

Microwave Filter Design and Fabrication For Teaching in Engineering Degrees

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Introduction

Radiofrequency and microwave courses in electronic and telecommunications engineering degrees, with a multidisciplinary character, are usually conditioned by a limited number of teaching hours to cover a broad and complex agenda. In this context, students' abilities for self-learning and consolidation of theoretical concepts through practice become essential. However, current simulation tools for microwave and radio frequency circuits are expensive and sophisticated, which results in a low learning slope for students.

Objectives

In this work a feasibility study is carried out for the adoption of a didactic tool in microwave and radio frequency engineering courses to improve the teaching/learning processes.

Methods

We have studied the use of an internal circuit simulator to build microstrip filters and simulate them for subsequent fabrication and measurement in the laboratory. The tool consists of a software for the design of microwave filters based on microstrip technology with the ability to export the designed layouts to be subsequently manufactured and characterized in the laboratory practices.

Results

The developed tool has resulted in three main outcomes: i) contributing to students' autonomous learning with an intuitive user interface and an easily controllable number of options, ii) being a useful tool in the laboratory to enhance the theoretical-experimental connection, and iii) facilitating the understanding and transfer of knowledge to students.

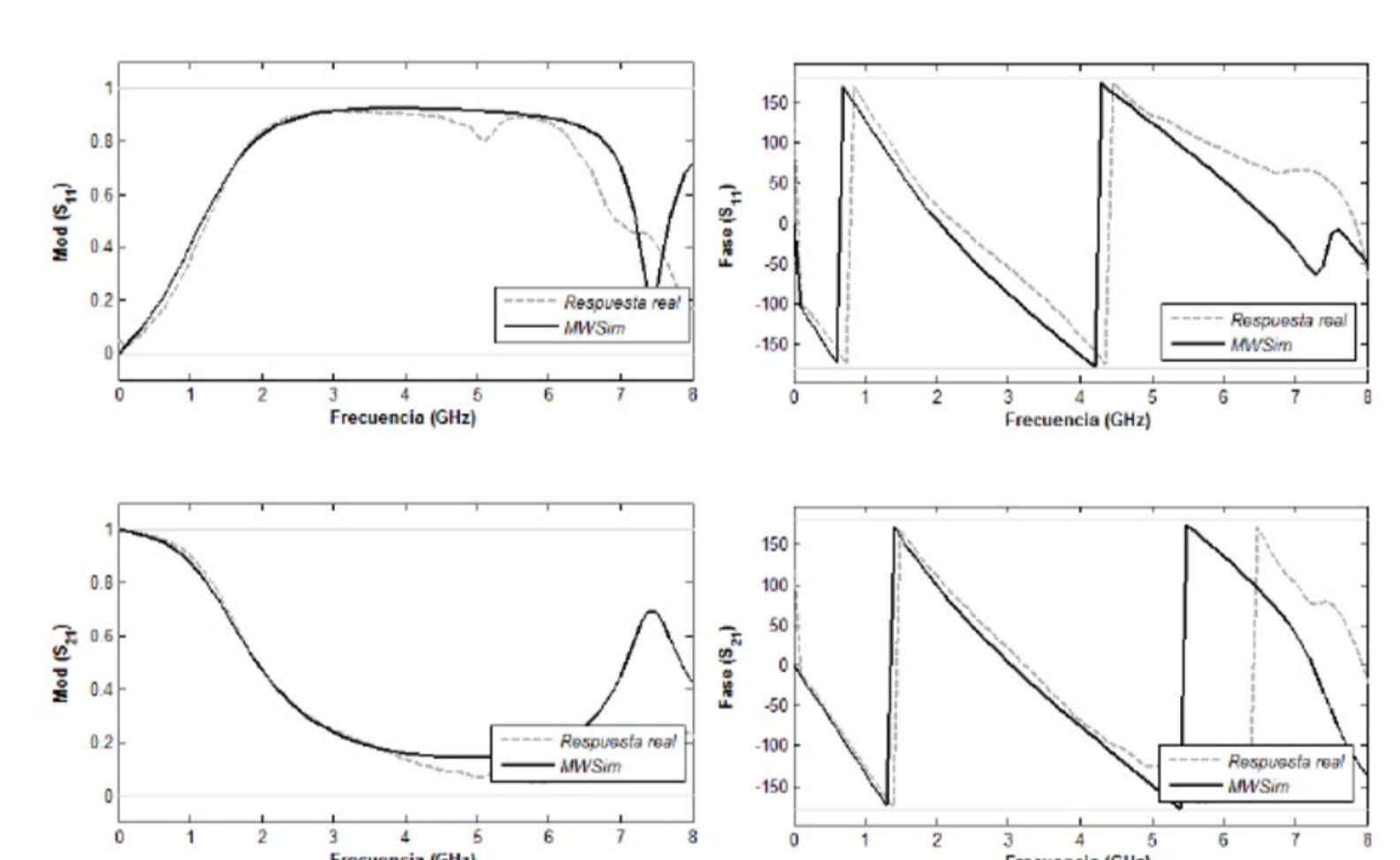
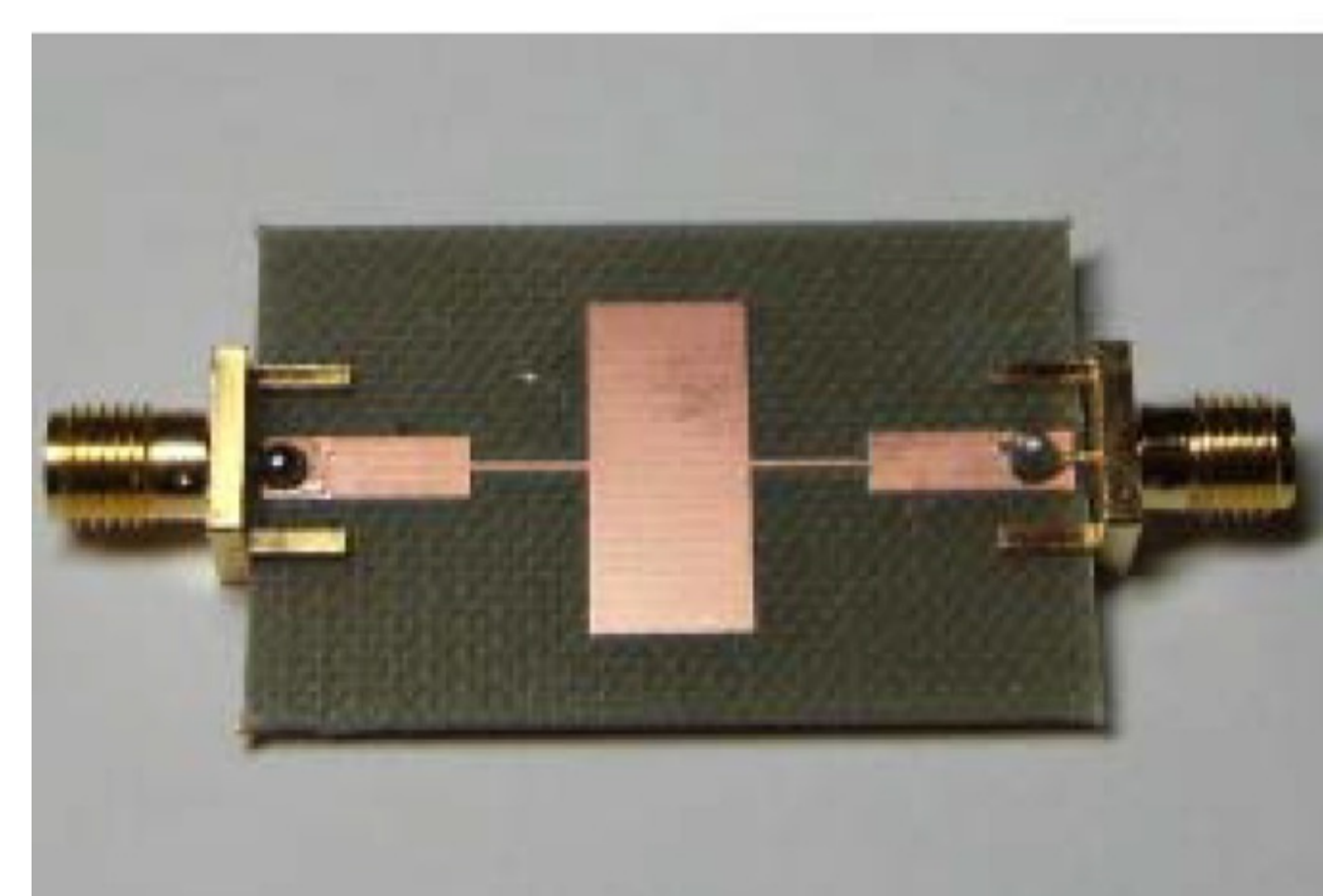
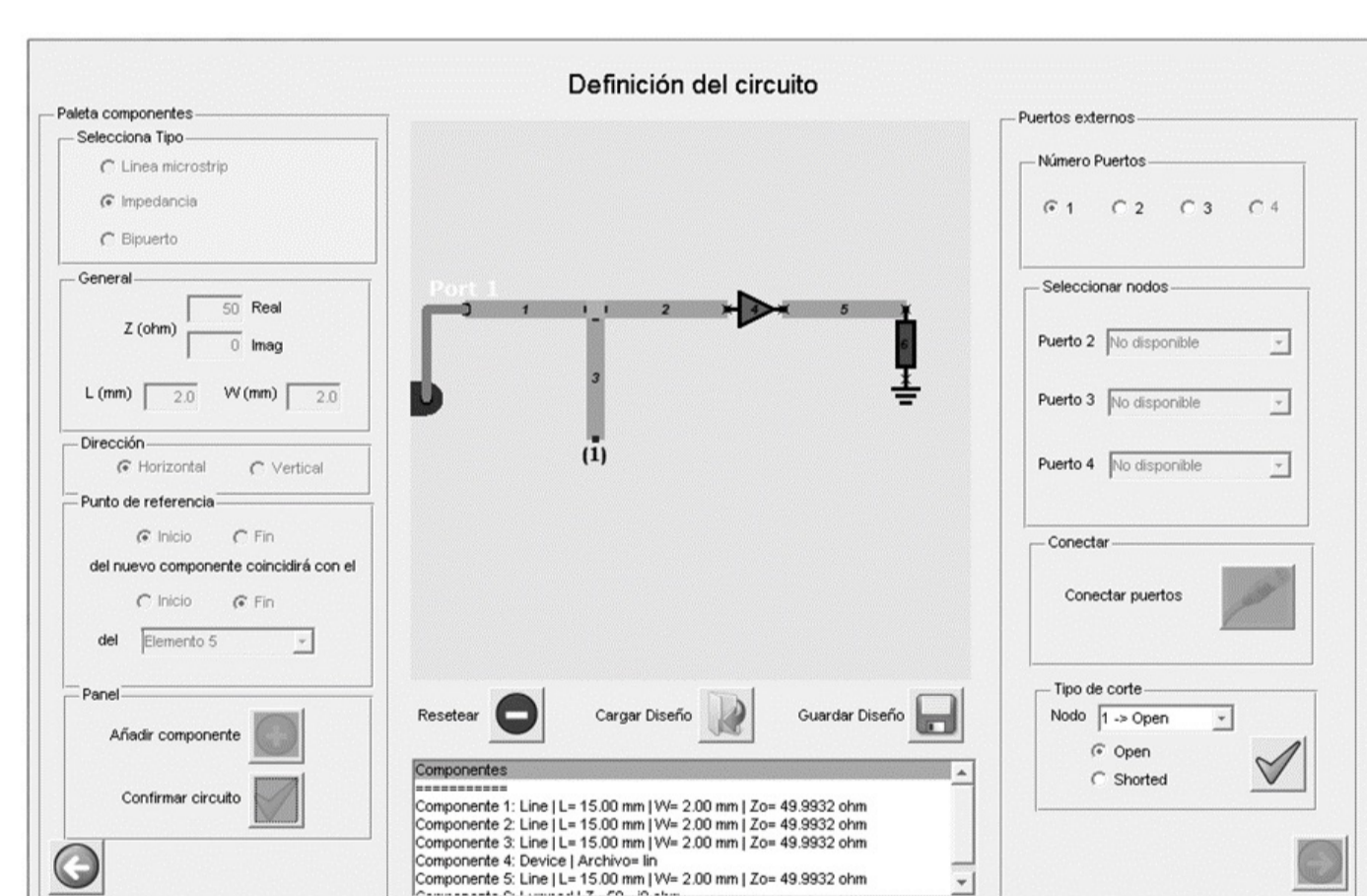
