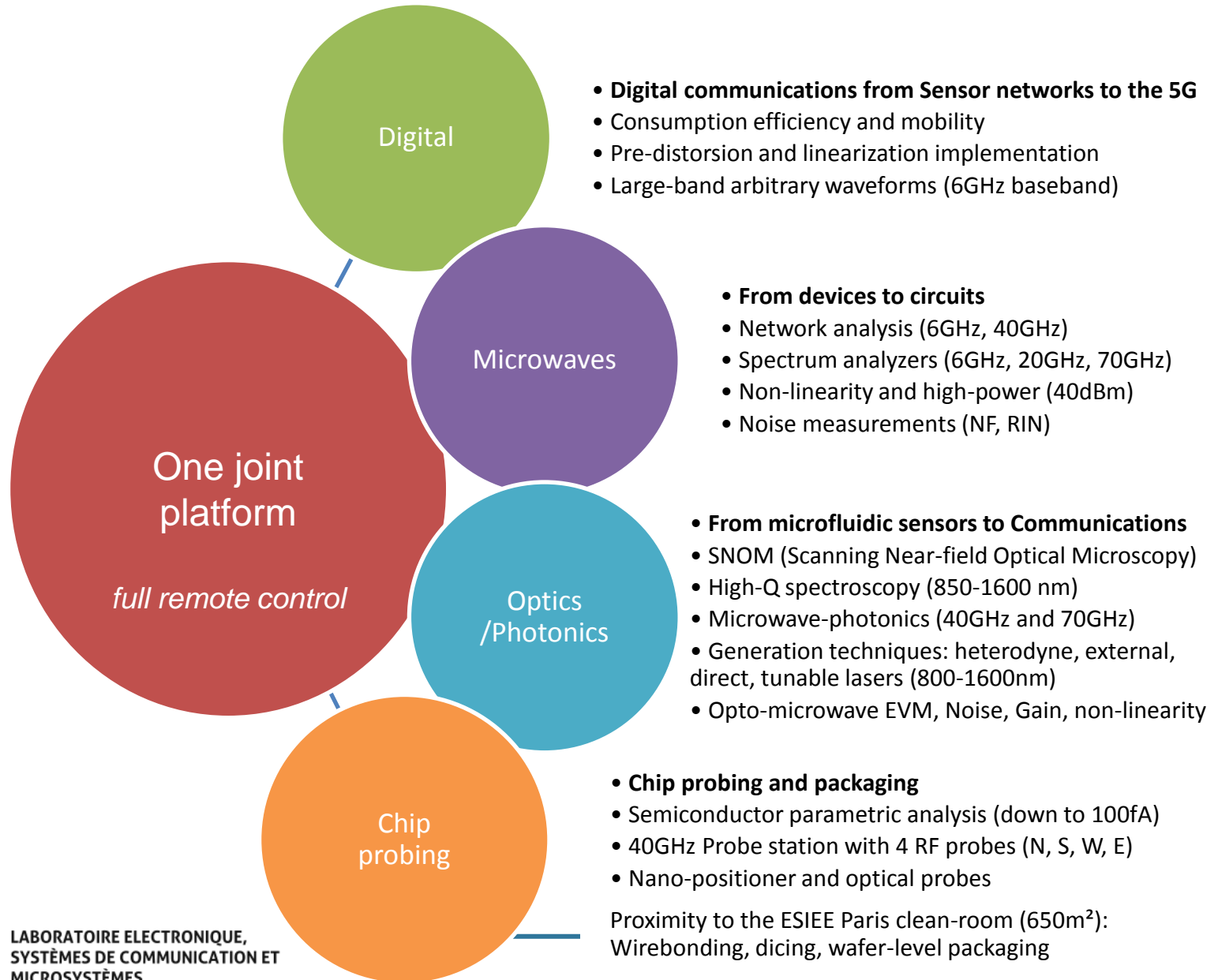


ESYCOM Characterisation Platforms

Digital Communications, RF, Microwaves and Optics/Photonics

