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Results Obtained with FBK Pixel Sensor Prototypes for the HL-LHC Tracker Upgrade of the CMS Experiment

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The High Luminosity Phase of CERN Large Hadron Collider (HL-LHC) will require an extensive upgrade of CMS tracker system, requiring, for the Inner Tracking system, high radiation tolerant silicon pixel sensors capable of withstanding fluences up to $1.9E16$ neq/cm² (1MeV equivalent neutrons). Thin planar and 3D pixel sensors have been recently chosen by CMS to be installed in the upgraded pixel tracker. Thanks to their peculiar structure, the 3D pixel sensors have some advantage with respect to planar ones, and are presently more suitable candidates for the innermost layer of the tracker. In this presentation results obtained with FBK planar and 3D sensors interconnected with prototype read-out chip RD53A will be shown. First single chip modules are being assembled in April 2022 with the new RD53C final chip prototype, also known as CMS Read Out Chip (or CROC); if available in time for this conference the first laboratory tests will be also presented. Both RD53A and CROC type sensors have $25 \times 100 \mu\text{m}^2$ pitch and $150 \mu\text{m}$ thickness, and they were manufactured by FBK foundry in Trento, in collaboration with INFN. The sensors interconnected with RD53A chip were also irradiated over a wide range of fluences and then tested in different test beam facility in order to validate them up to the fluences foreseen for HL-LHC. The analysis of collected data shows very high hit detection efficiencies and good spatial resolutions as measured after irradiation. All the results in this presentation are obtained on

Primary author: BARDELLI, Giulio (Universita e INFN, Firenze (IT))

Presenter: BARDELLI, Giulio (Universita e INFN, Firenze (IT))

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