



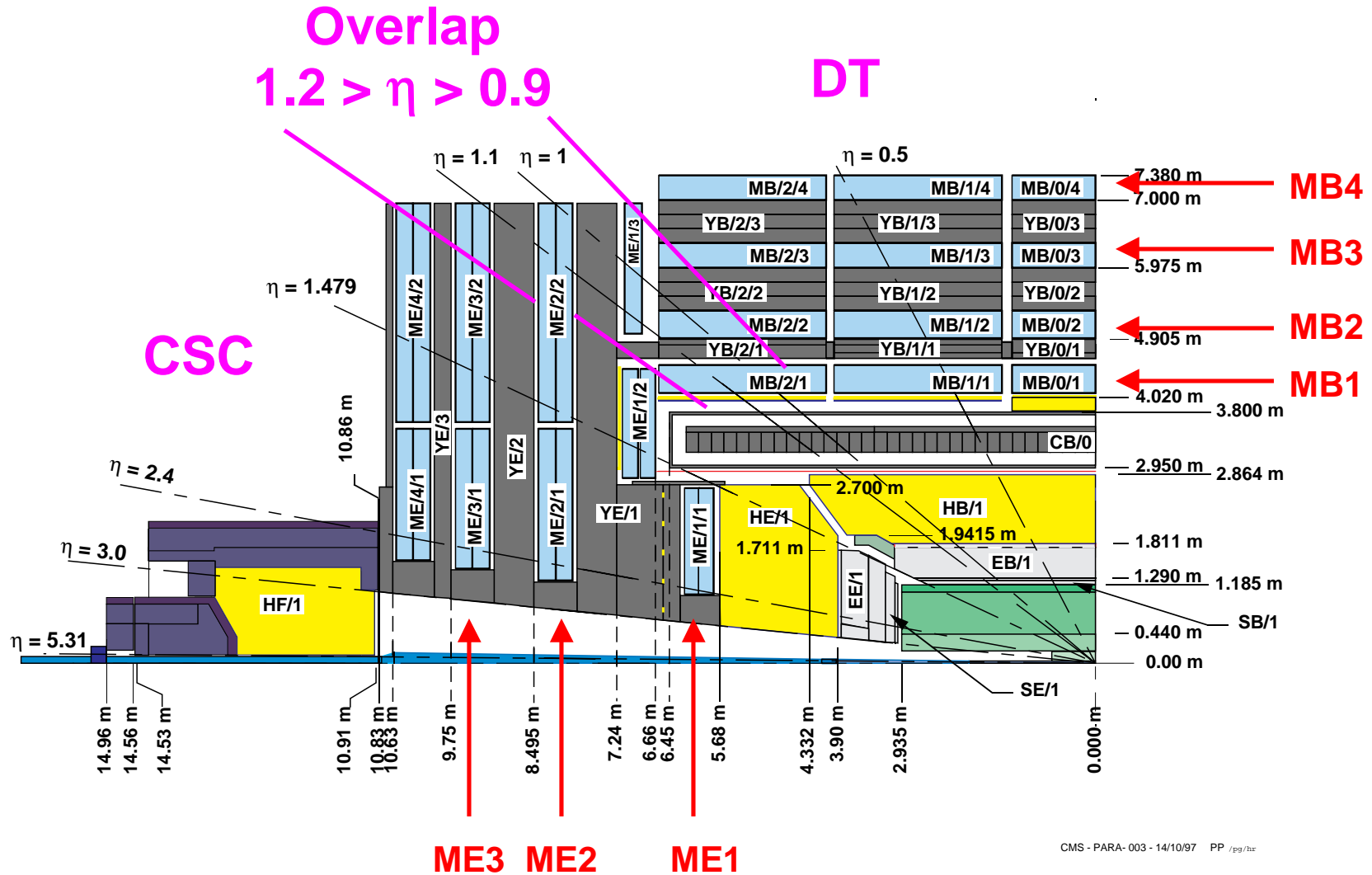
# EMU Trigger Simulations

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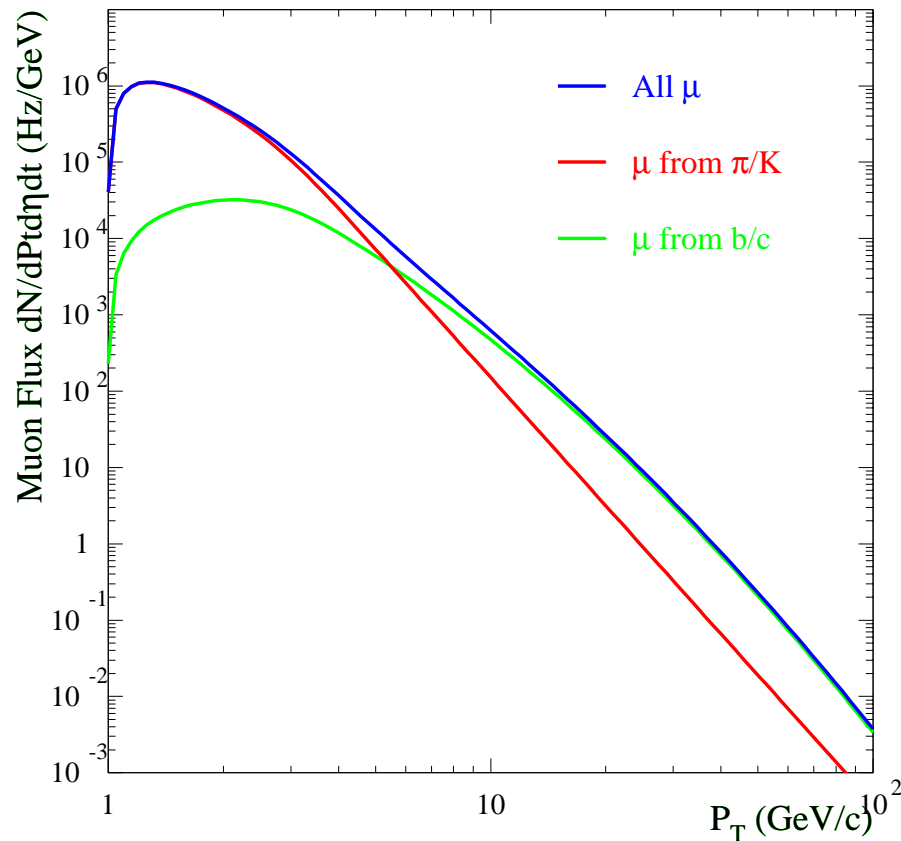


