Contribution ID: **44** Type: **On-site planned, but remote also possible**

TANGERINE –Test beam characterization of Monolithic Active Pixel Sensors

Tracking detectors are key parts of the instrumentation in high energy physics experiments, and their majority is making use of silicon pixel sensors to detect charged particles. A new generation of Monolithic Active Pixel Sensors (MAPS), produced in a 65 nm CMOS imaging process, promises higher densities of on-chip circuits and hence smaller pixel sizes or more sophisticated circuitry. MAPS offer the possibility to build cost-effective and light silicon detectors with a low power consumption.

The TANGERINE project aims for a sensor with a spatial resolution below 3 µm, temporal resolution between 1 ns to 10 ns and a physical thickness of about 50 µm, suitable for future Higgs factories or as beam telescope in beam-test facilities, to serve as reference for other detector developments. To optimize the layout of the new sensor, an extensive program of simulations is pursued, which needs to be validated in terms of comparison to measurements.

A batch of test chips, produced in the same 65 nm CMOS imaging process, will be tested at the Mainzer Mikrotron (MAMI) end of spring 2022. MAMI provides an electron beam with currents up to 100 µA and an energy up to 1.5 GeV. To reconstruct reference tracks, the ALPIDE beam telescope will be used. A track based analysis of the data set will be performed using the CORRYVRECKAN
framework –a standard tool for the analysis of test beam data –to reconstruct observables like hit efficiency, cluster size, spatial and temporal resolution.

The student will learn the basics of hit reconstruction in segmented detectors, particle tracking, and pixel sensor characterization. The analysis will be based on the open source software frameworks ROOT and CORRYVRECKAN, both written in C++. Prior knowledge in linux, shell, C++ and ROOT will be helpful but are not required. Can be online-only if necessary.

Field

B3: Development of experimental particle physics equipment (hardware-oriented)

DESY Place

Hamburg

DESY Division

FH

DESY Group

ATLAS – TANGERINE

Special Qualifications:

Prior knowledge in linux, shell, C++ and ROOT would be helpful. A remote student would be preferred to work approximately during UTC+2 working hours.

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