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The Phase 2 upgrade of the CMS Outer tracker

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The Large Hadron Collider at CERN will undergo a major upgrade in the Long Shutdown 2 from 2026-2028. The High Luminosity LHC (HL-LHC) is expected to deliver peak instantaneous luminosities up to $7.5E34/cm^2/s$ and an integrated luminosity in excess of 3000/fb during ten years of operation. In order to fully exploit the delivered luminosity and to cope with the demanding operating conditions, the whole silicon tracking system of the CMS experiment will have to be replaced. The Phase-2 Outer Tracker (OT) will have an increased radiation hardness, a higher granularity, and will be able to cope with larger data rates. A key upgrade of the CMS detector is to incorporate the identification of charged particle trajectories in the hardware-based (L1) trigger system. A 40 MHz silicon-based track trigger on the scale of the CMS detector has never before been built; it is a novel handle with potential to not only solidify the CMS trigger strategy but to enable searches for completely new physics signatures. To achieve this, each module consists of two closely spaced sensors, which are connected to the same readout chips. The readout chips correlate data from both sensors for a rough transverse momentum measurement. This novel concept allows to keep trigger rates at a sustainable level without sacrificing physics potential. The design of the CMS Phase-2 Outer Tracker, highlights about prototyping activities will be presented.

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