EMBox Lab

EDUCATION TOOL

DIDACTIC

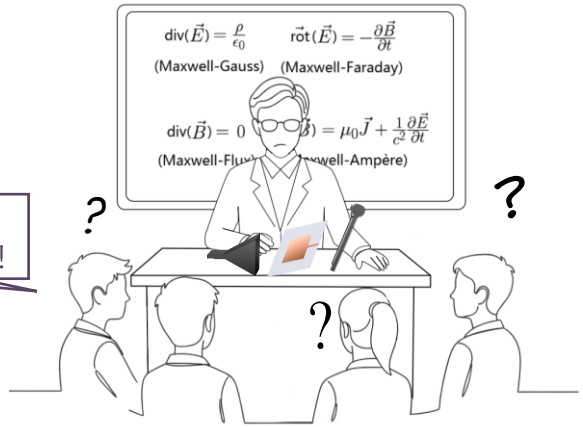
FAST

USER-FRIENDLY

PLUG AND PLAY

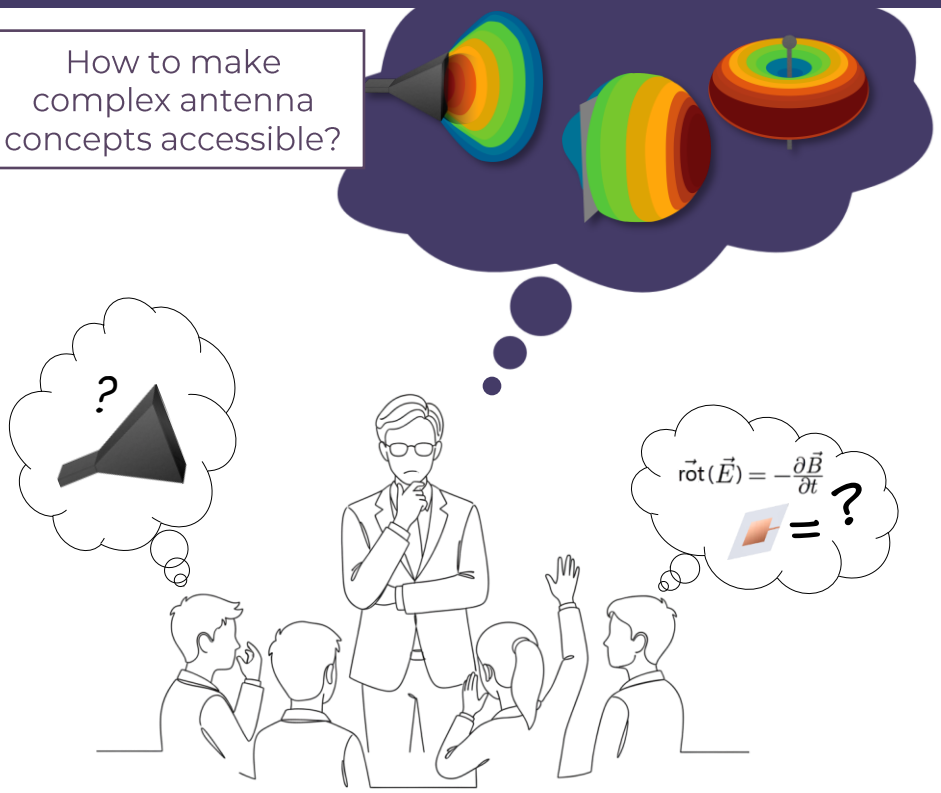
Innovative antenna measurement solution

This story is based on true events.

