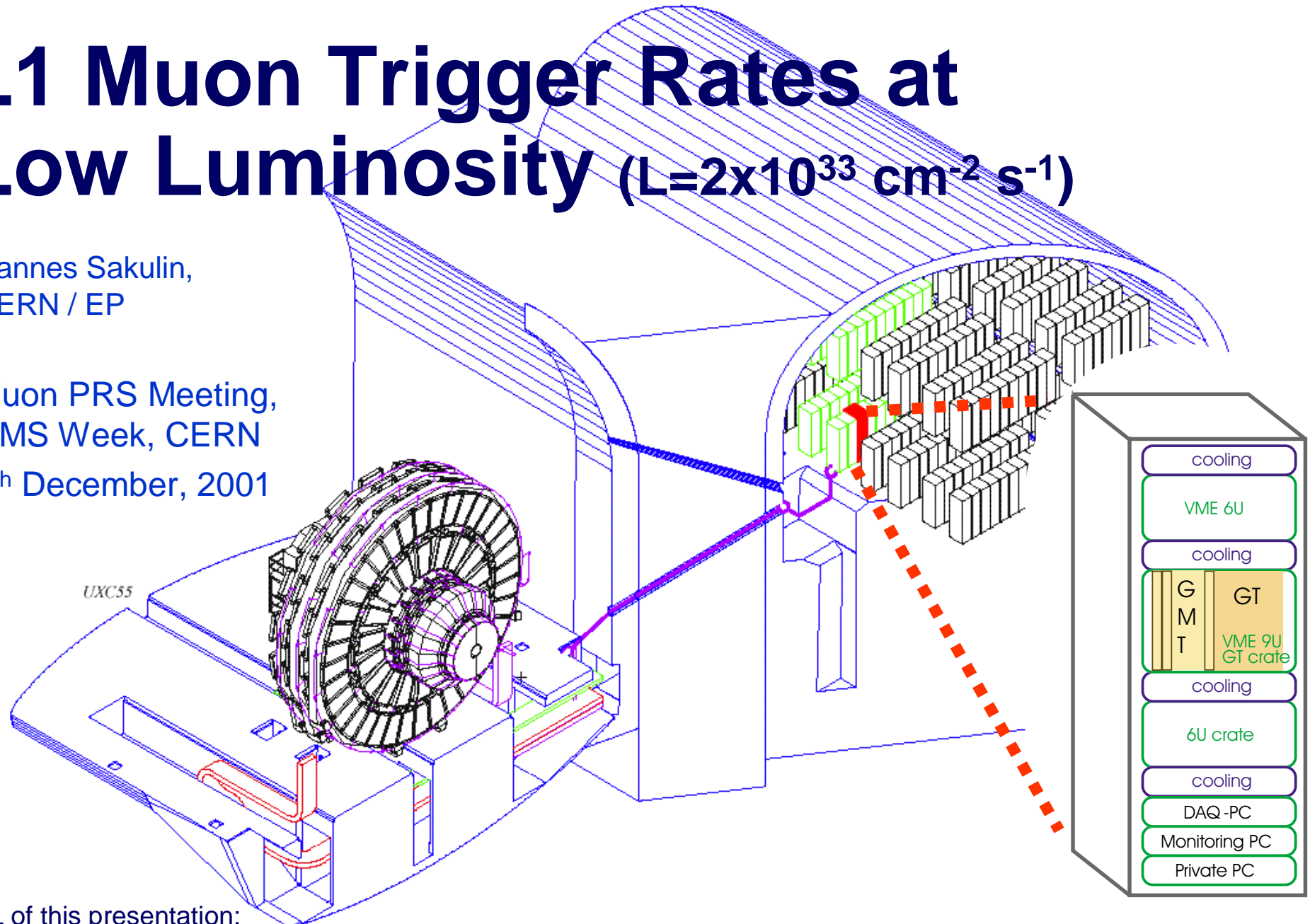


L1 Muon Trigger Rates at Low Luminosity ($L=2 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$)

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CERN / EP

Muon PRS Meeting,
CMS Week, CERN
4th December, 2001



URL of this presentation:

<http://wwwhephy.oeaw.ac.at/p3w/cms/trigger/globalMuonTrigger/trans/L1Mu-PRSmu04Dec2001.pdf>



Outline



- 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 η -range up to in CMSIM (now 5.5, in **2000**: 2.5)
- ⇒ muons in pile-up vetoed
- ⇒ LHC luminosity $L = 2 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$
- ⇒ **new** (Nov 2001): **increased statistics**

