Low-Profile Dual-band Circularly Polarized Microstrip Antenna for GNSS Applications

Faycel FEZAI, Amro A. Nour, Johann Sence, Thierry Monediere, François Torres, Regis Chantalat, Stéphane Bila, Bernard Jarry

XLIM-UMR CNRAS 7252, Université de Limoges
123, avenue Albert Thomas - 87060 LIMOGES Cedex – France
http://www.xlim.fr

institut de recherche

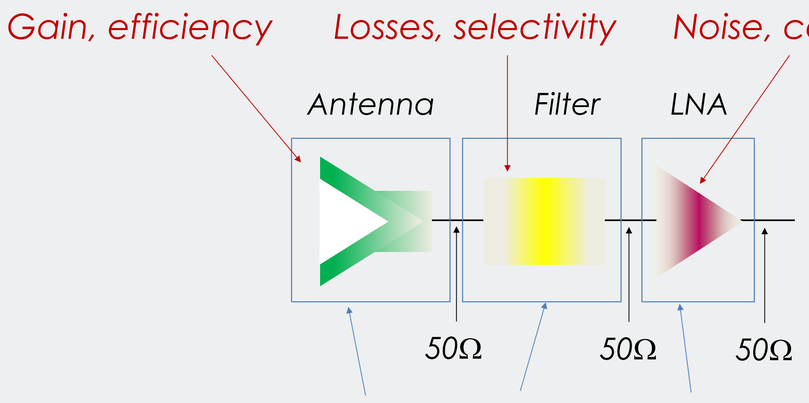
CONTACT:
Faycel FEZAI
faycel.fezai@xlim.fr

This paper presents a design of a micro-strip circularly polarized antenna intended for the Global Navigation Satellite Systems (GNSS). The presented device is composed of a micro-strip slotted patch antenna printed on a Rogers RO3006 substrate, a foam layer of 2 mm thick and a wideband commercial 3-dB SMT coupler. The combined full-wave antenna results with the measured S-Parameters of the coupler shows very good performances in terms of antenna matching and axial ratio on large bandwidths.

Context "COCORAM" and Solution "Slotted Patch Antenna"

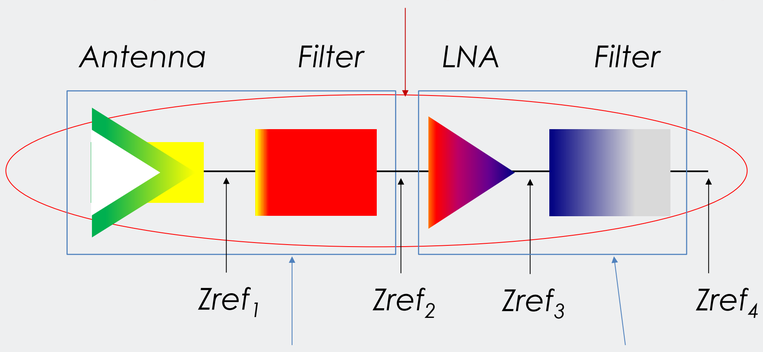
Co-design: Optimize interconnections, reduce size, and improve performance

Synthesis at system level: benefit from contributions of other circuits



Distributed: high performance *MMIC: compact*

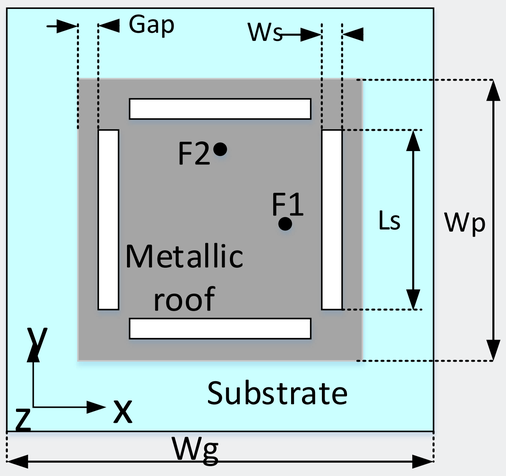
Gain, efficiency, losses, selectivity, noise, consumption…



