COMPACT WIDEBAND MSA FOR WIRELESS APPLICATIONS

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ABSTRACT

Modified shaped compact microstrip patch antenna is proposed in this paper for wide band operation. Modified shaped microstrip patch antenna is used to obtain wide bandwidth. The obtained impedance bandwidth for 10 dB return loss is coming out to be 31 % (530 MHz) of the center frequency at 1.71 GHz. Compact sized, wide bandwidth antenna is practically applicable for the wireless communication systems.

Keywords: Bandwidth, impedance loci, return loss, wideband.

1. Introduction

Microstrip patch antenna in general have a conducting patch printed on a grounded substrate and have the attractive features of low profile, light weight, easy fabrication and conformability to mounting. On the other hand, microstrip antennas inherently have a narrow bandwidth and bandwidth enhancement is usually demanded for practical applications in wireless communication systems. The compactness and bandwidth enhancement are main design considerations for practical applications of microstrip antenna. Therefore, studies to achieve compact and wide band operations of microstrip antennas have greatly increased [4]. Microstrip patch antennas are widely used in many commercial applications of wireless communication. Microstrip patch antennas are manufactured using printed circuit technology, so the mass production can be achieved at a low cost.

Compact microstrip patch antennas have received much attention due to the increasing demand of small antennas for mobile and wireless communication systems. To achieve compact and wide band microstrip antenna at a fixed operating frequency, the use of a high-permittivity substrate is an effective method. The obtained impedance bandwidth for a compact design can be greater than that of the corresponding conventional microstrip antenna.

The electromagnetic simulation of the proposed antenna has been carried out using IE3D software of Zeland software. Return loss, smith chart, directivity, efficiency etc. are being evaluated using IE3D software.

2. Antenna Design and results

In this patch antenna design, an effort has been made to enhance the bandwidth due to modified microstrip patch antenna. The 50-ohm coaxial cable with SMA connector is used for feeding the microstrip patch antenna. Fig. 1 shows the modified microstrip patch antenna of antenna design. In this antenna design, with center frequency f_0 = 1.71 GHz within the frequency range 1 GHz to 3 GHz, step frequency = 0.01 GHz. In this modified patch antenna design, length of patch L = 30 mm**,** width of patch W = 40 mm, feed point locations at the patch is (14.9,-19.5). Fig. 2 shows the variation of return

ISSN 2229-5518

loss with frequency for antenna design; the impedance bandwidth is taken from the 10-dB return loss. Fig. 3 shows the variation of VSWR with frequency for antenna design. Fig. 4 shows the variation of gain with frequency for antenna design. Fig. 5 shows the variation of efficiency with frequency for antenna design. Fig. 6 shows the radiation pattern for antenna design at the center frequency 1.71 GHz. Fig. 7 shows the Impedance loci (Smith chart) for antenna design. At resonance frequency 1.71 GHz, the simulated input impedance of antenna is in good agreement with the 50 ohms impedance. Here due to modified microstrip patch antenna design; the impedance bandwidth, determined from the 10-dB return loss, is coming out to be 31 % (530 MHz) of the center frequency at 1.71 GHz. Bandwidth for the proposed antenna design is sufficiently high and other radiation characteristics are also satisfactory.

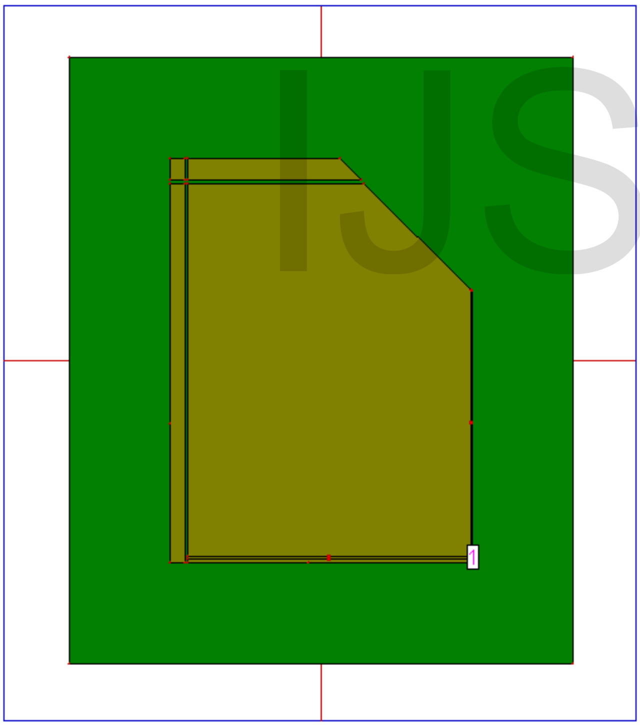

Fig. 1: Modified microstrip patch antenna.

