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Prototype module construction for the high luminosity upgrade of the CMS pixel detector

With the planned upgrades of the LHC towards a high luminosity, the entire CMS silicon tracker will be replaced in order to cope with the resulting elevated pileup and radiation levels. To meet these requirements for the inner tracker, a new pixel readout chip was developed by the RD53 collaboration in 65nm CMOS technology, featuring a higher readout bandwidth and increased granularity and radiation tolerance. These chips are operated at high currents rendering the classical parallel powering of individual devices inefficient. A serial powering scheme has therefore been developed where the input current is shared by a chain of devices, reducing considerably the power loss in the detector and thus keeping the requirements for powering and cooling at acceptable levels.

Novel module concepts, implementing the new readout and powering schemes, were developed and multiple prototypes are currently under test. The development, construction and test results of prototype modules for the upgraded CMS pixel detector will be presented.

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