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Test Beam Measurements for the Upgrade of the CMS Phase I Pixel Detector

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Based on the strong performance of the LHC accelerator, it is anticipated that peak luminosities of two times the design luminosity of L = 2 x10^34 cm^-2s^-1 are likely to be reached before 2018 and probably significantly exceeded in the so-called Phase I period until 2022. At this higher luminosity and increased hit occupancies the current CMS pixel detector would be subject to severe dead time and inefficiencies introduced by limited buffers in the analog read-out chip and effects of radiation damage in the sensors. Therefore a new pixel detector is being built and will replace the current detector in the extended year-end technical stop in 2016. The new front-end readout chip is an integral part of the upgrade and comprises larger data buffers, an increased transmission bandwidth, and low-threshold comparators. These improvements allow the new pixel detector to sustain and improve the efficiency of the current pixel tracker at the increased requirements imposed by high luminosities and pile-up. This contribution presents performance measurements of the production read-out chip and final detector modules conducted at the DESY test beam facility.

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