

# 12th Beam Telescopes and Test Beams Workshop



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## Test Beam Results on 3D pixel sensors for the CMS Tracker Upgrade at the High-Luminosity LHC

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The High Luminosity upgrade of the CERN Large Hadron Collider (HL-LHC) calls for new high-radiation tolerant silicon pixel sensors, capable of withstanding, in the innermost tracker layer, fluences up to  $2.3E16$  neq/cm<sup>2</sup> (1MeV equivalent neutrons). An extensive R&D program aiming at 3D pixel sensors, built with a top-side only process, has been put in place in CMS in collaboration with FBK (Trento, Italy) and CNM (Barcelona, Spain) foundries. A number of sensors were interconnected with the CROC readout chip; CROC is the prototype, in 65nm technology, of the pixel readout chip which will be used in the HL-LHC inner trackers. The modules have been tested on beam at CERN and DESY, before and after irradiation up to an equivalent fluence of about  $1.5E16$  neq/cm<sup>2</sup>. Analysis of collected data shows great performance, with hit detection efficiencies around 98% measured after irradiation.

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