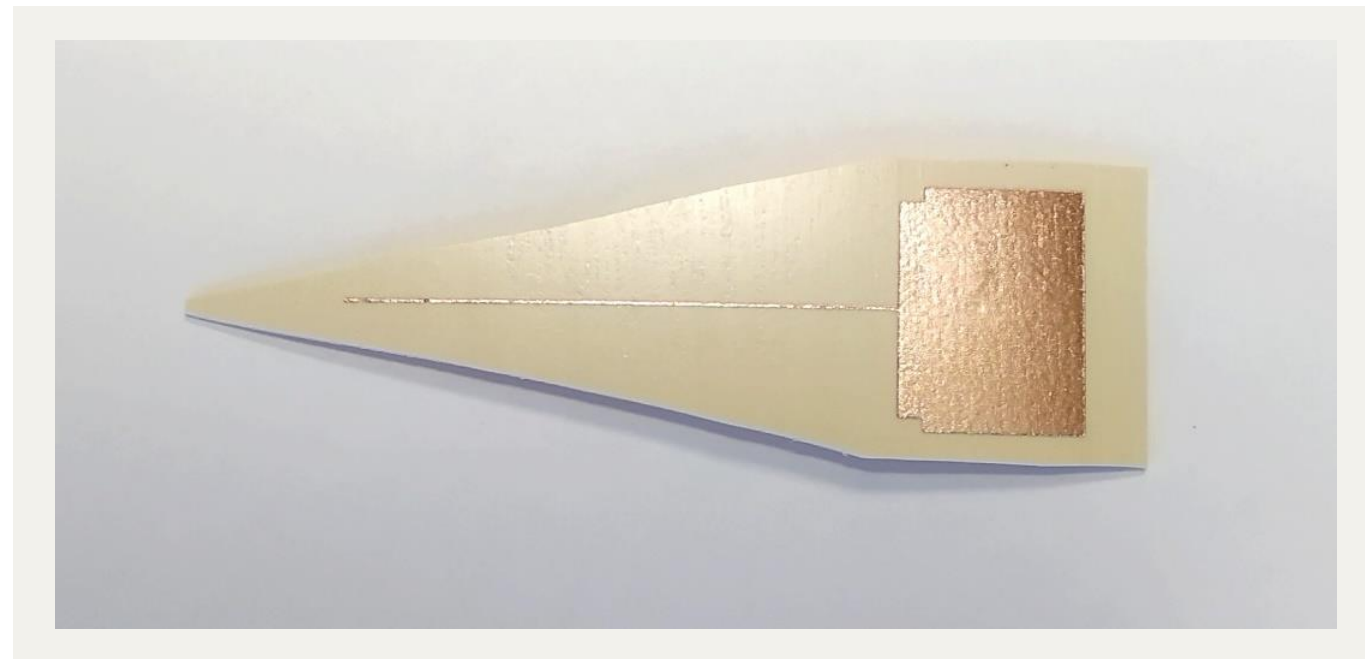


OVERVIEW ANTENNAS



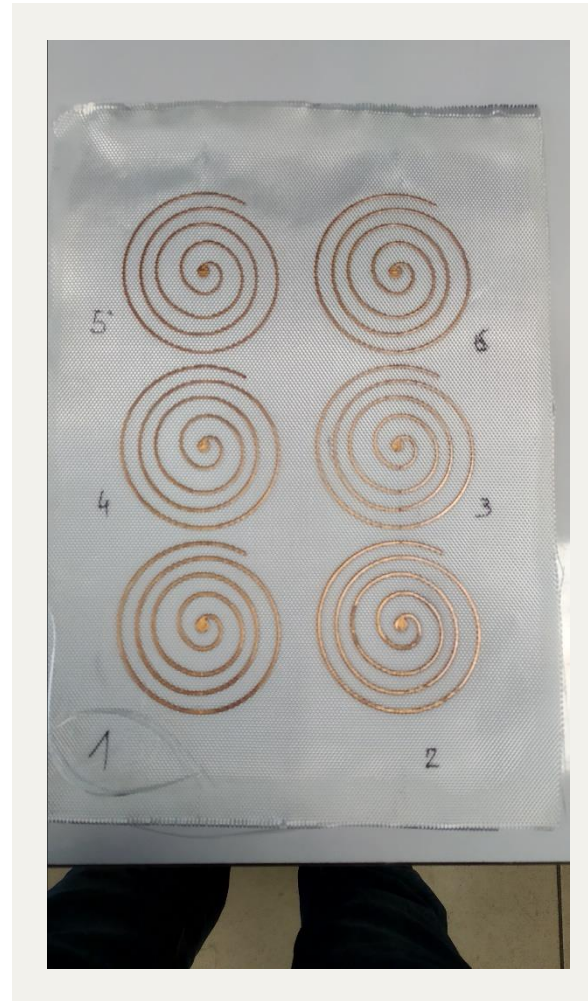
ADDITIVE ANTENNA:

- Broadband antennas on different substrates: glass and Premix materials.
- Made by spraying and screen printing



ADDITIVE ANTENNA:

- Broadband antennas on Porcher glass fabrics for integration in composites.
- The printed spirals are 100% continuous.
- Track width: 0.9 to 1mm

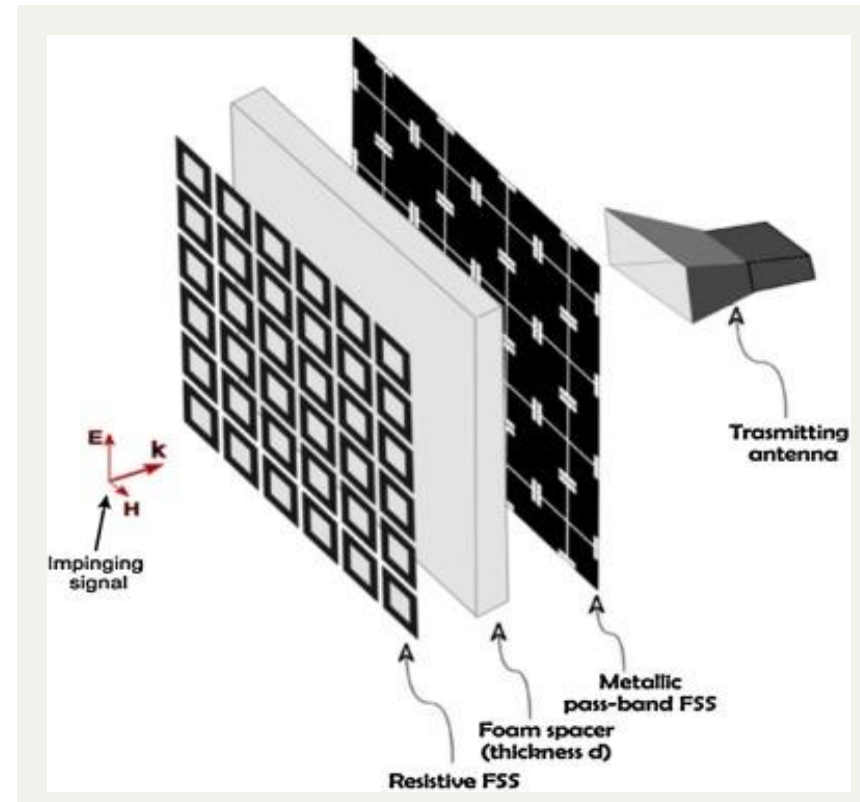


ADDITIVE ANTENNA:

FSS : Frequency selective surface

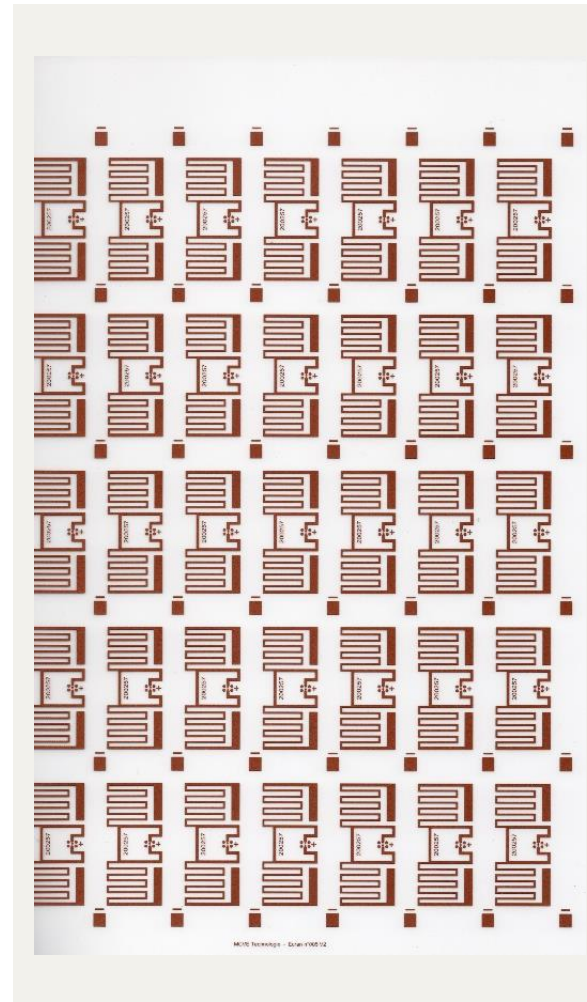
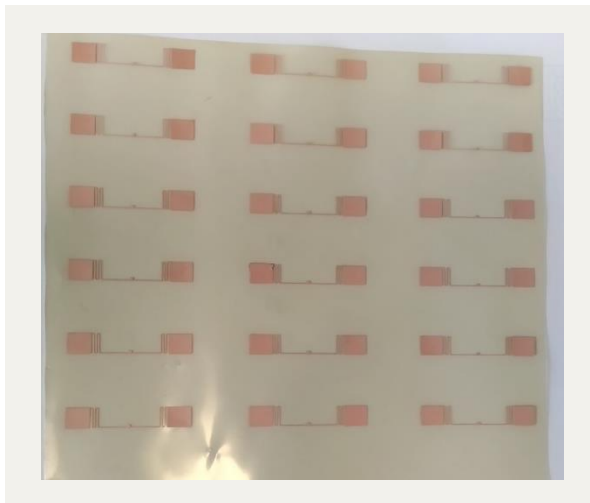
- Standard pattern
- Periodic design
- Unconnected pattern
- Copper conductivity
- GFR substrate

Further investigation for EBG applications



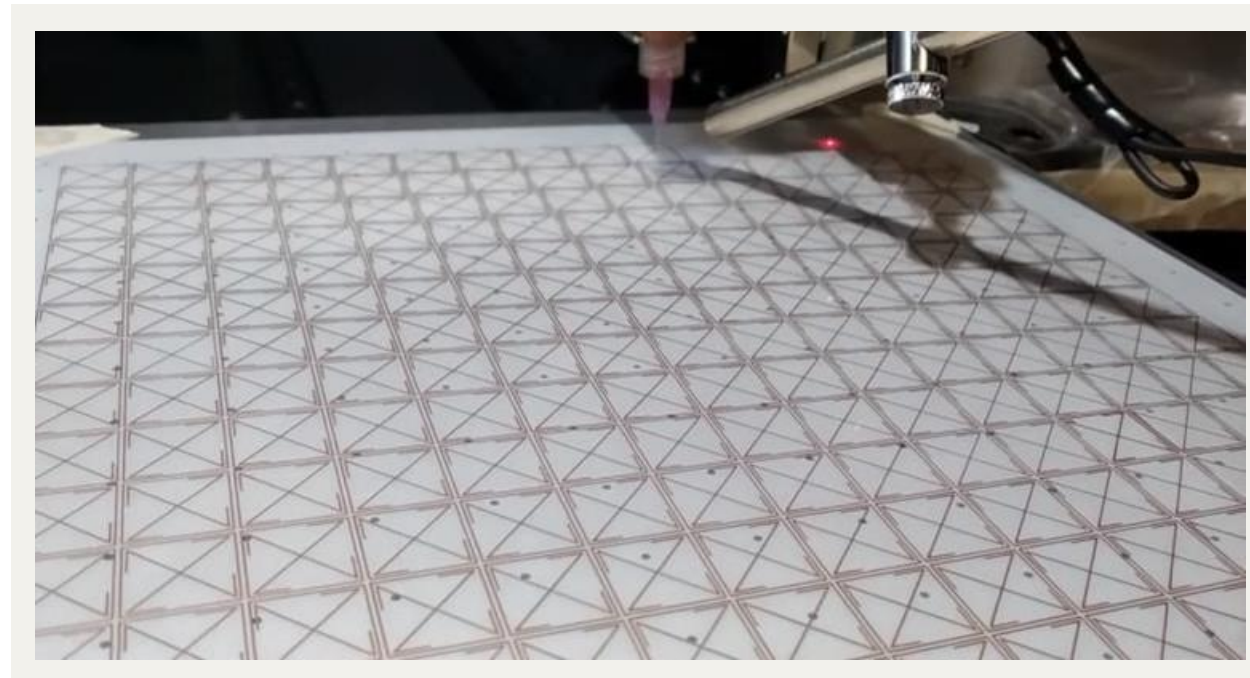
ADDITIVE ANTENNA:

- NFC made in dispenser or NFC in silk-screen printing.
- On PET and flexible PPE but also on rigid PC.

