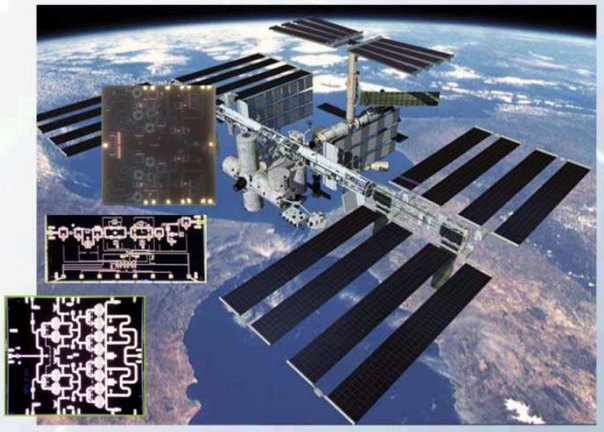
Competences

- Advanced Design techniques for MMICs and Hybrid circuits design for space, military and telecom applications
- Advanced Techniques for active device modeling for specific applications
- Characterization and measurements of active devices and circuits
- Implementation of prototype hybrid circuits and test jig for MMIC evaluation
- Measurement Set-up design for Small- and Large-Signal Characterizations

Main Skills & Applications

Defense

Space

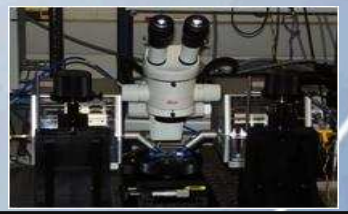


Comm.

- High-Power Amplifiers (MMIC and Hybrid)
- High-Linear Amplifiers
- DC/DC conveter
- Low-Noise Amplifiers
- Wideband LNA
- Mixers
- Up-Converter
- VCO
- Digital Phase Shifter
- Digital Step Attenuator

0 1-2 5 10 15 20 30 GHz

From Specs to Chip



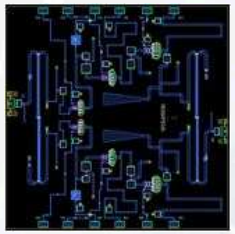
Specs

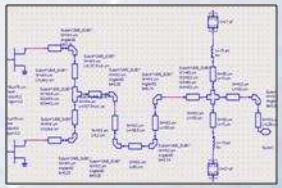
Feasibility Study

Feasibility Review

Analysis of Technologies

Sample Characterization



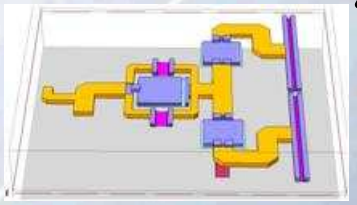


Model Validation

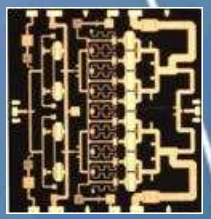
Analysis/Study of Topologies

Circuit Design

Layout



Design Tuning



EM Simulations

DRC

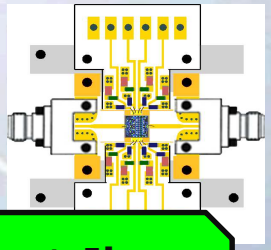
Foundry

MMIC

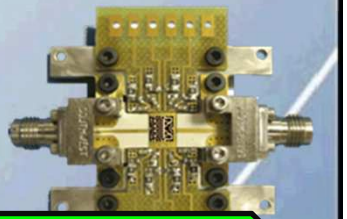
Performances Vs. Specs

On Wafer Foundry Test

Chip Sorting



Test Jig Design

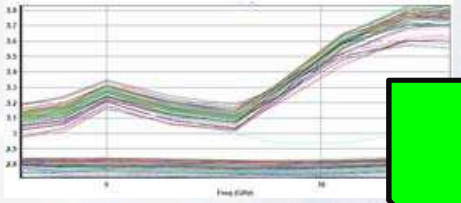


Prototyping

Measurement Set-up

Test Campaign

Results Analysis



Performances Vs. Specs

Test on Modules

Reverse Engineering

Design: Key Points (1)

- **Main research activities on advanced design methodologies**
- **Main CAD tools for circuit design**
  - Standard Simulations
    - S-parameter (small signal simulations)
    - Harmonic Balance (non-linear simulations)
    - Load Pull (Pout, PAE, Gain, IMD, etc…)
    - 2-Tones (Linearity, IMD, etc…)
    - Optimization-Tuning (Matching Networks, etc…)
    - Mixer Simulations

Design: Key Points (2)

- **Different kind of analysis to guarantee circuit stability:**
  - **Small Signal stability**
  - **Differential Stability (Odd-mode)**
  - **Large signal – parametric stability**
- **Design for Yield**
  - **Sensitivity Analysis and DFM (*Design For Manufacturing*) for production Yield optimization**
- **Electromagnetic Simulation**
  - **Passive Matching Networks optimized by proper EM simulations.**

Modeling Activities

- **Intensive Modeling of active devices to best fit their behavior for different circuit functions**
  (HPA, Mixer, LNA, H-Lin, Switch, etc..)

2-different Modeling Approaches

- **Empirical Approach**

  Based on specific tests and characterizations of the devices

- **EM Approach**

  Based on Electromagnetic simulations of device passive structures to enhance model periphery scaling accuracy