
ID de Contribution: **22** Type: **12mOral**

# Evaluation of pixel sensors produced with a commercial 150nm CMOS process for the CMS Phase-2 Upgrade

*mercredi 20 novembre 2024 12:04 (20 minutes)*

CMS will undergo a major upgrade to prepare for the High-Luminosity phase of the LHC. Within the frame of this upgrade, studies on a novel passive sensor production technique for planar hybrid detectors have been performed. The sensors were produced using a commercial CMOS production process with a feature size of 150nm. This process enables the use of stitching to produce large sensors out of different sub-reticles of $11.5 \times 9.6$ mm$^2$. This provides the possibility to produce sensors larger than the size of a reticle of $\sim 3 \times 2$ cm$^2$ while retaining the small feature sizes enabled through projection lithography. Additionally, the use of commercial production lines enables higher throughput and potentially less expensive development with the possibility to process larger wafers than in conventional productions that apply contact lithography. To evaluate this novel sensor production process, two large prototyping campaigns have been performed for the CMS Phase-2 Inner Tracker. This includes the production of large sensors with a size of up to $\sim 4 \times 4$ cm$^2$ and a pixel pitch of $25 \times 100$ $\mu$m$^2$. The sensors were irradiated to a non-ionizing radiation dose of up to $1 \cdot 10^{16}$ 1 MeV $n_{eq}$/cm$^2$. Both, before and after the irradiation campaign, the sensors were tested in test beam environments bump-bonded to RD53A and CROC, read-out chips. The prototyping campaigns have shown, that sensors produced with a commercial 150nm CMOS process fulfill the performance requirements for CMS Phase-2 Inner Tracker and are a promising candidate, also for future detectors. In this talk, a summary of the two prototyping campaigns will be presented, including the yield of the sensor production, the performance of the sensors and a comparison of their detection efficiency and spatial resolution before and after irradiation.

**Auteur principal:** HARTE, Thierry Guillaume (ETH Zurich / CMS)

**Orateur:** HARTE, Thierry Guillaume (ETH Zurich / CMS)

**Classification de Session:** Sensing materials & Radiaiton tolerance

**Classification de thématique:** High energy and nuclear physics experiments