

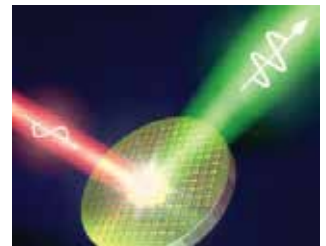
# METAMATERIALS

for advanced applications

## METAMATERIALS

are made from assemblies of multiple elements fashioned from **composite materials** such as metals or plastics. The materials are usually arranged in **repeating patterns**, at scales that are smaller than the wavelengths of the phenomena they influence.

**METASURFACES** represent the **2D version of metamaterials**. They have been applied to large number of scenarios.



**Free Space** has developed a prominent background on this subject and is able to propose industrial solutions for a large variety of applications, as for instance:

### METASURFACES

Metasurfaces and frequency selective surfaces (**FSS**)

Ultrathin e.m. **wave absorbers** (narrowband or wideband)

Artificial Impedance Surfaces (**AIS**) and **Bandgap surfaces**

Tunable **AIS**

Wide Angle Impedance Matching layers (**WAIM**)

### ANTENNAS AND SENSORS

**Reflectarrays**

Low-profile **antennas**

Low RCS **antennas**

**RFID** sensors

**Magnetic Resonance** coils

**Biomedical** RF devices

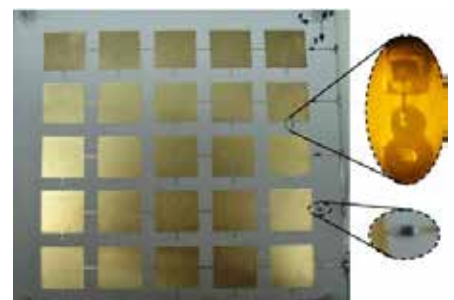
Free space can provide a **complete electromagnetic characterization of materials and metamaterials** through **novel extraction algorithms** from d.C. To k band

## ARTIFICIAL IMPEDANCE SURFACES AND BANDGAP SURFACES



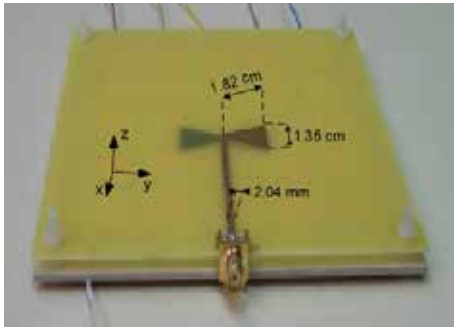
■ High Impedance surfaces

## TUNABLE AIS



■ AIS loaded with varactors

## LOW-PROFILE ANTENNAS



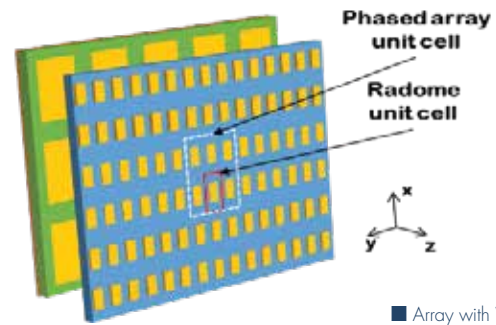
■ Dipole backed by a tunable AIS

## REFLECTARRAYS



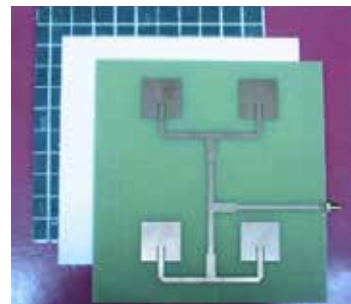
■ Three-band reflectarray antenna

## WIDE ANGLE IMPEDANCE MATCHING LAYERS (WAIM)



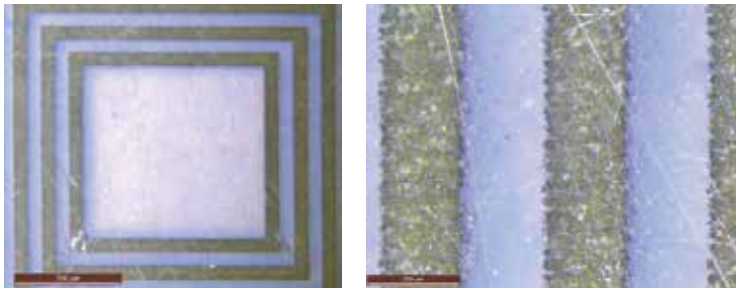
■ Array with WAIM superstrate

## LOW RCS ANTENNAS



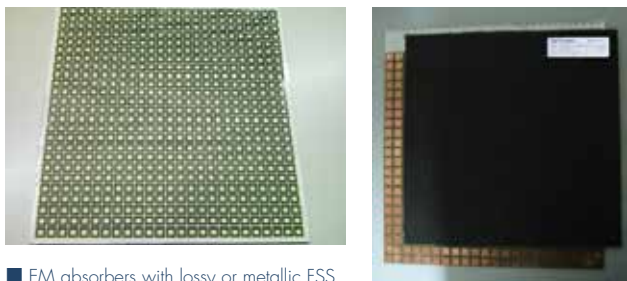
■ Array antenna backed by EM absorber

## RFID SENSORS



■ Inkjet printed chipless humidity sensor

## EM WAVE STRUCTURAL ABSORBERS



■ EM absorbers with lossy or metallic FSS

## WIDEBAND POLARIZERS



■ Genetically optimized metasurface for wideband polarization conversion

WE PROVIDE HIGH LEVEL SUPPORT FOR **INTEGRATING METAMATERIALS**  
IN CONVENTIONAL ELECTROMAGNETIC SYSTEMS.

Contact us for exploring unveiled possibility to improve your technology ([info@free-space.it](mailto:info@free-space.it))