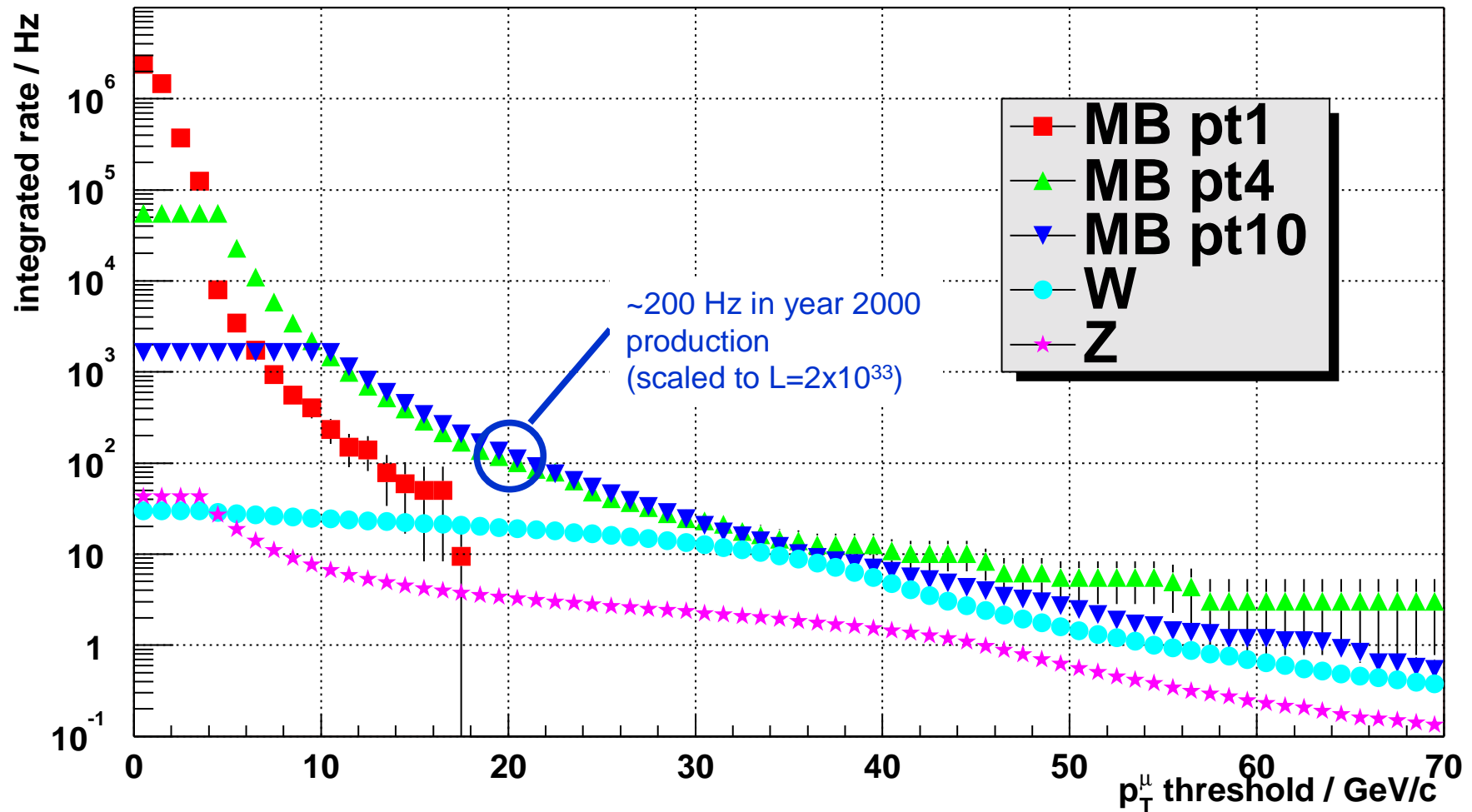
Sample	$L_{\text{int}} / \text{nb}^{-1}$	Events in luminosity
mu_MB1mu_pt1	0.0247	231k (x1.5)
mu_MB1mu_pt4	0.4071	107k (x2)
mu_MB1mu_pt10	2.81	41k
W_1mu	2856.	43k
Z_1mu	2336.	50k
mu_MB2mu	0.2935	32k (x3)

