

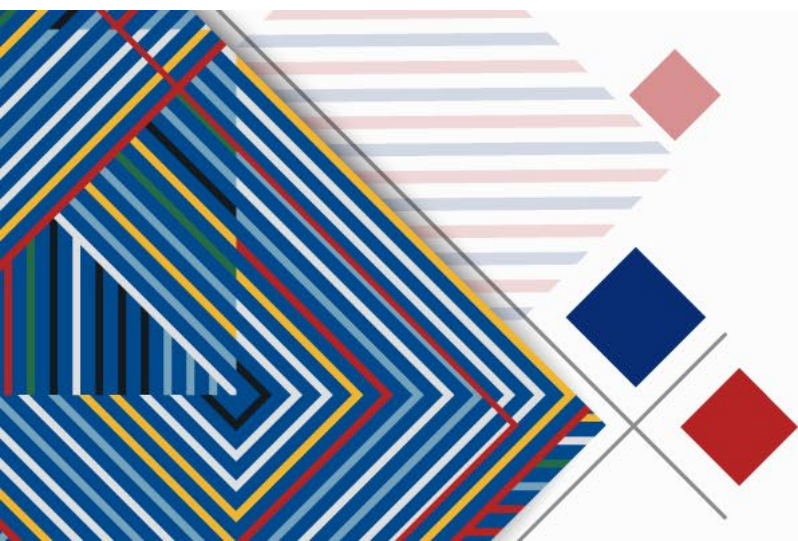


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Radiocommunication Activities at the Universitat Politècnica de València

Miguel Ferrando-Bataller. [Antennas and Propagation Lab](#)

Vicente E. Boria-Esbert. [Microwave Applications Group](#)



SMART MATERIALS
FOR RADIO SCIENCE

17TH

PORTUGUESE COMMITTEE
OF URSI



UNIVERSITAT POLITÈCNICA DE VALÈNCIA

The UPV is Spain's leading technological university

- **30.782 students**
 - Bachelor: 21.965
 - Máster: 4.909
 - PhD: 2.639
- **2.552 teaching** and research staff
- 1.456 administration and services





The Institute of Telecommunications and Multimedia Applications (**iTEAM**), is a research center integrated in the Polytechnic City of Innovation.

- **Microwaves Applications - Space - (GAM)**
- **Antennas and Propagation Lab - (APL)**
- Optical Systems and Components
- Mobile Communication Systems
- Signal Processing
- Multimedia Applications





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ITEAM
Instituto de Telecomunicaciones
y Aplicaciones Multimedia



ANTENNAS &
PROPAGATION
LAB



Microwave Applications Group

APL research focuses on the analysis and design of antennas for microwave and millimeter wave applications, and on the study of propagation and modeling of radio channels, highlighting Characteristic Mode Theory, design of slot arrays and new guiding technologies, and the development and validation of loss models in complex environments.

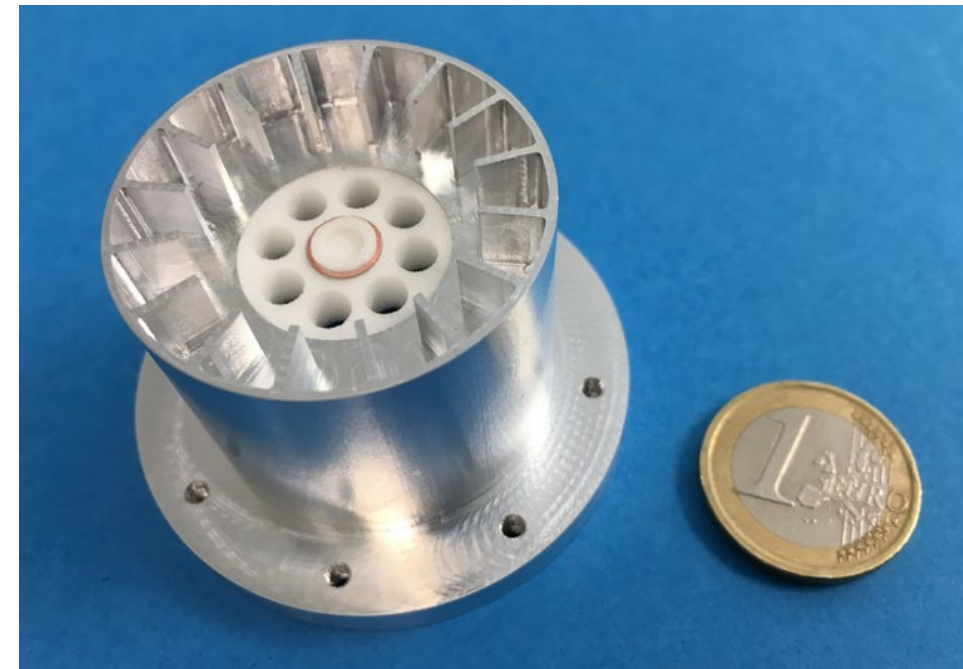
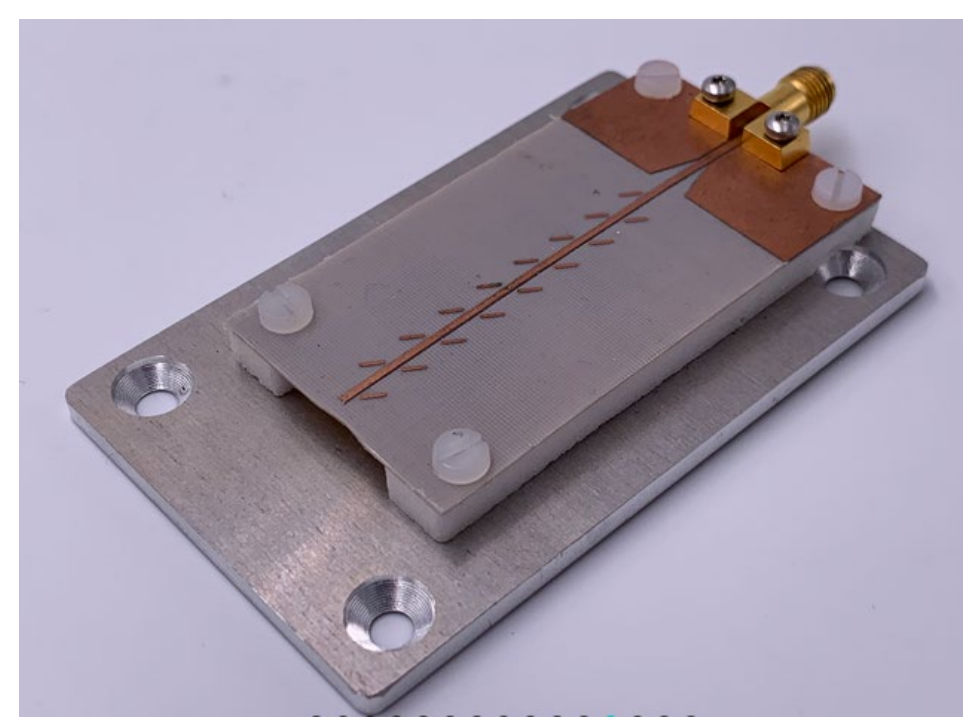
The Microwave Applications Group (GAM) focuses its research activity on the development of analysis and design techniques of passive components for high frequency applications (microwaves and millimeter waves), such as filters, matching networks, multiplexers, switches, probes, and transitions.



**ANTENNAS &
PROPAGATION
LAB**

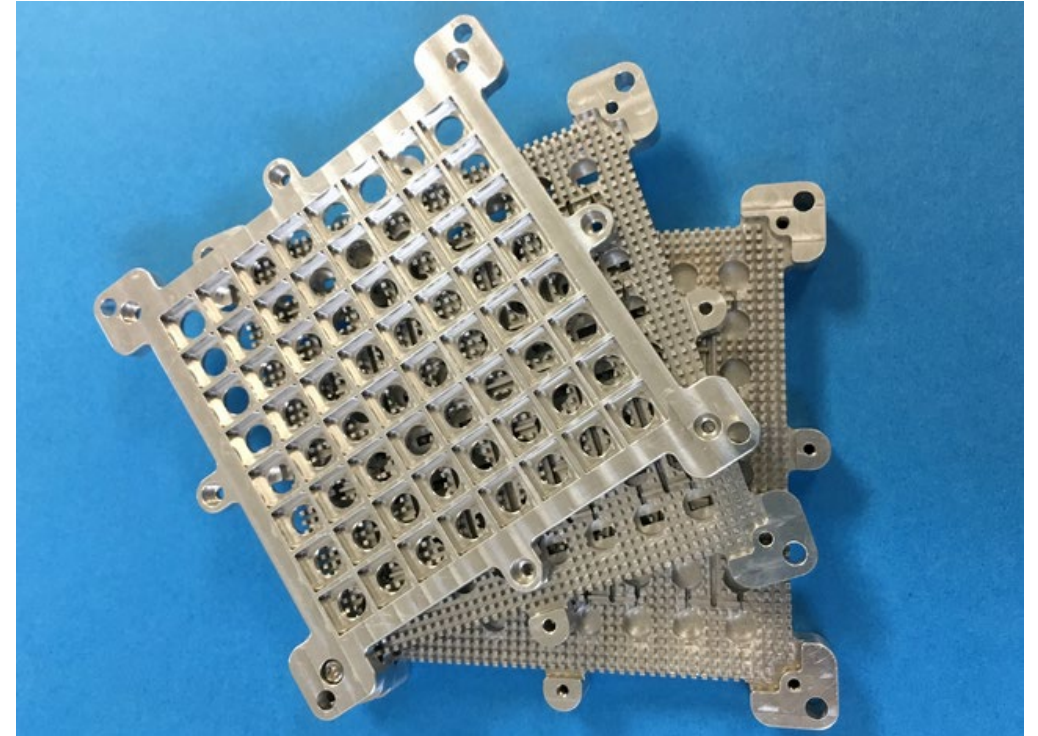
Research activities

- Design, manufacture and measurement of small antennas.
- Design, manufacture and measurement of antenna arrays in the microwave and millimeter bands.
- Antenna diagnostics and measurements.
- Design, fabrication and measurement of passive microwave devices.
- Low Temperature Cofired Ceramics (LTCC) Antennas.
- Propagation and radio channel modeling.
- **Band Gap Materials**

