L1 Muon Trigger Rates at Low Luminosity \((L=2\times10^{33} \text{ cm}^{-2} \text{ s}^{-1})\)

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URL of this presentation:
November 2001 re-processing of 2001 muon production (low luminosity $L=2 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$)

Single muon trigger rates

November 2001 Global Muon Trigger re-tuning

Di-muon trigger rates

Combined single and di-muon trigger rates

- symmetric di-muon thresholds
- asymmetric di-muon thresholds
Re-processing of 2001 Production

- Monte Carlo production (Pythia 6.152, CMSIM 121)
  - using Pythia default normalization
  - lower $p_T$-cut (p-cut) in forward region (now $p > 3.5$ GeV/c, in 2000: $p_T > 1.5$ GeV/c)
  - increased $\eta$-range up to in CMSIM (now 5.5, in 2000: 2.5)
  - muons in pile-up vetoed
  - LHC luminosity $L = 2 \times 10^{33}$ cm$^{-2}$s$^{-1}$
  - new (Nov 2001): increased statistics

- L1 Trigger simulation (ORCA 5.3.1)
  - new CSC Trigger Primitives (since ORCA 5.1.2)
  - updated CSC Track Finder (since ORCA 5.1.2)
  - updated Global Muon Trigger (since ORCA 5.1.2)
  - new with respect to last processing
    - DT re-digitized, updates in CSC Trigger and CSC Track Finder
  - RPC: without noise and neutral background simulation

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Sample | $L_{\text{int}} / \text{nb}^{-1}$ | Events in luminosity
---|---|---
mu_MB1mu_pt1 | 0.0247 | 231k (x1.5)
mu_MB1mu_pt4 | 0.4071 | 107k (x2)
mu_MB1mu_pt10 | 2.81 | 41k
W_1mu | 2856. | 43k
Z_1mu | 2336. | 50k
mu_MB2mu | 0.2935 | 32k (x3)

background samples – 2001 muon production
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L1 Muon Trigger Rates at Low Luminosity (L=2x 10^33 cm^{-2} s^{-1})

Generated rates

~200 Hz in year 2000 production (scaled to L=2x10^{33})
L1 single muon trigger rates
samples: pt1, pt4, pt10, W, Z

whole detector: $0 < |\eta| < 2.5$

75 kHz DAQ
5.5 kHz
@ 12 GeV/c
Scaled from TDR: 10.6 kHz

50 kHz DAQ
3.5 kHz
@ 14 GeV/c
Scaled from TDR: 7.1 kHz

25 kHz DAQ
1.55 kHz
@ 20 GeV/c
Scaled from TDR: 2.9 kHz

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L1 Muon Trigger Rates at Low Luminosity (L=2x 10^{33} cm^{-2} s^{-1})

Nov 2001 Re-tuning of GMT algorithm

L1 single muon trigger rates (p_T > 16 GeV/c)

GMT Sep2001 tune

GMT Nov2001 tune

eff = 96.5 %

eff = 96.9 %

(*) efficiency to find muon of any p_T in flat p_T sample
L1 di-muon trigger rates
samples: pt1, pt4, pt10, 2mu_pt1, GMT Nov 2001 tune

trigger rates in Hz

plots of muon p_{T2} (GeV/c) as a function of muon p_{T1} (GeV/c) for different thresholds.
L1 di-muon trigger rates, $p_{T,2} \geq 4$ GeV/c
samples: pt1, pt4, pt10, 2mu_pt1, GMT Nov 2001 tune

Di-muon Rates - $p_{T,2} \geq 4$ GeV/c

- Gen
- DT + CSC
- CSC
- RPC
- GMT
- GMT from ghosts
- GMT 2 $\mu$ from 1 event
- GMT 2 $\mu$ from 2 events in 1 bx

L1 Muon Trigger Rates at Low Luminosity (L=2x $10^{33}$ cm$^{-2}$ s$^{-1}$)
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L1 single & di-muon trigger rates
symmetric di-muon cut, GMT Nov 2001 tune

L1 single and di-muon trigger rates

trigger rates in kHz

binning

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L1 Muon Trigger Rates at Low Luminosity (L=2x 10^{33} cm^{-2} s^{-1})
L1 single and di-muon trigger rates, lower di-muon cut: 3.0 GeV/c

trigger rates in kHz

lower threshold 3 GeV/c

binning

L1 Muon Trigger Rates at Low Luminosity (L=2x10^{33} cm^{-2} s^{-1})
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L1 single & di-muon trigger rates  
asymmetric di-muon cut, GMT Nov 2001 tune

L1 single and di-muon trigger rates, lower di-muon cut: 4.0 GeV/c

trigger rates in kHz

Binning

L1 Muon Trigger Rates at Low Luminosity (L=2x10^{33} cm^{-2} s^{-1})
L1 single and di-muon trigger rates, lower di-muon cut: 5.0 GeV/c

trigger rates in kHz

L1 single and di-muon trigger rates, lower di-muon cut: 5.0 GeV/c

upper di-muon $p_T^{cut}$ GeV/c

6.0
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0

lower threshold 5 GeV/c

binning

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Conclusion

- Increased Statistics of Muon 2001 production
- Samples re-processed with ORCA 5.3.1
- GMT re-tuned
  - more efficiency in overlap region
  - approximately same rate
- Updated L1 Results for L=2x10^{33} cm^{-2} s^{-1}
  - single muon trigger rates
  - di-muon trigger rates
  - combined single- and di-muon rates with symmetric and asymmetric cuts