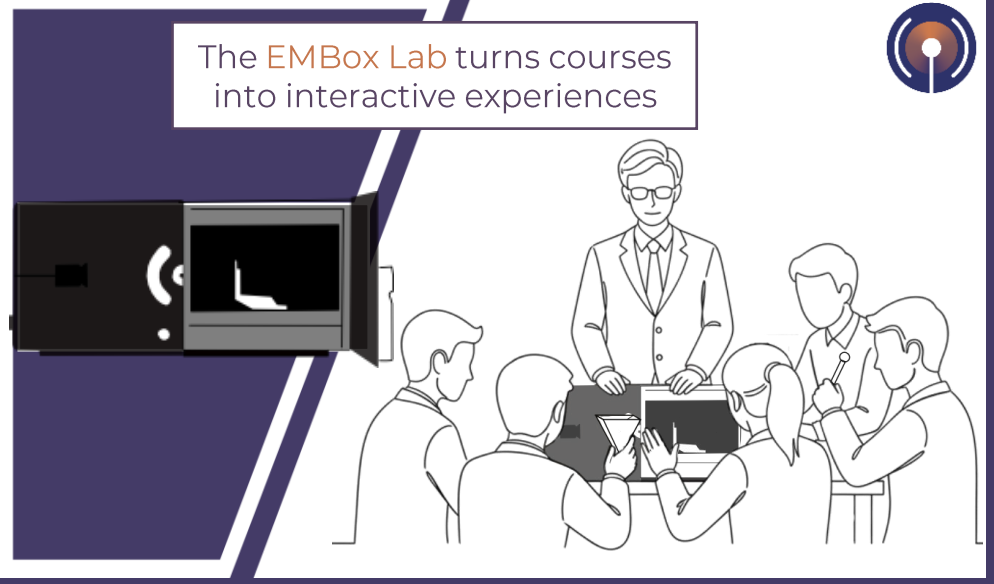


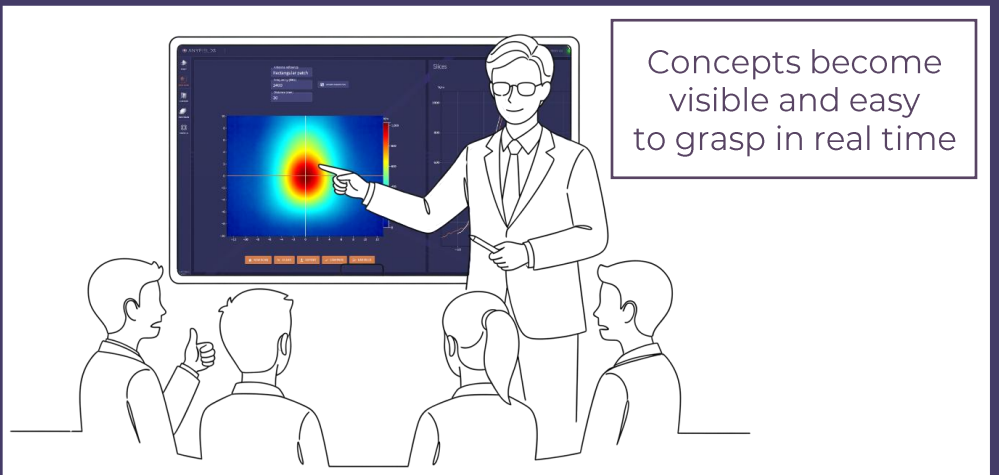
Uh... I didn't catch all of that!

How to make complex antenna concepts accessible?

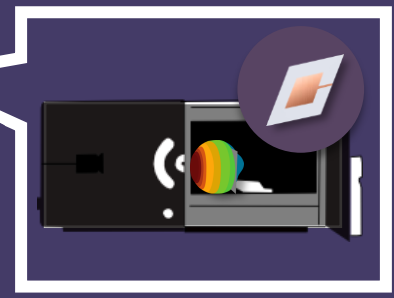


The EMBox Lab turns courses into interactive experiences





Concepts become visible and easy to grasp in real time



EMBox Lab!
Understanding antennas has never been easier

The future of antenna learning

At the heart of tomorrow's technologies, **RF, electromagnetism, and antenna engineers are vital** to space, aerospace, 5G, iOT telecommunications or defense sectors.

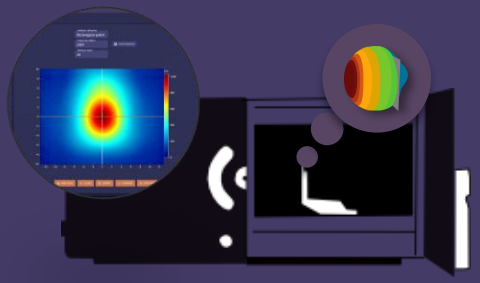
LET'S INSPIRE THEM...

The **EMBox Lab** leverages a unique, multi-patented infrared thermography technology, developed by **ONERA Lab,** using a surface sensor to instantly visualize and measure antenna radiation.

