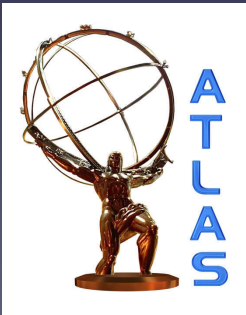


Real time data analysis with the ATLAS Trigger at the LHC in Run-2

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On behalf of the ATLAS Collaboration



The Context:

The LHC physics program requires high statistic data samples to:

- Have sensitivity to new physics in very small phase space regions or with highly exclusive final states;
- Reach very high precision in Standard Model measurements.

→ The LHC is constantly increasing the instantaneous luminosity delivered to the experiments

The Problem:

This is very challenging for ATLAS (and CMS) data-taking in Run-2:

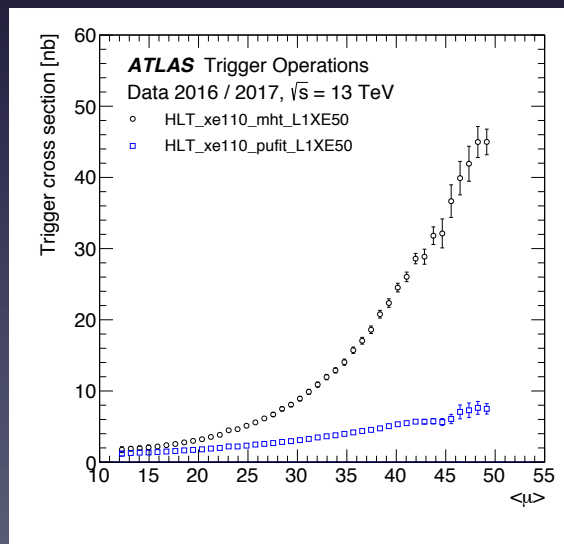
- The Data Acquisition System can only cope with a maximal rate of events to be processed (CPU and timing) and stored;
- At Run-2 luminosity (peak at $21 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$), a very high number of pile-up events degrade the performance of the data-taking process.

The Solution:

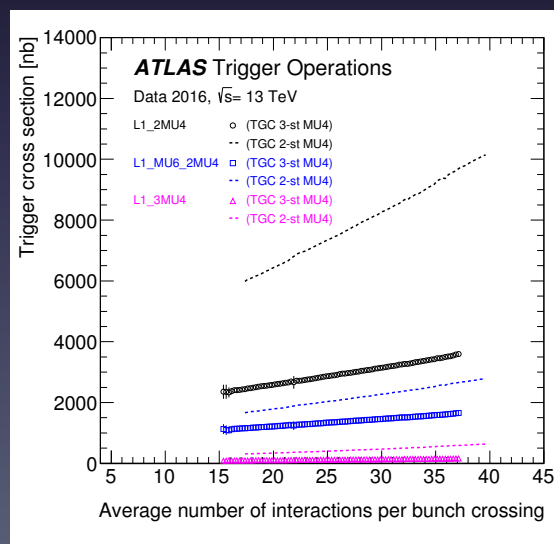
The ATLAS Trigger system, both the hardware and software components, has been upgraded in multiple ways permitting real time analyses that:

- Keep the phase space of the stored events large enough for the physics program to be successful;
- Control the rate by improving on the purity of the datasets collected and keeping a linear dependence on pile-up increase.

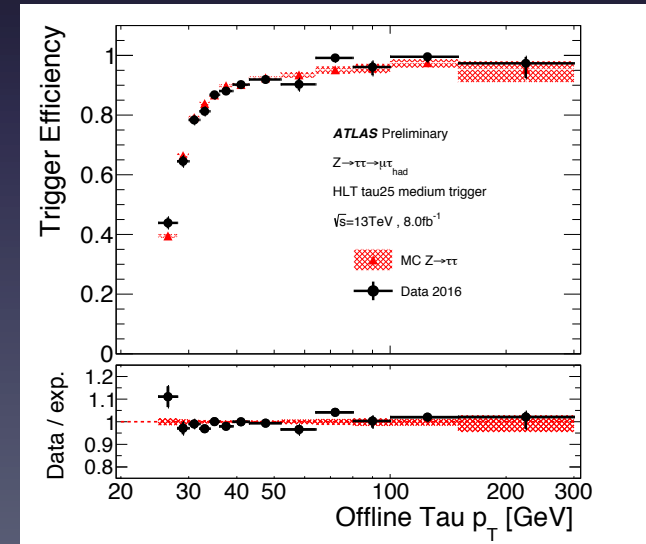
A few examples:



A new E_T^{miss} algorithm suppressing pile-up



TGC coincidences to remove muons not from vertex



High performance of the tau trigger using a BDT at HLT