background samples – 2001 muon production

➤ 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

generated rates



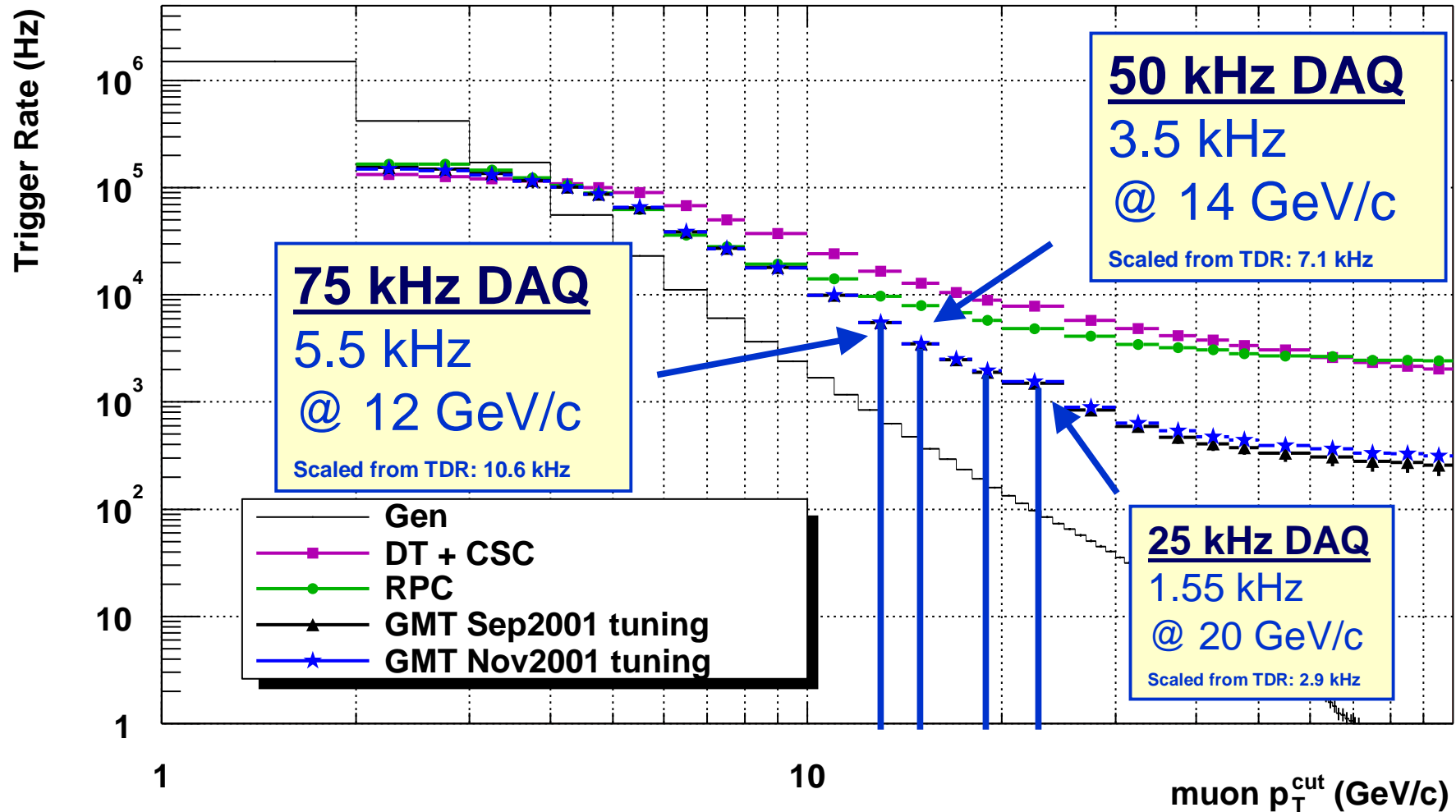


L1 single muon trigger rates

samples: pt1, pt4, pt10, W, Z



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





