

## Laboratory measurements of 3D devices assembled with FEi4 readout electronics

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During the 2023-2024 shutdown, the Large Hadron Collider (LHC) will be upgraded to reach an instantaneous luminosity up to  $7 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ . This upgrade of the accelerator is called High-Luminosity LHC (HL-LHC). The ATLAS and CMS detectors will be replaced to meet the challenges of HL-LHC: an average of 200 pile-up events in every bunch crossing and an integrated luminosity of 3000 fb<sup>-1</sup> over ten years.

In order to have high resolution tracking performance, in such a challenging and dense environment, pixel cell size needs to be minimized. A new 65 nm Front-End is being developed by the RD53 collaboration with a readout cell size of  $50 \times 50 \mu\text{m}^2$ . The new front-end chip will be compatible with  $50 \times 50 \mu\text{m}^2$  or  $25 \times 100 \mu\text{m}^2$  pixel size sensors.

Italian groups are involved in the R&D effort on the design and production of new 3Ds sensors with thicknesses of 100 to 200  $\mu\text{m}$ , 5  $\mu\text{m}$  diameter columns and smaller pixel cells. A first batch of sensors have been produced by FBK Trento. As the new read-out chip with small pixel size is not available yet, sensors have been bump-bonded by Leonardo to FE-I4 chips, the read-out electronics used in the Pixel layer inserted in ATLAS in 2014. Although the read-out size is  $50 \times 250 \mu\text{m}^2$ , measurements of the new smaller size sensor pixel have been done.

This short contribution is meant to be a poster detailing the measurements done in the laboratory on all the 3D devices. So it will report the full statistics of the assembled devices, their IV curves, noise as a function of the pixel size, charge collection using sources and laser setup.

### TRACK

3D Sensors

**Presenter:** FUMAGALLI, Elisa (Universita e INFN Genova (IT))

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