



SPEAKER: Giuseppe Iacobucci  
TITLE: **The path to picosecond-level time resolution with SiGe BiCMOS monolithic pixel sensors**  
DATE: 4 Oct 2019, 11:00  
PLACE: 40/S2-C01 - Salle Curie

## ABSTRACT

An R&D; on monolithic silicon pixel sensors aiming at time resolutions below 100 ps without an internal gain mechanism was started in the framework of the TT-PET medical-physics project. A series of small ASICs was produced in the 130 nm SiGe processes of IHP. These prototypes include a low-noise and very-fast SiGe HBT amplifier able to provide an equivalent-noise charge of 90 electrons on 70 fF capacitance and a total time walk of less than 1 ns. In a testbeam experiment with minimum-ionizing particles, a first monolithic prototype, containing a TDC with a 50 ps binning and a matrix of pixels of 500x500  $\mu\text{m}^2$  area with 750 fF capacitance, provided full efficiency and 110 ps time resolution at a power consumption of 375  $\mu\text{W}/\text{channel}$ . Recently, in a lab test with a 90Sr source, a second prototype with pixels of smaller area provided a time resolution of 50 ps on 70 fF, a result that is competitive with silicon technologies that integrate an avalanche mechanism. Future developments of this technology towards picosecond-level time resolution might allow for the production of thin monolithic detectors for the 4D trackers of the next generation of particle-physics experiments.