Run 2 Atlas Muon Trigger System

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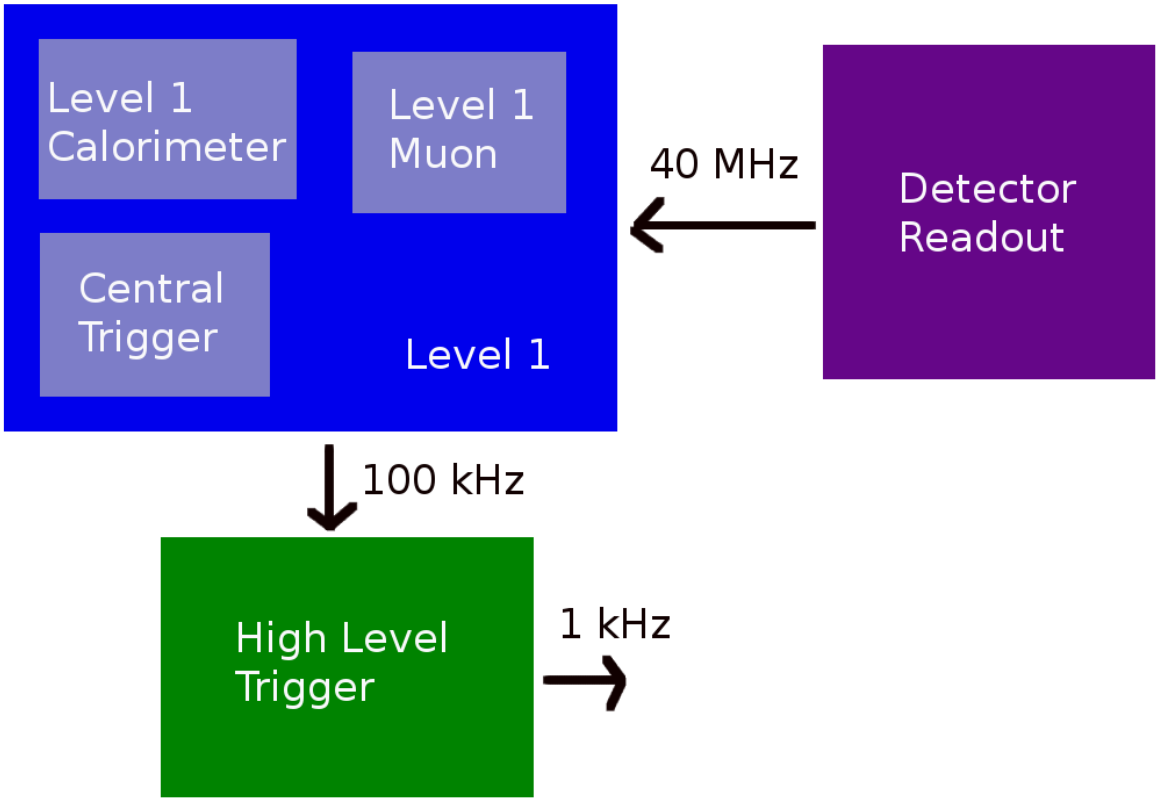
Overview

- Overview of Trigger system
- Improvements to Muon Trigger for Run 2
- 2015 Performance