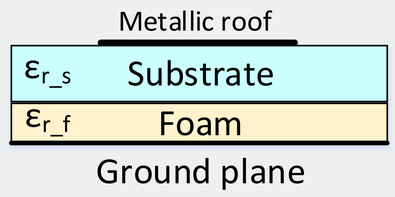
Distributed: high performance *MMIC: compact*

Co-integration → Development of a proper strategy (and tools)

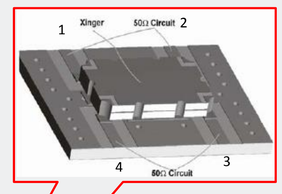
Mixing technologies: optimize global performance and compactness

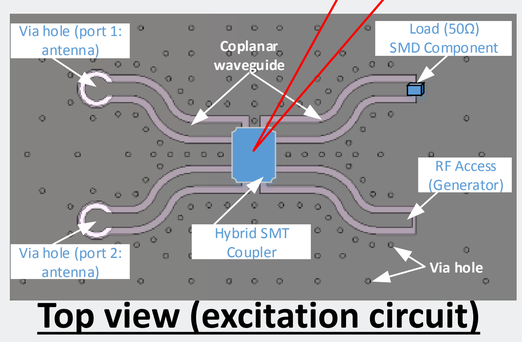


Top View



Cut View



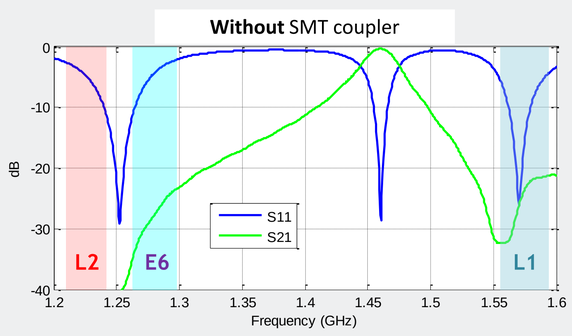


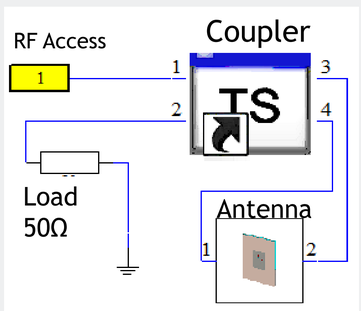
Top view (excitation circuit)

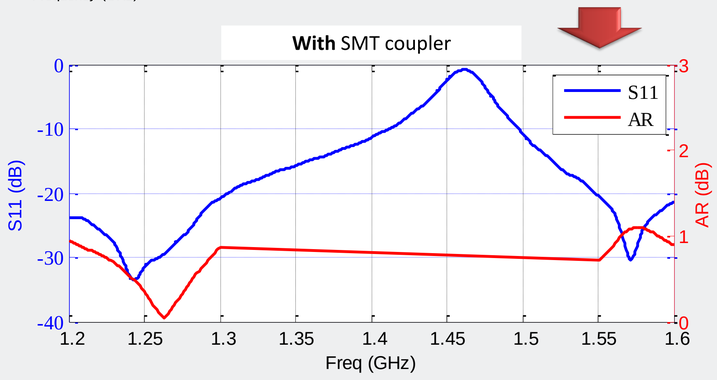
- The simulated design is composed of a slotted patch antenna printed on a 5.42 mm thick Rogers RO3006 substrate of $\varepsilon_r = 6.15$ and $\tan\delta = 0.002$.
- Foam (Rohacell): $\varepsilon_r = 1.07$
- The excitation circuit is made on a 0.76mm thick Rogers RO4350 substrate of $\varepsilon_r = 3.5$ and $\tan\delta = 0.004$.

