

Design process of the CMS Silicon Tracker for Super-LHC

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Following an expected increase of the LHC luminosity beyond its design value of $10^{34} \text{ cm}^{-2}\text{s}^{-1}$ the CMS collaboration is planning for an upgrade of the experimental apparatus. In particular the silicon tracker should undergo a major rebuild to cope with the new ultimate luminosity of the upgraded collider (SLHC) which is foreseen to be a factor ten greater than the present limit. In these extreme conditions several hundred of interactions per beam crossing are expected and the large number of charged particles generated will correspondingly increase, requiring a new detector with a much higher granularity. This should be achieved keeping both the tracker power consumption and the material budget at levels which will not jeopardize the instrument operability and performance. Furthermore the radiation tolerance of the new silicon sensors should be much higher than the present one, requiring major developments on the detector technology side. Finally the new tracker should be able to provide data to contribute to the CMS first level trigger. Possible layouts of the new tracking system have to be simulated in detail to understand the behaviour of the apparatus in a very high pile-up condition and to define a new optimal design which could meet the SLHC requirements. The motivations for the upgrade together with the status of this design process and recent developments on the various R&D activities will be described.

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