Real-time visualization of RF/EM phenomena

A more practical approach

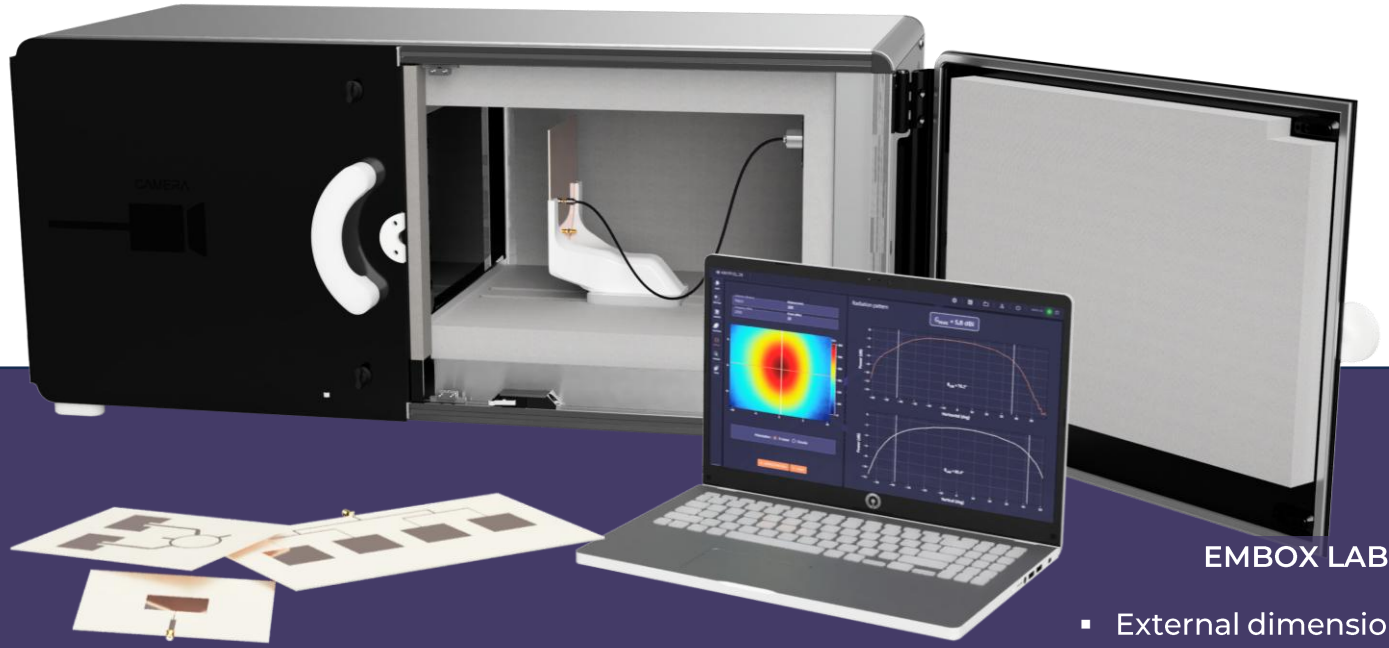
Connect equations and simulations to experiments



EMBox Lab education pack

Kit includes

EMBox Lab — EMSoft controlling software
Antennas starter pack



Single Patch, Patch Array 2x1 & 4x1

- Radiation pattern measurement
- Near-field antenna analysis
- HPBW & Gain

In 10 seconds

EMBOX LAB – MEASUREMENT TOOL

- External dimensions 940x425x410mm
- RF Source 2.3-2.65 GHz 5.7-5.9 GHz optional

Surface sensor

- **Sensor dimensions** 33x25cm
- **Definition** 300 000 datapoints

Craft your own courses

- 1 click measurement
- High-definition visualization of electromagnetic field
- Portable and plug & play

EMSOFT – ADVANCED & USER FRIENDLY

Automatic multi measurement

- **Antenna position adjustable** 256 mm range
- **Frequency sweep**

Simulation upload for comparison (HFSS, FEKO, CST...)

- Smart data management
- Quick export
- Web based interface
- Works on any computer

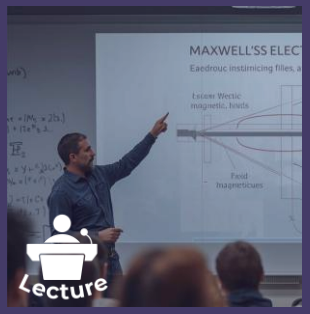
EMBox Lab powers your courses

Introduction to antennas

15 MIN

New possibilities unlocked

- Introduce the concepts of electromagnetism and antenna radiation
- Observe near field to far field formation
- Display the radiation pattern



Advanced antennas

20 MIN

- Understand the fundamental principles of antenna radiation
- Explore antenna characteristics: gain and radiation pattern
- Analyze the behavior of electromagnetic fields

Antennas lab work

30 MIN

- Measure an antenna and evaluate its radiation performance
- Acquire hands-on experience with measurement equipment
- Confirm simulation results with experimental measurement

For all universities, engineering schools, institutes of technology, HND programs...