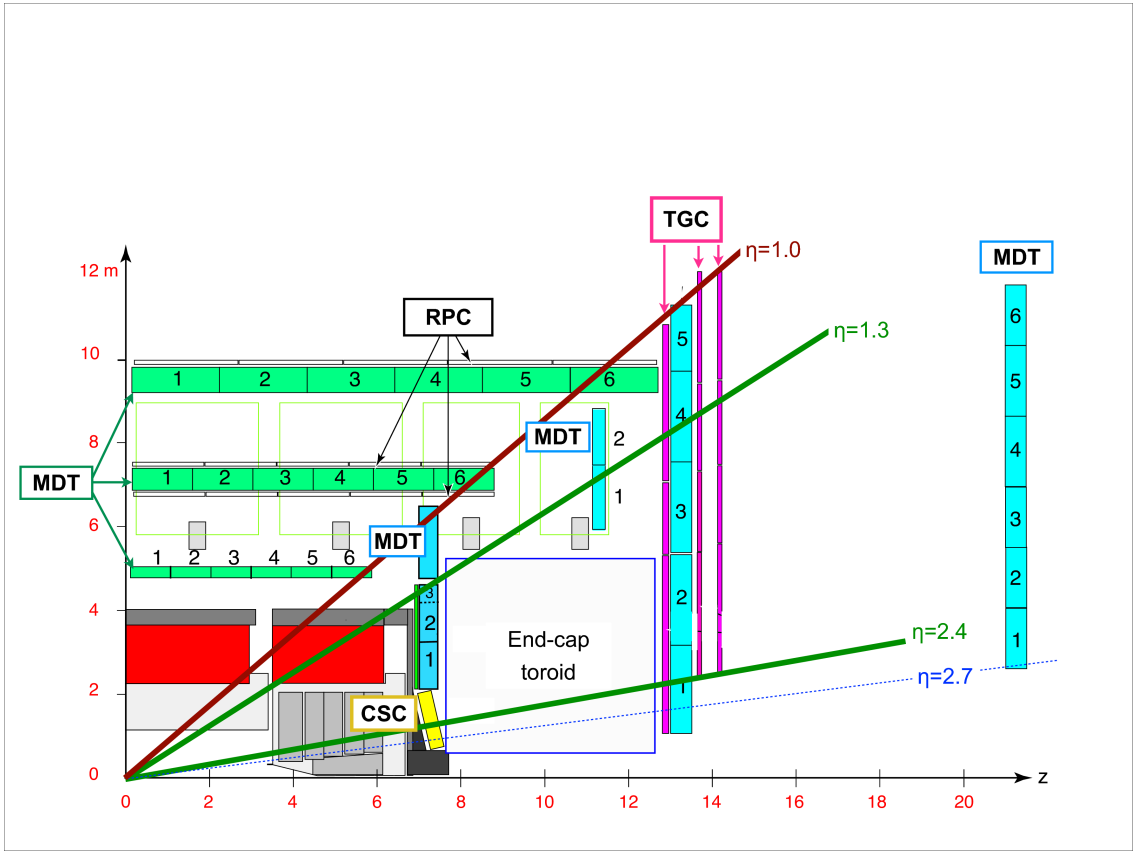
Introduction



	Center-of-Mass Energy	Bunch spacing	Instantaneous luminosity
Run-1	8 TeV	50 ns	$8 \times 10^{33}\ cm^{-2}s^{-1}$
Run-2	13 TeV	25 ns	$1 - 2 \times 10^{34}\ cm^{-2}s^{-1}$

ATLAS Muon System

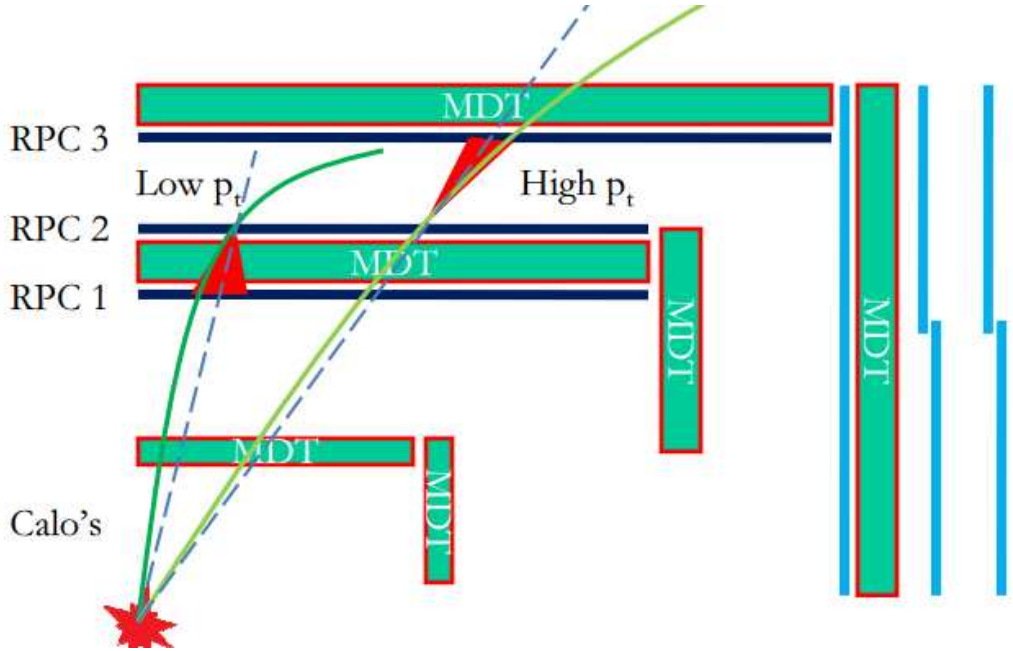
- Level 1 hardware based trigger provided by Resistive Plate Chambers (RPC) and Thin Gap Chambers (TGC).



- Monitored Drift Tubes (MDT) and Cathode Strip Chambers (CSC) provide more precise measurement used in high level trigger.