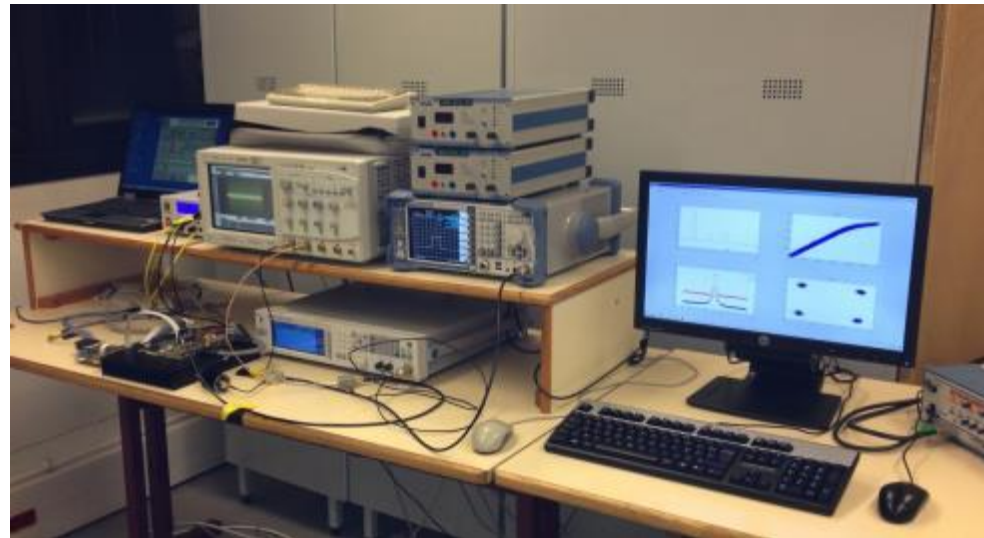
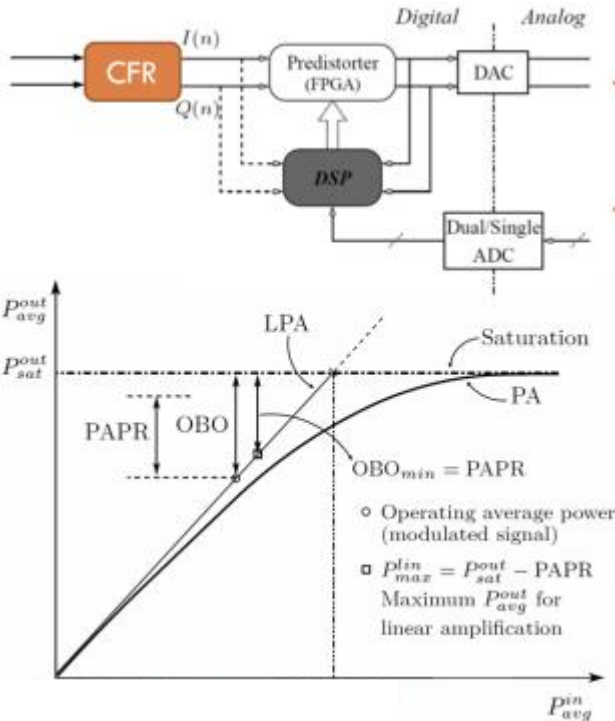
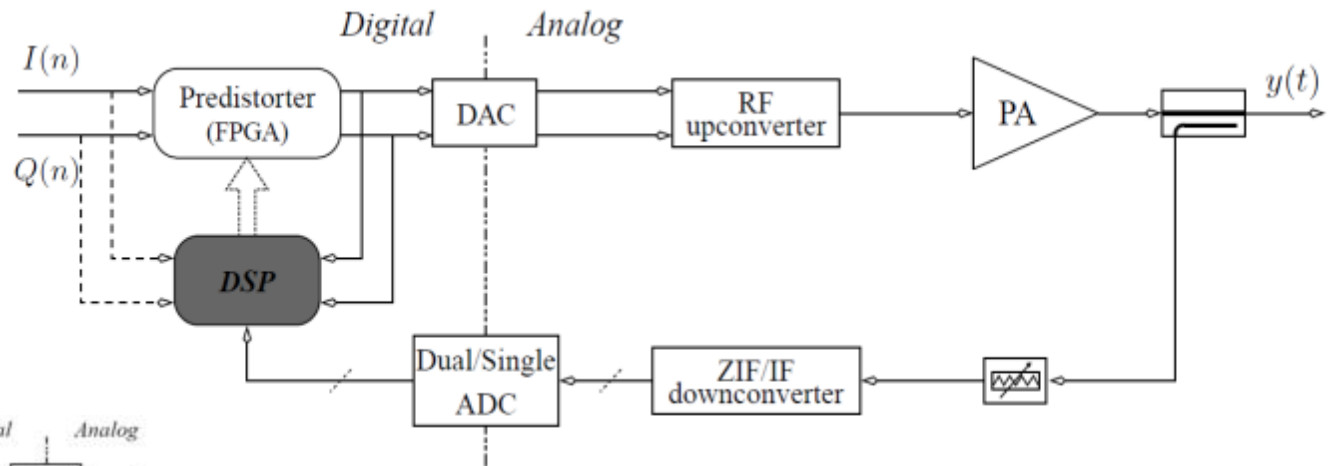


