Clustering Algorithm Performance Studies for the ATLAS Trigger System at the HL-LHC[1] TAYLOR CONTRERAS, STEPHANIE MAJEWSKI, CHRISTOPHER DUDLEY, Univ of Oregon, ATLAS COLLABORATION — The Large Hadron Collider (LHC) at CERN is a particle accelerator providing massive amounts of data which can reveal new physics about fundamental particles and forces. An upgrade to the LHC that will increase the luminosity will be enacted in 2026, called the High-Luminosity LHC (HL-LHC) to run with pp collisions at $\sqrt{s} =$ 14 TeV with the ATLAS detector. The higher luminosity will increase the rate of proton-proton interactions in detectors like ATLAS, thus these detectors must increase the speed of sorting through data. This sorting is performed by the ATLAS Trigger System, which decides whether an interaction is interesting enough to keep within about ten microseconds. Our group is studying the efficiency of different algorithms that cluster energy for implementation on a Field Programable Gate Array (FPGA) in the Global Trigger. These algorithms cluster energetic cells in multiple layers of the detector to reconstruct particle showers. We have implemented the algorithms used on the FPGA in python in order to validate the performance of the FPGA, analyze the background rejection and trigger efficiency of the clustering algorithms, and compare these quantities between different algorithms.

[1]PURS

Taylor Contreras
Univ of Oregon