

Post-doctorate offer: characterization and modelling of optoelectronic devices (SPAD)

Context:

Within the framework of **European project Nano2022** in collaboration with **ST Microelectronics**, ICube laboratory offers a 34 months postdoc position. Le candidate will join the SMH team (Heterogeneous Systems et Microsystems) and work in close collaboration with ST Microelectronics Crolles to develop a model of **avalanche photodiode SPAD** (Single Photon Avalanche Diode) diode. The model is dedicated to the conception of **CMOS-integrated** Imagers. The existing ST-custom model should be improved by integrating physical phenomenon currently not in it.

The candidate should have advanced microelectronics background with analogue hardware description language skills (for instance VerilogA) together with advanced skills in semi-conductor device characterization methods. In particular, good knowledge of optoelectronic devices, characterization as well as Cadence CAD environment will be appreciated.

Forecasted work program:

The use of SPAD as photon detector requires optimization of its control electronics. Each SPAD combined together with its own control circuit is a pixel of the imager. Optimizing the pixels requires advanced knowledge and modelling of all phenomena that occur during the avalanche phase (photon-electron conversion, impact ionisation,...), including their dynamics and statistics, as well as the behaviour of the SPAD in darkness, and the effects due to large scale pixel matrix integration (cross-coupling, optical coupling,...). The state-of-the-art models of SPAD for mature technologies are limited to the description of standard diode behaviour, which is by far insufficient to describe the photon-triggered avalanche effect dynamics.

The first challenge will be to develop an electro-optical characterization method which is fast enough to apprehend the dynamics of avalanche triggering (i.e. by using picosecond laser pulses, reflectometry with ~10ps transitions) and the associated statistics. The second challenge will be to develop a CAD-efficient dedicated SPAD model that takes the complexity of its avalanche physics into account (triggering, amplification, return to steady state,...), based on valid transient domain experimental results. The model should allow fine tuning of the SPAD's pixel-embedded control electronics and enable transient fluctuations simulation (jitter).

Location:

ICube laboratory, UMR 7357, SMH team, University of Strasbourg and CNRS, 23 rue du Lœess, 67037 Strasbourg Cedex. <http://icube-smh.unistra.fr/fr/index.php/Accueil>

Duration: 34 months maximum

Wage: 2950/mth gross

Contacts:

Pr. Wilfried Uhring wilfried.uhring@unistra.fr

Pr. Christophe Lallement : c.lallement@unistra.fr

Please send detailed CV, motivation letter and at least one recommendation letter.