Convergence of fields



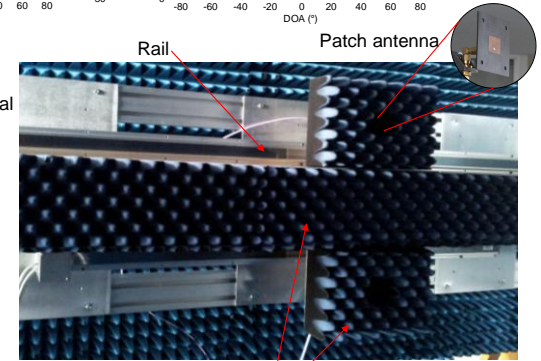
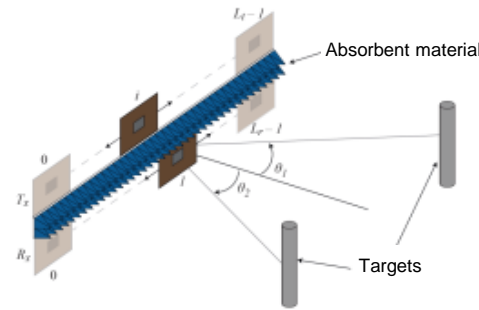
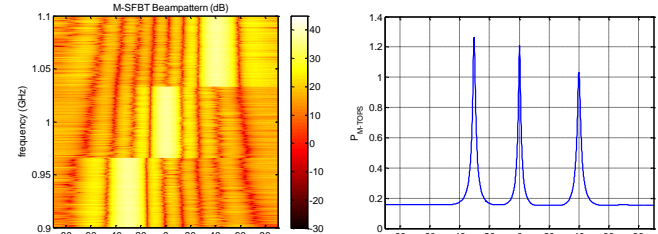
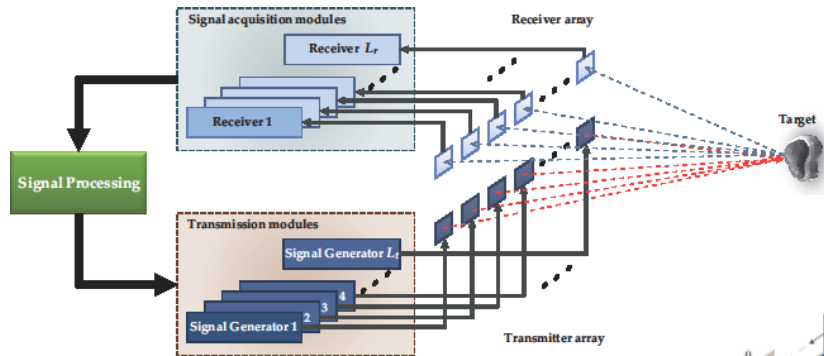
Transceiver architectures and algorithms for wireless communications and localization systems

Linearization Digital predistortion



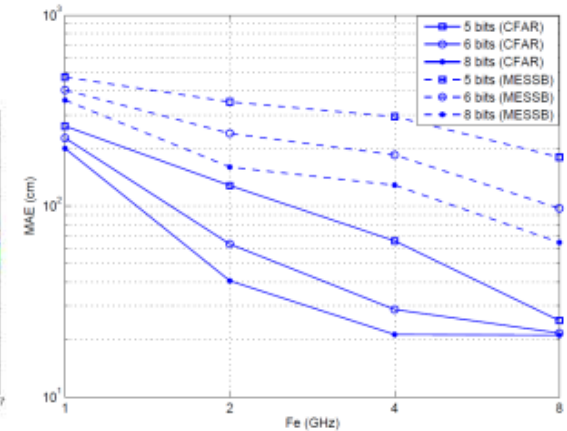
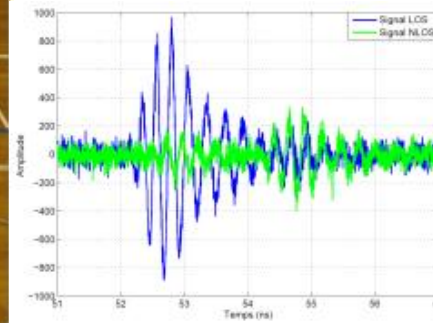
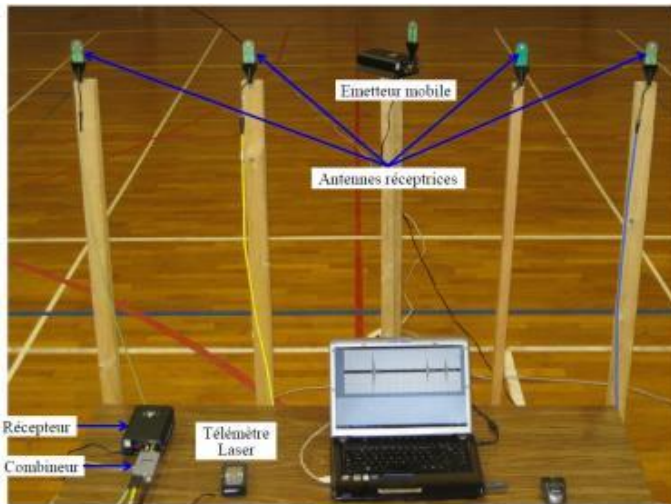
Transceiver architectures and algorithms for wireless communications and localization systems

