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Reverse E-Shaped Patch Antenna with multiple slits

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Outline

- Introduction
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- The design
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Introduction

- Microstrip patch antennas have been used in wireless application for a long time due to their advantages such as being low-cost, their simplicity etc.
- But, still, they have disadvantages such as narrow frequency band and low gain, which could be modified and increased with many proposed methods in literature
- A low gain microstrip patch antenna consists of a conducting patch and a ground layer separated by a dielectric substrate.

Introduction

- In this paper a new antenna design is proposed. The design is simulated and analyzed for gain, and the results are tabulated for some frequencies.

- Design is simulated using Sonnet software.

- The antenna is designed with reversed E-shaped patches on three sides.

Previous Works

In literature, various types of patch antennas have been designed to meet the requirements in many applications.

The rectangular patch shape is the most popular one, as it can be easily analyzed and modified in order to get desired results

Previous Work

- M. L. &. K.-M. Luk, "A low-profile wideband planar antenna," *IEEE Transactions on Antennas and Propagation,* vol. 61, p. pp. 4411–4418, 2013.

The authors used the concept of complementary antennas where the planar antenna is presented with a U-shaped metal reflector in order to achieve unidirectional propagation

Previous Works

- X. Gao and Y. Q. &. Y. C. Jiao, "Design of multiplate back-reflector for a wideband slot antenna," *IEEE Antennas and Wireless Propagation Letters.*

A wideband slot antenna was designed with multiple metal back reflectors.

Previous Works

- R. KARLI and H. AMMOR, "A SIMPLE AND ORIGINAL DESIGN OF MULTI-BAND," *International Journal of Microwaves Applications,* p. 4, 2013.

In order to increase bandwidth, multiple techniques are implemented, such as: using frequency selective surface, using thicker profile for folded shorted patch antennas, the use of slots, the use of thicker substrate, E-shaped patch antenna, etc.

The design

- The size of the antenna is 75×84 mm.
- The antenna is designed on an Aluminum (96%) dielectric substrate whose thickness and permittivity are 1.6 mm and 4.4, respectively.
- The antenna is designed with reversed E-shaped patches on three sides.
- The box in the simulation program is 10 times bigger than the patch, which makes an effect on the gain and bandwidth value.
- The geometry and top view of the low gain antenna is shown in Fig. 1.

