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RD50 Collaboration Overview: Development of New Radiation Hard Detectors

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RD50 is a CERN R&D collaboration dedicated to the development of radiation hard semiconductor devices for application in high luminosity colliders. It is based on four pillars: Defect and Material Characterization; Detector Characterization; Development of New Structures; Full Detector Systems. Its ultimate goal is to develop radiation hard devices that can cope with a fluence of 2×10^6 neq/cm², to be applied for the high- luminosity LHC runs.

This factor 10 increase in fluence requires both material and device engineering. A number of new technologies are developed within RD50. This presentation will report on the following topics:

- 3D devices, which have columnar implants across the bulk so that depletion region grow sideways instead of vertically. They are characterized by low depletion voltage.
- CMOS pixels in HV technology, built on low resistivity p-type silicon. These detectors, characterized by an n-well deeper than the one normally used in CMOS monolithic active pixels (MAP's), are expected to be more radiation hard.
- Low Gain Avalanche Detectors (LGAD's): diodes realized with this technology exploit the avalanche multiplication mechanism in order to generate a moderate and controlled gain.

These devices can be read-out by the same electronics used for non-multiplying diodes. Thinner substrates can also enhance their time resolution, thus opening up to various applications. Both pixels and strips are targets for this technology.

Collaboration

CERN RD50 Collaboration

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