Level 1 (L1) Muon Trigger

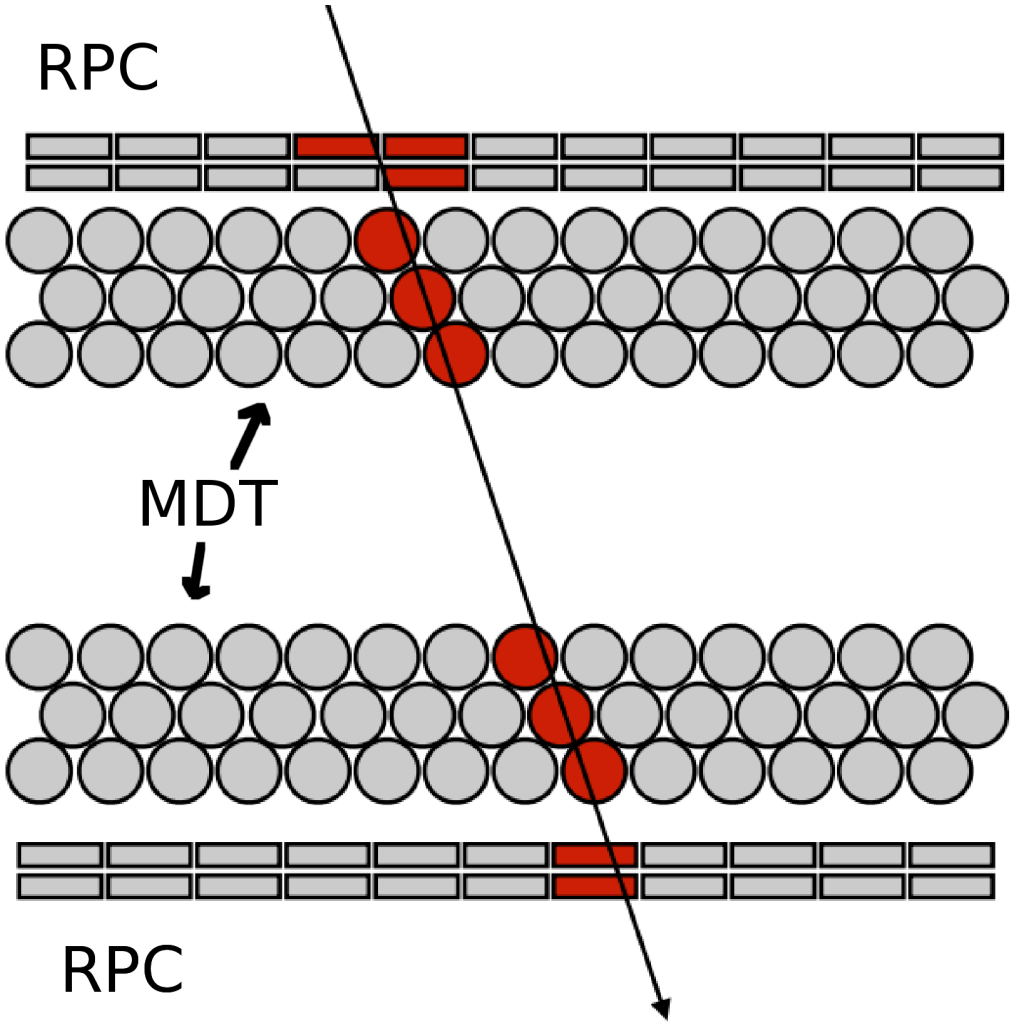
- Muons identified using coincidence of hits in either 2 or 3 layers of the RPC ($|\eta| < 1.05$) or the TGC ($1.0 < |\eta| < 2.4$).
- Momentum is estimated from how much the hit pattern deviates from the expected pattern for a muon with infinite momentum.



Muon High Level Trigger (HLT)

- Software based HLT to reconstruct muons with high precision.
  - Includes a first pass with a fast hits-on-road approach to further reduce rate, followed by a more precise full reconstruction.