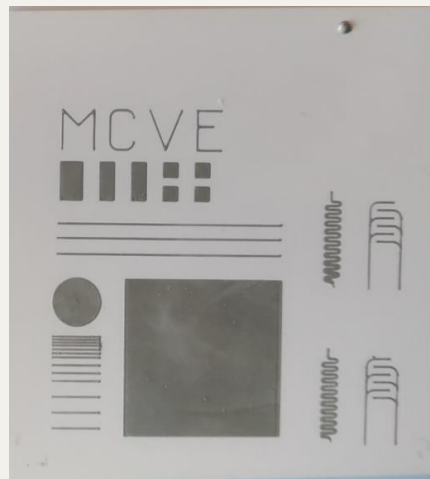


ADDITIVE ANTENNA:

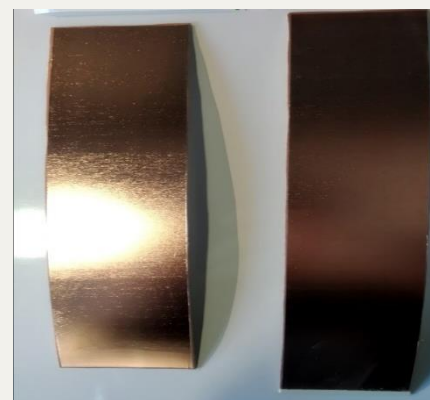
- Passive amplification of 5G signals through building windows.
- Printed with dispenser on adhesive PET.



Substrat PPE Flexible & Rigide



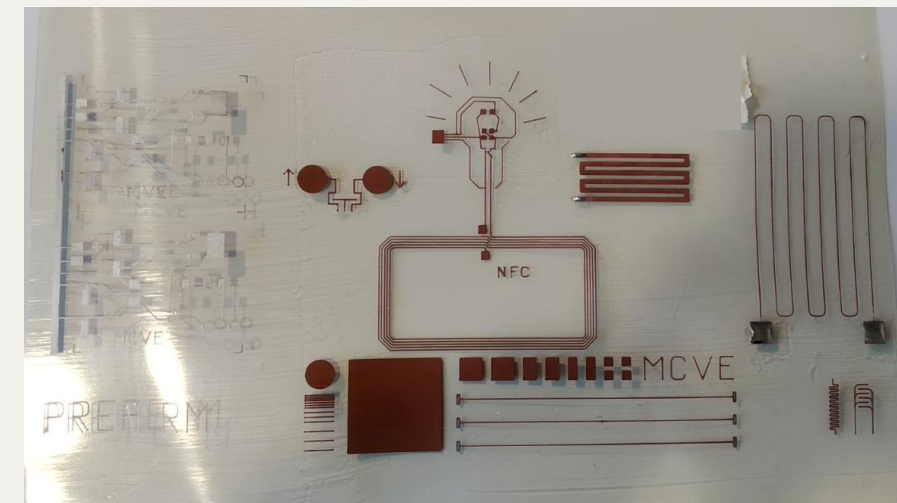
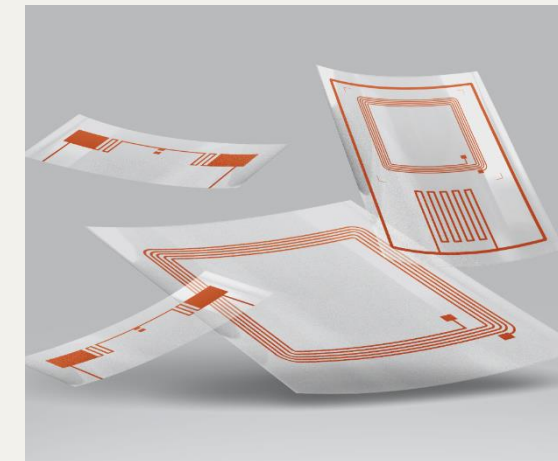
PPE rigid 2mm
Electroless Copper 3µm Tin
plating



PPE flex 0,75mm Electroplated
Copper 20µm

-  **Antennes**
-  **Capteurs**
-  **Circuits**
-  **Métallisation/Blindage**
-  **Soudure**

