

Scheda Laboratori di Ricerca

<p>Denominazione del Laboratorio</p>	<p><i>Italiano</i>                  Laboratorio di Campi Elettromagnetici  <i>Inglese</i>                  Electromagnetic Fields Laboratory</p>
<p>Gruppo di Ricerca di Riferimento</p>	<p><i>Italiano</i>  <a href="#">Diagnostica Elettromagnetica</a>  <a href="#">Elaborazione delle immagini e sensoristica ottica e a microonde</a>  <i>Inglese</i>  <a href="#">Electromagnetic Diagnostics</a>  <a href="#">Image Processing and Optical Microwave Sensors</a></p>
<p>Descrizione sintetica delle attrezzature, della strumentazione e delle attività di ricerca</p>	<p><b>Main activities of the Laboratory</b></p> <ul style="list-style-type: none"> <li>• Electromagnetic diffusion measurements.</li> <li>• Microwave tomography.</li> <li>• Diagnostics of wall structures.</li> <li>• Antennas testing.</li> <li>• Materials characterization.</li> <li>• Electromagnetic pollution measurements.</li> <li>• Ground penetrating radar.</li> </ul> <p><b>Main equipment</b></p> <p><b>Shielded anechoic chamber</b></p> <p>It is a 3-by-4-meter room with a 2-meter-by-0.90-meter door. The door has a handle that can be operated from the inside. It is metal on the outside. Inside, it has panels of microwave-blocking expanded polyurethane with carbon powder. The panels have a pyramid shape with plastic coating. This prevents carbon dust from being released, which is compatible with ISO class 5 clean rooms. The metal shields the chamber from external electromagnetic radiation. Anechoic panels reduce electromagnetic field reflection from the walls. The room has lighting and ventilation.</p> <p><b>Microwave tomograph</b></p> <p>This tool is a prototype for the positioning and movement of two antennas in a vertical plane, which is placed inside the anechoic chamber. It comprises a 2.5 m horizontal positioner on which two 2 m high vertical towers are mounted, on to which two slides can slide. Movement is controlled by an electronic device located outside the chamber, which can be activated either by joystick or by personal computer. The equipment is equipped with a mushroom button for emergency stop.</p> <p><b>Ground penetrating radar</b></p> <p>It is a commercial instrument composed of an IDS RIS K2 radar control</p>

and data acquisition unit and an antenna system for subsurface radar prospecting of both vertical (e.g. walls) and horizontal (e.g. floors, soil) structures. It is equipped with two antenna systems, 200 MHz and 600 MHz.

### **Network analyzers**

These are commercial instruments for measuring the scattering parameters of microwave devices. They are equipped with a microwave generator. Two Vector Network Analyzers (VNA) from ARITZU are available at the laboratory: the model 37225B, with a frequency range of 20 MHz to 13.5 GHz and four channels, and the MS4624D model, with a frequency range of 10 MHz to 9 GHz. Additionally, a recently acquired VNA from KEYSIGHT, the P9373A model, has been added to the laboratory's resources: it covers the range of 300 kHz to 14 GHz with four channels.

### **MIMO radar**

These are high-frequency radars equipped with multiple transmitting and receiving antennas (hence the acronym MIMO, Multiple Input Multiple Output) for the detection and localization of objects, with automotive applications. Two 77 GHz systems are in use at the laboratory: one from Texas Instruments' model mmWave Cascade Radar and one from INRAS's model RadarBook2.

### **Field radar**

This portable ground-penetrating radar with stepped frequency technology enables wall diagnostics in a multi-bistatic measurement configuration through a linear scan of approximately 2 m obtained by moving the sensors on a special movement track. The transmitter, based on the stepped frequency operating principle, operates between 800 MHz and 4 GHz. The broadband antennas range from 800 MHz to 3 GHz with linear polarization.

### **Radar targets**

These are metallic and dielectric objects.

### **Computer**

These are Personal Computers used for the management of the equipment, for the acquisition of data during the experiments and for their processing.

### **Microwave antennas and cables**

### **Trolley with USAG tools**