Muon Reconstruction Overview



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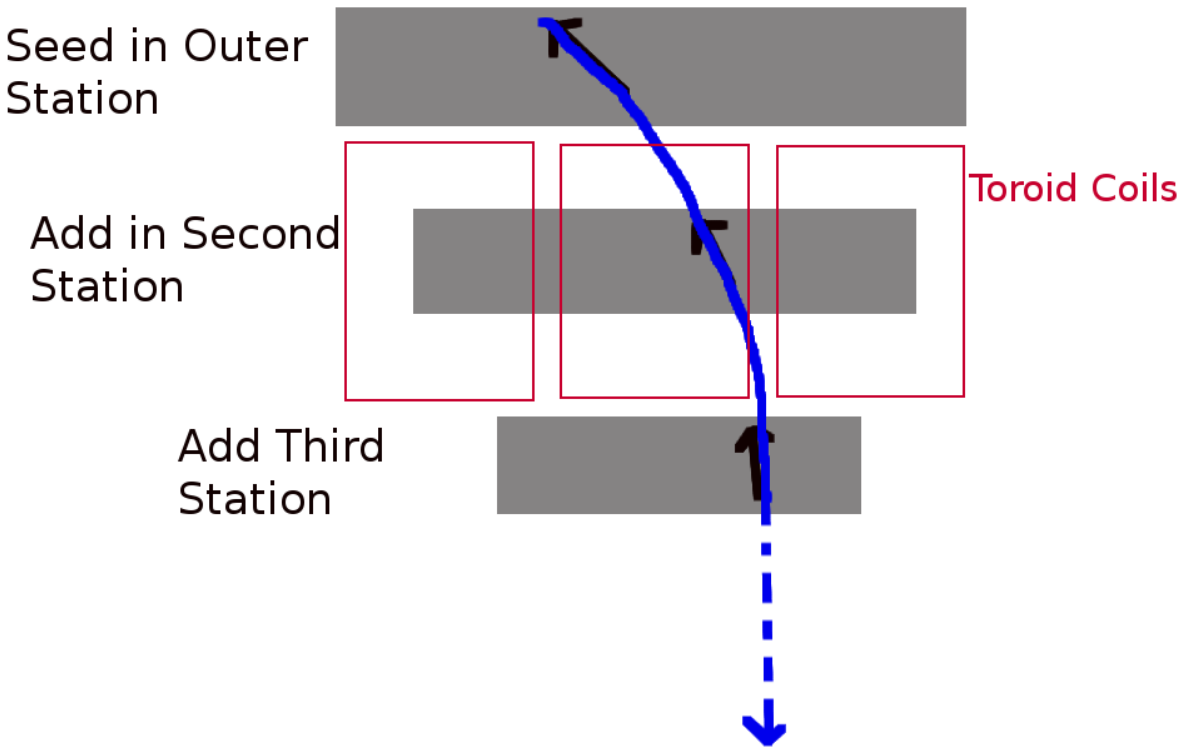

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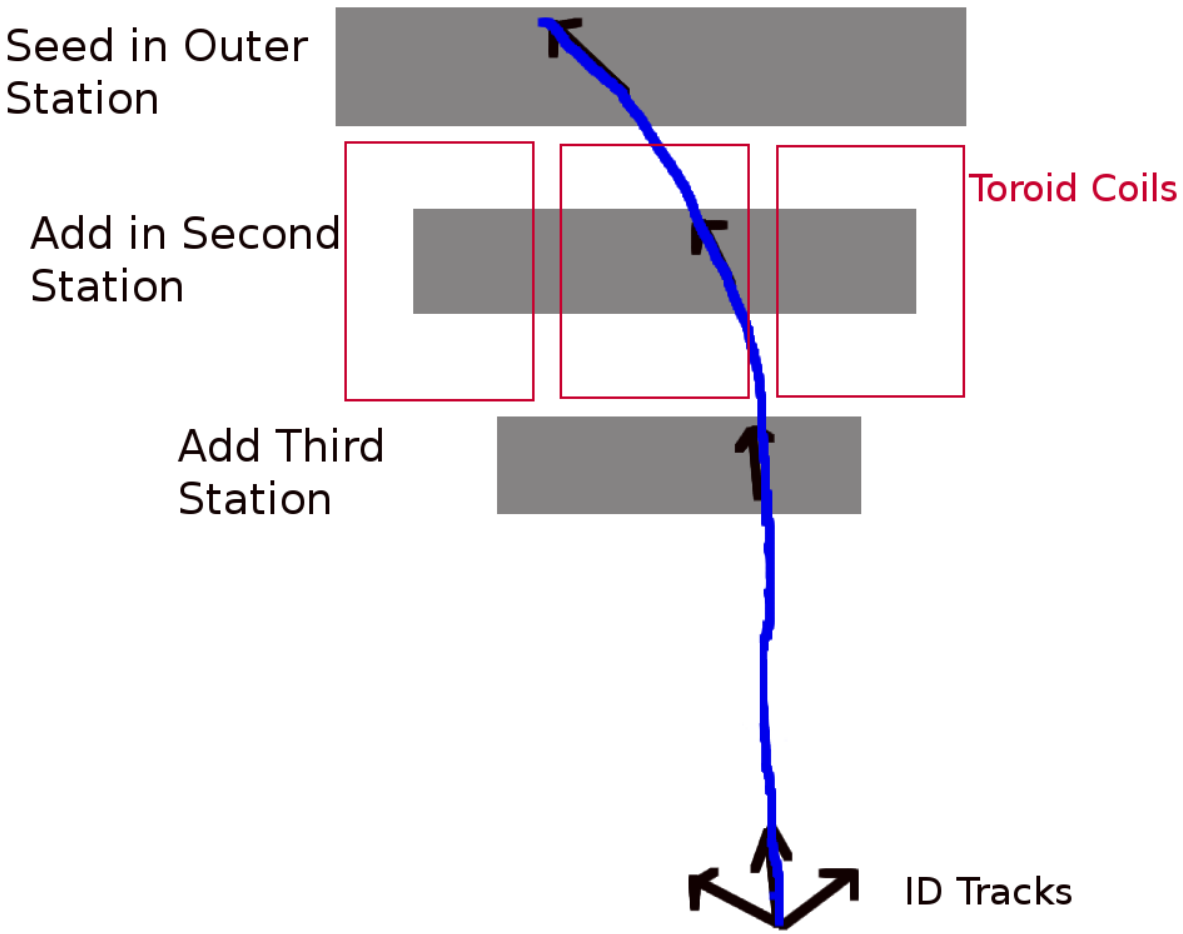