PPE Dielectric properties at 2.4GHz
Dielectric Constant ϵ_r 2.58 to 9.5
Loss tangent, $\tan \delta$ 0.0009



PPE flex 130µm Electroless copper 3µm
Conformal coating & tin plating

COMPARISON OF ANTENNA MATERIALS

Characteristics

- Permittivity (measured at 1MHz)
- Manufacturing
- Relative cost

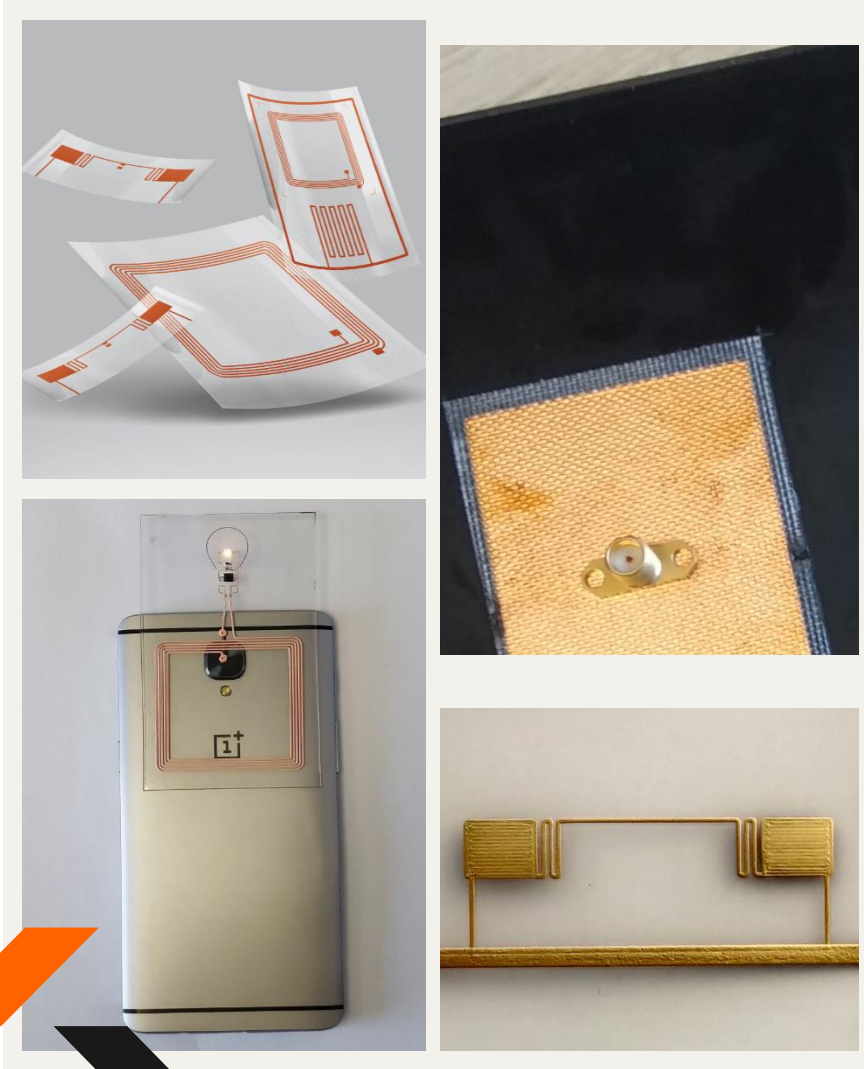
→ **Choice of MCVE for the substrate**
PPE (PolyPhénylène-Ether)

Materials	Er [1Mhz]	Manufacturing	Relatif cost
FR-4-epoxy	3,5-3,6	Etching	1
Polyimide Epoxy	3,5-3,6	Etching	10-15
Polyimide	3,3-3,4	Etching	10-20
PTFE	2,03-2,09	Etching	10-20
PPS	2,07-4.3	Injection	5-10
PPE	2,5-2,7	Additif R2R	5-10

PPE

- Low dielectric constant
- Recyclable thermoplastic
- Low loss at high frequencies (10GHz to 60GHz)
- Temperature-stable RF properties
- Low moisture absorption

FLEXIBLE ANTENNAS with EOPROM®



Substrat

- Deformable and robust
- Wide frequency range
- Advantageous dielectric performance
- Thermal and humidity resistance

EOPROM®

- Copper thickness can be adjusted according to requirements
- Freedom of design
- Form factor
- Surface: shielding
- Gold finish possible

➔ Further innovation in additive copper antennas on high-performance flexible substrates



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