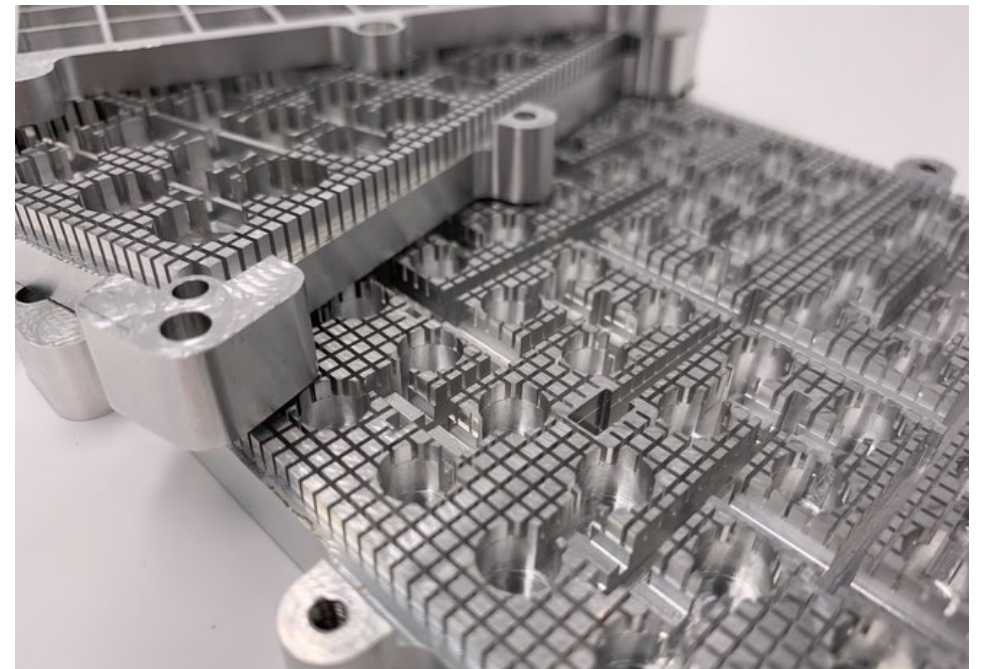
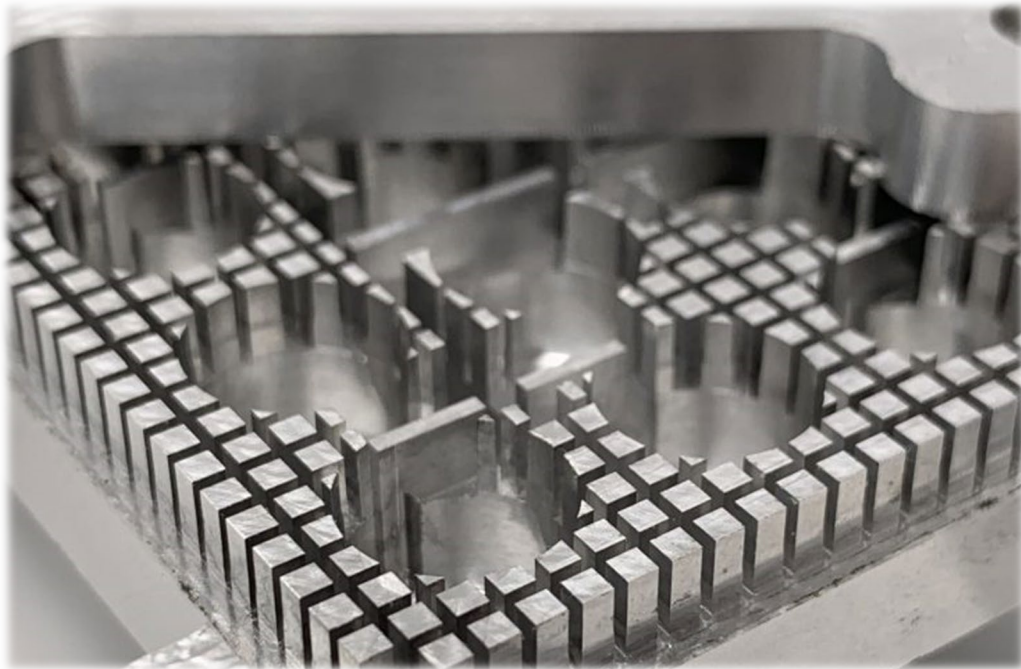


Applications

- Highly directive multi-beam and steerable beam antennas (Defense, SATCOM and other applications).
- Dual band antennas for duplex communications applications.
- Dual polarization antennas.
- Antennas for mobile terminals, MIMO and UWB systems, DVB-T / DVB-H standards and vehicular applications.
- Channel models for 5G cellular systems (indoor and outdoor), vehicular systems (V2I and V2V), MIMO, UWB and millimeter wave.



Gap waveguide research



Alejandro Valero



Mariano Baquero



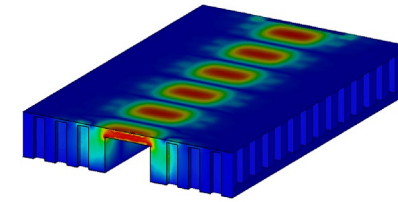
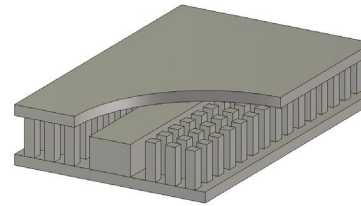
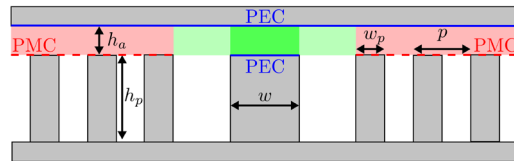
Jose I. Herranz



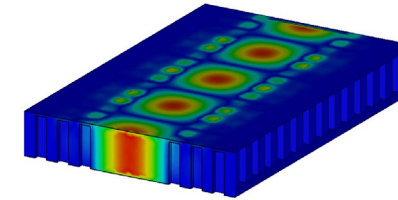
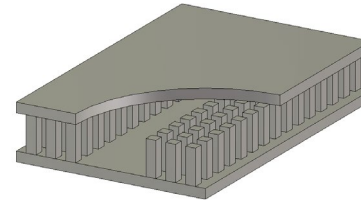
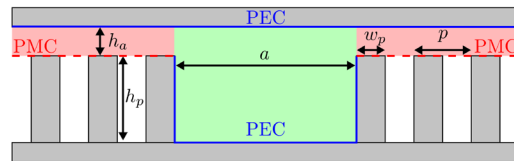
Miguel Ferrando-Rocher

Gap waveguides

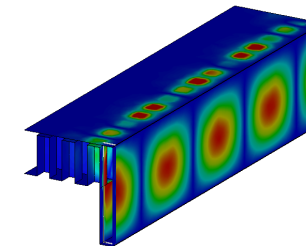
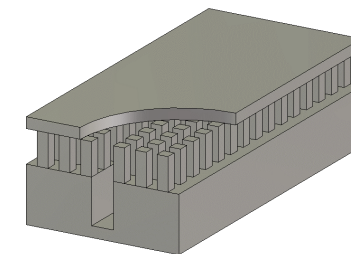
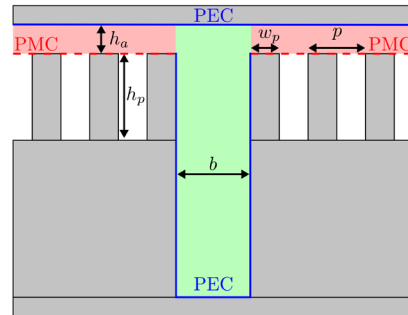
Ridge Gap Waveguide (RGW)



V-pol Groove Gap Waveguide (GGW)