Improvements for Run 2

- HLT algorithms closer to offline reconstruction algorithms for increased acceptance in physics analyses.
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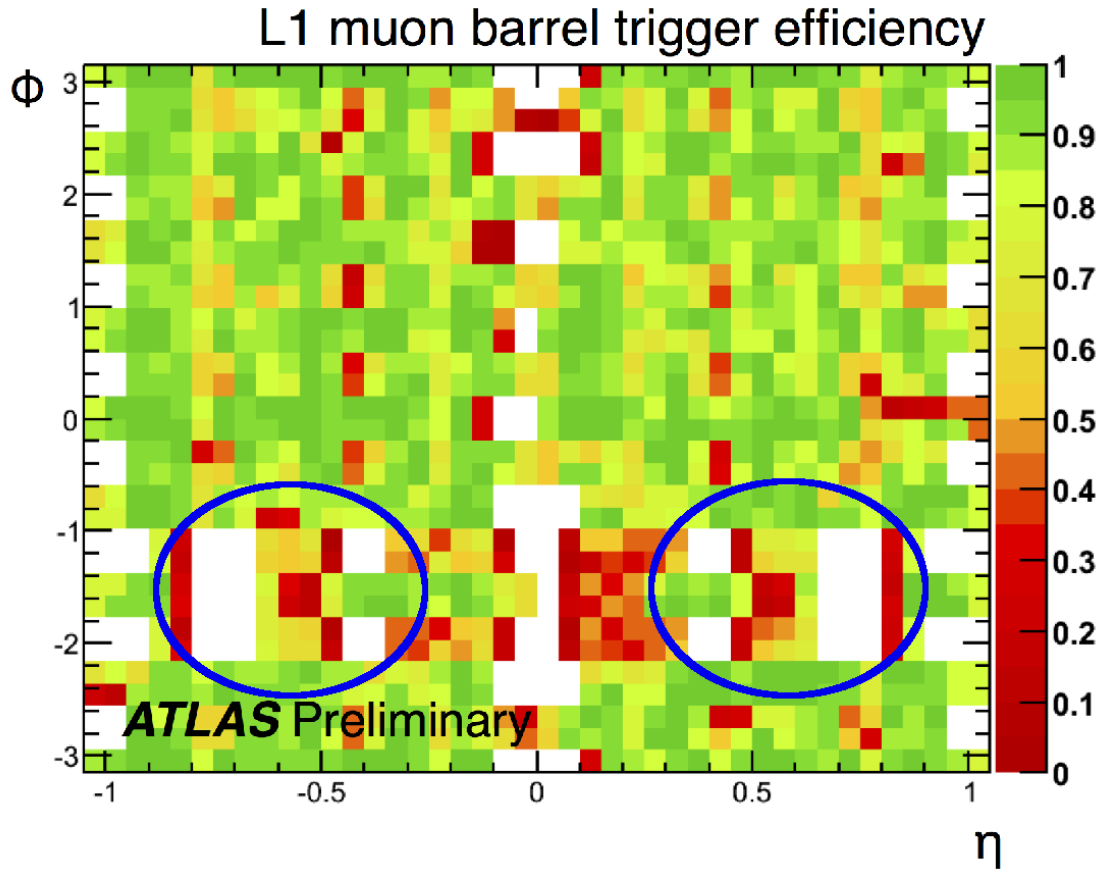
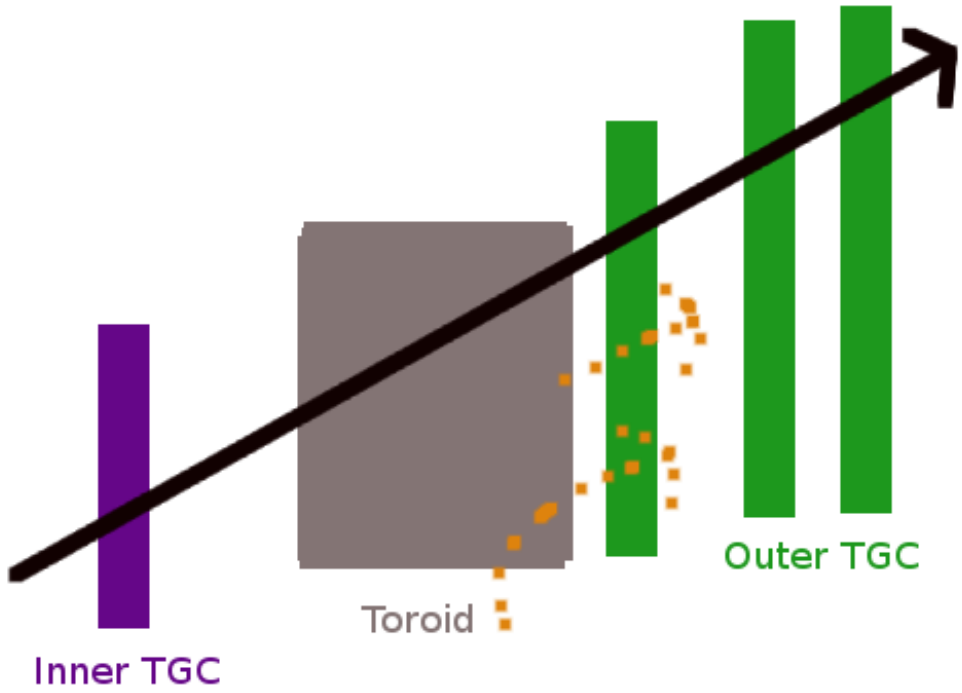
- New RPC chambers to increase coverage.