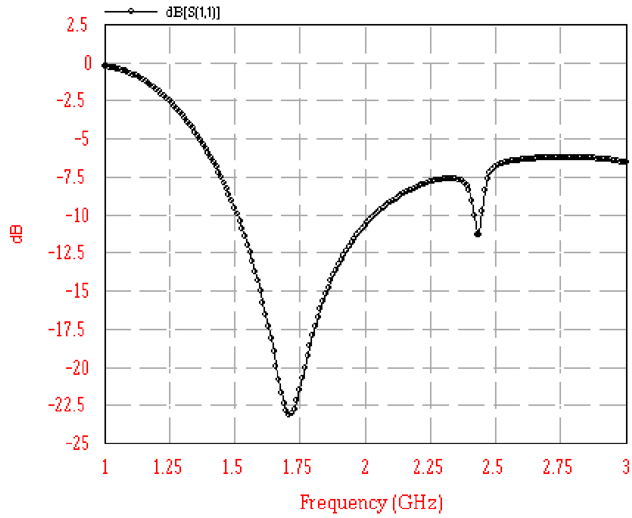

Fig. 2: Variation of return loss with frequency for proposed antenna design.

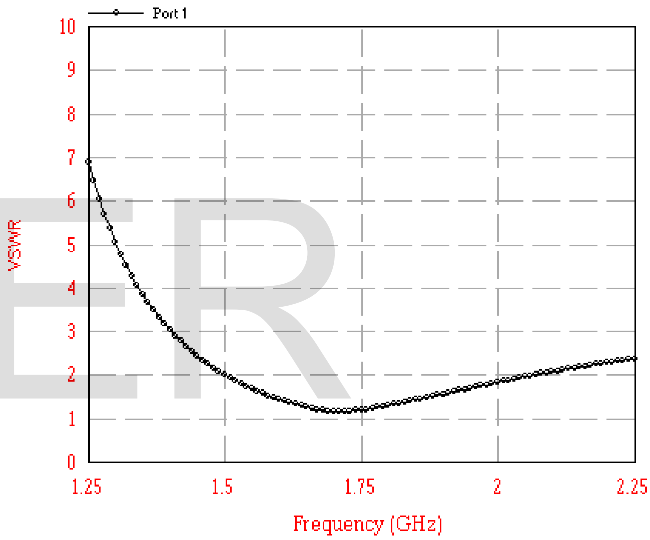

Fig. 3: Variation of VSWR with frequency for proposed antenna design.

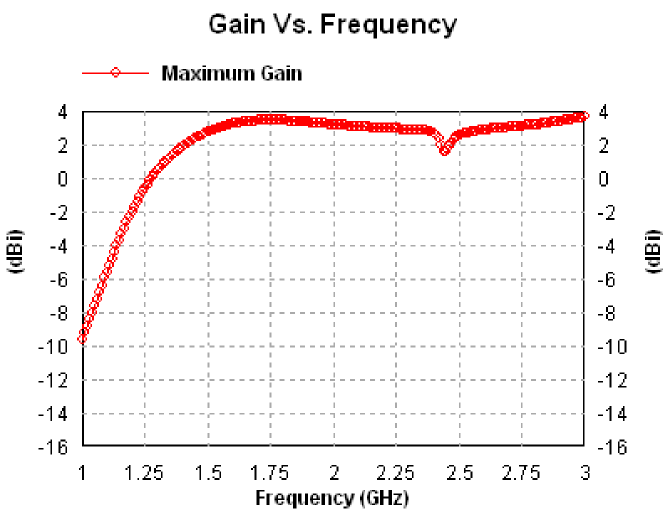

Fig. 4: Variation of gain with frequency for proposed antenna design.

