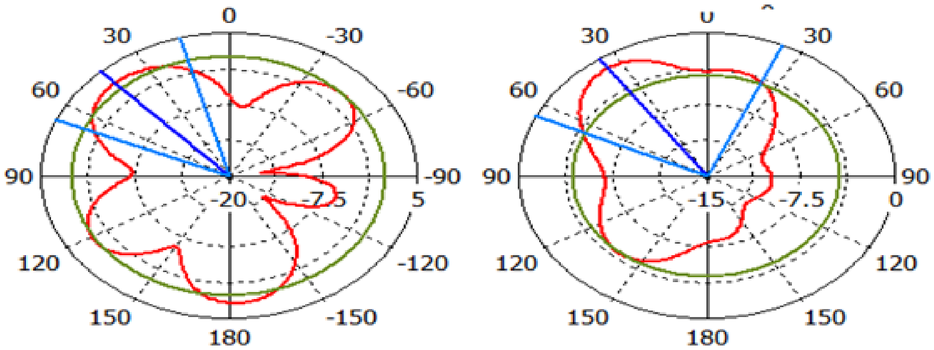


Figure (3) The numerical results of the radiation patterns at differentfrequencies: (a) θ=90° and (b) Φ=90° at 1 GHz. (c) θ=90° and (d) Φ=90° at 6GHz. (e) θ=90° and (f) Φ=90° at 12GHz.(g) θ=90° and (b) Φ=90° at 18 GHz.

1.3 Gain

Another parameter is the gain of the antenna. As shown in Fig (4) the gain is about 4.5 dBi at the resonance frequency.

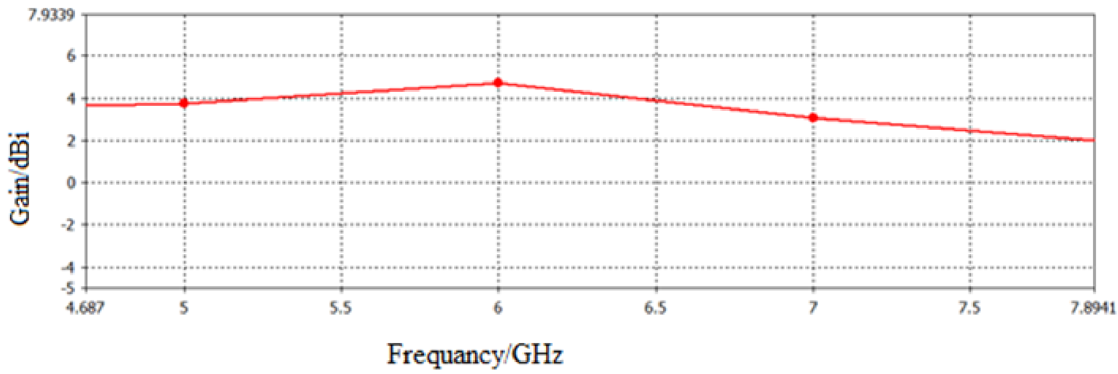


Figure (4) the numerical result of the gain.

IV. Conclusion

This paper presentsa novel design forarray slotted patch antenna. The simulated result including return loss, radiation pattern, and gain for theproposed antenna reveal that the antenna is resonant at 6 GHz with bandwidth of relatively to 1 GHz.simple structure of that antennamake it very easy to fabricate and suitable for many communication applications such case of satellite communication.

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