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Results on 3D Pixel Sensors for the CMS Inner Tracker Upgrade at the High Luminosity LHC

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The High Luminosity upgrade of the CERN Large Hadron Collider (HL-LHC) will require new high-radiation tolerant silicon pixel sensors, capable of withstanding, in the innermost tracker layer, fluences up to $2.3 \times 10^{16} n_{eq}/cm^2$ (1MeV equivalent neutrons). An extensive R&D program aiming at 3D pixel sensors, built with a top-side only process, has been put in place in CMS. A few sensors were interconnected with the RD53A readout chip, the first prototype in 65nm technology of the pixel readout chip which will be used in the HL-LHC inner trackers. In this presentation results obtained in laboratory measurements and beam tests before and after irradiations will be reported. Irradiation of single chip interconnected modules were performed at CERN IRRAD facility up to a maximum equivalent fluence of $1 \times 10^{16} n_{eq}/cm^2$, which corresponds to about half of the full fluence foreseen at HL-LHC. Preliminary analysis of collected data shows excellent performance and hit detection efficiencies close 99% measured after the above mentioned irradiation fluence. Latest results on spatial resolution of 3D pixel sensors with pitch $50\mu m \times 50\mu m$ and $25\mu m \times 100\mu m$ will be also shown.

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