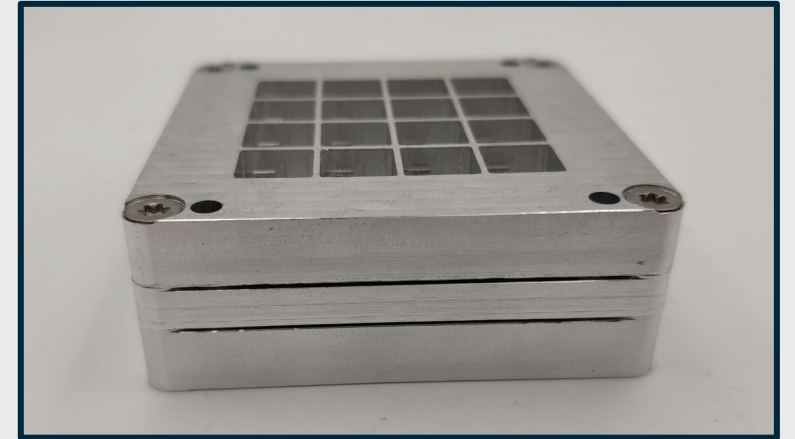
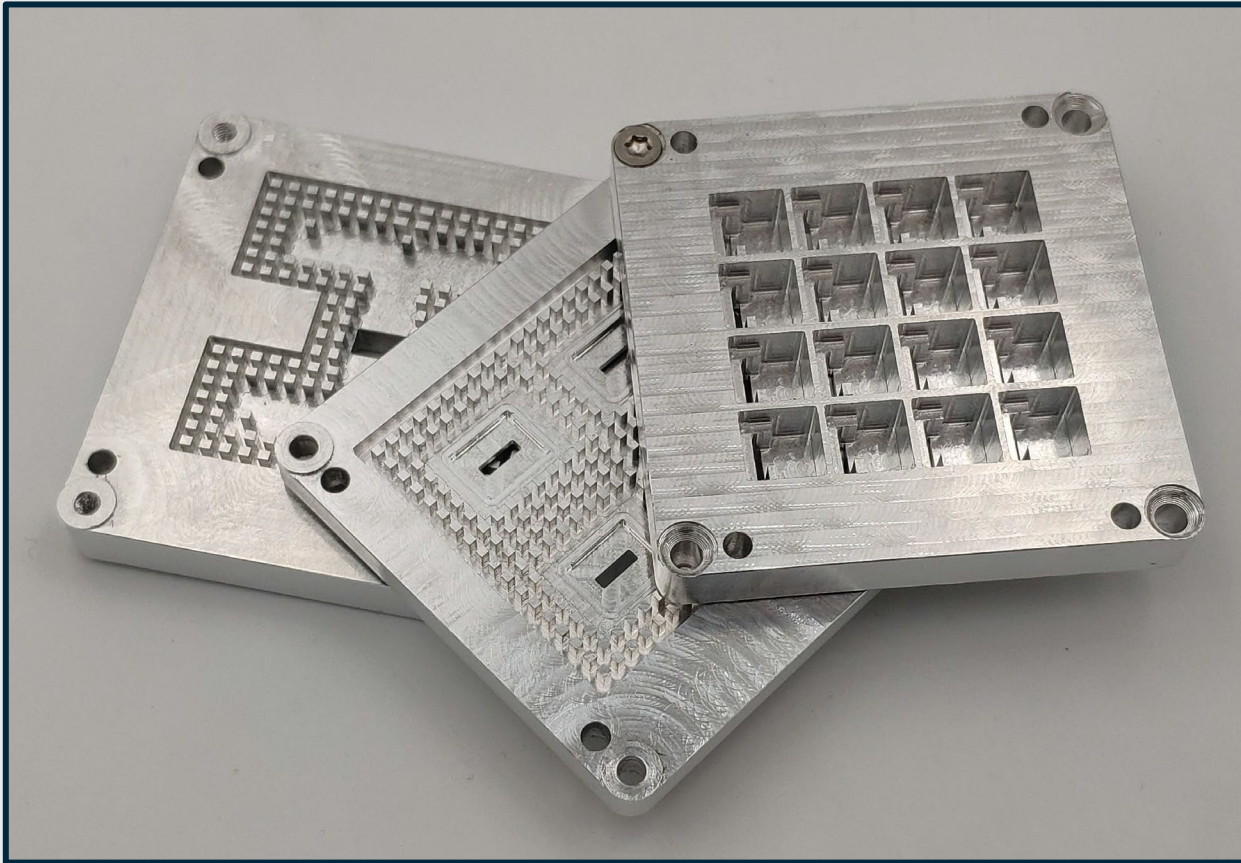


H-pol Groove Gap Waveguide (GGW)



Multilayer feeding networks EBG materials

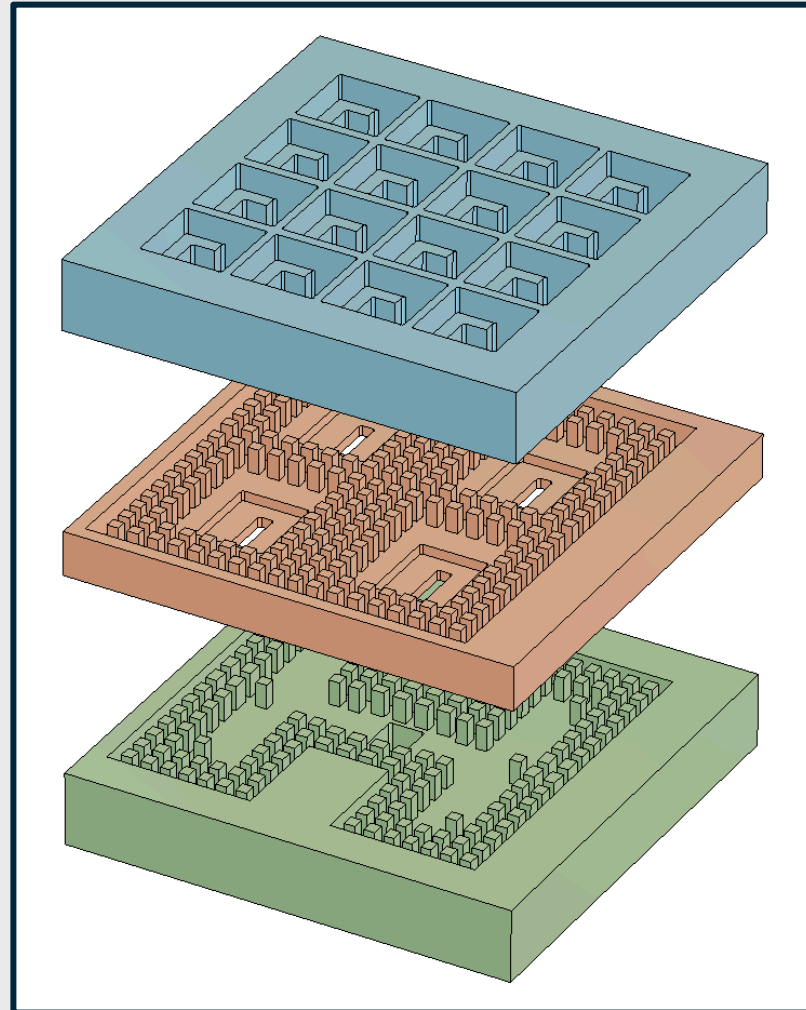
H-pol GGW feeding layer + Cavity layer



Jose I. Herranz-Herruzo, et. al., "Wideband Circularly Polarized mm-Wave Array Antenna Using H-Shaped Low-Axial-Ratio Apertures," in *IEEE Transactions on Antennas and Propagation*. (2023)

Multilayer feeding networks

H-pol GGW feeding layer + Cavity layer



Radiating layer

- 4x4 H-shaped elements
- Waffle grid
- External frame

Coupling layer

- 4 rectangular cavities
- 4 coupling slots (stepped)
- Pins (gap waveguide technology)

