

Test Beam results of FBK 3D pixel sensors interconnected to RD53A readout chip after high irradiation

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Columnar pixel sensors, also known as 3D sensors, are considered for the innermost layers of the tracking detectors of the CERN Large Hadron Collider High Luminosity upgrade (HL-LHC). In the case of the CMS experiment, the first layer of pixel detectors will be installed at about 3cm distance from the beam pipe; it will be exposed to unprecedented fluences of up to $2E16$ neq/cm² (1MeV equivalent neutrons). In addition, in order to cope with the extremely track dense environment, the area of a single pixel cell will be 2500 μm^2 with an active thickness of 150 μm . In this presentation results obtained in beam test experiments with 3D pixel sensors interconnected to the RD53A readout chip are reported. RD53A is the prototype, in 65nm technology, issued from RD53 collaboration for the future readout chip to be used in the upgraded pixel detectors. The irradiations of the interconnected detectors were performed at different irradiation sites up to a maximum fluence of about $2E16$ neq/cm². The sensors were produced in the FBK foundry in Trento, Italy, and their development was done in collaboration with INFN (Istituto Nazionale di Fisica Nucleare, Italy). The performance of the irradiated detectors was measured at different beam facilities (SPS-CERN and DESY II). The analysis of collected data shows very high hit detection efficiencies and good spatial resolutions as measured after irradiation. Analysis of most recently collected data is still underway; an overview of the up-to-date results, together with details of the pixel sensors, will be shown. All the results which make the object of this presentation are obtained in the framework of the CMS experiment R&D activities.

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