



# Updated Study on the Effect of Backgrounds on the L1 CSC Trigger

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# Unbiased Background Studies

In order to ascertain the effects of punch-through, pile-up, and neutrons, the following was done:

Created an unweighted minimum bias DB

- 130K events generated in Florida
- Pythia6 generation with same parameters as Y2K production
- CMSIM 121 hit generation

Created a “signal” sample of neutron background hits

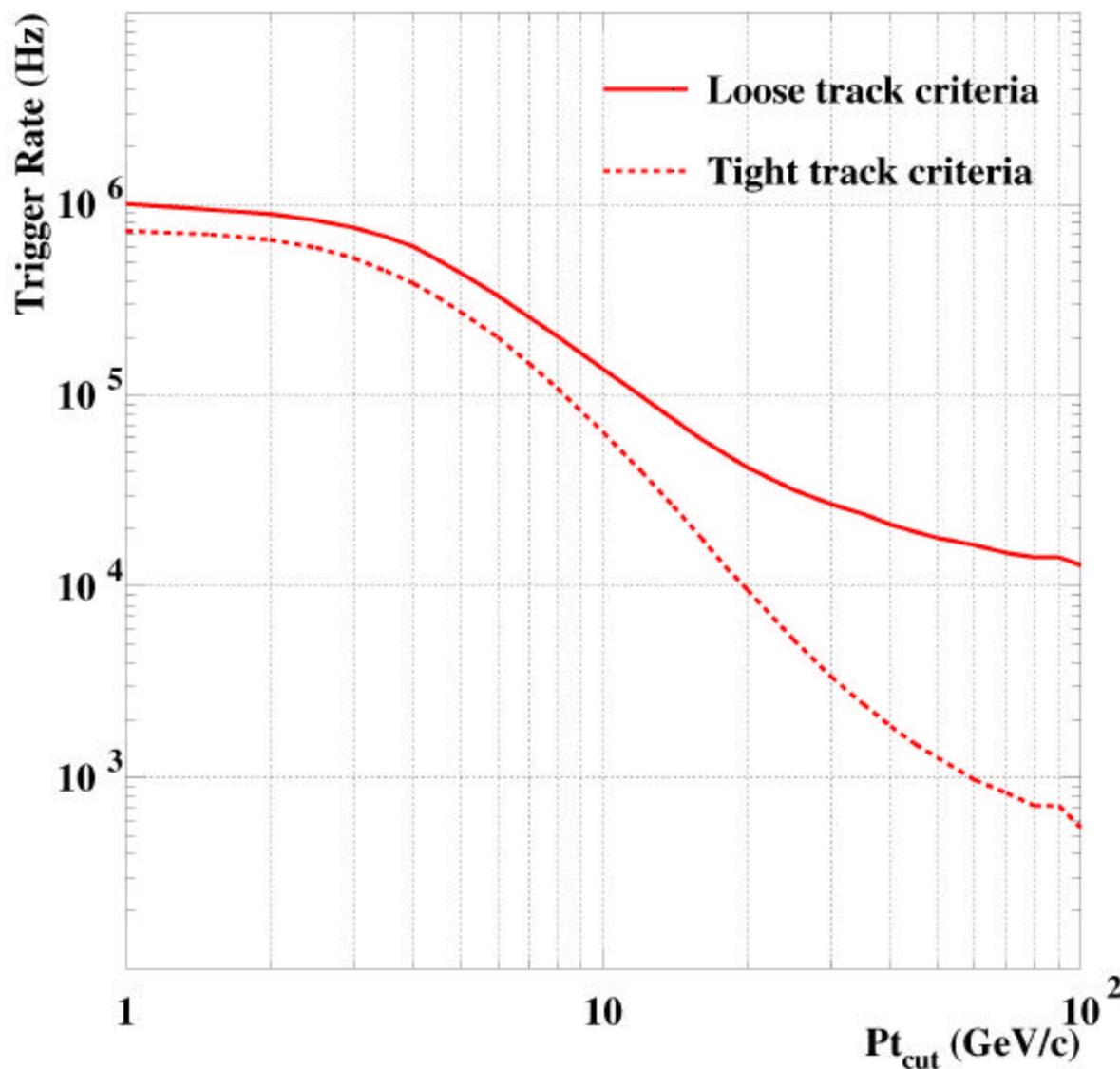
- *Includes* Tim’s bug fix to the neutron parameterization in CMSIM

Analyzed samples in ORCA\_4\_4\_0

- Piled-up 17.3 min bias events in *current* beam crossing only
- Used ORCA\_4\_5\_0 release of L1CSC trigger simulation



