

## Testbeam and laboratory characterization of 3D CMS pixel sensors

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The pixel detector at the heart of the CMS experiment at the CERN LHC will be exposed to unprecedented radiation fluences, i.e.  $1 \times 10^{16}$  neq/cm<sup>2</sup>, at the high-luminosity LHC upgrade in 2020. Standard planar technology was shown to be unable to meet the CMS physics requirements at this high fluence regime. Ultra radiation-hard 3D technology is one of the most promising candidates for replacement due to its superior features. The CMS 3D pixel sensors, fabricated at FBK, have been tested thoroughly both in laboratory and beam tests before and after irradiation. Characterization measurements were carried out for the CMS 3D sensors, diode, and test structures from different batches. We will report on our 3D test results obtained so far.

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