

Characterization of CNM's 3D pixel sensors for the phase-2 upgrade of the CMS vertex detector

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The Large Hadron Collider (LHC) is developing a very successfully work in the last two years, and it will suffer an important accelerator upgrade by 2020, the High Luminosity-LHC (HL-LHC). These improvements will increase by a factor ten the instantaneous luminosity as well as the particle fluxes at the detectors, such as the Compact Muon Solenoid (CMS) experiment. The inner tracker detector will be the most affected part, increasing substantially its occupancy and radiation damage. In order to conserve the sensors performance under this new conditions, the CMS pixel detector will be upgraded. The new requirements demand the use of new silicon technologies instead of actual pixel planar sensors. Planar sensors have not shown enough radiation hardness for the innermost layers where the radiation doses can reach values around 2×10^{16} neq/cm². 3D sensors technologies are one of the candidates to be used in the closest layers to the beam pipe. They show higher radiation hardness at lower operating voltages, and the double sided design provide some additional technical advantages. Several wafers have been produced at the IMB-CNM (Barcelona, Spain), implementing two different pitches between p-electrodes. First characterizations have been carried out at IMB-CNM and PSI (Villigen, Switzerland). Results after electrical characterization and radioactive source test (90 Sr), before and after irradiation will be presented, as well as the first results after a test beam at DESY facilities.

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