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Silicon Detectors for the LHC Phase-II Upgrade and Beyond –RD50 Status Report

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The inner tracking layers of all LHC experiments were designed and developed to cope with the environment of the present Large Hadron Collider (LHC). At the LHC Phase-II Upgrade foreseen for 2026, the particle densities and radiation levels will increase by roughly an order of magnitude compared to the present LHC conditions. Therefore, the inner tracking layers will need to be replaced. The new inner tracking layers, which will all be based on silicon detectors, must be significantly more radiation hard.
Within the RD50 Collaboration, a large R&D program has been underway for more than a decade across experimental boundaries to develop silicon sensors with sufficient radiation tolerance for HL-LHC trackers. Key areas of detectors R&D include HV CMOS sensors, detectors made in the 3D technology and Low Gain Avalanche Detectors (LGADs). We will present the state of the R&D in several silicon detector domains, in particular 3D and LGAD detectors. We will also comment on the options for detector choices experiments beyond the LHC, using the FCC as an example.

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