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Characterisation of the silicon oxide quality in HGCAL sensor prototypes

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The quality of the silicon oxide layer in 8" sensor prototypes for the CMS High Granularity Calorimeter (HGCAL) is studied by means of X-ray irradiation of dedicated test structures at the CERN ObeliX facility. A fully automated irradiation and measurement setup called AXIOM (Automated X-ray Irradiation and Oxide Measurements) has been developed at CERN for this purpose.

Different oxide variants provided by Hamamatsu are characterised and compared to the results obtained with HGCAL 6" prototypes and sensors of the CMS outer tracker. A clear preference has emerged from these studies, and the oxide type with the best performance has been irradiated up to a dose of 3 MGy, the expected absorbed dose in the forward region of the detector at the end of the High-Luminosity LHC run. The findings of this measurement campaign have contributed to the choice of the oxide type for the next version of the HGCAL sensor prototypes, which will undergo larger scale testing.

Primary author: DEFRANCHIS, Matteo (CERN)

Presenter: DEFRANCHIS, Matteo (CERN)

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