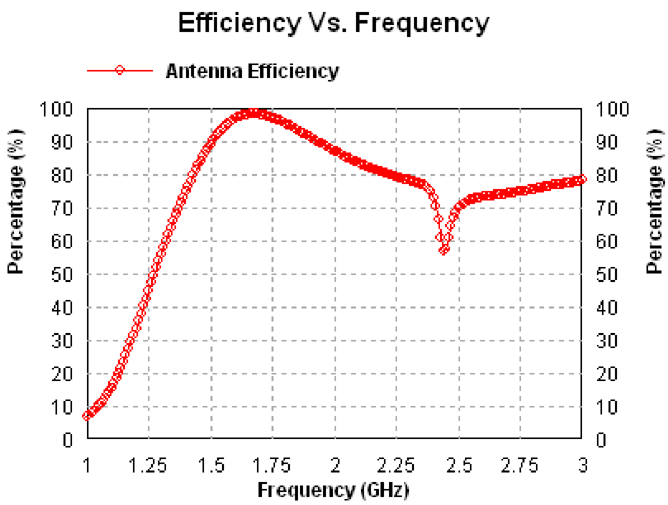

Fig. 5: Variation of Efficiency with frequency for proposed antenna design.

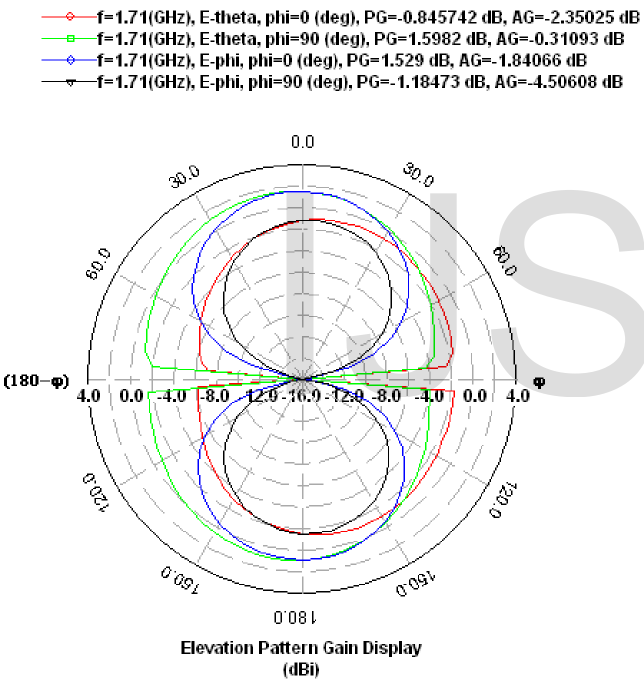

Fig. 6: Radiation Pattern for antenna design at center frequency $f_0 = 1.71$ GHz..

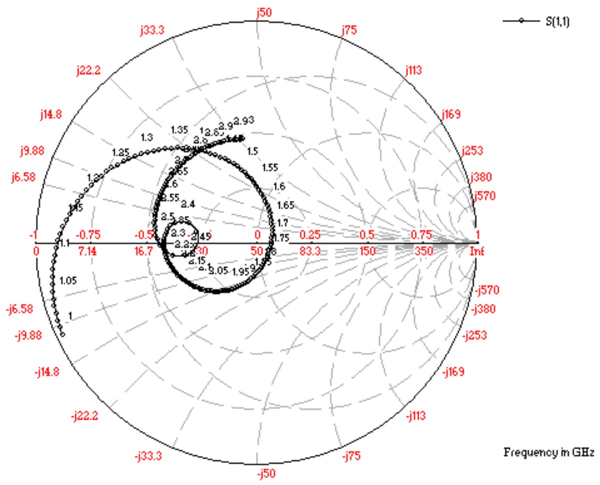

Fig. 7: Impedance loci for proposed antenna design

3. Conclusion

The simulation result of the proposed antenna design has been carried out by using IE3D software. For modified microstrip patch antenna, the obtained impedance bandwidth for 10 dB return loss is coming out to be 31 % (530 MHz) of the center frequency at 1.71 GHz, other radiation characteristics are also optimized, which is very good agreement for wireless communication applications.

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