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The CMS Inner Tracker Endcap Pixel Upgrade

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The High Luminosity Large Hadron Collider (HL-LHC) at CERN is expected to collide protons at a centre-of-mass energy of 14 TeV and to reach the unprecedented peak instantaneous luminosity of $7 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ with an average number of pileup events of 200. This will allow the ATLAS and CMS experiments to collect integrated luminosities up to 4000 fb^{-1} during the project lifetime. To cope with this extreme scenario the CMS detector will be substantially upgraded before starting the HL-LHC, a plan known as CMS Phase-2 upgrade. The entire CMS silicon pixel detector (IT) will be replaced and the new detector will feature increased radiation hardness, higher granularity and capability to handle higher data rate and longer trigger latency. The upgraded IT will be composed of a barrel part, TBPX, and small and large forward disks, TFPX and TEPX. The TEPX detector has four large disks on each side, extending the coverage up to $|\eta|=4.0$. In TEPX the modules are arranged in five concentric rings. In this contribution the new TEPX detector will be presented, with particular focus on the mechanics and thermal performance. A thorough overview of the TEPX design will be presented, including the validation of the serial powering implementation for the pixel modules. Lightweight material, including prototype titanium cooling loops, ensure a low material budget. Mechanical design, together with prototypes will be discussed. The effect of the material choice for various cooling pipes and disk support structures using finite element methods, connecting the modules with the CO₂ coolant, is also discussed.

In-person participation

Yes

Primary author: LIECHTI, Sascha (Universitaet Zuerich (CH))**Presenter:** LIECHTI, Sascha (Universitaet Zuerich (CH))**Session Classification:** Poster Session**Track Classification:** Operation, Performance and Upgrade (Incl. HL-LHC) of Present Detectors