*Detector Lab's*

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# Precision Timing with Silicon Detectors

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Silicon detectors with precision timing capabilities are playing an increasingly vital role in particle physics instrumentation. Among their many applications, pileup rejection and time-of-flight measurements at the Large Hadron Collider (LHC) stand out as prominent examples.
This presentation explores various silicon-based timing sensors, including silicon pad and pixel sensors, Low-Gain Avalanche Detectors (LGADs), Single-Photon Avalanche Diodes (SPADs), and Silicon Photomultipliers (SiPMs). We examine the primary factors that influence time resolution, such as Landau fluctuations, electronic noise, variations in signal shape due to the pad response function, and gain fluctuations. The fundamental limits to timing precision imposed by these effects, along with practical considerations and constraints in real-world applications, will be discussed.

**Werner Riegler** studied Physics at Vienna University of Technology and achieved the Ph.D. with the ATLAS experiment in 1997. Afterwards, he was a Postdoctoral fellow at Harvard University working in ATLAS and CDF. Since 2000, he is a CERN staff member, first in LHCb and then, since 2004, in ALICE. Since 2009, he is Technical Coordinator of the ALICE experiment and, since 2015, he is coordinating the FCC-hh detector studies. His main areas of activity are experimental particle physics, specifically particle detector development and detector physics studies, signal theory and study of fundamental performance limits of particle detectors.