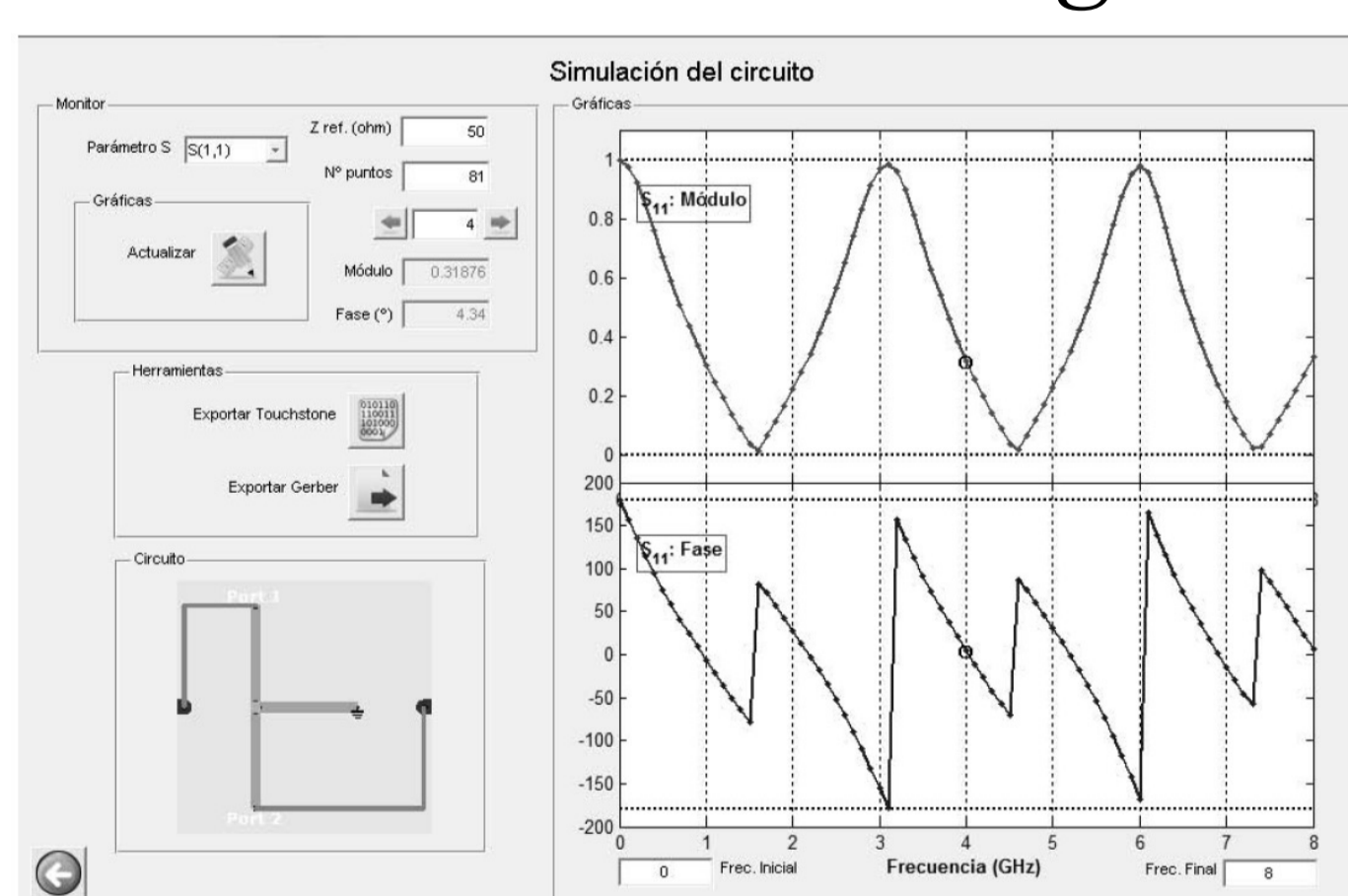


Figure 1. Interface of the numerical simulator implemented

Figure 2. Screenshot of the simulator results screen

Figure 3. Designed and fabricated microwave filter

Figure 4. Simulated and characterized filter response

Conclusion

By providing useful tools for the autonomous learning of students, it is possible to increase their interest in the subject of microwaves, improving their knowledge regarding the operation of the systems studied as a function of the different physical parameters and enhancing their engineering skills.

References