MIMO radar



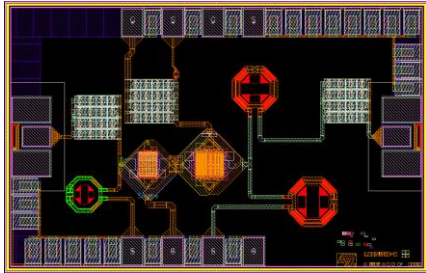
Absorbent material to reduce Tx-Rx coupling

UWB localization

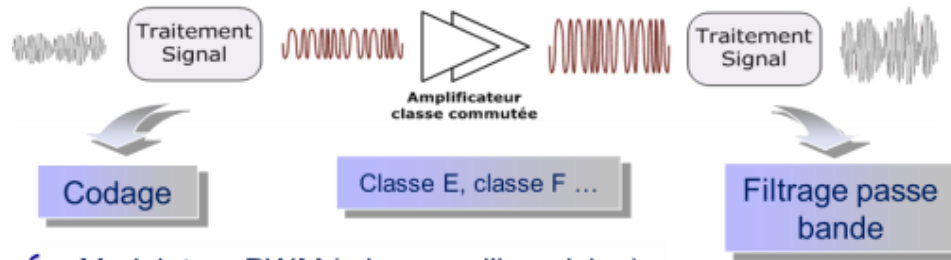


Transceiver architectures and algorithms for wireless communications and localization systems

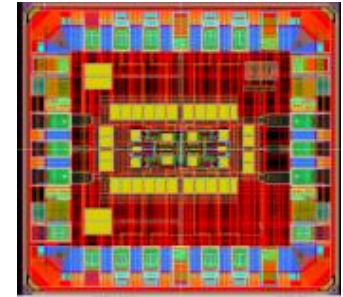
All-digital transmitter architectures



Class E PA, $f = 3,7 \text{ GHz}$
 $\eta = 63,3\%$, $\text{PAE} = 62,1\%$
 Gain = 17,3 dB, $\text{Pout} = 23 \text{ dBm}$

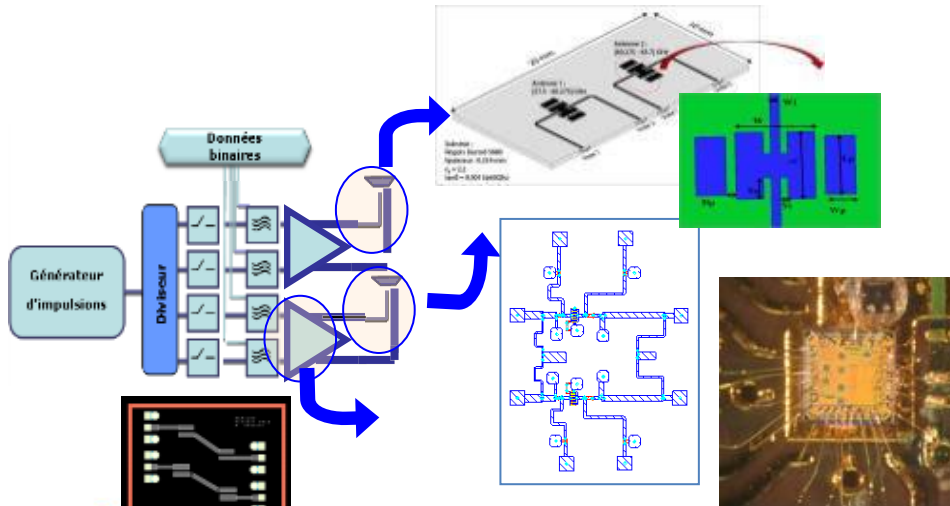


- Modulateur PWM (a largeur d'impulsion)
- Modulateur $\Sigma\Delta$ (1 bit)



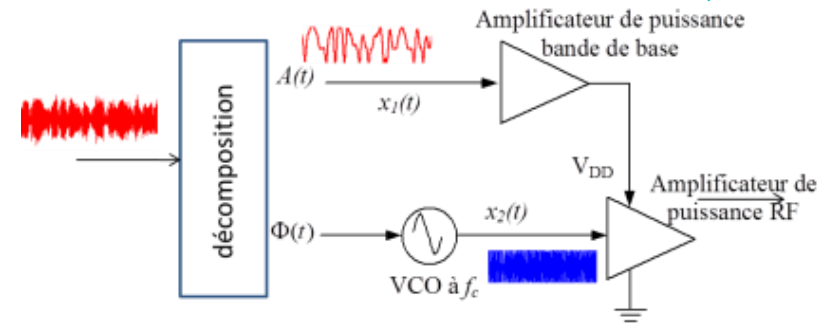
Reconfigurable CMOS LC RF filter for all digital transmitter architecture

MBOOK UWB transceiver



LABORATOIRE ELECTRONIQUE,
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Power-efficient architectures: EER, ...



