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## The upgrades of the CMS tracker: status and plans

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LHC is expected to increase its luminosity above the original nominal value of  $1 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$ , eventually achieving an order of magnitude increase after major upgrades will be performed after 2020. This configuration of the machine is known as High Luminosity-LHC (HL-LHC). CMS plans two upgrades of the tracking system.

In the second half of this decade the present pixel system will be replaced. This replacement is called the Phase-1 upgrade and aims to improve the performance up to peak luminosities of  $3 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$ . The new features are ultra-light mechanical design with four-barrel layers and three end-cap disks, a novel two-phase cooling system and a digital readout chip with higher rate capabilities.

In the next decade the CMS experiment will need a completely new tracking system (called the Phase-2 upgrade) to maintain adequate performance in the HL-LHC environment and to provide tracking information for the Level-1 trigger decision. Innovative solutions are being studied to improve tracking resolution, reduce the material budget, increase the sensor granularity and provide useful information for an upgraded trigger system. The new detector will also have to fit within the constraints of the present allocated services and volumes, thus a special care is needed in managing the power budget and the available I/O bandwidth.

The presentation will cover both upgrades with emphasis on prototypes and production plans for Phase-1 while for the Phase-2 system the focus will be on the most relevant requirements and constraints, along with highlights from the R&D activities.

### for the collaboration

CMS

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