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# Power dissipation and hit efficiency of CNM 3D pixel sensors irradiated to 1.6e16 neq/cm$^2$

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The Large Hadron Collider (LHC) will be improved to be able to reach about seven times its current nominal instantaneous luminosity. The High-Luminosity LHC (HL-LHC), is planned to start operation in 2027. To face the consequent increase of the particle fluence close to the proton-proton interaction point, the ATLAS detector will include in its upgraded Inner Tracker (ITk) new sensor technologies. In particular, 3D pixel sensors have been chosen for the inner most pixel layer of ITk because of their high-radiation tolerance.

Novel 3D pixel sensors were manufactured at CNM using a single-side technology on Silicon on Insulator (SOI) wafers. The active thickness for those pixel sensors is 150 μm. Two kinds of pixel sensor were manufactured featuring cells of 50 x 50 μm$^2$ and 25 × 100 μm$^2$ both with one collecting electrode. In the ATLAS ITk the 50x50 μm$^2$ pixel sensors will be mounted in the rings of the innermost layer, while the 25x100 μm$^2$ will be loaded in the barrels. CNM sensors were connected to a RD53A chip prototype and irradiated with proton beams in different facilities up to a neutron equivalent fluence of 1.6E16 neq/cm$^2$. The modules were then tested on an electron beam at DESY. In this presentation, I am going to show their power dissipation and their hit efficiency performance measured at two different incident angles, 0° (normal to the incident beam direction) and at 15°.

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