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Readout upgrade for the ATLAS Pixel Detector: reasons, status and results

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The Large Hadron Collider (LHC) at CERN obtained several important results such as the discovery of the Higgs Boson. However, the study of Standard Model parameters and the search for new physics can be enhanced by acting on two key parameters: energy and luminosity. Particle beams at LHC will reach the design energy (14 TeV in the center of momentum frame) within the end of Run 2, while the design luminosity, $10^{34} \text{ cm}^{-2} \text{ s}^{-1}$, has already been reached during Summer 2016. LHC is planning, in the short term future, to further enhance the luminosity, resulting in a higher trigger frequency and an increased pileup. These factors constitute a challenge for the data readout since the rate of data to be transmitted depends on both pileup and trigger frequency. In the ATLAS experiment, the effect of the increased luminosity is most evident in the Pixel Detector, which is the detector closest to the beam pipe. In order to face the difficult experimental challenges, the readout system was upgraded during the last few years. The main purpose of the upgrade was to provide a higher bandwidth by exploiting recent technologies. The new readout system is composed by two paired electronic boards, Back Of Crate (BOC) and ReadOut Driver (ROD). In this presentation the main effects of the luminosity on the ATLAS Pixel Detector will be discussed, as well as the strategies and technological solutions adopted to face the above problems and the achieved results.

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