ATLAS Trigger system for Run 3

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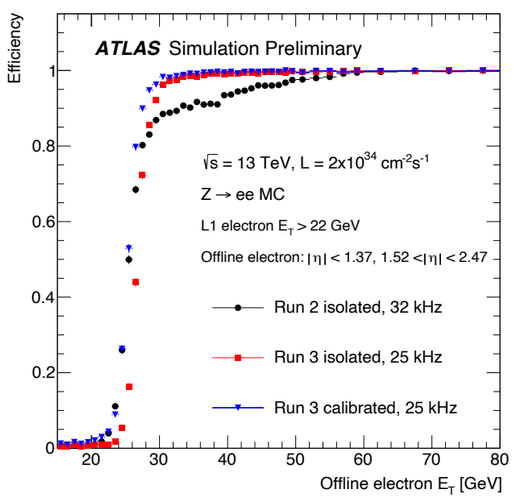
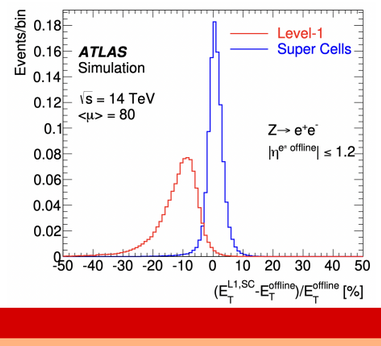
Main improvements for Run 3

Finer-granularity LAr Calorimeter input
- better resolution and background rejection

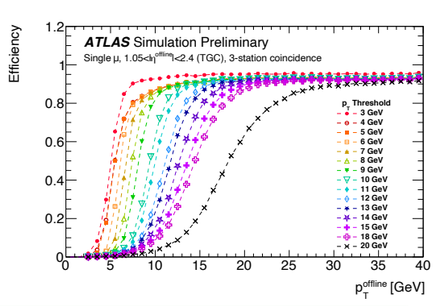
New ATCA-based Feature EXtractors (FEX)
- eFEX
  - identifies electrons, photons and taus
  - sophisticated clustering algorithms and isolation
- jFEX
  - identifies jet, E_T^{miss}, had-decaying taus
  - jet reconstruction algorithms
- gFEX
  - full-scan algorithms to compute global event quantities

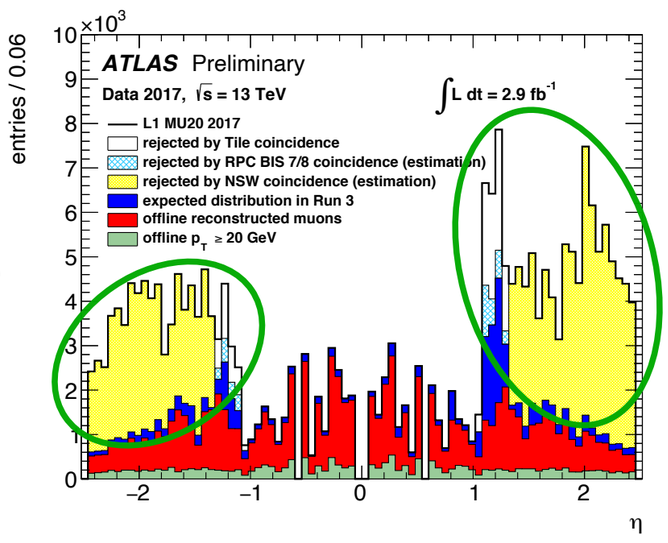




Main improvements for Run 3

New detectors!
- New Small Wheel (1.3<|η|<2.7)
  - Designed to improve fake muons rejection
  - MicroMegas
  - small-strip Thin Gap Chambers
- New RPC detectors: RPC-BIS78 (1.0<|η|<1.3)
  - added to the boundary region between barrel and endcap
- New Muon to Central Trigger Processor Interface
- Coincidences between TGC and NSW/RPC-BIS78
- New L1 Muon endcap sector logic