Antennas for WSN
 UWB/RFID

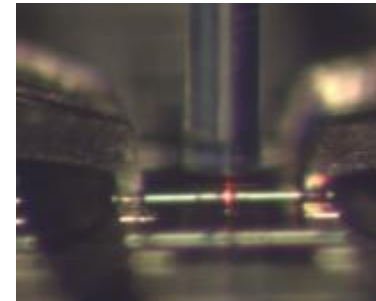
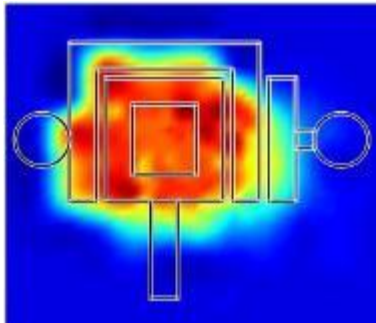


Components and circuits for wireless and optical communication systems

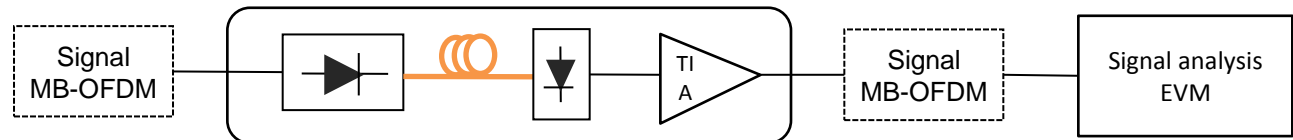
➤ Photonics and micro- nano- RF technologies

Development of key solid-state devices and associated original circuits with:

- low power and smart circuits for RF communications, to solve key bottlenecks including high efficiency, tunability and ultra-low phase noise;
- microwave-photonics technologies and systems for Radio-over-Fiber (RoF) and millimeter-wave applications, including
 - microwave phototransistors (HPT) in SiGe or InGaAs,
 - analog VCSELs,
 - silicon sources and silicon photonic 3D integration.



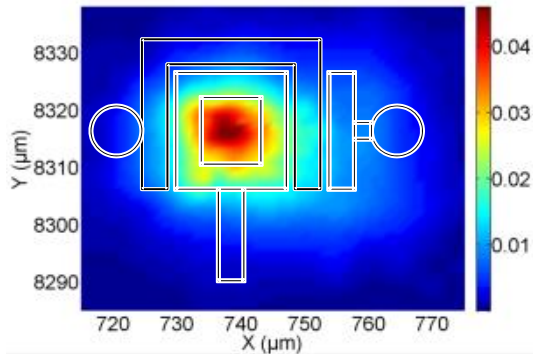
Applications to RoF communications



Components and circuits for wireless and optical communication systems

Microwave HPT (Hetero-junction Phototransistor) and VCSEL integration

Techno. Telefunken GmbH HBT SiGe 80 GHz
operates at $\lambda=850$ nm (datacom and short distances)

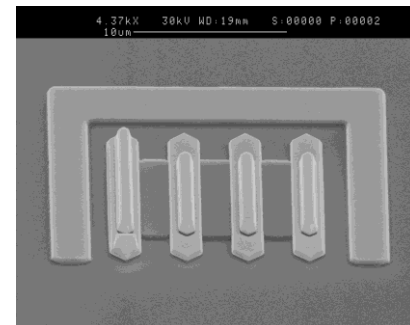
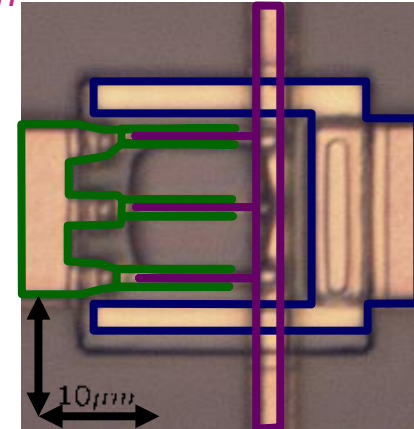


Opto-Microwave (OM) power gain

$$\text{OM power gain} = \frac{\text{microwave power at the output of photodetector}}{\text{power at the output of a reference photodiode}}$$



Map in function of the position of the illumination under probe



With THALES and the III-V Lab:
Fabrication of HPT InGaAs with
different geometries

