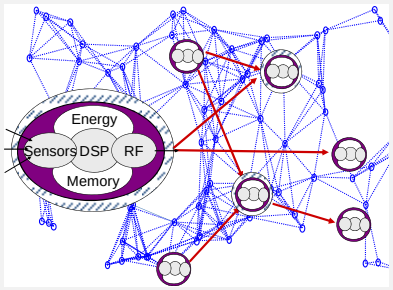
CSAM
Circuits Systèmes et Applications des Microondes

Link reliability, Localization and Communication

Objectives:
Knowing the environment
Ensure reliability
Network life duration

Constraints
Low power
Low complexity

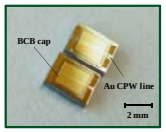
Topics:
Modeling (channel,interference)
Receiver design / Cooperation
Localisation



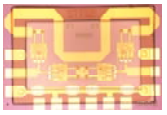
SIP approach global system modeling

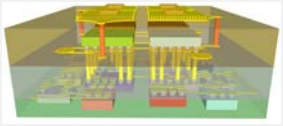
3D Heterogeneous Integration: RF System in Package (SiP)

BCB polymer packaging by wafer scale transfer technique



BCB capping of MMIC with MEMS switch on substrat GaAS 100µm

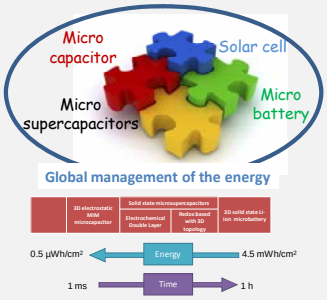




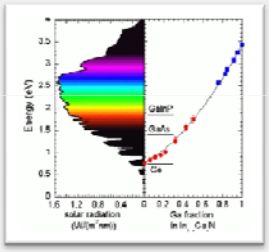
- Miniaturization <1 cm3
- Expected average power consumption < 100 uW
- Multiphysics Approach (EM, Electrical, Thermal, Mechanical)
- Through Silicon Coaxial vias (millimeter-wave)
- Thermal management

Towards autonomous millimeter-wave wireless microsystem and sensor network

Power Sources: energy storage & energy scavenging micro-devices



Development of InGaN solar cells

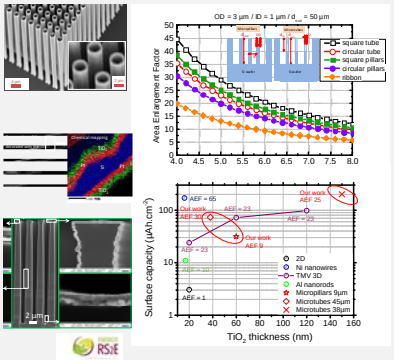


Chemical synthesis in solution for 3D integrate MicroSupercapacitor

Low cost process
Eco-friendly

Mesoporous silica in silicon
Cavities with embedded electrical pads and low cost packaging
Expected results: **1000 mF/cm²**

3D micromachining of a silicon substrate for 3D Li-ion microbattery

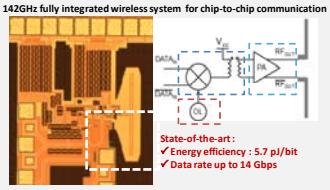


Circuits and Systems Architectures

Millimeter Wave RF system low power consumption

➢ Investigation of low voltage silicon technologies in the MMW frequency band - Partnership with ST & CEA-LETI.

142GHz fully integrated wireless system for chip-to-chip communication



State-of-the-art :
✓ Energy efficiency : 5.7 pJ/bit
✓ Data rate up to 14 Gbps

Circuit silicon area including antenna = 0.11 mm² (0.13µm BiCMOS)

High data rate 60 GHz Vector Modulator

state of the art:
✓ Low power consumption : 24mW
✓ Low LO power : -2dBm
✓ Improved OIP1 = -6dBm (2.1V)

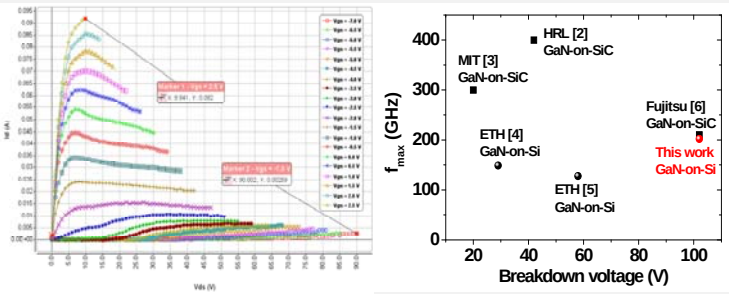
	1Gbps	2Gbps
QPSK	4.8%	6.6%
16QAM	9.7%	11.2%

Experimental EVM at OIP1

Circuit silicon aera: 2.5 mm² (65nm SOI-CMOS)

New circuits based on an original GaN on Si approach

➢ Development of a mmW GaN-on-Si structure delivering breakthrough performance enabling novel mmW circuit architectures



✓ **Unique combination of high current density, high frequency performance and high breakdown voltage**

Collaborations:

Academic : VTT, IMEC,TU DELFT, FHG ISIT, University of Perugia, Univ Twente, EPFL, Univ COCODI, Univ-YORK, Univ Wuppertal, Univ Berkeley, IMT Bucharest ,UCL (London) CEA-LETI, CEA-LITEN, INRETS, LIFL, IETR, XLIM, LAAS, INT, IMS, LABSTICC, FEMTO ST, SYRTE, LiP6, LTCI, IMN, CTP, FRESNEL,UCCS, INRIA, PhLAM, …

Industrial: Thales Alenia Space (Toulouse, Rome), Thales TRT, III-V lab,E2v, OMMIC, ST-M (Crolles, Milan), Technicolor, NXP, St-Ericsson, Alcatel-Lucent, Prysmian Group, EPIGAN, EADS, TOPGAN, NOVAGAN, SaverGlass, Gongaden ….

Support: MEDEA+/ CATRENE/ENIAC, FP7 , ANR, CPER, DGA, FUI

Participation to LABEX: GaNEX, FIRST-TF

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