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Planar silicon sensors for the CMS Tracker upgrade

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The CMS tracker collaboration has initiated a large material investigation and irradia- tion campaign to identify the silicon material and design that fulfills all requirements for detectors for the high luminosity phase of the Large Hadron Collider (HL-LHC).
A variety of silicon p – in – n and n – in – p test-sensors made from Float Zone (FZ), Magnetic Czochralski (MCz) and epitaxially grown (Epi) materials were manufactured by one single industrial producer (Hamamatsu Photonics K.K.). Thus guaranteeing similar conditions for the production and design of the test-structures, properties of different silicon materials and design choices have been systematically studied and compared.
The samples have been irradiated with 1 MeV neutrons and protons corresponding to max- imal fluences as expected for the positions of detector layers in the future tracker. Three different proton energies have been used (23 MeV, 800 MeV and 23 GeV) in order to eval- uate the energy dependance of the defect generation in oxygen rich material.
All materials have been characterized before and after irradiations, and throughout an an- nealing treatment. The measurements performed on the structures include electrical sensor characterization, measurement of the collected charge injected with beta sources and laser light and bulk defect characterization. In this talk, results from the ongoing campaign are presented.

quote your primary experiment

CMS tracker Collaboration

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