Top view of the antenna

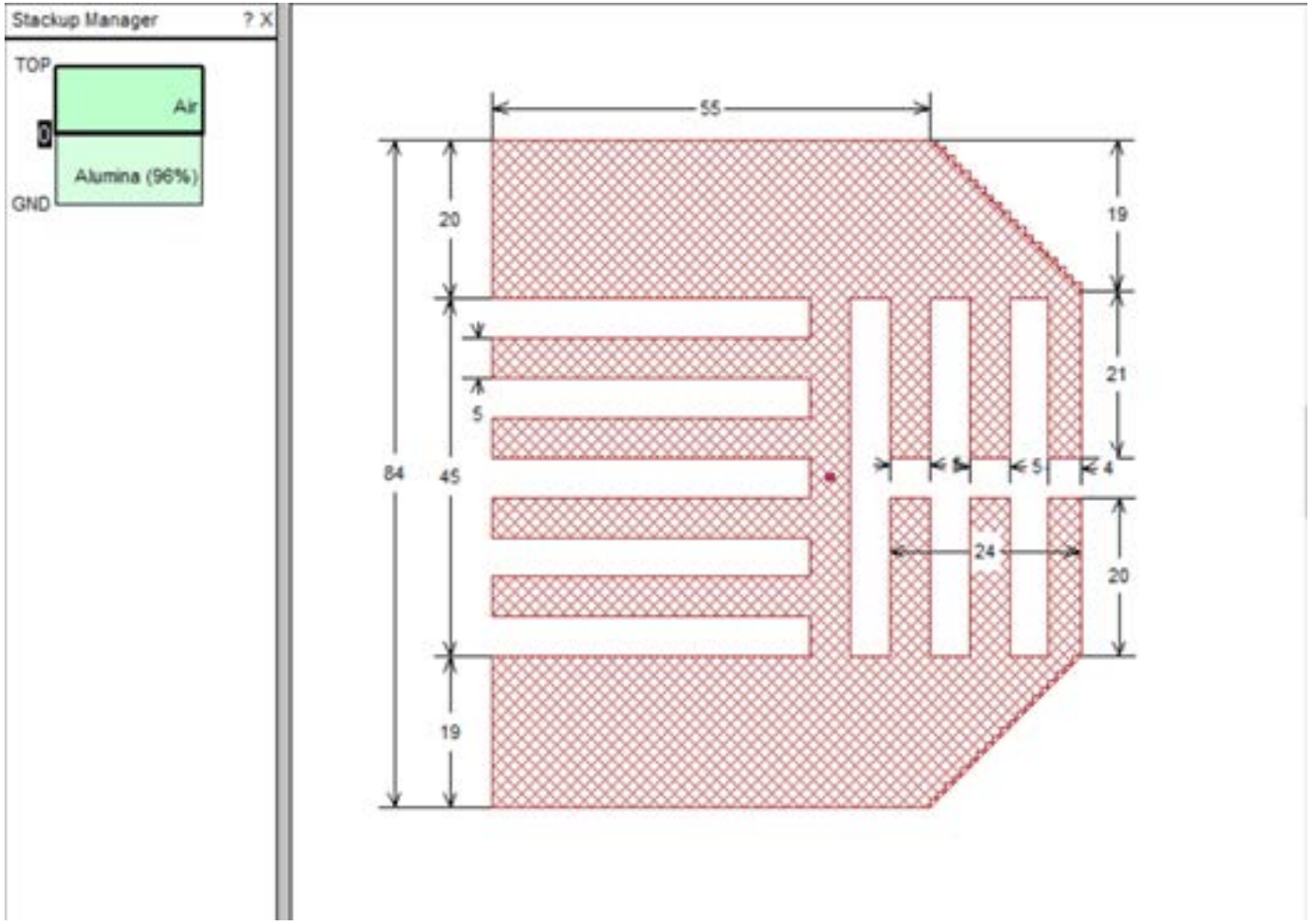

Fig. 1. Top view of the antenna

Simulation Results

- The antenna is modelled and analyzed using the Sonnet Software program.
- The input return loss (S_{11}) of the antenna is shown from 4 GHz to 10 GHz in Fig. 2.
- S_{11} has magnitudes values less than -10 dB between 6.82 GHz and 9.96 GHz.

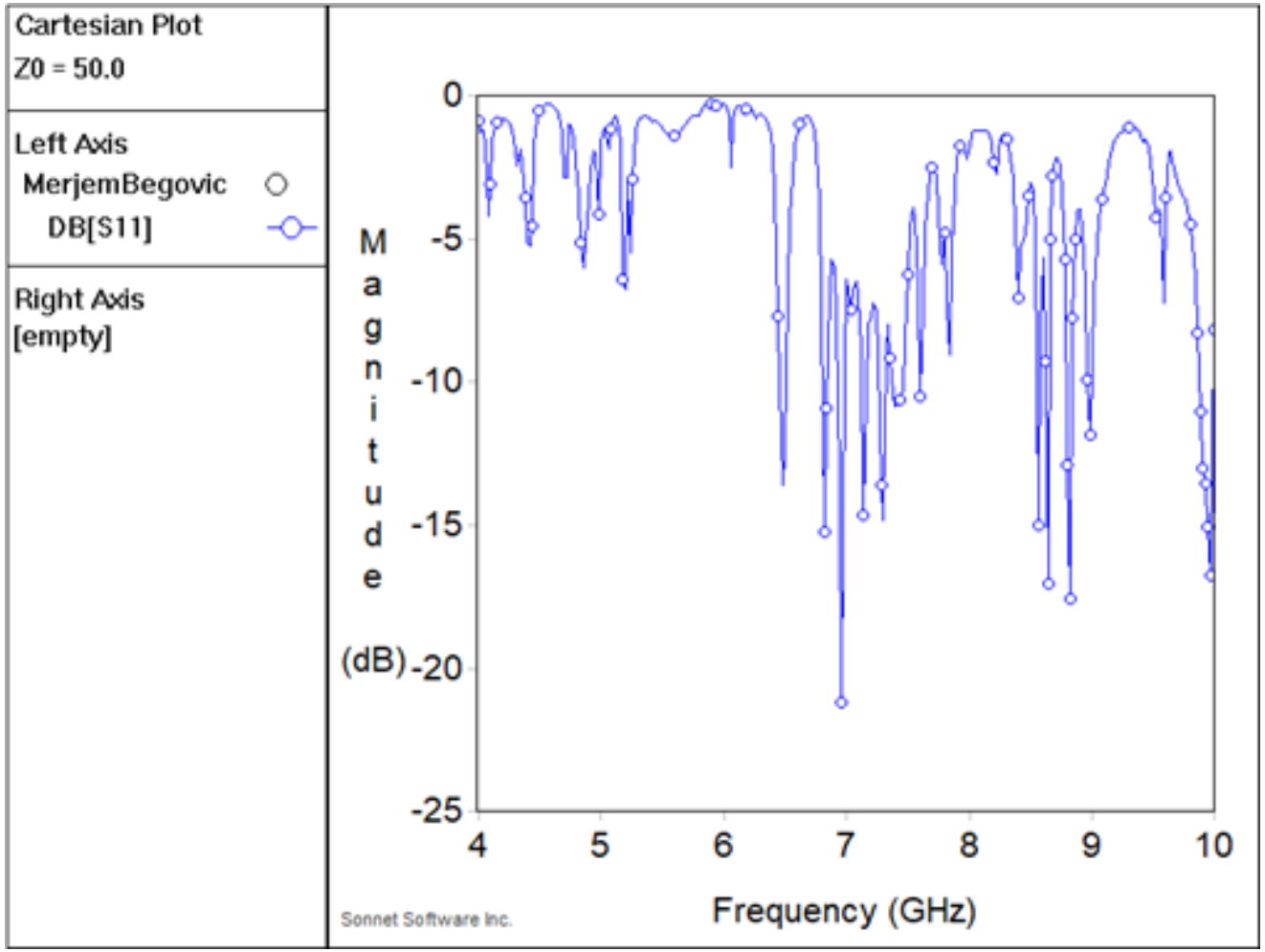

Fig. 2. Input match of the antenna.

