Wideband Printed Rectangular Monopole Antenna for Circular Polarization

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1 Introduction

Authors have proposed a wideband rectangular printed monopole antenna for circular polarization [1]. In this paper, by changing the shape of the ground plane and the position of the connection of the microstrip line to the patch, the further enhancement of the bandwidth of the 3dB-axial ratio is examined.

2 Antenna Design

Fig.1 shows the printed rectangular monopole antenna for circular polarization. The microstrip line is connected to the short side of the patch. The shape of the ground is also rectangle. However, the section of the ground plane overlapped with the patch is removed. The short side of the patch is t_1 and the long side of it is t_2. The center of the patch is located at (x_0, y_0). There is gap between the patch and the ground plane. The size of gap along the short side of the patch is g_1 and that of the long side is g_2. The relative dielectric constant, the thickness and the loss tangent of the dielectric substrate are ε_r = 2.6, h = 1.6mm and tanδ = 0.001, respectively. The size of the dielectric substrate is fixed to $W_1 \times W_2$ = 50mm × 60mm. The dimension of the ground plane is $d_1 \times d_2$. The angle between x axis and the long side of the patch is α = 50°. The SMA receptacle is connected behind the dielectric substrate. The feed point is set to S_d = 3mm.

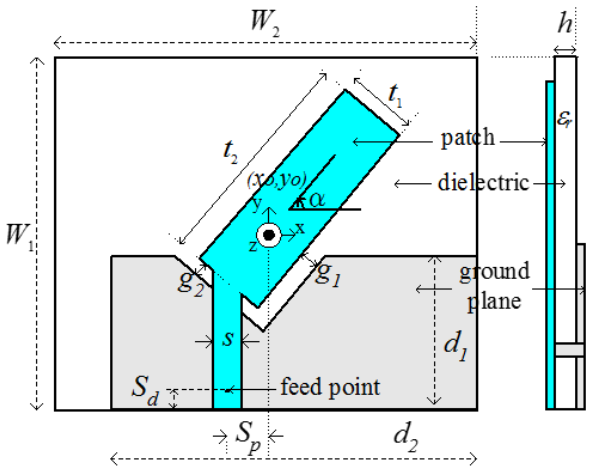


Fig. 1 Geometry of proposed antenna

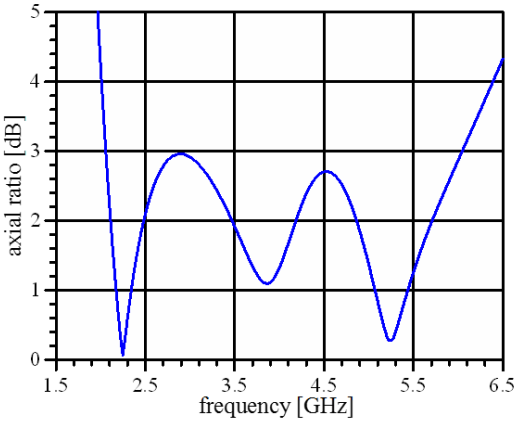


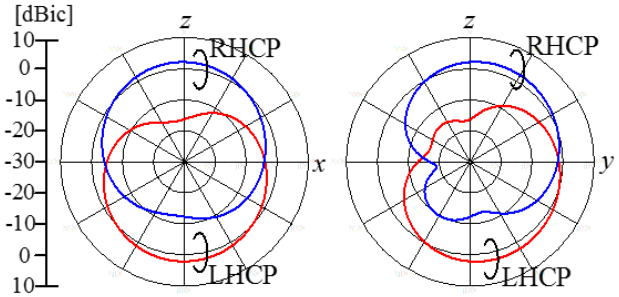
Fig. 2 Simulated axial ratio of the optimized antenna

3 Antenna Characteristics

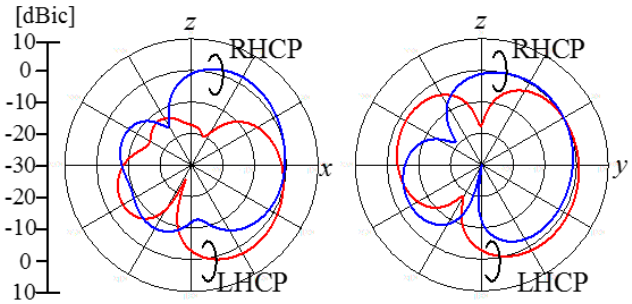
The proposed antenna is designed according to the parametric studies. The optimal dimensions of the proposed antenna are follows: x_0 = y_0 =4.3, t_1 =10, t_2 =38, g_1 = 4, g_2 = 0, S = 5, S_p = 7, S_d = 3, d_1 = 21.5, d_2 = 52 (unit : mm), and α = 50°.

Fig. 2 shows the simulated axial ratio of the designed antenna. The simulated bandwidth of 3dB-axial ratio is from 2.06GHz to 6.04GHz (98%). In [7], the simulated bandwidth is 65.8%

Fig. 3 shows the simulated radiation patterns. It is observed that the RHCP is radiated at θ = 0° and that the LHCP is radiated at θ = 180°. The beamwidth of the circular polarization is wide at 2.5GHz. However, the radiation pattern tilts at 4.5GHz.



(a) 2.5GHz



(b) 4.5GHz

Fig. 3 Simulated radiation patterns

4 Conclusion

A wideband printed rectangular monopole antenna for circularly polarized wave has been proposed. Our future work is to improve the return loss.

References

[1] T. Fujimoto and K. Jono, *IET Microwave, Antennas Propagation*, vol. 8, pp. 649–656, 2014