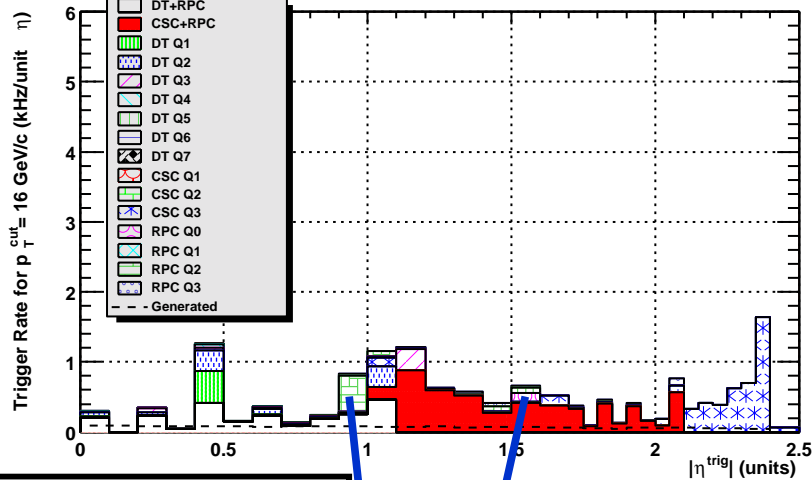
Nov 2001 Re-tuning of GMT algorithm



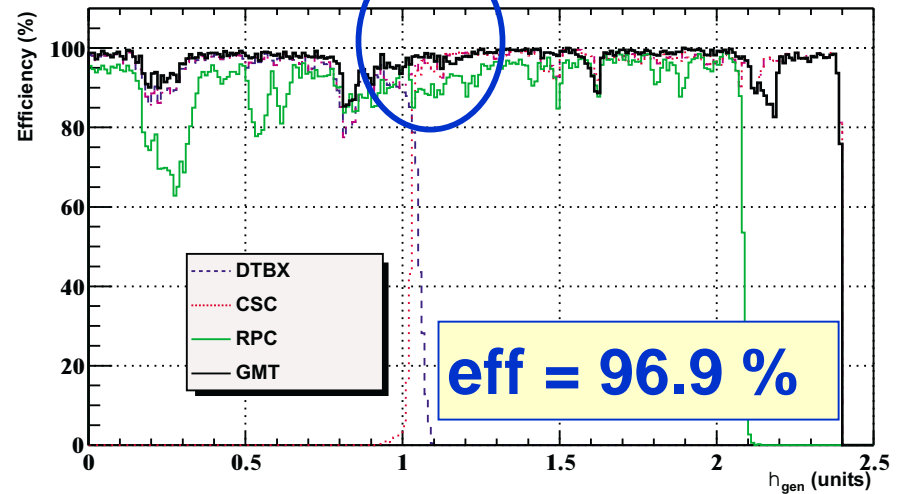
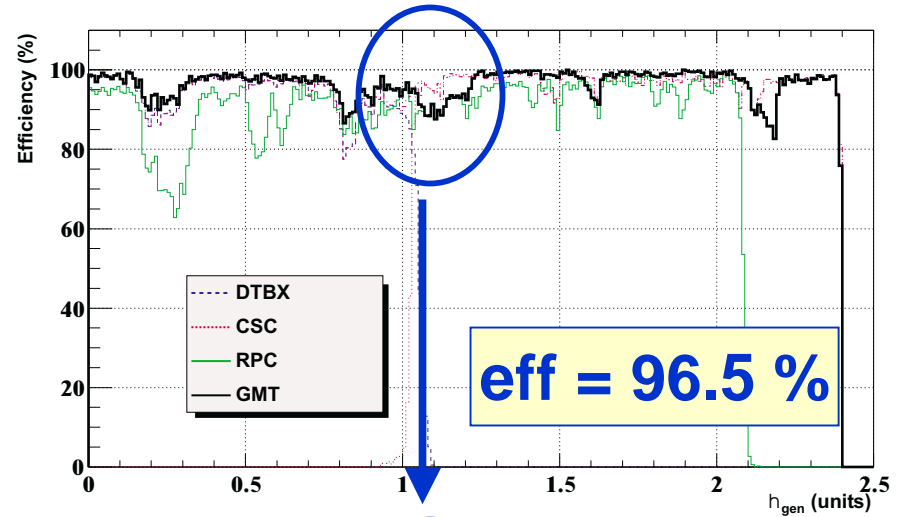
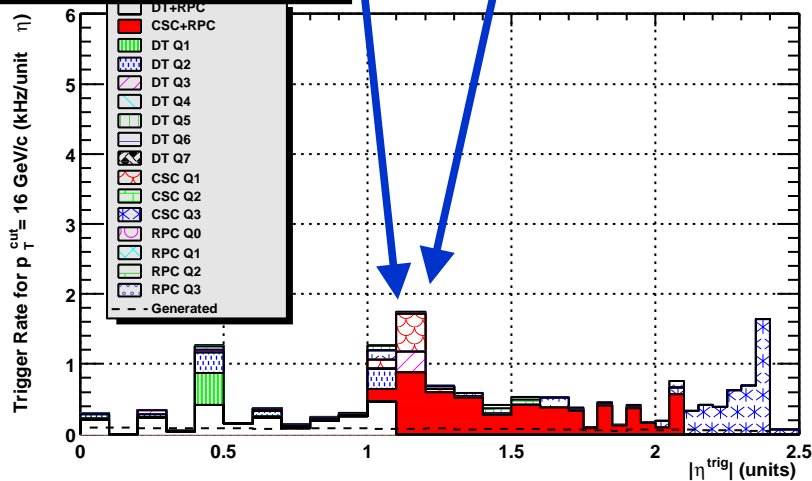
L1 single muon trigger rates ($p_T > 16$ GeV/c)