# CSC and DT Layout





# Estimated Muon Flux

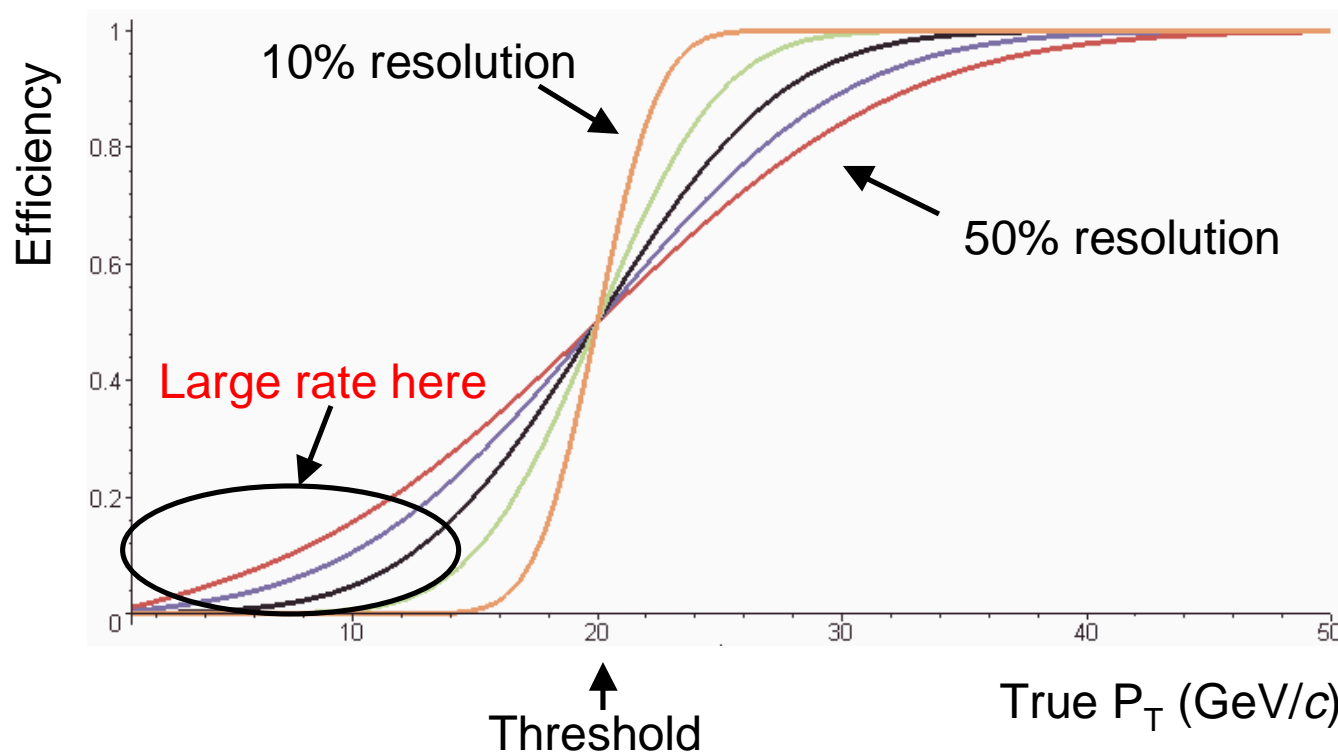


- Estimate muon flux at  $L=10^{34}$  from QCD events
  - Parameterization based on Pythia (CMS Note 1997/096)
  - Includes  $\pi/K$  which decay before calorimeter
- Fold in probability to punch through calorimeter in endcap region
