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#11-246 A High-Granularity Timing Detector for the Phase-II upgrade of the ATLAS Calorimeter system: detector concept, description and R&D and beam test results

Friday, June 25, 2021 9:00 AM (20 minutes)

The increase of the particle flux (pile-up) at the HL-LHC with luminosities of $L \approx 7.5 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ will have a severe impact on the ATLAS detector reconstruction and trigger performance. The end-cap and forward region where the liquid Argon calorimeter has coarser granularity and the inner tracker has poorer longitudinal vertex position resolution will be particularly affected. A High Granularity Timing Detector (HGTD) is proposed in front of the LAr end-cap calorimeters for pile-up mitigation and for luminosity measurement.

It will cover the pseudo-rapidity range from 2.4 to 4.0. Two Silicon sensors double sided layers will provide precision timing information for MIPs with a resolution better than 30 ps per track in order to assign each particle to the correct vertex. Readout cells have a size of 1.3 mm \times 1.3 mm, leading to a highly granular detector with 3 millions of channels. Low Gain Avalanche Detectors (LGAD) technology has been chosen as it provides enough gain to reach the large signal over noise ratio needed. A dedicated ASIC is being developed and some prototypes have been already submitted and measured

The requirements and overall specifications of the HGTD will be discussed. LGAD R&D campaigns are carried out to study the sensors, the related ASICs, and the radiation hardness. Laboratory and test beam results will be presented.

Primary author: IMAM, Hajar (CERN)

Co-author: Dr ANDEEN, Tim (CERN)

Presenter: IMAM, Hajar (CERN)

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