



Contribution ID: 90

Type: Oral Presentations

Prototype validation for the CMS Inner Tracker Phase-2 upgrade

Wednesday, 6 September 2023 11:40 (20 minutes)

The **Inner Tracker** of the **CMS experiment** will be replaced during the Phase-2 upgrade in order to maintain nominal performance under the harsh conditions of HL-LHC. The main factors defining the new detector design are:

- radiation dose: 1 MeV neutron equivalent fluence of up to 2.3×10^{16} neq/cm² and a total ionizing dose (TID) of up to 12 MGy (1.2 Grad);
- projected hit rates of up to 3 GHz/cm²;
- pile-up of 140-200 collisions per bunch crossing.

The core components of the Inner Tracker making it compatible with these conditions are pixel sensors with smaller thickness and finer pitch, as well as a new readout chip with improved radiation hardness.

This contribution will give an overview of the **Phase-2 upgrade of the CMS pixel tracker**, focusing on the ongoing testing and validation of module prototypes in preparation for large-scale production. This includes wafer-level testing of readout chips, laboratory characterisation of assembled module prototypes and testing their performance with charged-particle beams.

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Session Classification: D1