Practical work with the EMBox Lab

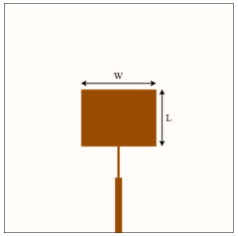
Characterization of a Rectangular Patch Antenna

The previous laboratory session focused on the design and numerical simulation of a rectangular patch antenna operating at **2.45 GHz**. For reference, the characteristics of the designed antenna are listed in **Table 1**, and the antenna geometry is shown in **Figure 1**.

Table 1: Characteristics of the designed rectangular patch antenna

Resonant frequency	2.45 GHz
Patch dimensions (W x L)	41 mm x 31 mm
Substrate dielectric constant	3.48
Substrate dimensions	125 mm x 125 mm
Substrate height	1.6 mm

Figure 1: Geometry of the rectangular patch antenna



The objective of this laboratory session is to experimentally characterize a prototype of the rectangular patch antenna designed according to the specifications given in Table 1.

1. Radiation pattern and Gain measurement (15 min)

Compute the minimum distance beyond which the antenna can be considered to operate in the far-field region and compute the radiation pattern and the gain of the patch antenna. To do so, use the EMBox Lab Far-Field functionality.

02/10/2025 - James Maxwell - FA24

A+

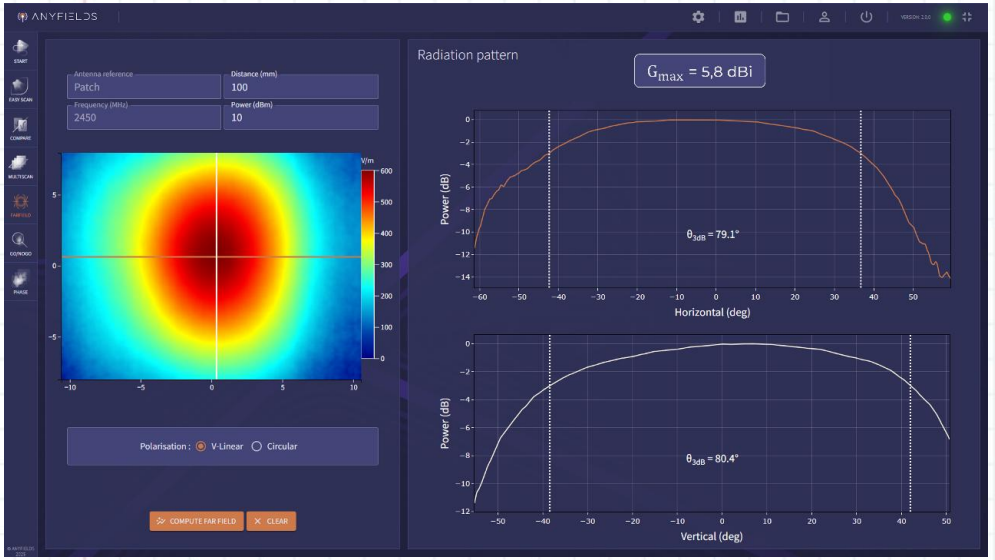
The far-field region, also known as the Fraunhofer region, is defined by the condition:

$$r \geq \frac{2D^2}{\lambda}$$

Where D is the maximum dimension of the antenna and λ is the free-space wavelength. Using the antenna characteristics given in table 1:

$$r \geq 25.6\ cm$$

The Far-Field functionality of the EMBox Lab is used to compute the radiation pattern and the gain of the patch antenna from the measured data.



According to numerical simulations, the expected gain is 5.85 dBi, with a 3 dB beamwidth in the E-plane of approximately 80°.

Good job

The experimental results yield a measured gain of **5.8 dBi** and a **3 dB beamwidth** of **79.1°**, which are in very good agreement with the simulated values. This confirms the **correct operation and radiation behavior** of the antenna.

DISCOVER THE EMBOX LAB BY ANYFIELDS
a practical antenna measurement tool for education.

Make electromagnetic concepts accessible in your classroom.

The EMBox Lab offers

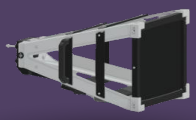
- instant results
- real-time visualizations
- rapid setup
- compact and mobile

By enabling students to explore antennas, electromagnetic waves behavior, and RF fundamentals through hands-on activities, the EMBox Lab connects theory to practice. No anechoic chamber required: just plug, test, and iterate.

Antenna measurement just got smarter

Discover our other products

EMBox XL



EMCam

ANYFIELDS
www.anyfields.eu