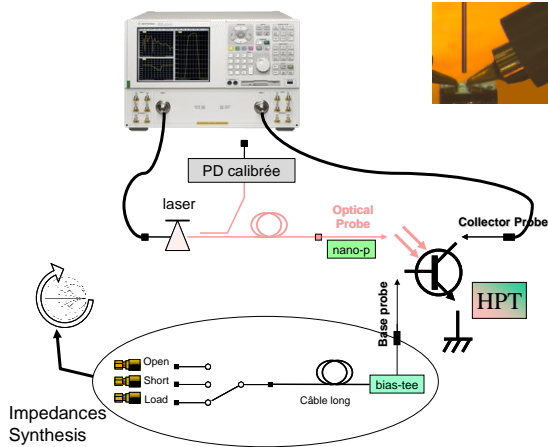
$$\rightarrow F_{tmax} = 90 \text{ GHz and } F_{topt} = 10 \text{ GHz}$$

VCSEL (Vertical-Cavity
Surface-Emitting Laser)
realized at Ulm and tested
at ESIEE



Microwave-Photonics measurement techniques

Banc Photonique-Microondes sous pointes



HPT SiGe/Si

$\lambda=850\text{nm}$

HPT en techno SiGe 80GHz
Technologie Telefunken GmbH
 f_T 46GHz, $G_{OM}=-38\text{dB}$ @ 5GHz
OE-MMIC

VCSEL GaAs

VCSEL Analogiques
Fabrication : ULM
BP 25GHz, 3mW
Dynamique >30dB

HPT InGaAs/InP

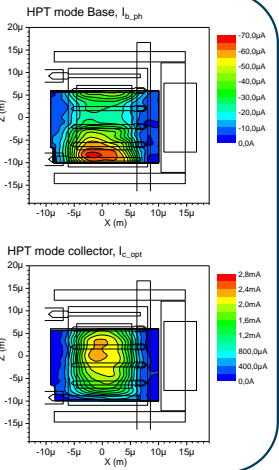
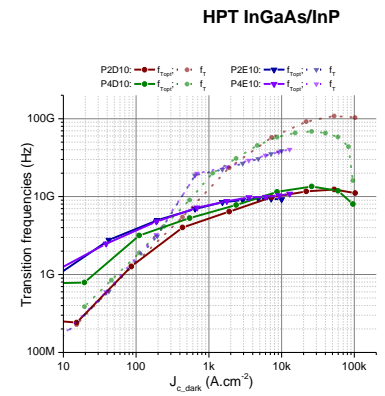
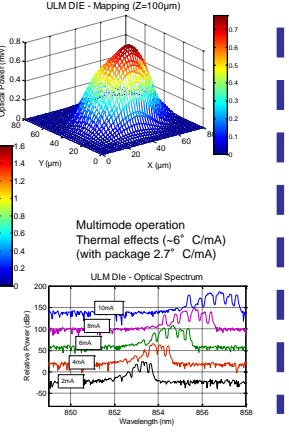
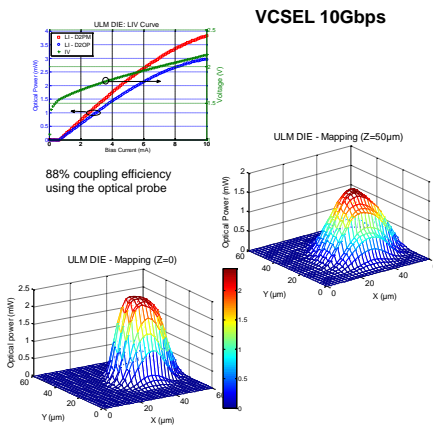
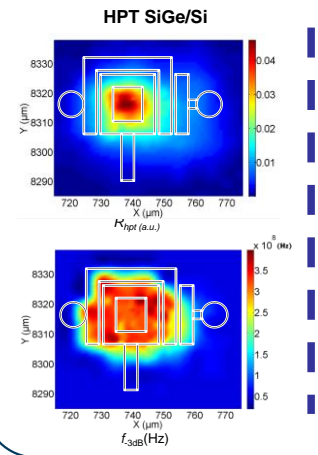
$\lambda=1550\text{nm}$

HPT en techno InGaAs
Fabrication : III-V Lab
Absorption à 1550 nm
 $f_T = 108,4 \text{ GHz}$, $f_{T,opt} = 13,5 \text{ GHz}$

- Caractéristiques du banc :**
- 850nm / 25GHz
 - 1550nm / 40GHz - 70GHz
 - 1000nm / 20GHz
 - Mesures de courant : 0,1nA (fA)