L1 efficiency

GMT Sep2001 tune



GMT Nov2001 tune



$\eta \longrightarrow$ (*)efficiency to find muon of any p_T in flat p_T sample

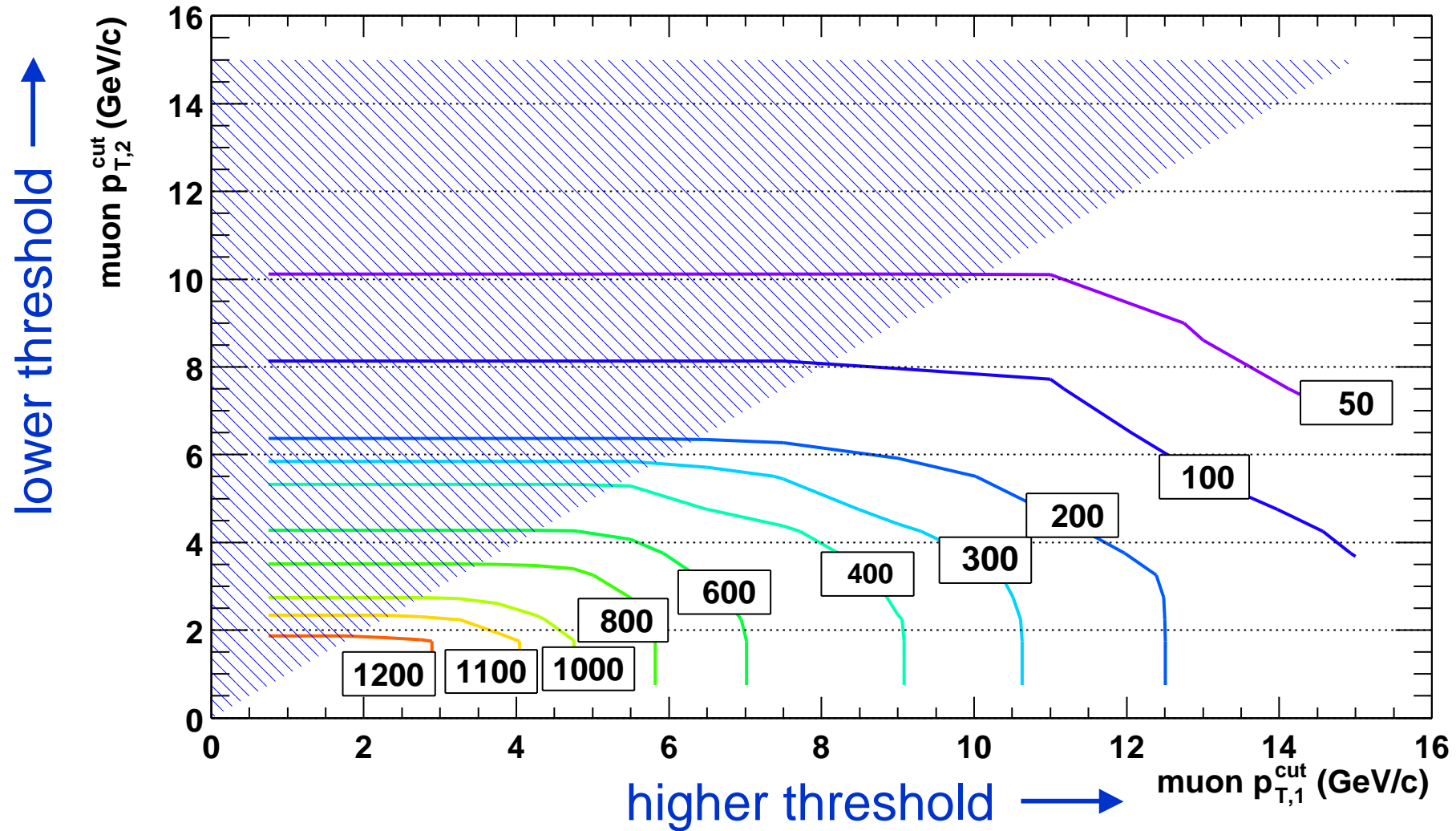


L1 di-muon trigger rates

samples: pt1, pt4, pt10, 2mu_pt1, GMT Nov 2001 tune



trigger rates in Hz



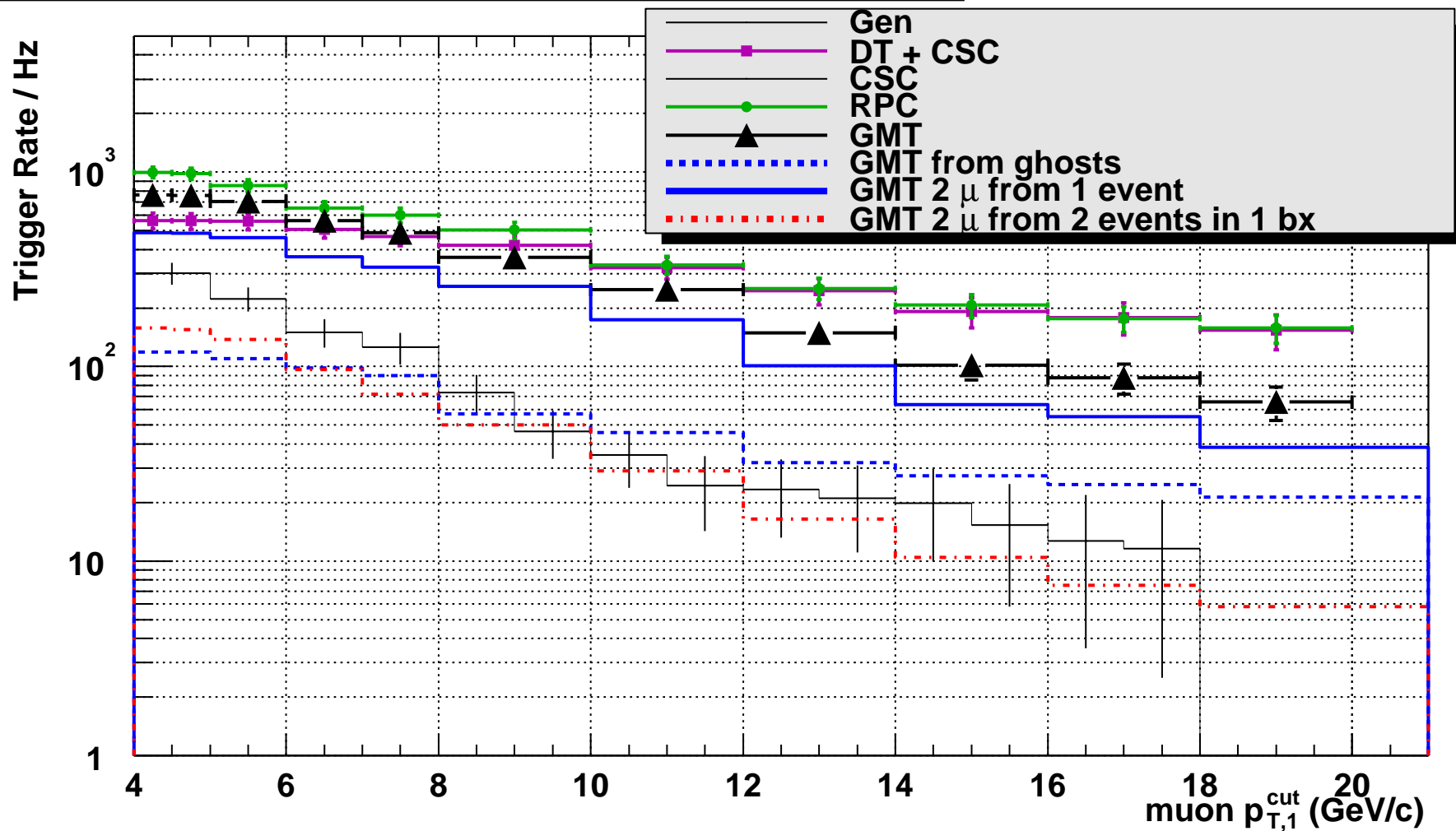


L1 di-muon trigger rates, $p_{T,2} \geq 4 \text{ GeV}/c$

