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CMOS R&D targeting a vertex detector for Higgs factories

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The vertex detector of the future Higgs Factory requires particularly high demanding performances, in terms of granularity, material budget, Power Consumption, data acquisition bandwidth and time resolution. IPHC Strasbourg has been pursuing its R&D effort on CMOS pixel sensors through several axis. One proposes to present of synthesis of these activities:

1/ A large scale CMOS sensor, called MIMOSIS, is currently developed at IPHC-Strasbourg in a 180 nm technology to equip the Micro-Vertex Detector (MVD) of the CBM experiment at FAIR/GSI. Targeting to reach 5 um spatial resolution, 5 us time resolution, a peak rate of 80 MHz/cm2, a radiation doses of 5 MRad and up to 10^{14} neq/cm^2 per year, MIMOSIS also plays the role of a demonstrator for Higgs factories. The last version (MIMOSIS-2.1) before the final production sensor has been produced in 2024 and is currently under test. Preliminary results will be presented. In particular, sensors produced with 50 microns epitaxial layer thickness will be compared to the regular process.
2/ IPHC is also pursuing its R&D effort on the TPSCo 65 nm technology, thanks to its CE_65 prototypes, through a detailed program studying the charge collection the charge encoding to optimize the spatial resolution for different pixel types. The next steps will consist in the exploration of new read-out architectures.

3/ To conclude, one will present our roadmap to propose a realistic, robust and large acceptance vertex detector in the context of FCCee, incorporating the R&D planned inside the DRD3.

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