  - Determined from CMSIM
- Assume 100% chamber efficiency



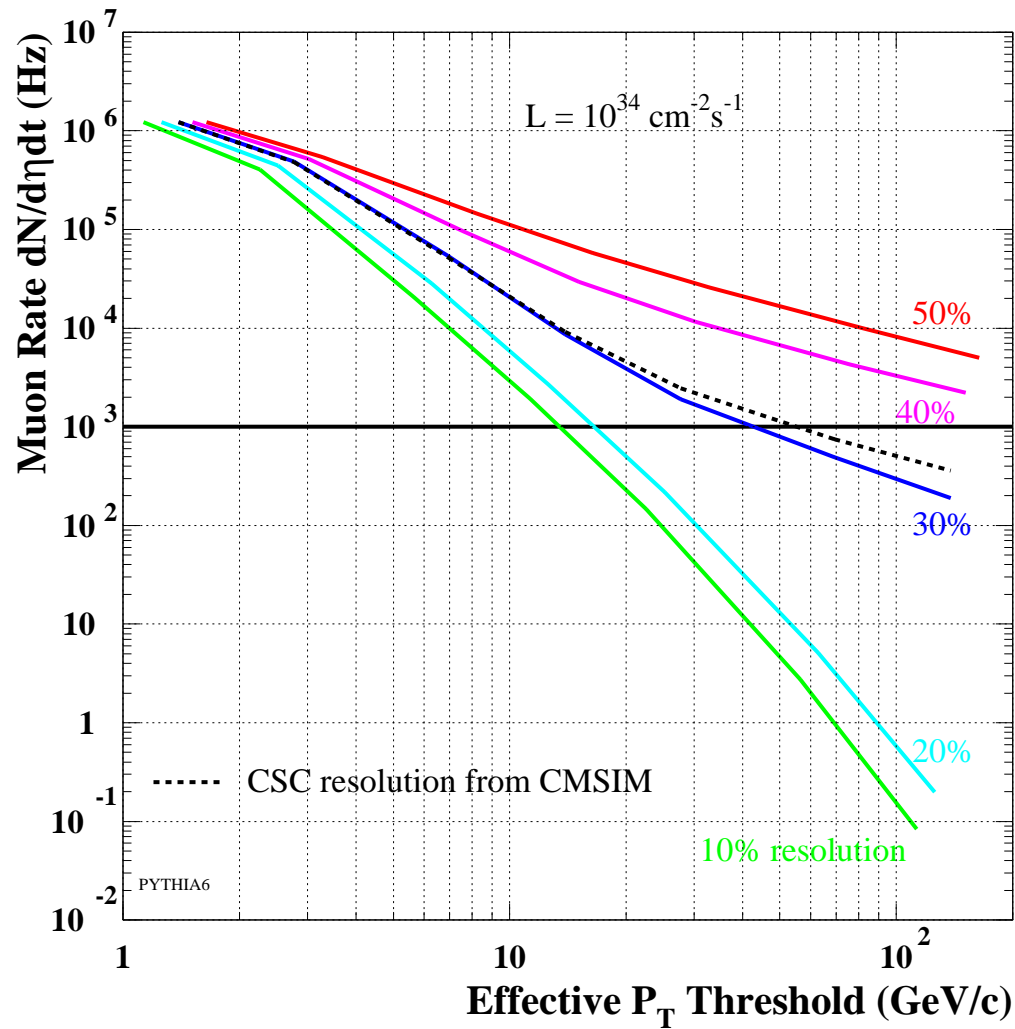
# Trigger Efficiency Curves

- Convolute muon flux with trigger efficiency curve to determine trigger rate
- Assume Gaussian errors for  $1/P_T$  resolution