samples: pt1, pt4, pt10, 2mu_pt1, GMT Nov 2001 tune



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





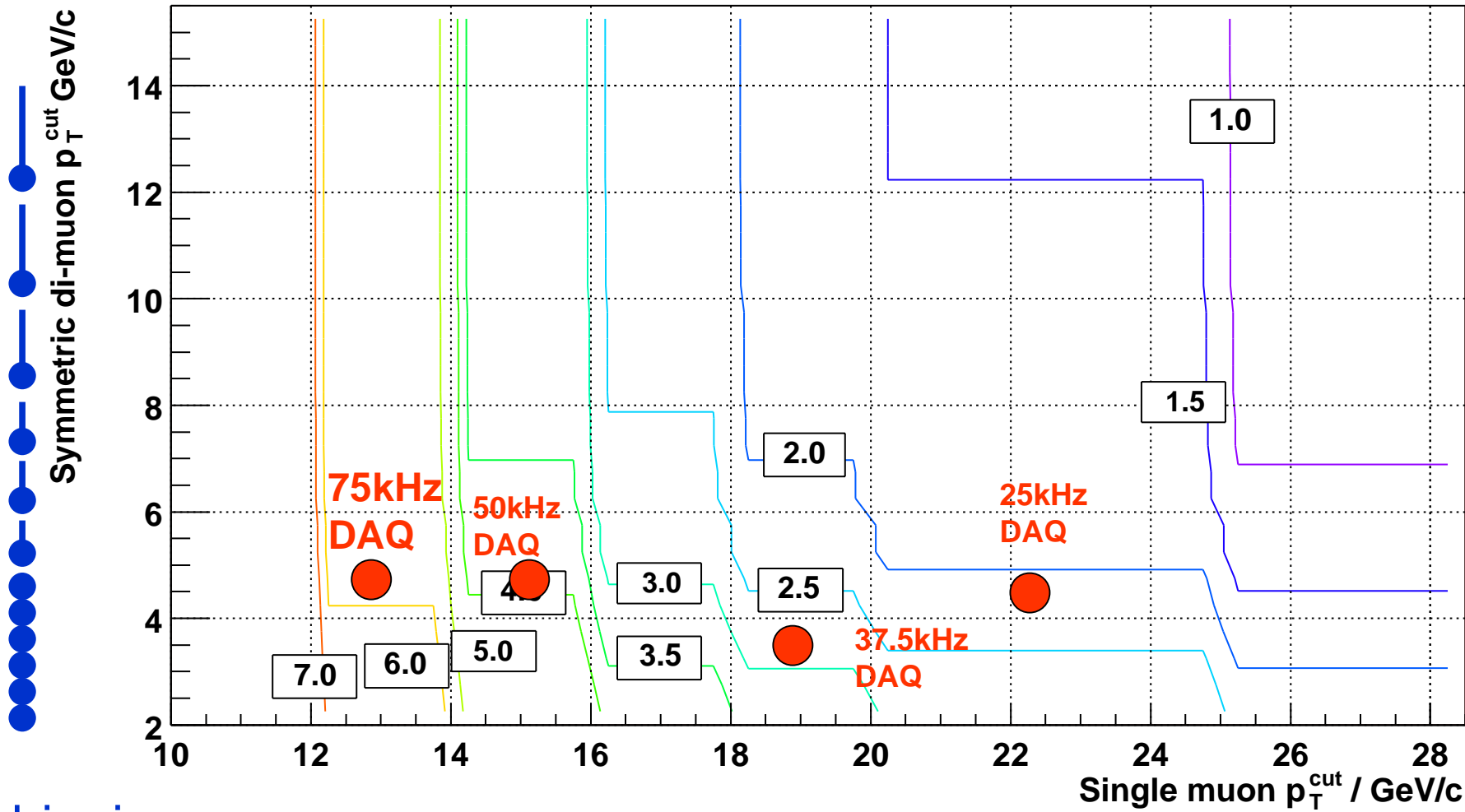
L1 single & di-muon trigger rates

symmetric di-muon cut, GMT Nov 2001 tune



L1 single and di-muon trigger rates

trigger rates in kHz



binning





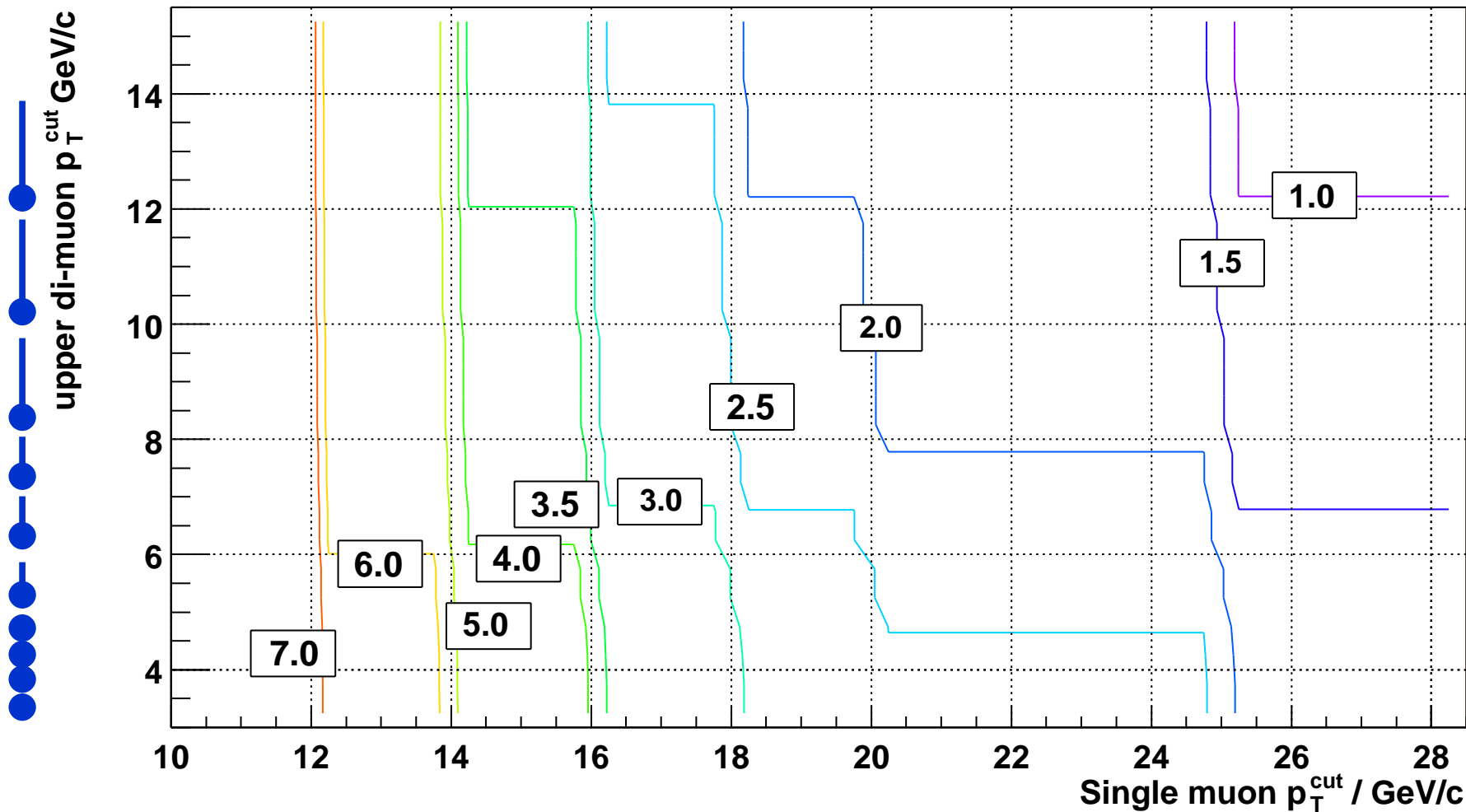
L1 single & di-muon trigger rates

asymmetric di-muon cut, GMT Nov 2001 tune