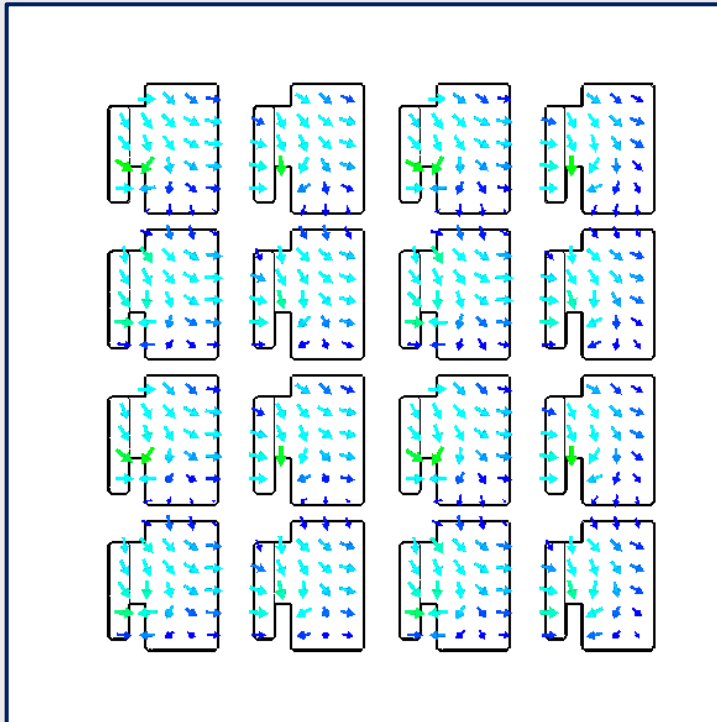
Feeding layer

- Corporate GGW network
- Matching pins
- Input port: WR-28

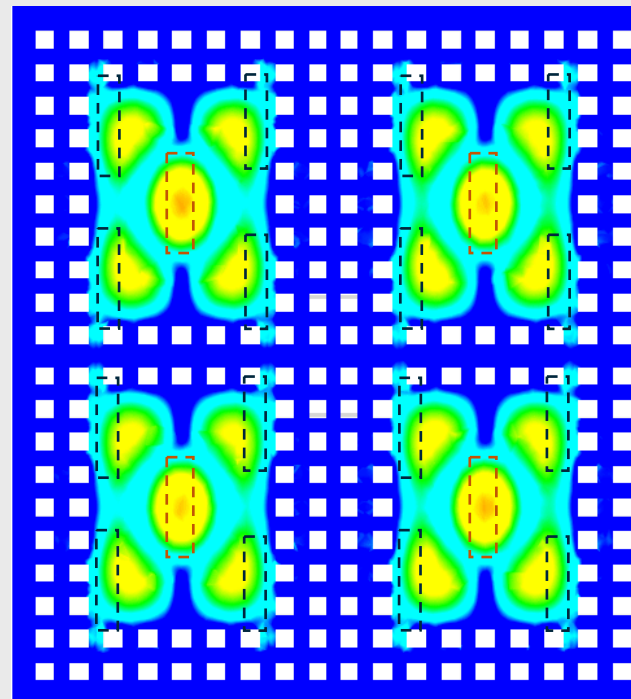
Multilayer feeding networks

H-pol GGW feeding layer + Cavity layer

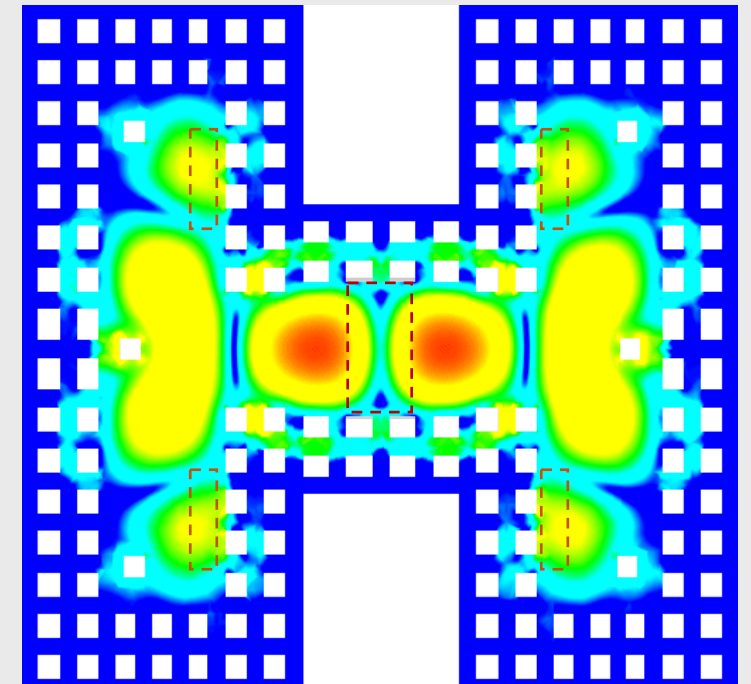
Radiating layer



Coupling layer

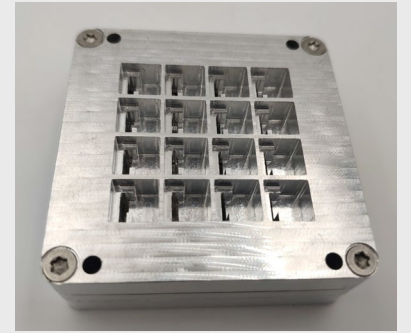


Feeding layer

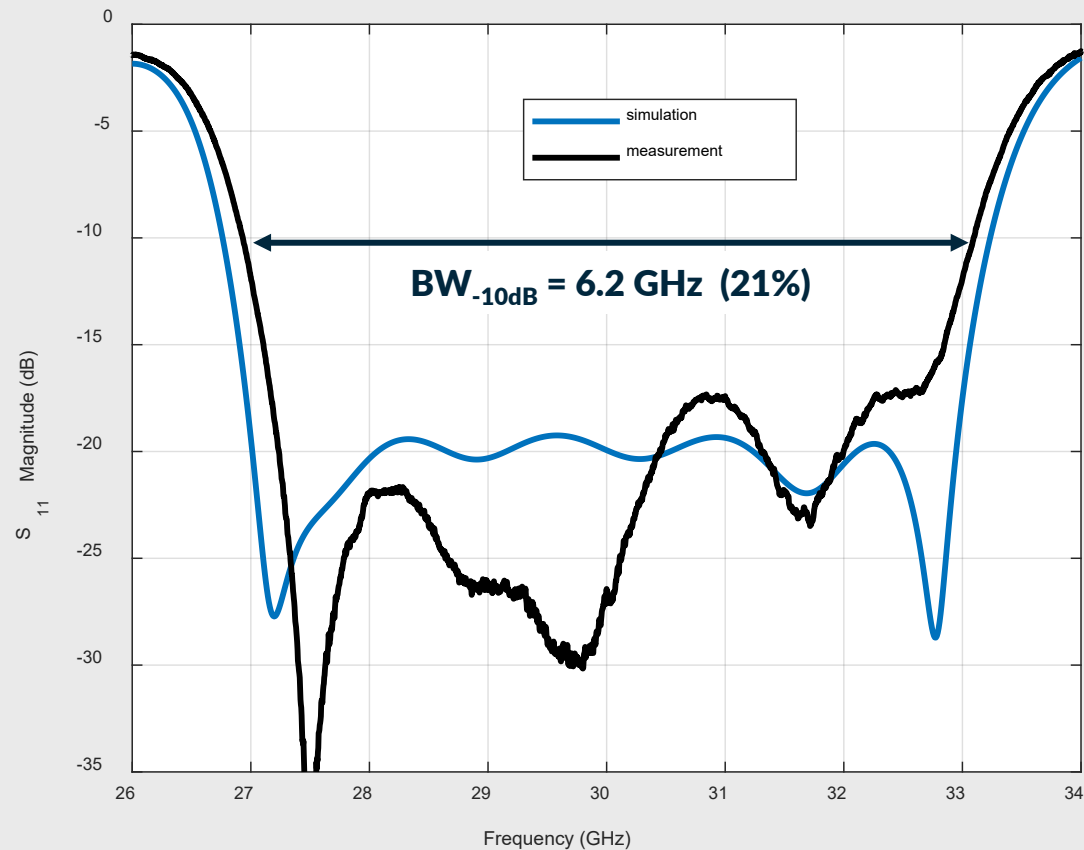


Multilayer feeding networks

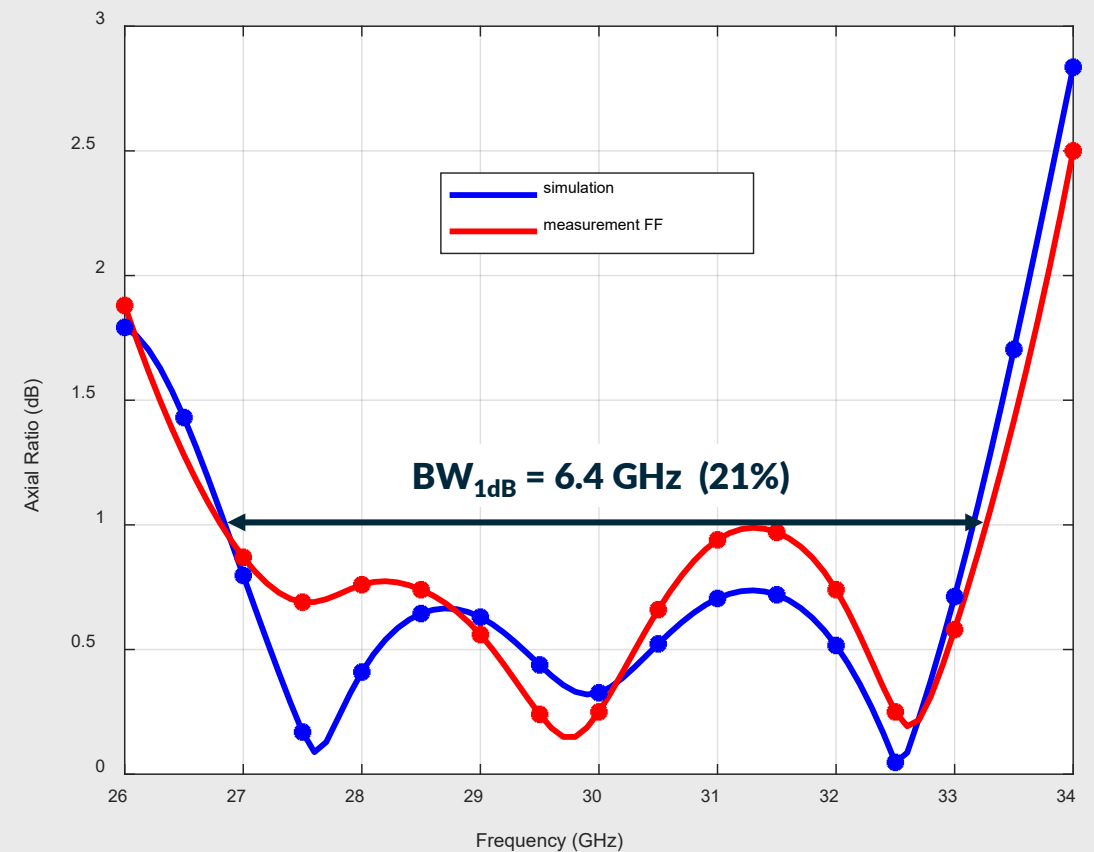