Improvements for Run 2

- HLT algorithms closer to offline reconstruction algorithms for higher efficiency.
- New RPC chambers to increase coverage.
- New coincidence logic between inner and outer TGC detectors.



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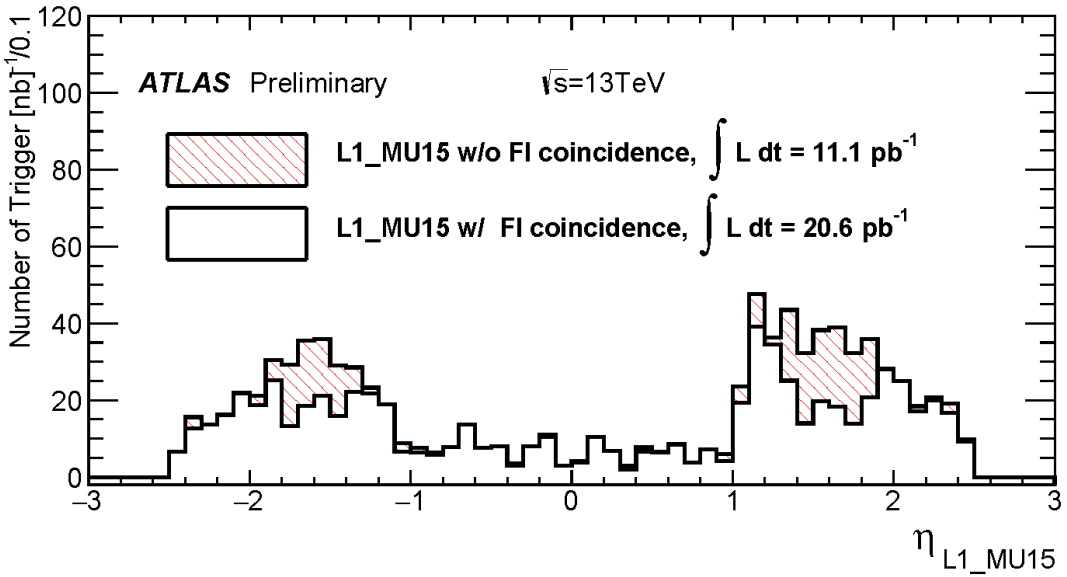