L1 single and di-muon trigger rates, lower di-muon cut: 3.0 GeV/c

trigger rates in kHz



binning



lower threshold 3 GeV/c



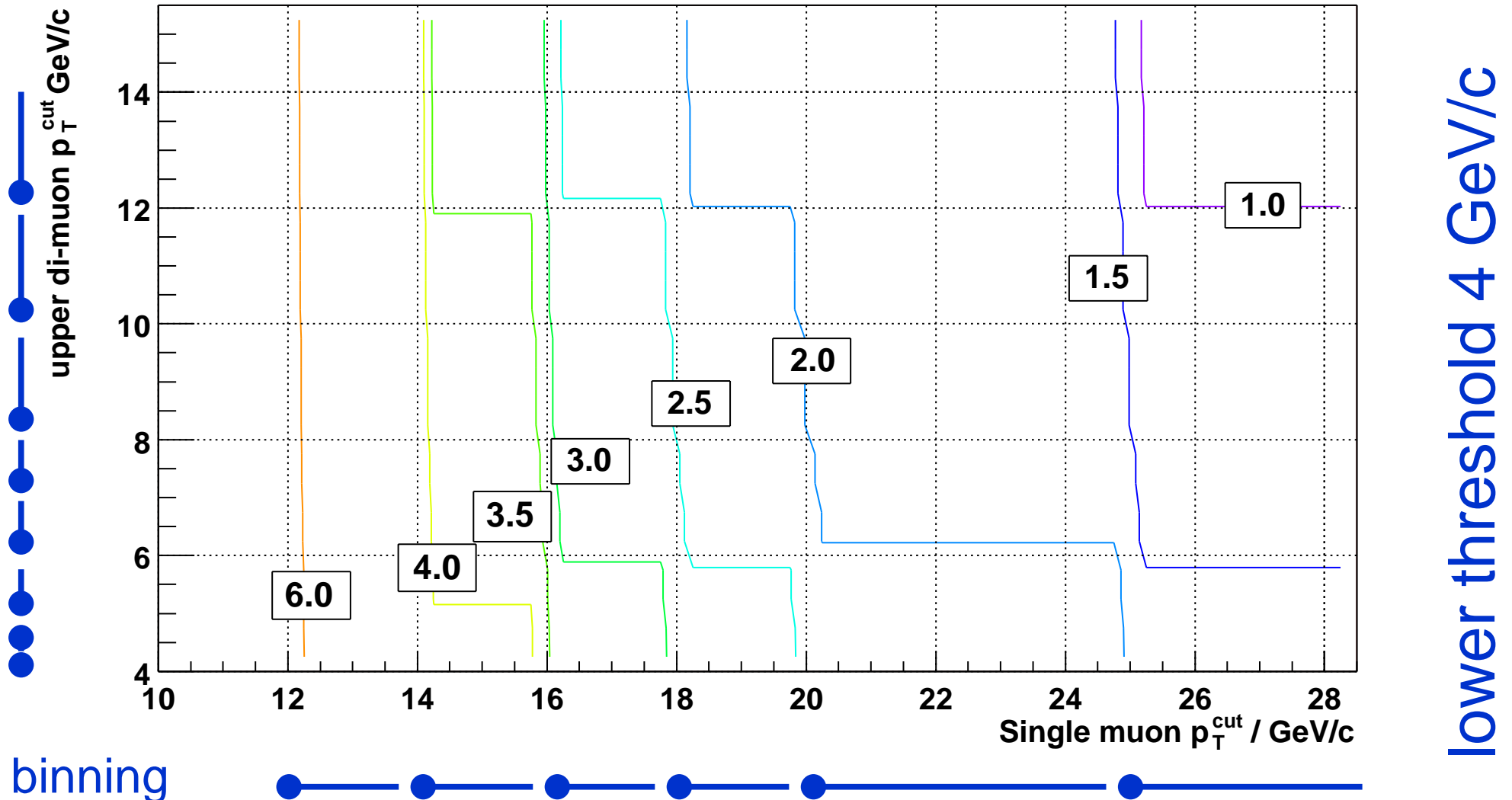
L1 single & di-muon trigger rates

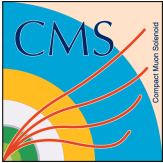
asymmetric di-muon cut, GMT Nov 2001 tune



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

trigger rates in kHz





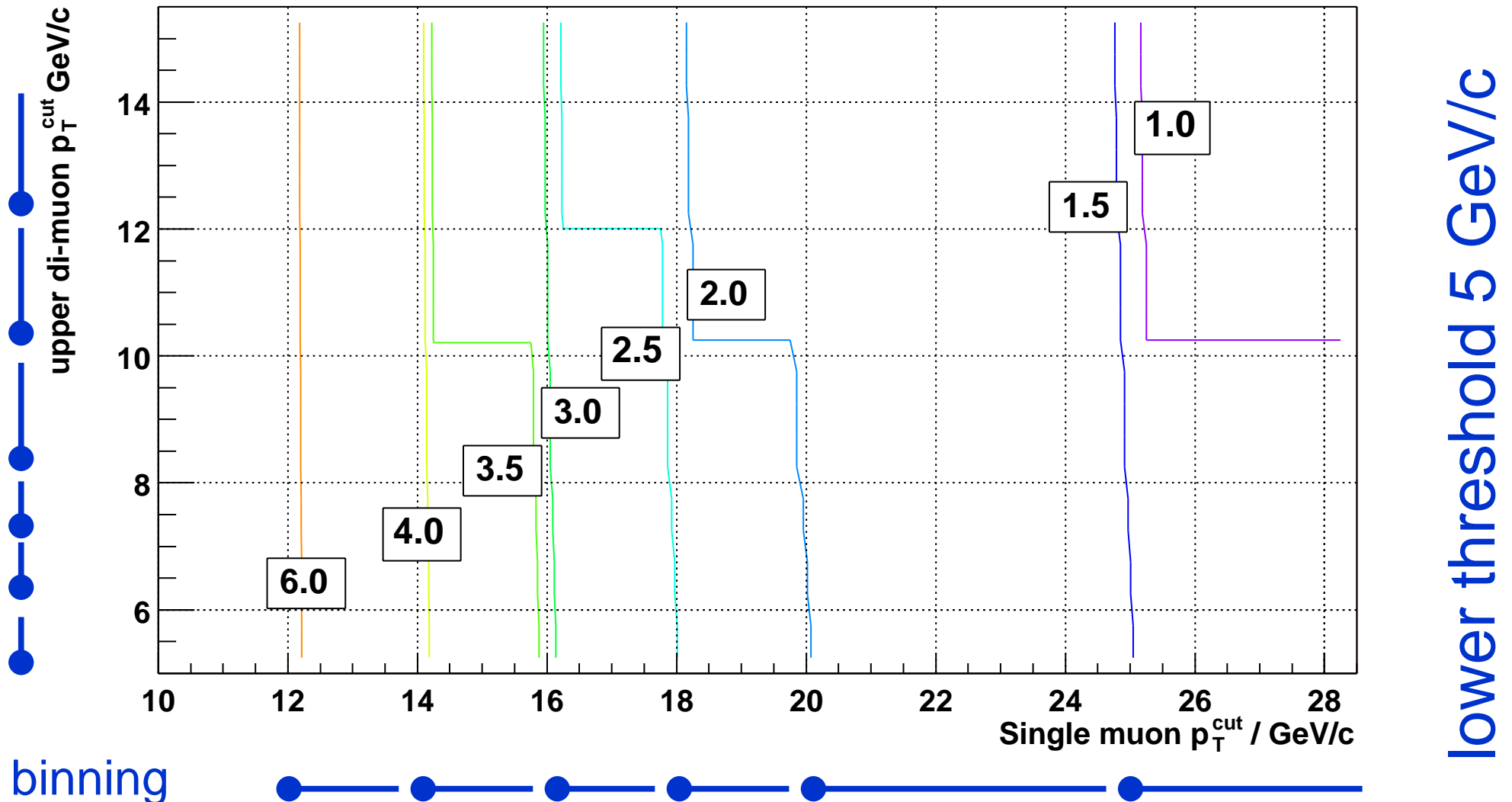
L1 single & di-muon trigger rates

asymmetric di-muon cut, GMT Nov 2001 tune



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

trigger rates in kHz





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 $L=2 \times 10^{33} \text{ cm}^{-2} \text{ s}^{-1}$
 - ⇒ single muon trigger rates
 - ⇒ di-muon trigger rates
 - ⇒ combined single- and di-muon rates with symmetric and asymmetric cuts