# L1 CSC Trigger Rate (weighted)

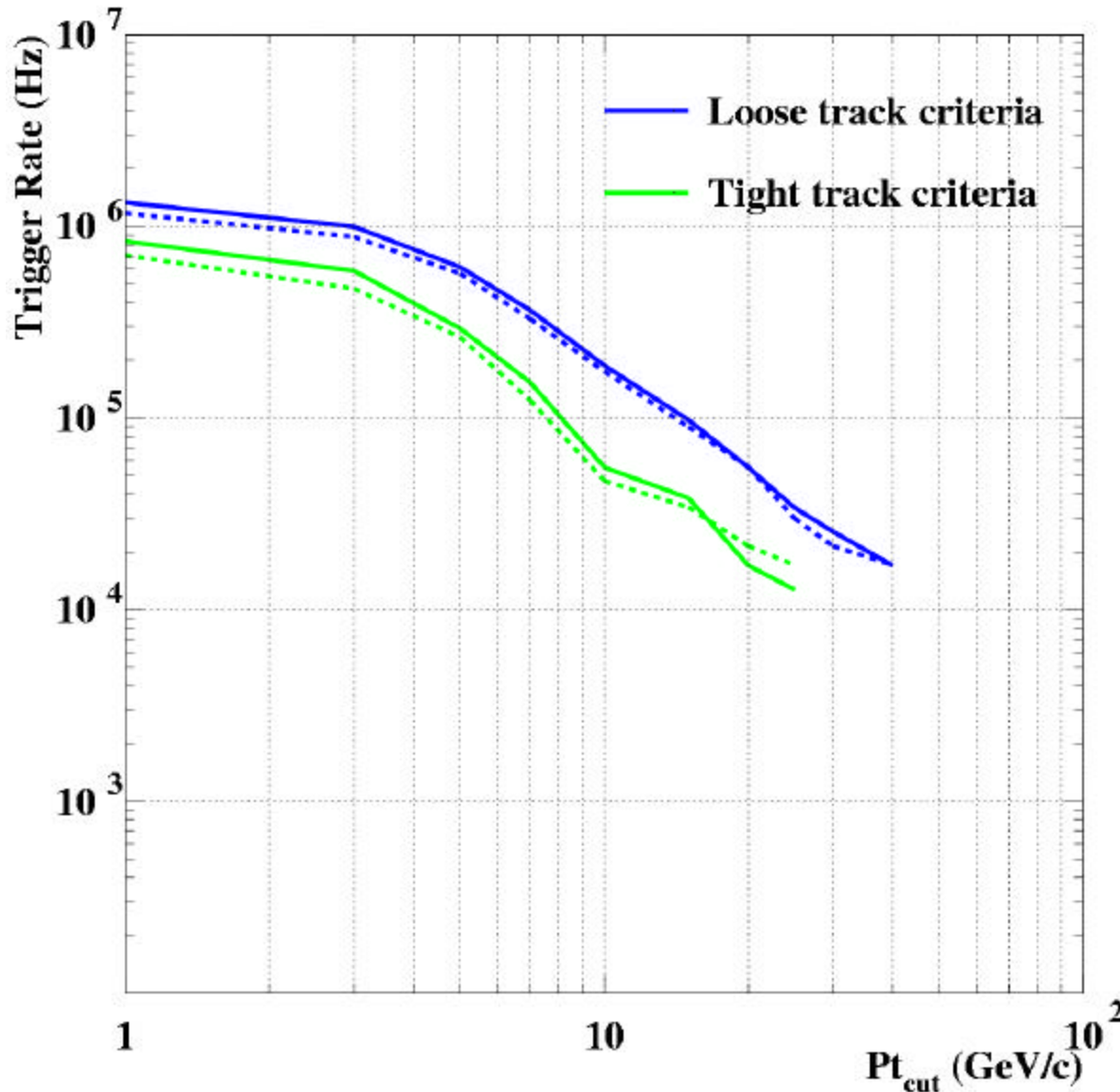


→ Single muon rate only

→ From weighted ORCA\_4\_3\_2 samples used for L1 TDR



# Unbiased CSC Trigger Rate



→ Solid curve is rate calculated without pile-up

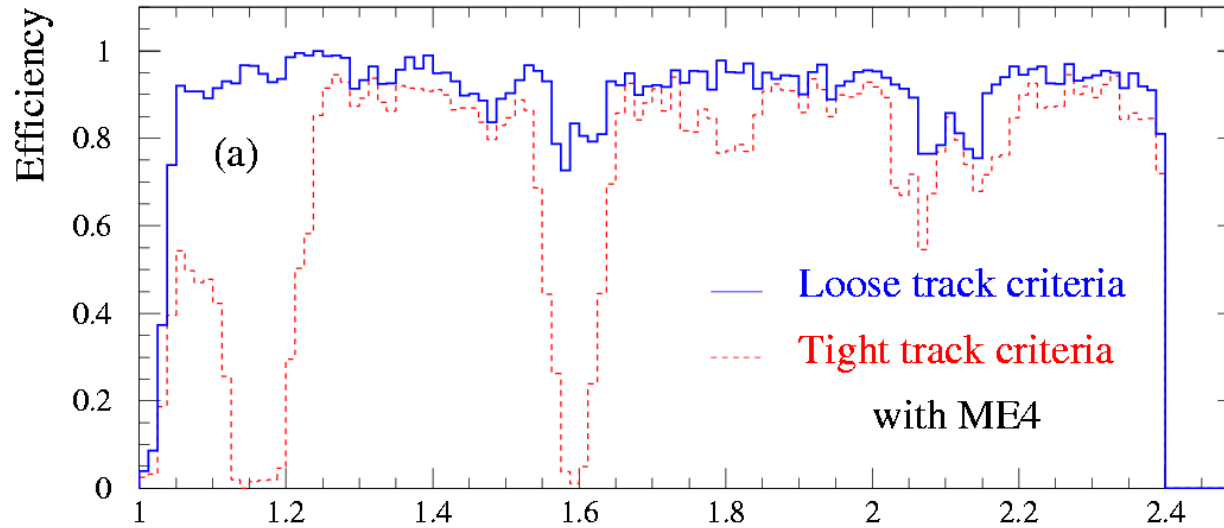
→ Rate is about 30% larger than weighted sample used in L1 TDR

→ Dashed curve shows that effect of pile-up and neutrons is to *reduce* rate by about 10%

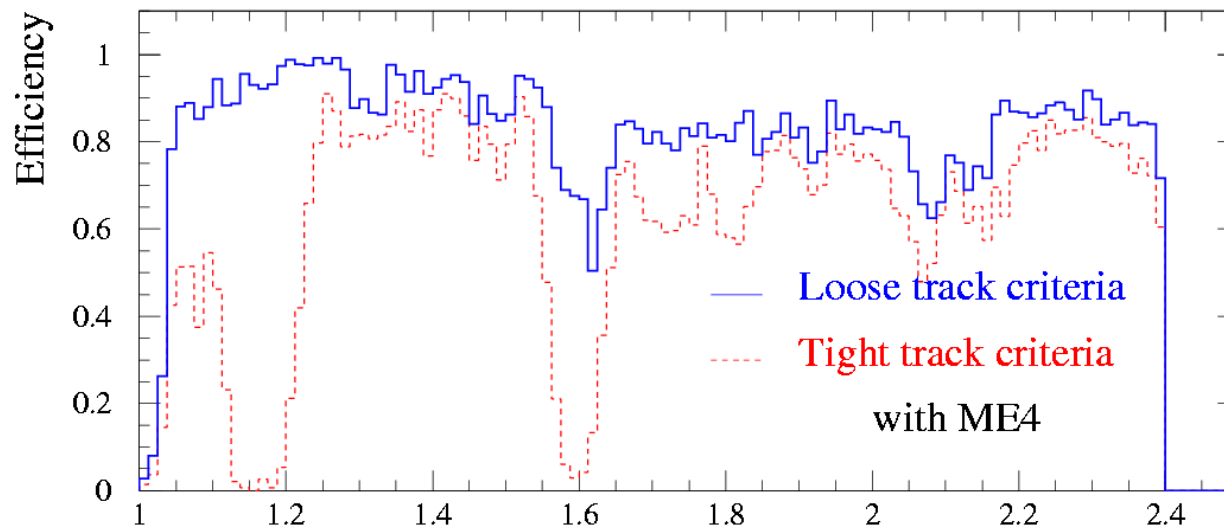
→ ORCA parameters set to use each min bias event exactly once



# Single Muon Trigger Efficiency



No background



10% drop overall  
with pile-up and  
neutrons, mostly  
at high  $h$

$\eta_{\text{gen}}$



# Inefficiency from Neutrons

**The inefficiency stems from the loss of a trigger primitive in ME1**

- The ALCT (wire) or CLCT (cathode) trigger logic fails to find a valid pattern from the muon in the presence of neutron hits

**More investigation is required to understand why**

**Similar inefficiency is observed for TeV muons that bremsstrahlung**

- Extra hits from shower products

**Would be interesting to know if similar inefficiency is seen in full reconstruction**

- However, if we lose the muon at L1, we may not recover it anyway



# News

## **CMS Note in preparation:**

### **“Simulated Performance of the CSC Track-Finder”**

- Includes the neutron background studies shown here**
- Documents the capability and performance of current simulation**

**New graduate student (B. Scurlock) will work on updating the structure of the CSC Track-Finder code to match the firmware better**

## **“Pre-GriPhyn” computing cluster being set up in Florida**

- 72 dual CPU Linux nodes**
- Should be able to contribute to future PRS/m production**