H-pol GGW feeding layer + Cavity layer



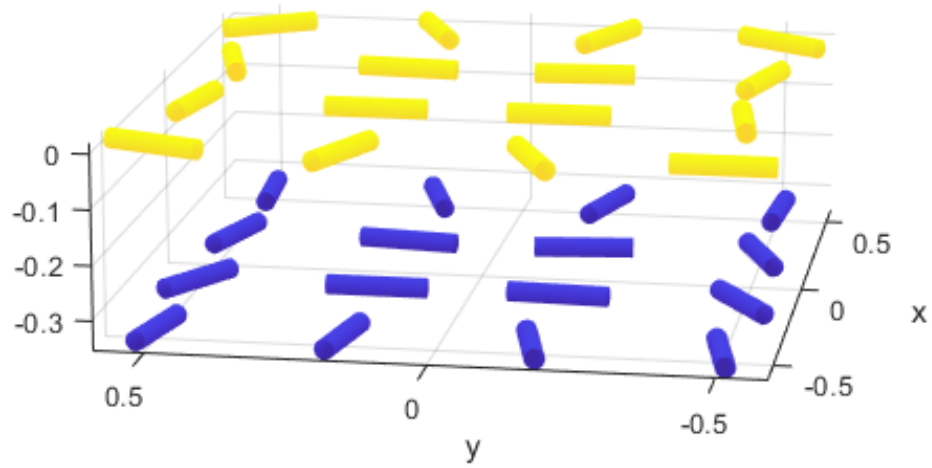
S₁₁-parameter vs. frequency



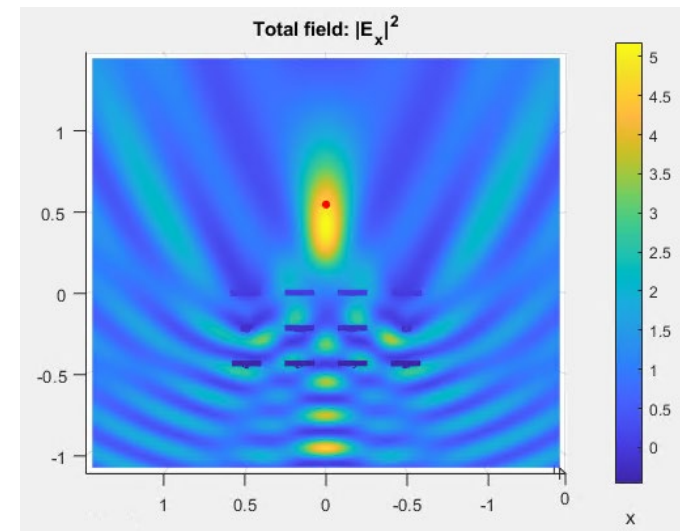
Axial Ratio vs. frequency



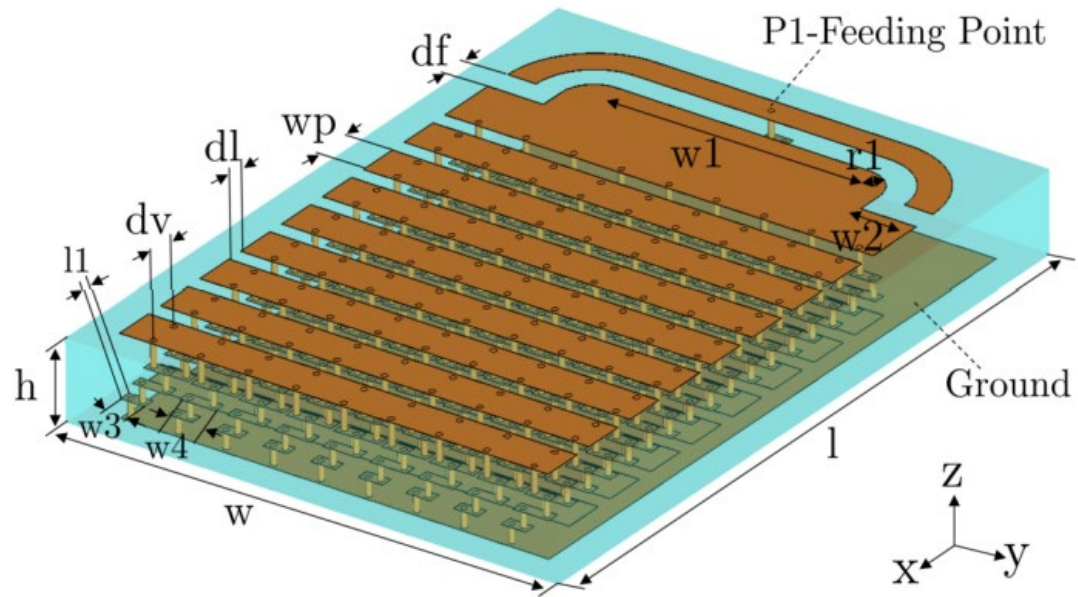
SMART MATERIALS



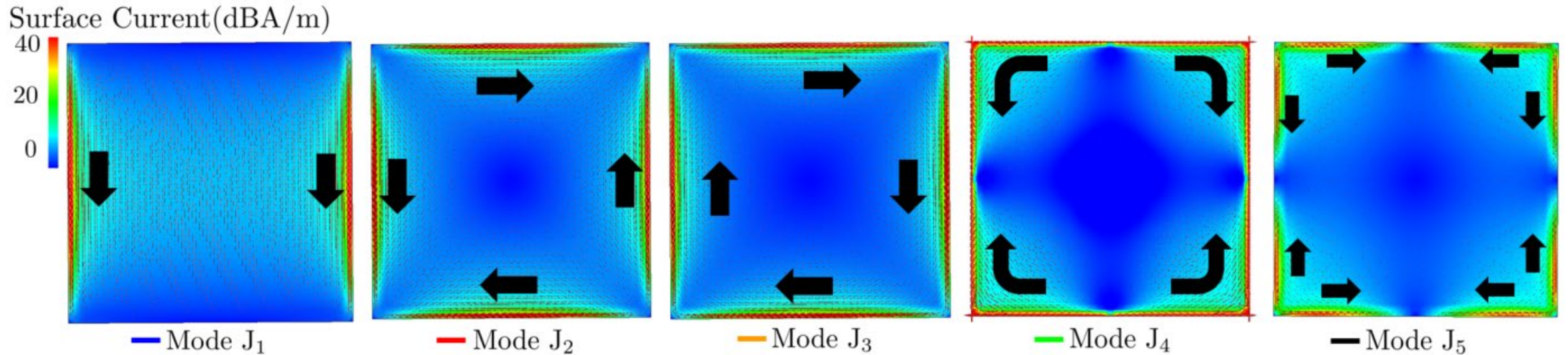
ANTENNAS &
PROPAGATION
LAB



LTCC 868 MHz Chip antenna



Characteristic Modes Analysis (CMA)



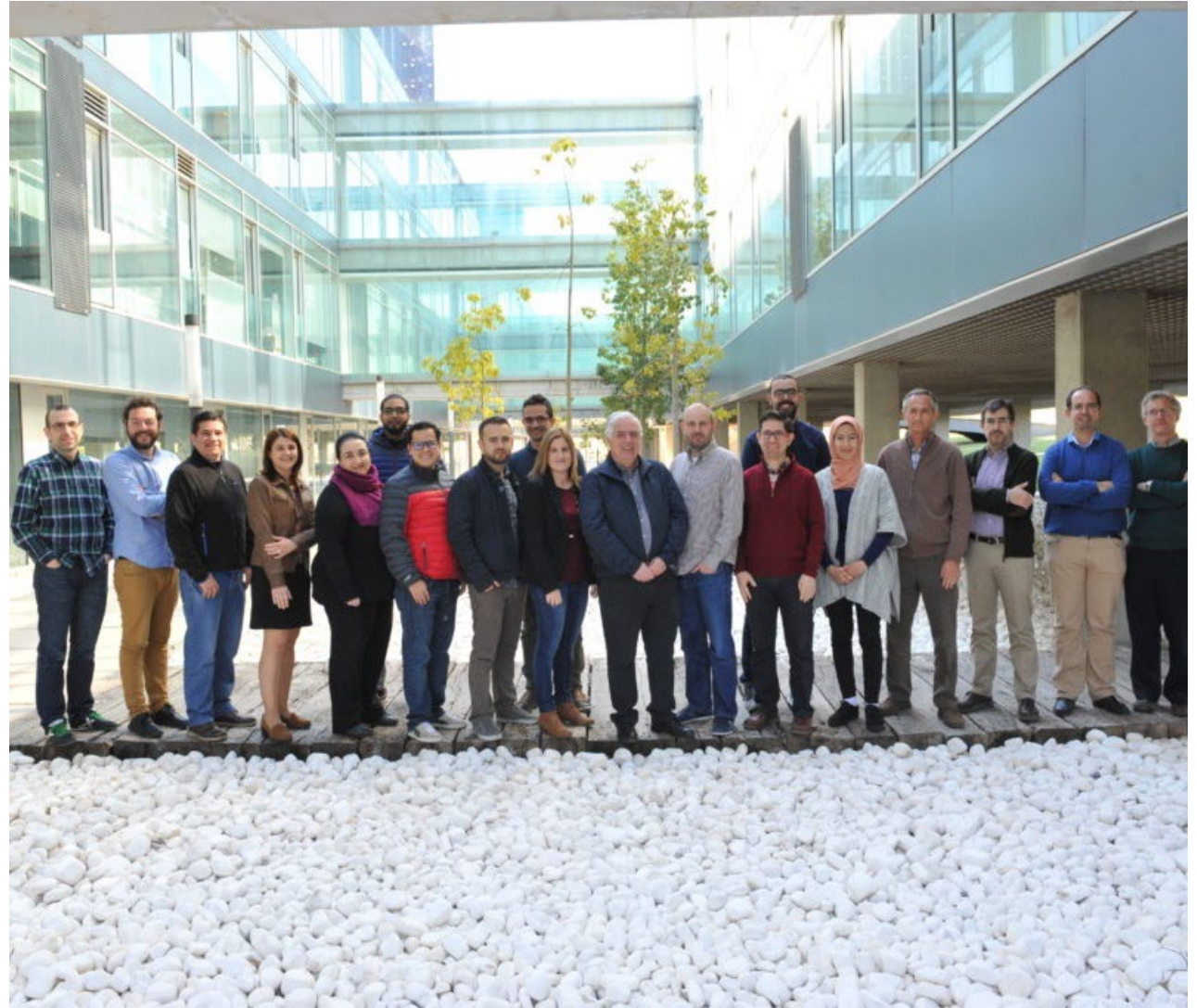
The ground plane is the main radiator.

