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3D Pixel Detectors for the AFP Experiment

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Pixel detectors with cylindrical electrodes that penetrate the silicon substrate (so called 3D detectors) offer advantages over standard planar sensors in terms of radiation hardness, since the electrode distance is decoupled from the bulk thickness. In the framework of the ATLAS Forward Physics (AFP) program, work has been carried out to study the suitability of 3D pixel devices for forward proton tracking. The AFP tracker unit will consist of an array of six pixel sensors placed at 2-3 mm from the Large Hadron Collider (LHC) proton beam. The proximity to the beam is essential for the AFP physics program as it directly increases the sensitivity of the experiment. Thus, there are two critical requirements for the AFP pixel detector. First, the dead region of the sensor has to be minimized. Second, the device has to be able to cope with a very inhomogeneous radiation distribution. Results of the characterization and beam test studies of inhomogeneously irradiated and slim-edged 3D pixel sensors produced at CNM-Barcelona will be presented.

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