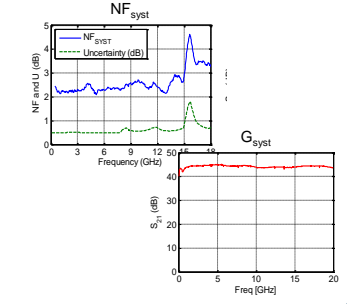
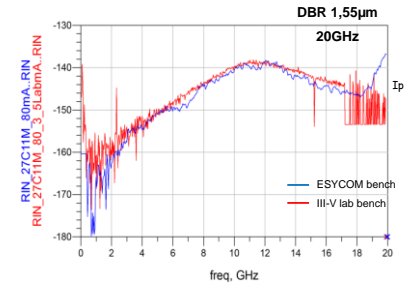
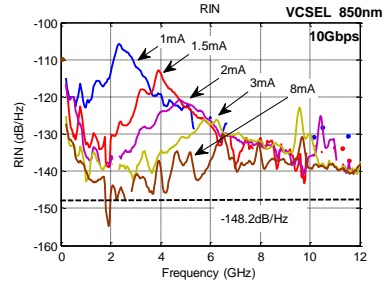
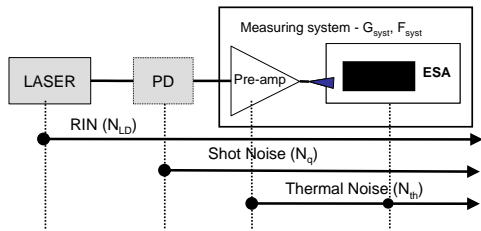
- Autres composants :**
- Photodiodes UTC, PIN...
 - IC & OE-MMIC

Scanning Near-field Optical Microscopy de type Optique-Microondes

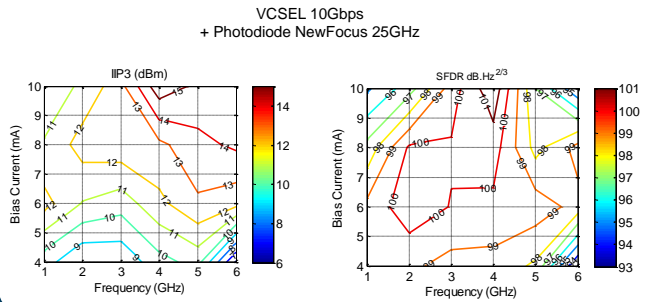


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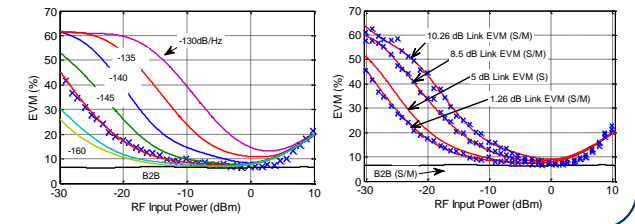
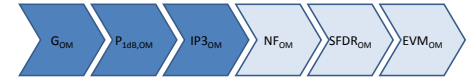
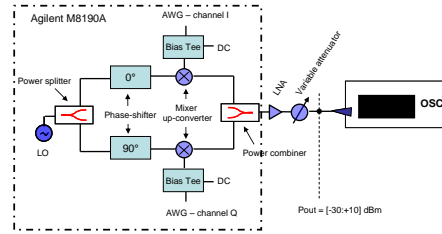
Mesures de bruit et RIN



Non-linéarités et performances systèmes



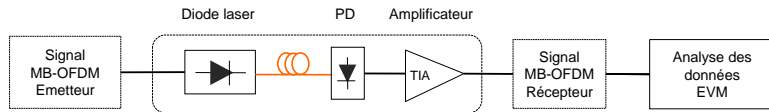
RoF 60GHz en mode IF-RoF 5GHz
IEEE 802.15.3C, HSI mode
 OFDM QPSK, 3.08Gbps, 1.815GHz bandwidth



Systèmes RoF et optique hétérodyne

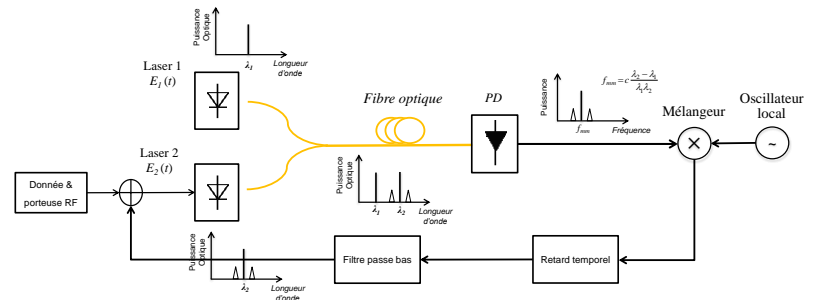
Liaisons radio sur fibre

- Applications : Convergence RoF/PON, Réseaux domestiques 60GHz
- Signaux de modulation complexe : MB-OFDM
- Caractérisation et simulation de tous les éléments du système
- Bancs et grandeurs $IP1_{OM}$, $IP3_{OM}$, NF_{OM} , $SFDR_{OM}$, EVM_{OM}
- Lasers : VCSEL (30dB dyn.OM) ou DFB (>35dB dyn.OM)
- Modulation d'intensité et détection directe (PD ou HPT)

