



Contribution ID: 9

Type: Nuclear and Particle Physics

ATLAS Luminosity Measurement and Long Term Stability Studies with ATLAS-TPX Network During Run-2

Friday, 18 February 2022 13:48 (12 minutes)

A network of 15 pixelated detectors based on Timepix ASICs was installed in ATLAS cavern to measure the Radiation Field composition and Luminosity during CERN-LHC Run 2. The Timepix detectors are capable of measuring Luminosity with 5 different algorithms namely Cluster Counting Algorithm, Hit Counting Algorithm, Total Deposited Energy Algorithm, Thermal Neutron Counting Algorithm and MIPs (Minimum Ionizing Particles) Counting Algorithm. In addition to measuring the number of proton-proton collisions at the Interaction Point, these finely segmented detectors (55um Pitch) allow a high-quality track reconstruction which helps to identify the particle types.

Different algorithms that were developed for Luminosity measurement were tested by comparing the Integrated Luminosity measurements with other ATLAS Luminosity detectors. Most algorithms show good agreement with other ATLAS Luminometers, while some algorithms showed slight disagreements which opened the door for crucial studies like track overlapping correction and Activation measurement in ATLAS cavern. Each algorithm comes with its statistical and systematic uncertainties.

Study of the Long-Term Stability of the LUCID calibration is of paramount importance because it adds a major contribution to the total uncertainty in the ATLAS Luminosity measurement. These studies are important to ensure that the Van der Meer calibration of LUCID is valid throughout the data taking year. We have conducted Long Term stability studies with the ATLAS-TPX network for the complete Run-2. We propose to present results from different Luminosity measurement algorithms and Long-Term Stability studies for the year 2016, 2017 and 2018 with ATLAS-TPX network. We also propose to present the status report of ATLAS-Timepix3 network which is the upgrade for the CERN-LHC Run-3. The next generation Timepix3 pixel detectors promise a much better performance in ATLAS Cavern and are synchronized with the LHC clock.

email address

muhammad.usman.1@umontreal.ca

Please select: Experiment or Theory

Experiment

Primary authors: Prof. LEROY, Claude (Universite de Montreal); USMAN, Muhammad (Universite de Montreal)

Co-authors: Ms GAGNON, Clara (Universite de Montreal); Mr PAPADATOS, Costa (Universite de Montreal); Mr BOUSSA, Mahdi (Universite de Montreal)

Presenter: USMAN, Muhammad (Universite de Montreal)

Session Classification: Particle Physics