The chip antenna produces currents in certain modes.

Lab members (PhD)

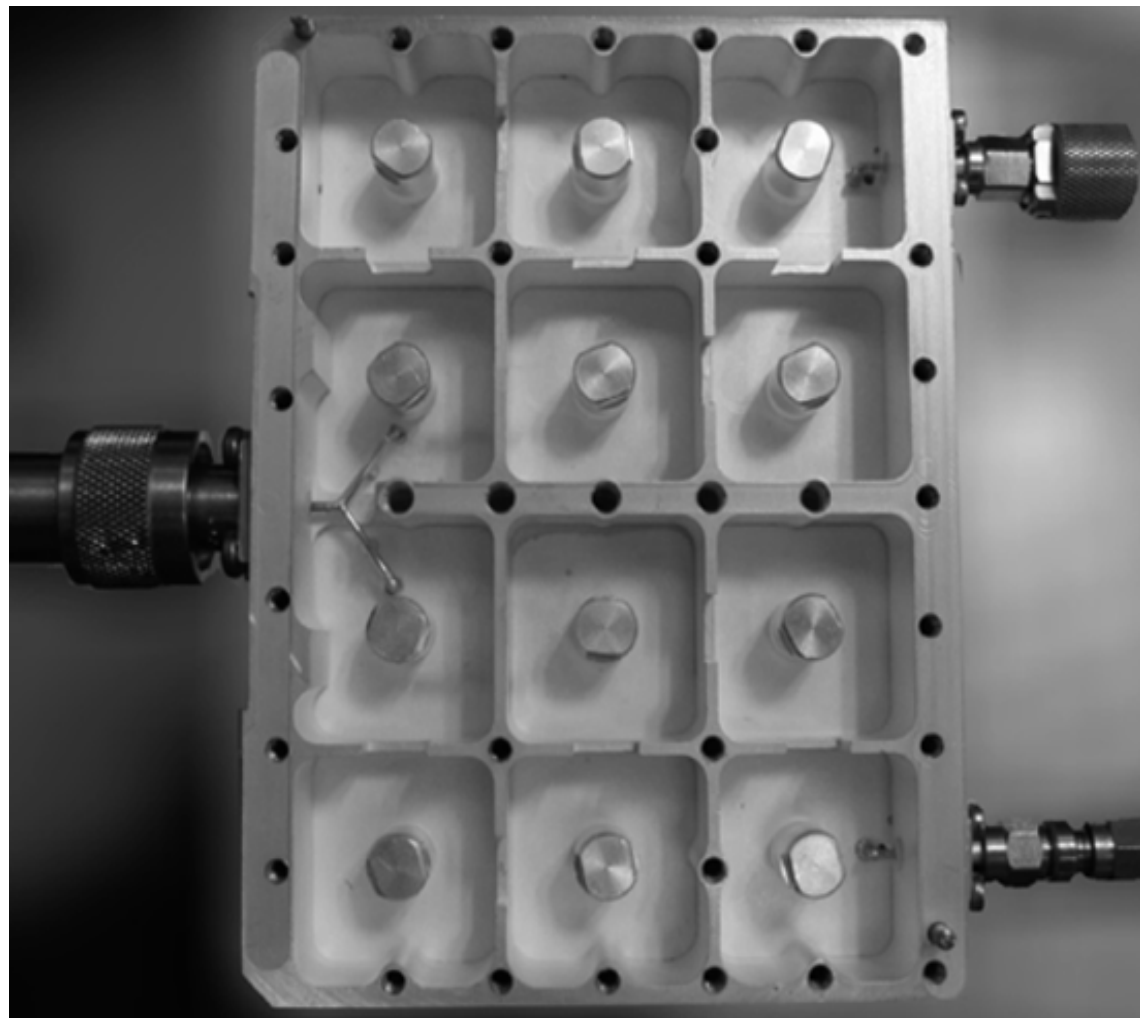


Miguel Ferrando Bataller
Mariano Baquero Escudero
Alejandro Valero Nogueira
Vicent Miquel Rodrigo Peñarrocha
Lorenzo Rubio Arjona
Juan Reig Pascual
Marta Cabedo Fabrés
Eva Antonino Daviu
José Ignacio Herranz Herruzo
Miguel Ferrando Rocher
Felipe Vico Bondía



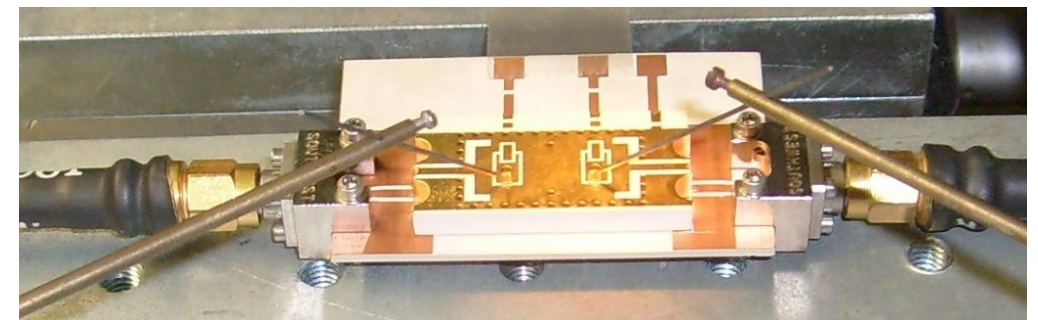
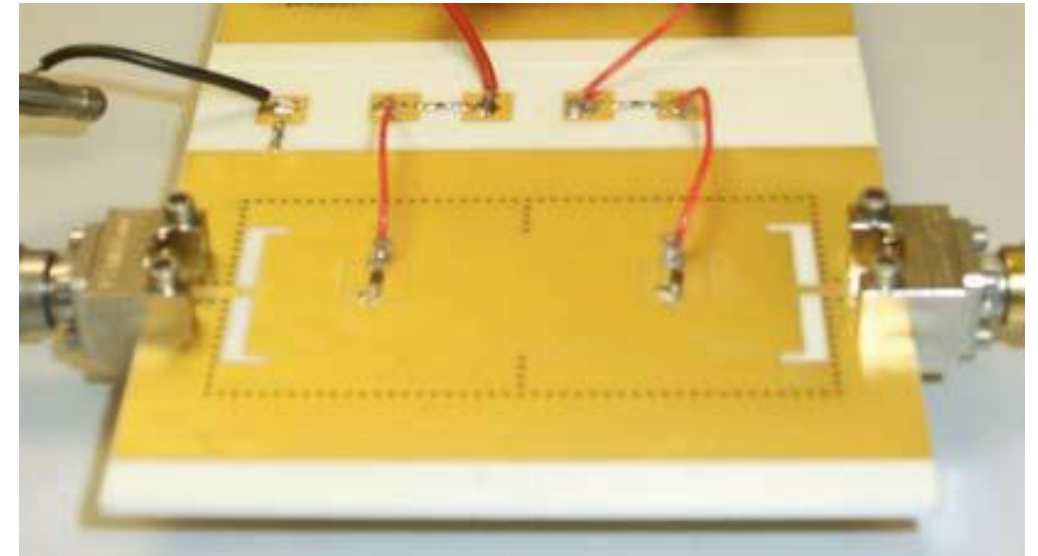


