



Contribution ID: 3

Type: **Talk**

High-Granularity Timing Detector for the Phase-II upgrade of the ATLAS Calorimeter system: Low-Gain Avalanche Diode silicon sensors and characterization in test beam

Tuesday 15 October 2019 15:30 (22 minutes)

Abstract: The large increase of pile-up interactions is one of the main experimental challenges for the HL-LHC physics program. A powerful new way to mitigate the effects of pile-up is to use high-precision timing information to distinguish between collisions occurring close in space but well-separated in time. A High-Granularity Timing Detector (HGTD), based on low-gain avalanche detector (LGAD) technology, is proposed for the ATLAS Phase-II upgrade. LGAD is innovative silicon sensors optimised for timing measurements based on the Low-Gain Avalanche Diode design. Using this technology, the time resolution per track for a minimum-ionising particle can reach 50 ps on average at the end of HL-LHC operation. LGAD also attracted for fast response for realizing a 4D tracker in future experiment and for possible other applications.

This talk will show beam test results and measurements of irradiated LGAD sensors, such as timing resolution, efficiency and collected charge. It will also cover a variety of strategies to improve its radiation hardness.

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Session Classification: Sensor/ASICs technology