Simulation Results

- The gain pattern of the antenna at 8.82 GHz is shown in Fig. 3.

- The maximum gain value at 8.82 GHz is 5.129 dB. The

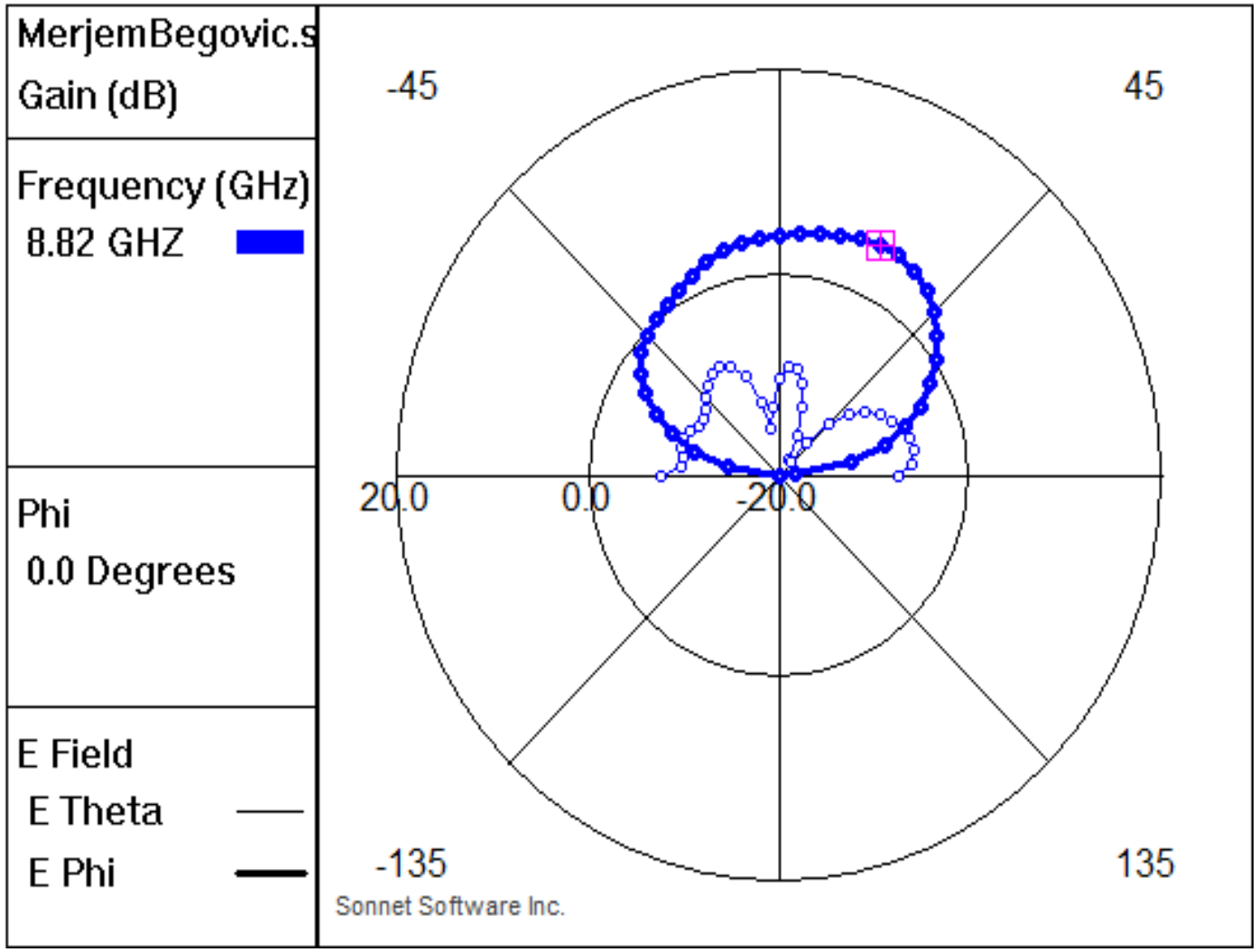

Fig. 3. Gain pattern of the antenna at 8.82 GHz

Simulation Results

- The positive gain values at different operating frequencies are tabulated in Table I.

Frequency (GHz)	Gain (dB)	Theta (θ)
6.82	0.115	5
6.96	**2.122**	**10**
8.64	**1.274**	**0**
8.82	**5.129**	**25**
9.96	**2.59**	**-40**

TABLE 1 Comparison of Gain vs. Frequency

Conclusion

- In this paper, a reversed E-shaped patch antenna, with multiple slits is designed and simulated on an Al (96%) substrate.
- According to analysis results, the antenna operates between 6.82 GHz and 9.96 GHz. At 8.82 GHz, the gain of the antenna is 5.129 dB.
- For further works, the antenna should be fabricated and measurements should be compared to the simulated results.

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Thank you for your time!