Success Story

LaSalle Students Design Matching Networks for Virtual Antenna Technology Using NI AWR Software

laSalle
UNIVERSITAT RAMON LLULL

"Microwave Office software enabled our graduate students to design and simulate a multiband antenna system in less than three weeks. With this approach, students are better prepared for their future professional engineering career path."

Dr. Jaume Anguera, Universitat Ramon LLull and Fractus Antennas

Company

La Salle, an institution with more than 300 years of history, is a founding member of Universitat Ramon Llull. It offers specialized university programs in engineering and belongs to the Lasallian network with more than one million students and 10 million alumni. The institution focuses on entrepreneurship through La Salle Technova Barcelona, an innovation park and accelerator for technologically-based startups.

Challenge

Drs. Jaume Anguera and Aurora Andújar teach a masters course in antenna technology in which they challenge their students to design small and multiband antennas using the Virtual Antenna™ antennaless technology developed by commercial partner Fractus Antennas. This technology relies on the use of a very simple antenna booster element with a matching network. In this way, the number of bands is fixed by the matching network, which is much faster and more flexible than designing a particular antenna geometry. Using the same antenna booster, students have mastered the concept that by changing the matching network, the antenna system can operate at any band of any communication system, such as mobile or internet of things (IoT).

Solution

The professors chose the NI AWR Design Environment platform, specifically Microwave Office circuit design software, for their students to design matching networks for the Virtual Antenna technology. S-parameter files of an antenna booster without any matching network were provided. Each group of three students designed the following cases:

- Project #1: Industrial, scientific, and medical radio band (ISM) 850, ISM 900

- Project #2: Global Navigation Satellite System (GNSS)

- Project #3: Long-Term Evolution (LTE) 900 MHz, LTE 1800 MHz

- Project #4: LTE 850 MHz, LTE 900 MHz, LTE 1900 MHz, LTE 2100 MHz

At-A-Glance
Application
▪ Antenna
Software
▪ NI AWR Design Environment
▪ Microwave Office
Benefits
▪ Ease of use
▪ Reduction in design time
▪ Career development

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The groups designed the appropriate matching network with lumped elements (inductor and capacitors). Ideal components were used first and then finite Q components were considered to analyze the impact of real elements, as shown in Figure 1.
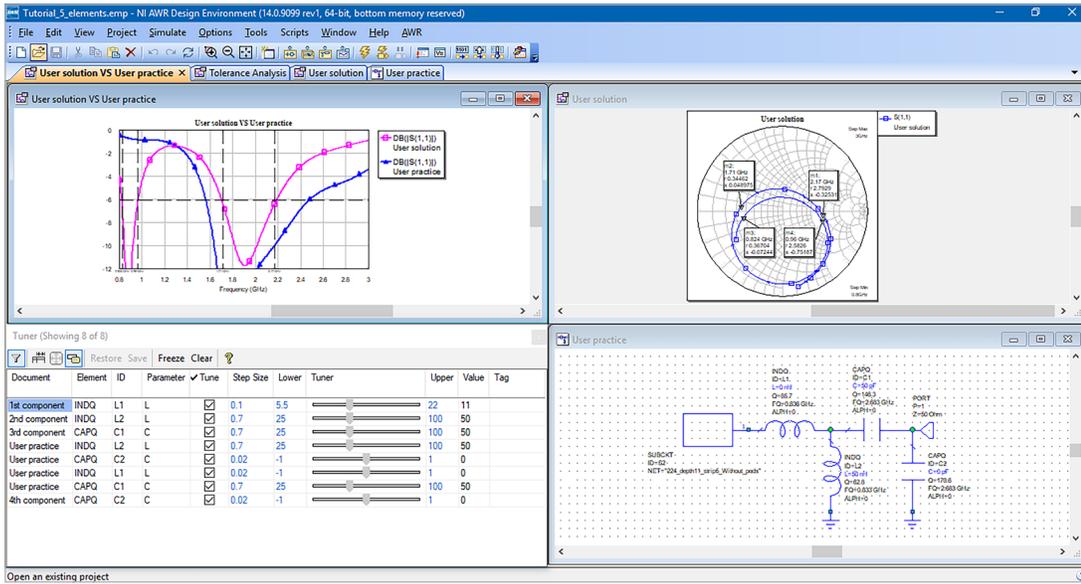

Figure 1: Schematic and simulation results shown in Microwave Office software.

In addition, Microwave Office optimization tools were used to obtain the values of L and C in the matching network. Finally, tolerance analysis was carried out to test the robustness of the designed matching networks. Using this procedure, students mastered how to design advanced antenna systems from a microwave perspective.

Conclusion

Using the tuning and optimization tools in Microwave Office software, students were able to design matching networks for the antenna booster to operate at LTE, GNSS, ISM, and Bluetooth bands. The professors appreciate that NI AWR software is very intuitive, easy to use, practical, and fast. The Virtual Antenna technology in combination with Microwave Office software enables their students to design and simulate a multiband antenna system in less than three weeks.

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