



Post-doctoral Position

- Title** **Reconfigurable and tunable RF devices modelling mixing charge mobility of the semiconductor junctions and microwave propagation**
- Contact person** Rozenn Allanic (mailto:rozenn.allanic@univ-brest.fr)
- Keywords** Comsol, DC, HFSS, microwave, modelling, semiconductors, Silvaco.
- Laboratory** Lab-STICC (<http://www.lab-sticc.fr>)
The candidate will be integrated into an internationally-recognized dynamic research group (gathering more than 10 PhD students) focusing on microwave components and systems providing original solutions in various domains such as telecommunications, defense and health.
Joining us is also a possibility to have regular contact with industry-related research through the Thales-Lab-STICC joint lab.
Facilities include highly specialized equipment spanning from simulations (HFSS, ADS, CST...) to technological realization (SLA and FDM Printers...) and measurement (VNA up to 110GHz).
- Subject** This post-doctoral proposal concerns the MCM-ITP An-DRO. The main objective of the project is to design tunable microwave devices based on a global approach mixing semiconductor and electromagnetism theories. A novel and innovative solution to co-design tunable microwave devices (such as switches, tunable filters, reconfigurable antennas...) has been developed [1]–[6]. The co-design method makes possible to build both the tunable element and the passive distributed component on the same silicon substrate. In a same design flow, this co-design permits to optimize the microwave function in terms of size and quality factor. The concept permits to choose the doped areas size, position and shape to offers a greater flexibility in the tunable devices design.
In this context, the first part of the work is then dedicated to the DC modelling of different junctions, such as metal-semiconductor junction, N+PP+ junction, MOS junction allowing a discrete or a continuous tuning. When the junction acts as a switch, the aim is to extract the R_{OFF} , C_{OFF} , R_{ON} values depending on the doping quantities, the junction depth, the junction area or the extract the capacitor or resistor range when the junction permits a continuous variation. The second part is to mix semiconductor and electromagnetism by the use of Comsol multiphysics or mixing SILVACO 3D and HFSS to take into account the charge mobility of the semiconductor into the RF design simulation. Several technology such GaAs, InP and SiC will be studied. Then some devices will be fabricated in the University of Sheffield. Measurements will be compared with simulations to enhance the modelling and the design flow.
[1]R. Allanic *et al.*, "Temperature Dependence of Tunable Resonators on FR4 and Silicon," in *Proc. Asia-Pacific Microwave Conf.*, 2017, pp. 8–11.

[2]R. Allanic, Y. Quéré, D. Le Berre, and C. Quendo, "Intrinsically microwave tunable resonator designed on silicon," *Electron. Lett.*, vol. 52, no. 20, pp. 1697–1699, Sep. 2016.

[3]R. Allanic, Y. Quéré, D. Le Berre, and C. Quendo, "A Novel Approach to Co-Design microwave Devices with Distributed Switches," in *Proc. Asia-Pacific Microwave Conf.*, 2016.

[4]R. Allanic *et al.*, "Three-State Microwave Tunable Resonator Integrating Several Active Elements on Silicon Technology in a Global Design," *IEEE Microw. Wirel. Components Lett.*, vol. 28, no. 2, pp. 141–143, 2018.

[5]R. Allanic *et al.*, "Impact of the doped areas sizes in the performances of microwave SPST switches integrated in a silicon substrate," in *2018 IEEE 22nd Workshop on Signal and Power Integrity (SPI)*, 2018, pp. 1–4.

[6]C. Quendo, R. Allanic, D. Le Berre, and Y. Quéré, "Novel Approaches to Design Tunable Devices," in *IEEE 18th Wireless and Microwave Technology Conference (WAMICON)*, 2017.

Candidate Profile - PhD holder (experience in microwave tunable devices and semiconductors)
- European Union citizenship is compulsory
- non-french-speaking candidates welcomed (English required)

Work contract Employer: Université de Bretagne Occidentale. (<http://www.univ-brest.fr>)

Situation Université de Bretagne Occidentale, in Brest (France).

Duration 1 year

Starting date January 2021 or sooner (to be discussed)

Monthly salary 2546€ (gross, including welfare cover)