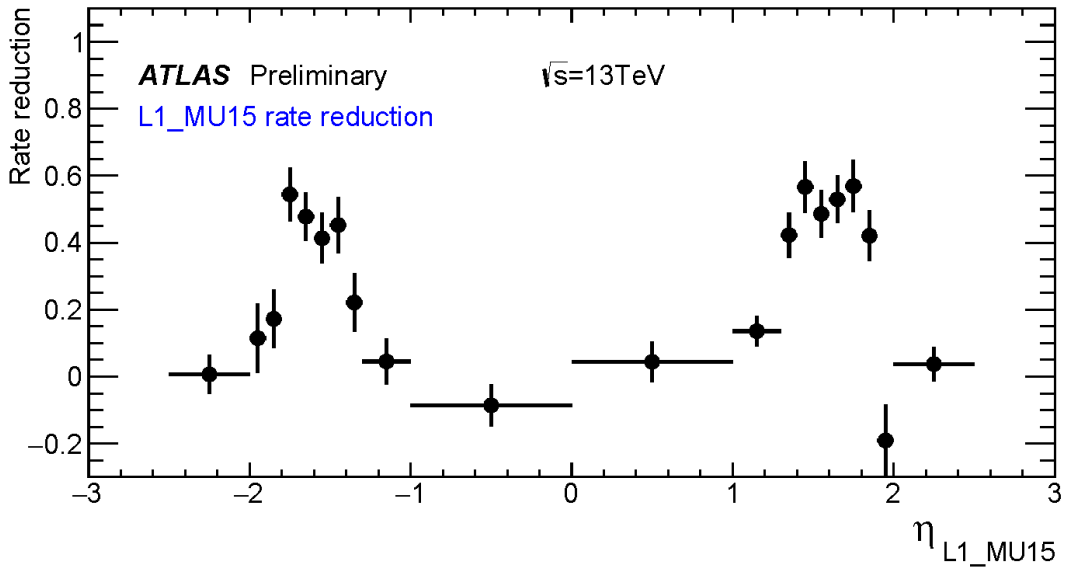

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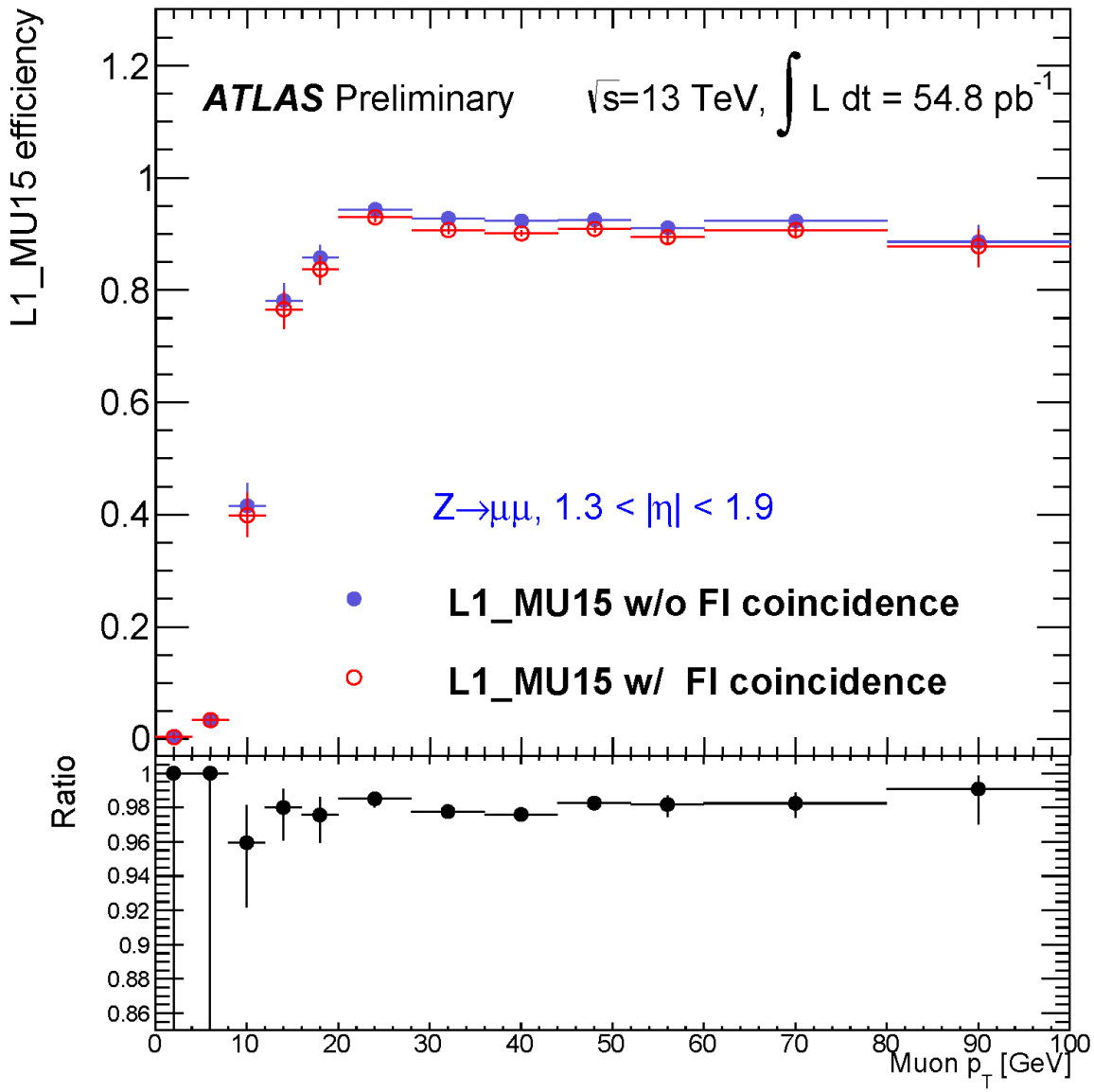
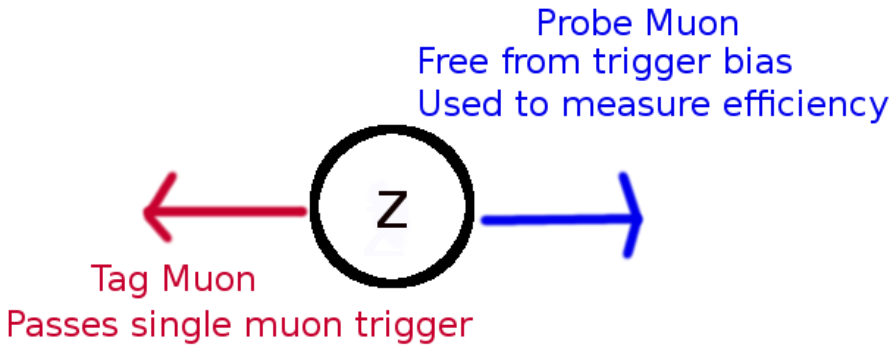