Microwave Applications Group

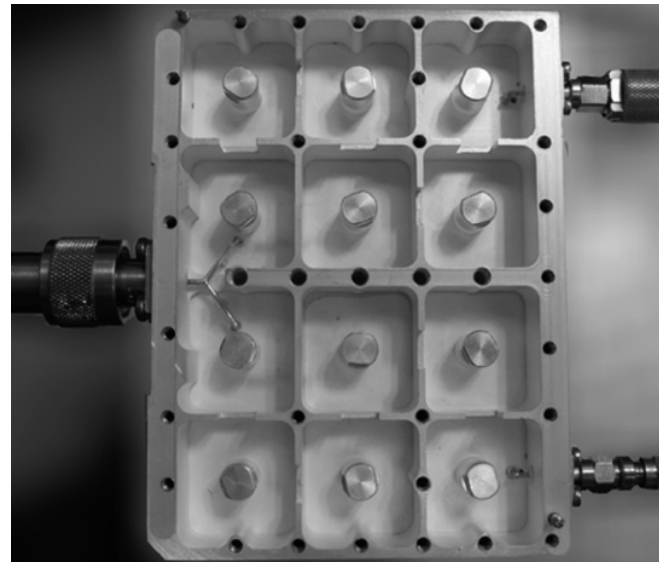
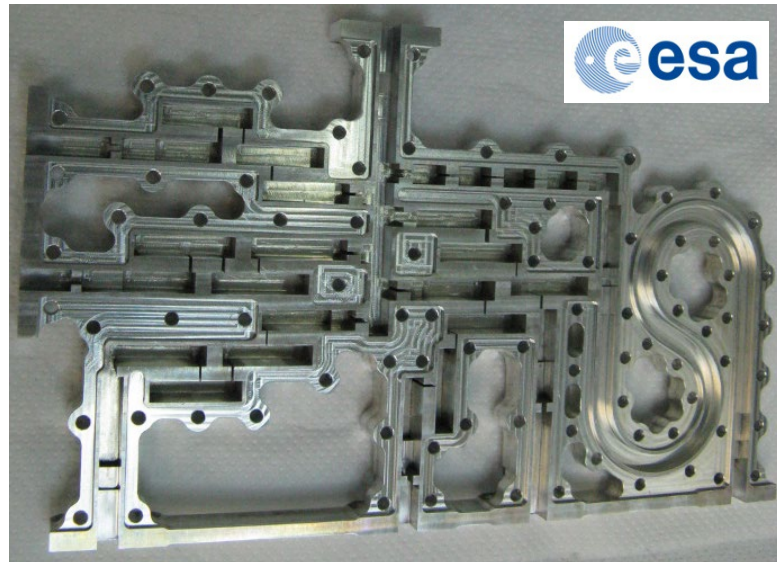
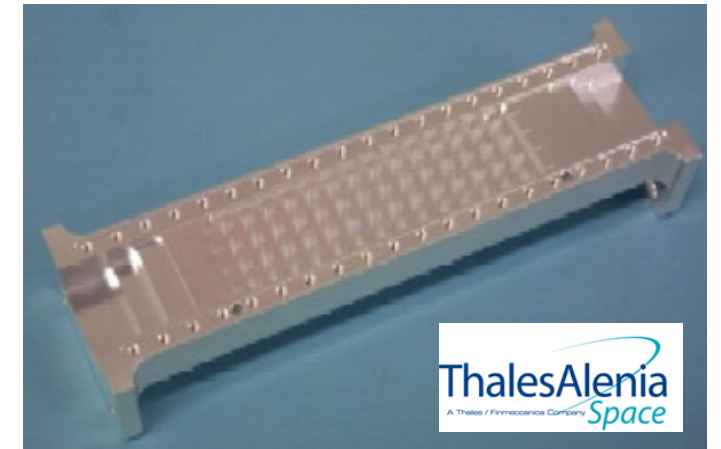
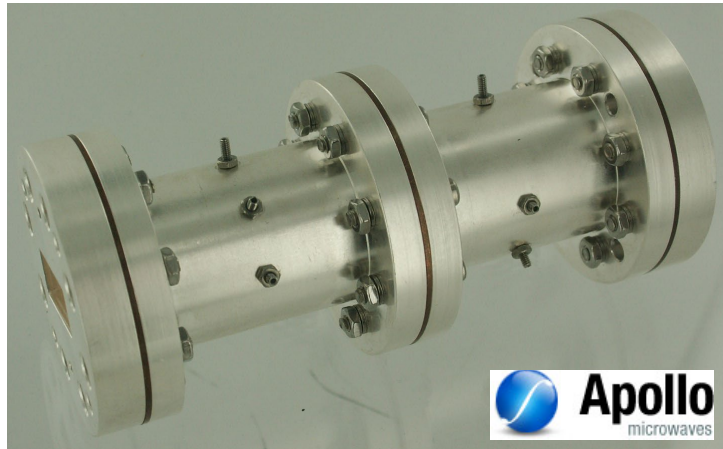


Research activities

- **High-Frequency 3D Waveguide Components**
 - Coaxial, canonical (rectangular/circular), arbitrarily-shaped waveguides
 - 3D coaxial/waveguide cavities, dielectric resonators, open-space
 - Groove Gap Waveguides (Q- and V-bands)
- **Planar and Hybrid Technology (SIW) Microwave Devices**
 - Microstrip, Coplanar Waveguides, Substrate Integrated Waveguides
 - Periodic structures (SRRs, OSRRs, CSRRs and OCSRRs)
- **Reconfigurable High-Frequency Circuits**
 - Varactors, MEMs, Functional materials



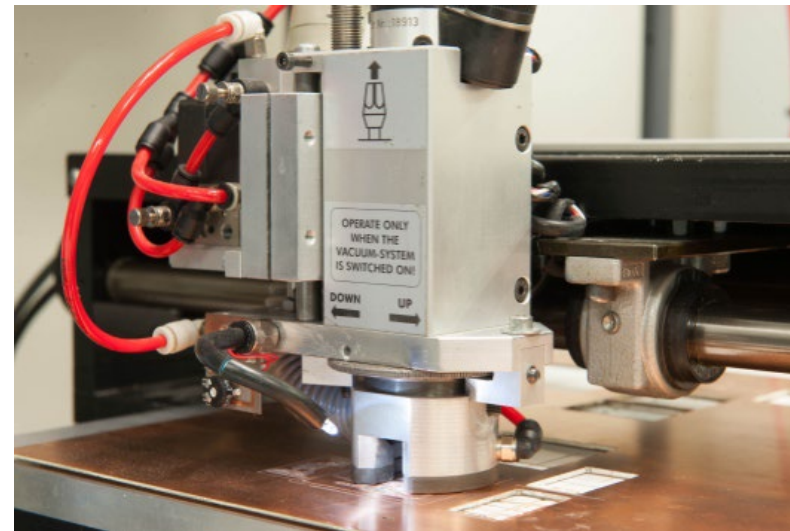
Research Activities (Filters and Muxes)



with AuroraSAT
and Thales-Alenia
Space (Spain)

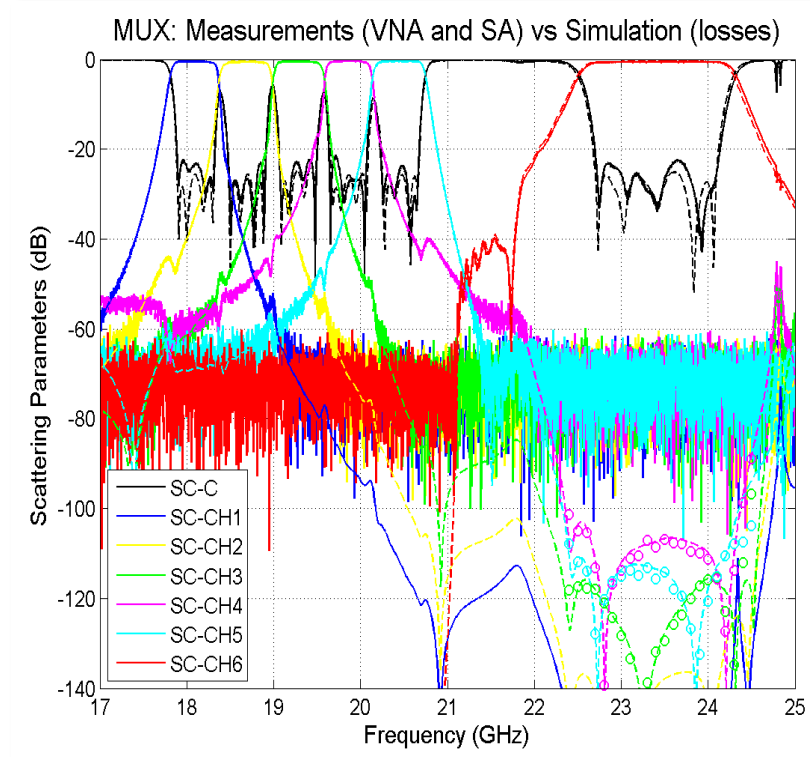
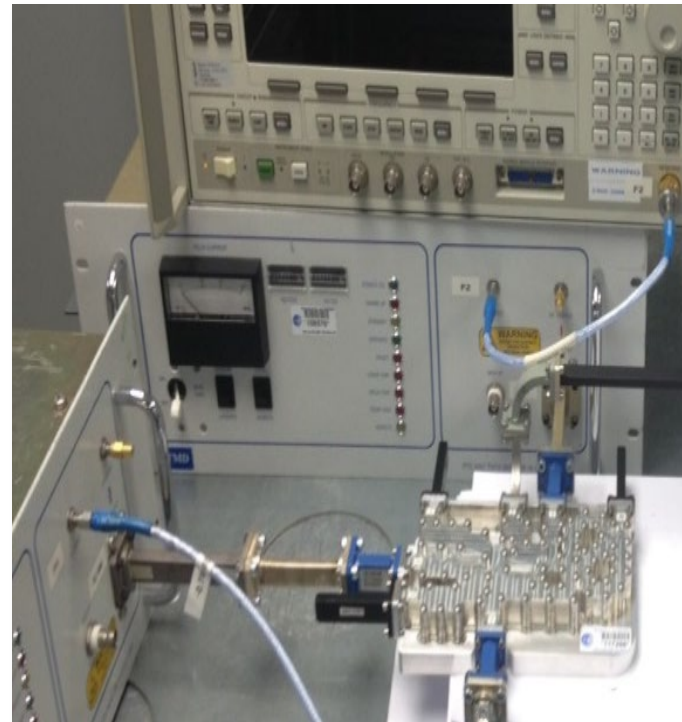
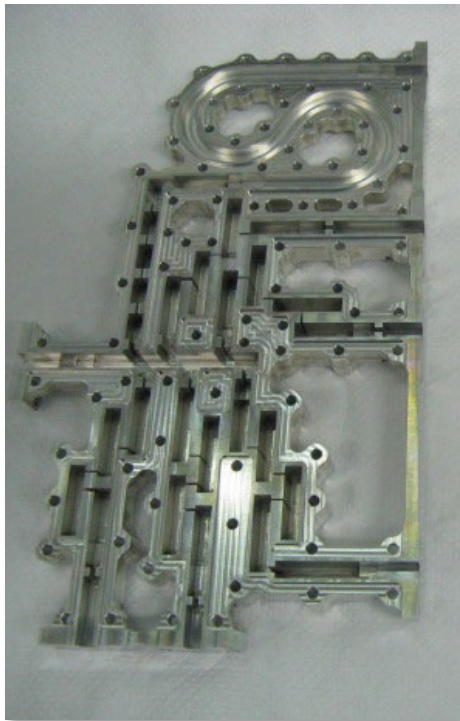
AURORASAT 
SOFTWARE, CONSULTING & TESTING

Manufacturing facilities



Research Activities (Design and Prototyping)

- Ka-band 6-channel Multiplexer (ESA-VSC PIM Facility)