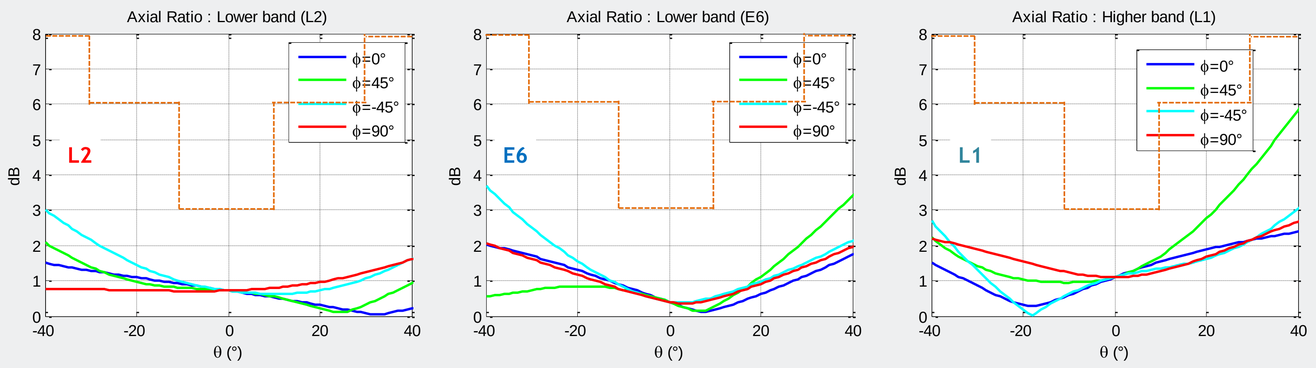
Insertion losses	< 0.2 dB
Phase balance	90°±1°
Amplitude balance	±0.3 dB
VSWR	1.2:1
Isolation	< 30 dB

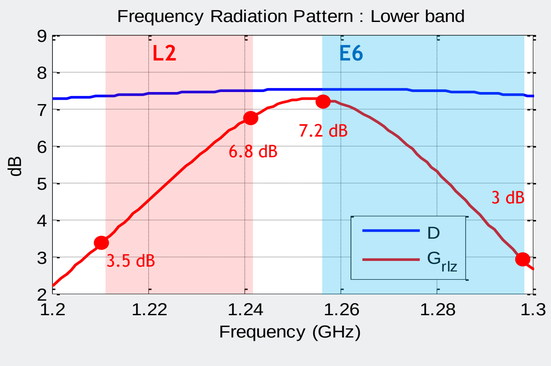
Performances: S-Parameters, Radiation patterns and Axial Ratio

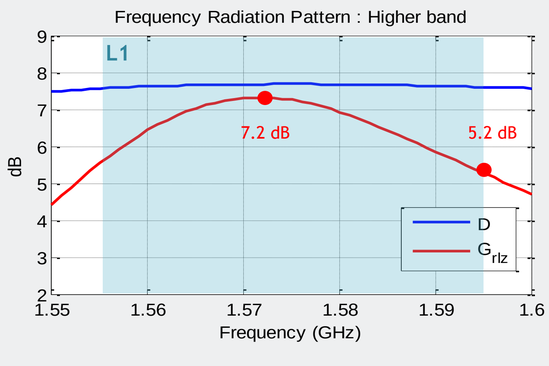












Performances with SMT Hybrid coupler

- Good matching of the overall system
- |S11|<-20dB
- High efficiency :
  - → The best level =93%
  - → The worst level is about 36%

- All the requirements are satisfied
- These performances can be improved by optimizing the interconnections between the elements
- The design is in realization stage, measurements will then be published

- ❑ **The proposed design of the circularly polarized antenna can be used for any GNSS applications (GPS/GALILEO/GLONASS).**
- ❑ **This design allows simultaneous working on several bands as: L2 (1.227GHz), E6 (1.278GHz) and L1 (1.575GHz.**
- ❑ **This work is funded by the DGA (French Defense Agency) and the ANR (French Research Agency) under an ASTRID-ANR French program COCORAM* to design a Controlled Reception Pattern Antenna (CRPA).**

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CISTEME

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