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[F07] The rise of 4D silicon detector

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Several anomalies have recently emerged in high energy physics experiments leading us to believe that discoveries are at reach in the next generation of collider physics experiments, however, for their success, technological advances are critical. Among them, 4-dimensional (4D) detectors that provide high-resolution space and time measurements in a single device are in growing demand, and will impact scientific research beyond high energy physics, e.g. nuclear physics, rare processes detection, space science, photon science etc. The fast-time silicon technology, namely LGAD, developed for the timing detectors at the High Luminosity LHC can be used as a stepping stone to reach <30 ps time resolution and <5 micron space resolution in a single device that also features low material budget and low power dissipation, and can be operated in a relatively high radiation environment. The seminar will illustrate the need for 4D detectors in a broad range of current and future scientific experiments, and will detail the progress made, as well as the one expected in the near future, in LGAD-based technologies to meet the stringent requirements of such experiments. This presentation will focus on recent advances made in the design, fabrication, performance characterisation and read out of AC-LGAD (AC-coupled LGAD) sensors for multiple scientific applications and will demonstrate that it is a mature technology for 4D detectors in the immediate future.

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