- **5x200 W** input carriers, **30% relative BW**
- **3rd, 5th, 7th and 9th PIM products**

Research Activities (Filters and Muxes)

- Planar and Hybrid Technology (SIW) Microwave Devices
 - Full-Wave EM Analysis Techniques (MM+IE, BI-RME)
 - In collaboration with other Spanish R&D groups
 - Synthesis Algorithms and Optimization Techniques
 - Practical Designs: Transitions, Filters, Diplexers and Multiplexers
 - Classical Technologies: microstrip, CPW, SIW
 - Periodic Structures and Resonant Rings:
 - EBGs (ridge-gap and groove gap waveguides, SRRs and CSRRs)
 - Manufacturing (in-house facilities, external for very high accuracy)
 - Measurements (electrical up to 120 GHz, high-power up to 40 GHz)



GAM

- Dr. Vicente E. Boria
- Dr. Santiago Cogollos
- Dr. Héctor Esteban
- Dr. Pablo Soto
- Dr. Jorge D. Martínez
- Dr. José V. Morro
- Dr. Marco Guglielmi
- Dr. Joaquín Valencia
- Eng. Mária Taroncher
- Eng. Marta Reglero



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E INNOVACIÓN



Plan de
Recuperación,
Transformación
y Resiliencia



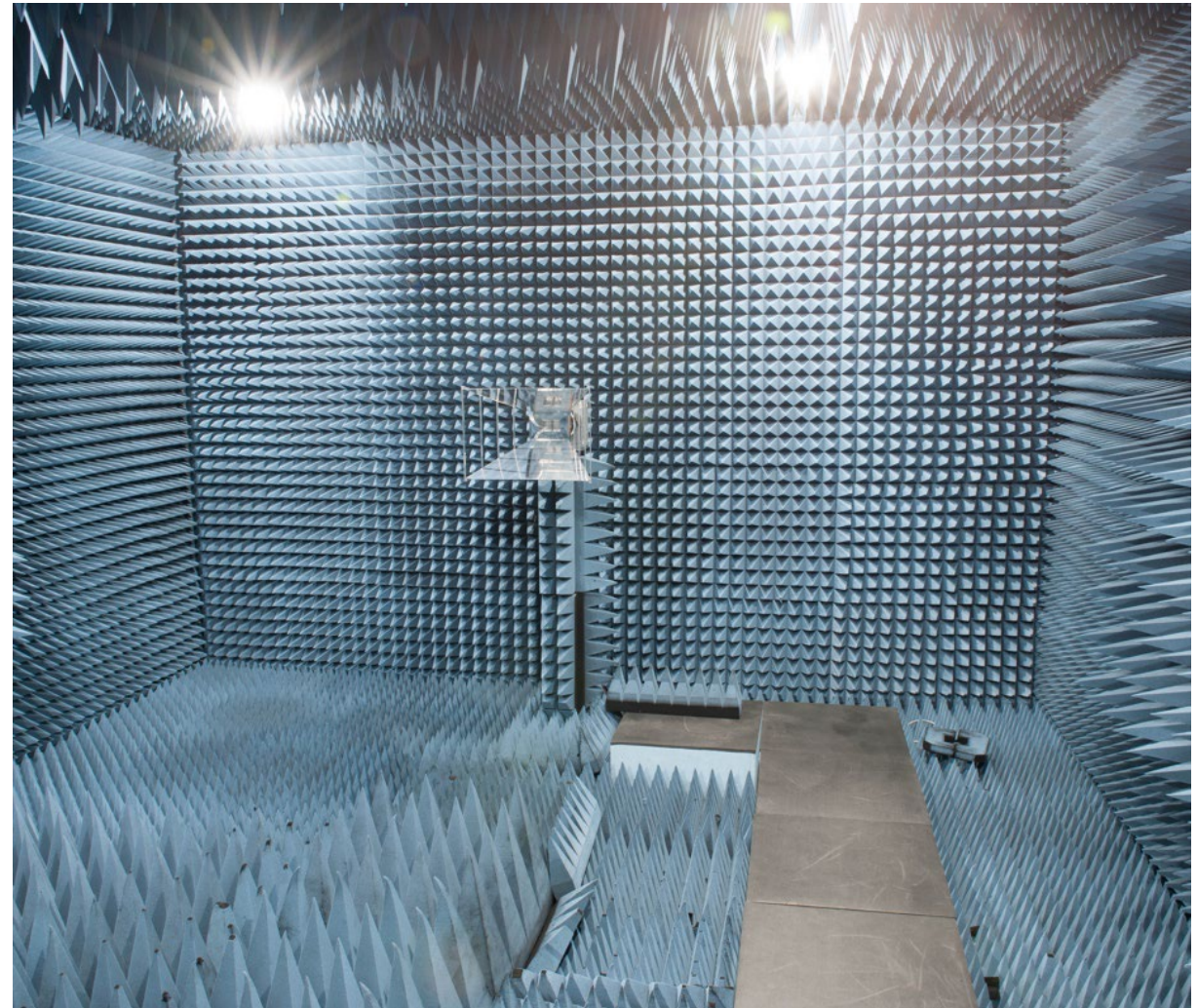
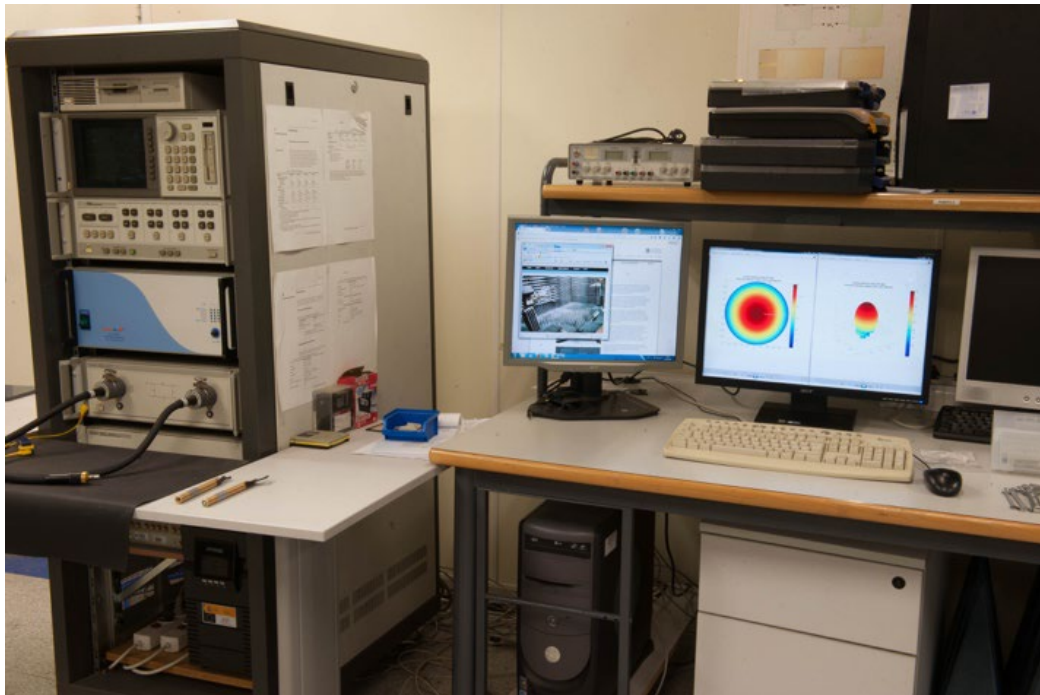
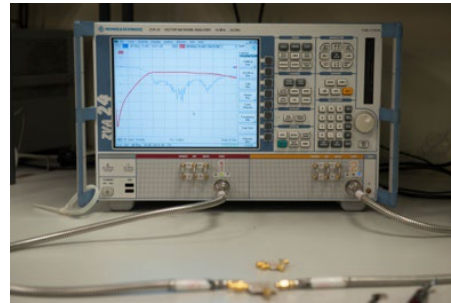
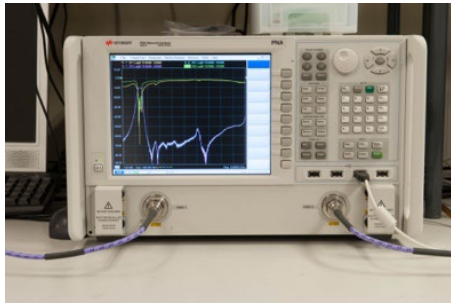
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Universidades, Ciencia
y Sociedad Digital



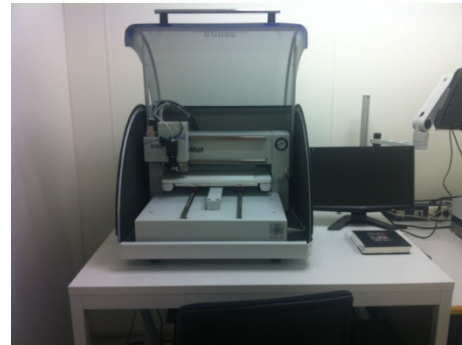
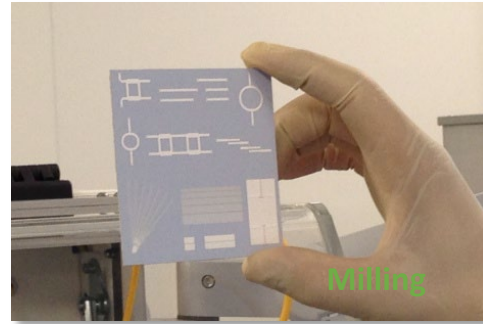


Laboratories

Measurement Systems



Fabrication and Experimental Facilities



COOPERATION WITH COMPANIES