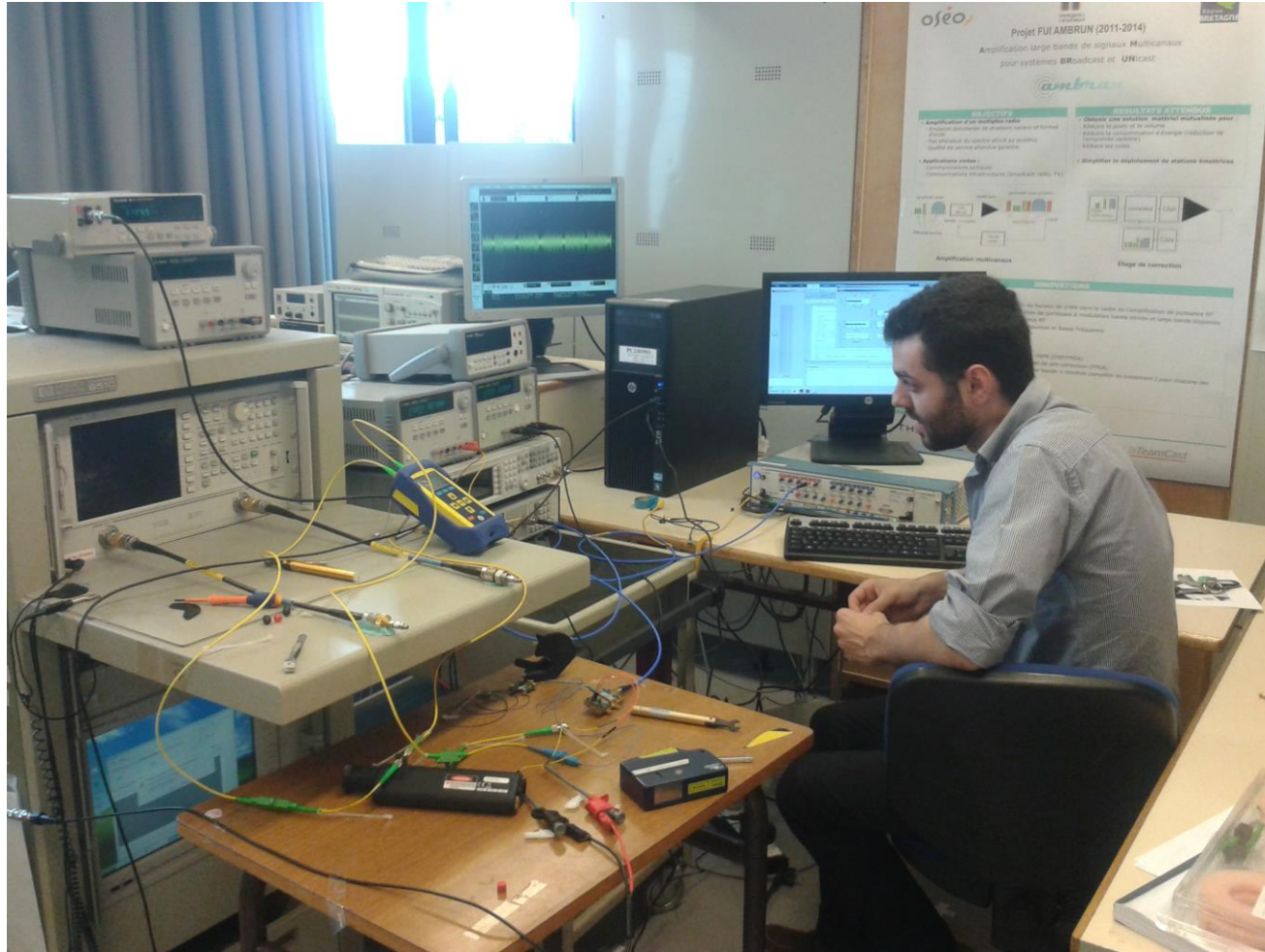


Hétérodyne optique

- Battement de deux lasers : modulation directe ou externe (MZM)
- Boucle à verrouillage de phase optique
- Intégration des circuits électroniques



When all kind of measurements are made possible to be combined altogether ...



EVM, Noise and non-linearity measurements of multi-channel OFDM 4G transmission over the fiber (FUI-MORF)