

11th Beam Telescopes and Test Beams Workshop



Contribution ID: 23

Type: **Talk**

Results of the ETROC1 Performance and Advancements towards the Next Generation Chip

Wednesday 19 April 2023 12:40 (20 minutes)

The MIP Timing Detector (MTD) will be installed as a part of the CMS Phase-2 Upgrade to sustain track reconstruction and particle identification by incorporating Time-of-Flight information in the High Luminosity LHC (HL-LHC) era. The Endcap Timing Layer (ETL) of the MTD makes use of Low-Gain Avalanche Diode (LGAD) sensors read out with frontend ASICs referred to as the Endcap Timing Read-Out Chip (ETROC). The design of the ETROC enables effective processing of LGAD signals with a time resolution of 50 ps per hit. By employing two detector layers, this configuration can achieve a time resolution of 35 ps per track.

During the year 2022, a telescope made of three layers of bump-bonded LGAD sensors and ETROC prototypes (ETROC1) were installed at the Fermilab Test Beam Facility. Using a 120 GeV proton beam the time resolution of a single hit was determined to be in the range of 42-45 ps, which is comparable to the results obtained in 2021 based on collected data over a few months of operation. We're setting up a new telescope to test the next version of ETROC, ETROC2, which includes 256 channels, a factor of 16 more than ETROC1, and has new features such as automatic calibration of discriminator threshold, a waveform sampler in one channel to monitor the waveform from the LGAD sensor, and ability to perform self-tests. In this talk, I will present the ETROC telescope setup and time resolution studies with beam, and discuss ongoing works for the future generations of ETROC.

Author: LEE, Jongho (University of Illinois Chicago)

Presenter: LEE, Jongho (University of Illinois Chicago)

Session Classification: Timing