Document details

‹ Back to results | 1 of 1

Export Download Print E-mail Save to PDF Add to List More... ›

Full Text View at Publisher

Journal of Instrumentation
Volume 15, Issue 4, April 2020, Article number P04017

Experimental study of different silicon sensor options for the upgrade of the CMS Outer Tracker (Article) (Open Access)

Adam, W.[a], Bergauer, T.[a], Blöch, D.[a], Brondolin, E.[a], Dragicevic, M.[a], Frühwirth, R.[a], Hinger, V.[a], Steininger, H.[a], Treberer-Treberspurg, W.[a], Beaumont, W.[b], Croce, D.D.[b], Janssen, X.[b], Lauwers, J.[b], Van Mechelen, P.[b], Van Remortel, N.[b], Blekman, F.[c], Chhibra, S.S.[c], De Clercq, J.[c], D'Hondt, J.[c], Lowette, S.[c],

View additional authors ⌄

[a]Institut für Hochenergiephysik, Wien, Austria
[b]Universiteit Antwerpen, Antwerpen, Belgium
[c]Vrije Universiteit Brussel, Brussel, Belgium

View additional affiliations ⌄

Abstract

⌄ View references (33)

During the high-luminosity phase of the LHC (HL-LHC), planned to start in 2027, the accelerator is expected to deliver an instantaneous peak luminosity of up to 7.5×10^{34} cm^{-2} s^{-1}. A total integrated luminosity of 0300 or even 0400 fb^{-1} is foreseen to be delivered to the general purpose detectors ATLAS and CMS over a decade, thereby increasing the discovery potential of the LHC experiments significantly. The CMS detector will undergo a major upgrade for the HL-LHC, with entirely new tracking detectors consisting of an Outer Tracker and Inner Tracker . However, the new tracking system will be exposed to a significantly higher radiation than the current tracker , requiring new radiation-hard sensors. CMS initiated an extensive irradiation and measurement campaign starting in 2009 to systematically compare the properties of different silicon materials and design choices for the Outer Tracker sensors. Several test structures and sensors were designed and implemented on 18 different combinations of wafer materials, thicknesses, and production technologies. The devices were electrically characterized before and after irradiation with neutrons, and with protons of different energies, with fluences corresponding to those expected at different radii of the CMS Outer Tracker after 0300 fb^{-1}. The tests performed include studies with β sources, lasers, and beam scans. This paper compares the performance of different options for the HL-LHC silicon sensors with a focus on silicon bulk material and thickness. © 2020 CERN for the benefit of the CMS collaboration.

SciVal Topic Prominence ⓘ

Topic: Silicon Detectors | Luminosity | Pixels

Prominence percentile: 90.628 ⓘ

Author keywords

Large detector systems for particle and astroparticle physics | Particle tracking detectors (Solid-state detectors) | Radiation-hard detectors | Si microstrip and pad detectors

Indexed keywords

Engineering controlled terms: Luminance | Silicon sensors | Silicon wafers

Engineering uncontrolled terms: Integrated luminosity | LHC experiments | Measurement campaign | Production technology | Silicon bulk materials | Silicon materials | Tracking detectors | Tracking system

Engineering main heading: Neutron irradiation

ISSN: 17480221
DOI: 10.1088/1748-0221/15/04/P04017
Source Type: Journal
Document Type: Article
Original language: English
Publisher: Institute of Physics Publishing

References (33)

View in search results format >

All | Export | Print | E-mail | Save to PDF | Create bibliography

1 Lindström, G., Ahmed, M., Albergo, S., Allport, P., Anderson, D., Andricek, L., Angarano, M.M., (...), Žontar, D.

Radiation hard silicon detectors - Developments by the RD48 (ROSE) collaboration

(2001) *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 466 (2), pp. 308-326. Cited 343 times.
http://www.sciencedirect.com.ezlib.iium.edu.my/science/journal/01689002
doi: 10.1016/S0168-9002(01)00560-5

View at Publisher

2 (2010) *RD50 Status Report 2008-Radiation Hard Semiconductor Devices for Very High Luminosity Colliders*

3 Moll, M.
(1999) *Radiation Damage in Silicon Particle Detectors-Microscopic Defects and Macroscopic Properties*. Cited 239 times.

4 Eremin, V., Verbitskaya, E., Li, Z.

The origin of double peak electric field distribution in heavily irradiated silicon detectors

(2002) *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment*, 476 (3), pp. 556-564. Cited 107 times.
doi: 10.1016/S0168-9002(01)01642-4

View at Publisher

5 Schmidt, B.

The High-Luminosity upgrade of the LHC: Physics and Technology Challenges for the Accelerator and the Experiments (Open Access)

(2016) *Journal of Physics: Conference Series*, 706 (Section 2), art. no. 022002. Cited 43 times.
http://www.iop.org/EJ/journal/conf
doi: 10.1088/1742-6596/706/2/022002

View at Publisher