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Silicon Pixel-Strip module characterisation for the CMS Outer Tracker Phase II Upgrade

Friday 24 June 2022 09:00 (20 minutes)

The Large Hadron Collider (LHC) will undergo a major "High Luminosity"upgrade with the goal of delivering a peak instantaneous luminosity of about $5 - 7.5 \times 10^{34} cm^{-2} s^{-1}$ by 2027. In order for the CMS experiment to cope with the higher radiation levels and data rates, the current CMS Silicon Tracker will be replaced. The upgraded Outer Tracker will introduce a new module concept, made of two vertically stacked silicon sensors, which will exploit the strong magnetic field inside the CMS detector to select high transverse momentum particles locally and send the corresponding information to the CMS Level-1 triggering system.

This talk will focus on one of the two foreseen designs, namely the Silicon Pixel-Strip (PS) module. The module is made of a $10 \times 5 cm^2$ strip sensor, with $2.5 cm$ long strips and 100μm pitch, stacked on top of a macro pixel sensor with $1400 \times 100 \mu m$ macro pixels bump-bonded to dedicated macro pixel ASICs. The sensor stack is surrounded by peripheral front-end, power and readout hybrids in charge of strip sensor readout and data concentration, power distribution and optical data transmission, respectively.

After an introduction to the concept and design of a transverse momentum discriminating module, with a mention of the Pixel-Strip module assembly and preparation, the talk will mainly cover the description of the DAQ test system and first results of test-beam characterisation performed at the DESY II Test Beam Facility, focusing on detection and momentum discrimination performance.

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