Level-1 Calo

Level-1 Muon

Read out

L1 Topo

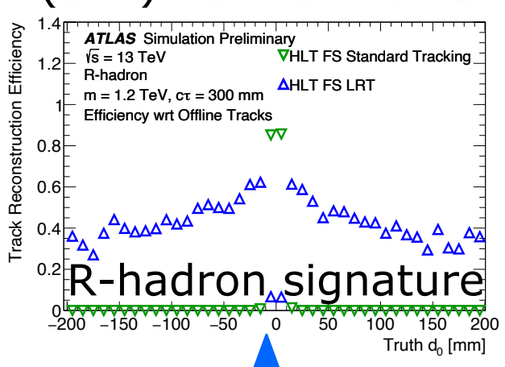
Central Trigger Processor

Data Flow

Saved to disk

High Level Trigger

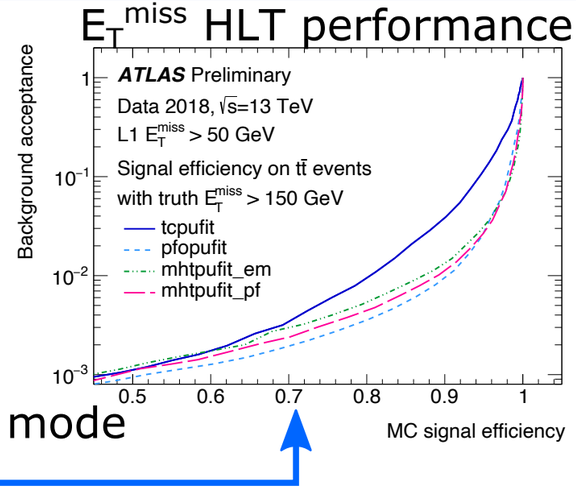
Large radius tracking (LRT) new for Run 3!



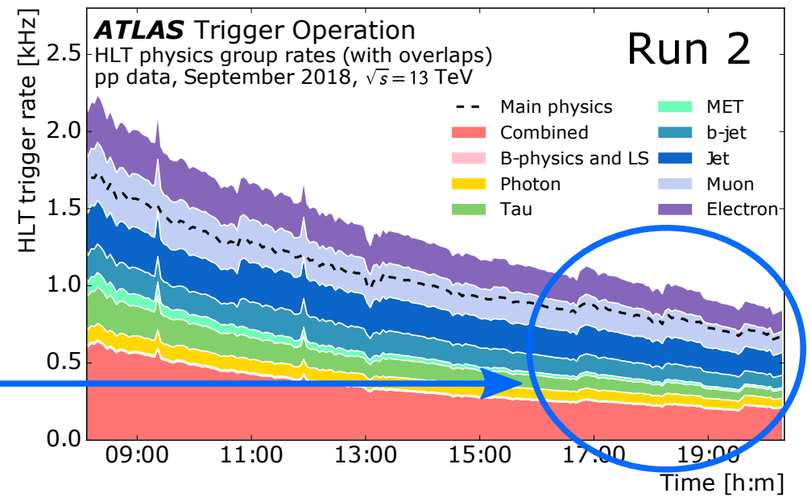
Software-based trigger (100 kHz → 3 kHz average) algorithms using full granularity detector information in either regions of interest (RoI) or the whole event

Main improvements for Run 3
- migration to multi-threaded software
- track reconstruction speed to be able to run in full scan mode
  - benefit to pile-up sentitive algorithms
  - new triggers for unconventional signatures

E_T^{miss} HLT performance



Trigger Menu: collection of triggers and corresponding prescales
- fit within hardware, rate and CPU constraints
- kept as inclusive as possible in term of signatures
- some margin for new ideas
- end-of-fill triggers (typically for B-physics) activated at lower instantaneous luminosities where there is bandwidth available



ATLAS Collaboration, *The ATLAS Experiment at the CERN Large Hadron Collider*, 2008 JINST 3 S08003 1-407

Technical Design Report for the Phase-I Upgrade of the ATLAS TDAQ System, CERN-LHCC-2013-018