2015 Performance

- Efficiency measured using tag and probe method.



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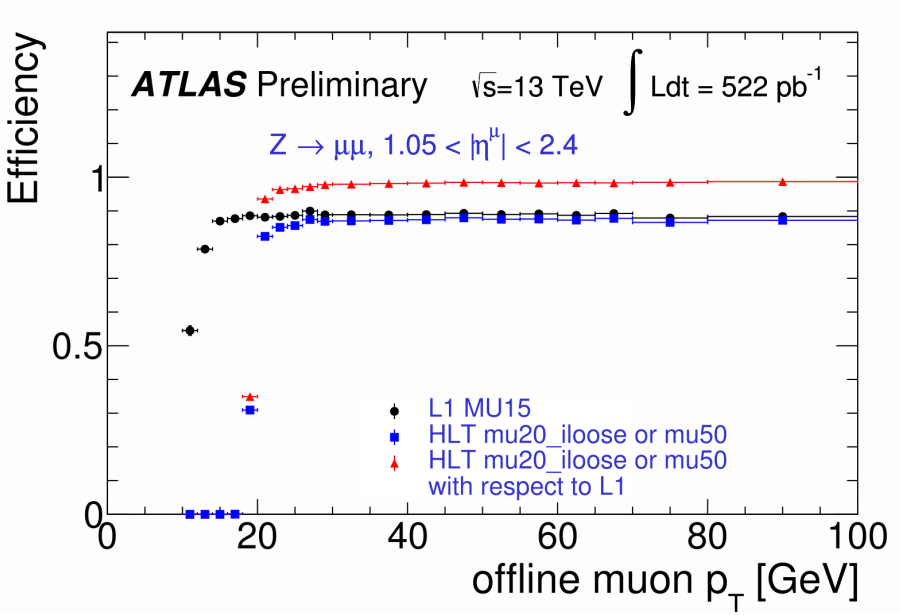
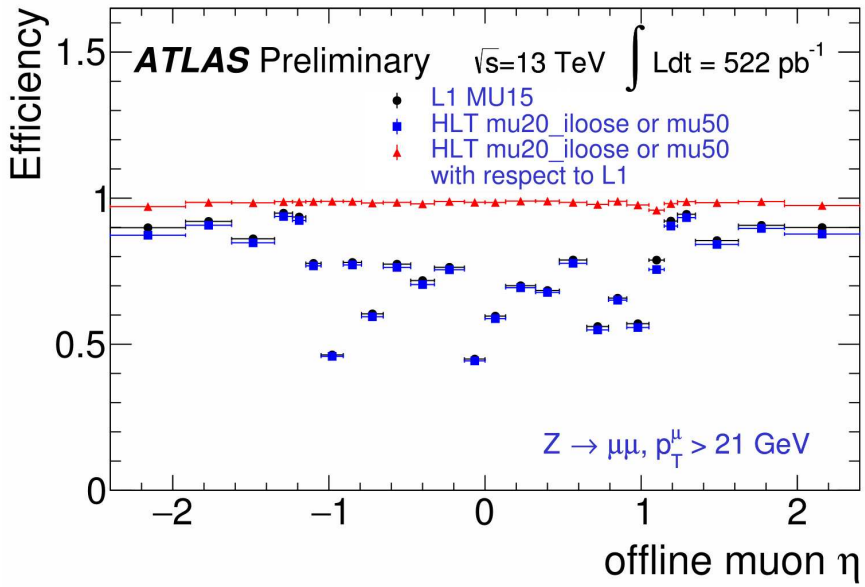


(a) Efficiency vs p_T



(b) Efficiency vs η

Summary

- Muon trigger upgraded for Run 2.
  - Improved coverage, improved rejection of fake muons, faster algorithms.
- Maintained high performance in 2015.
- Continued high effort in place to ensure smooth running in 2016.