# CSC Muon Trigger Rates



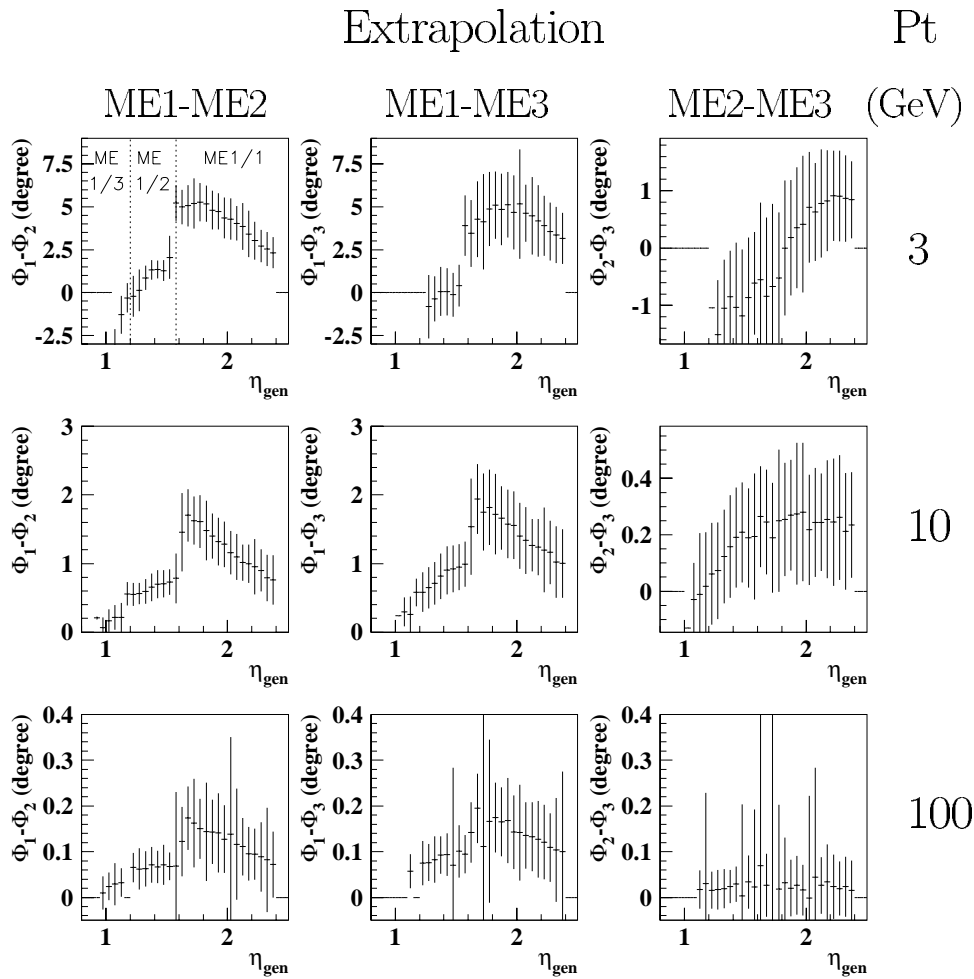
- Single  $\mu$  rate from Pythia, convoluted with efficiency curve
- Thresholds set for 90% efficiency
- Require rates  $< 1$  kHz per unit rapidity
- Not satisfied for  $P_T$  resolution worse than 30%



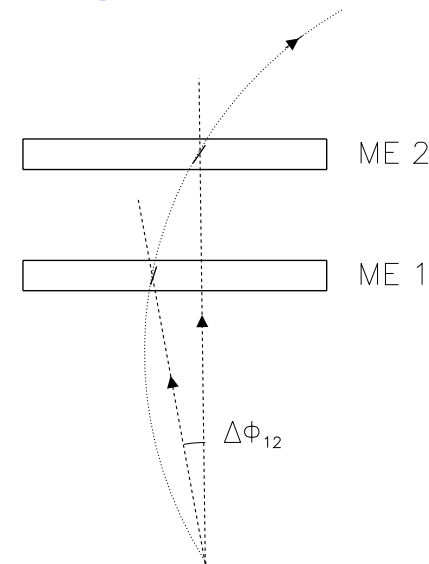
# CMSIM Study of CSC Trigger Resolution

$\Delta\phi$  vs  $\eta_{\text{gen}}$  at different  $P_T$

- Study dependence of  $\Delta\phi$  on  $\eta$  and  $P_T$

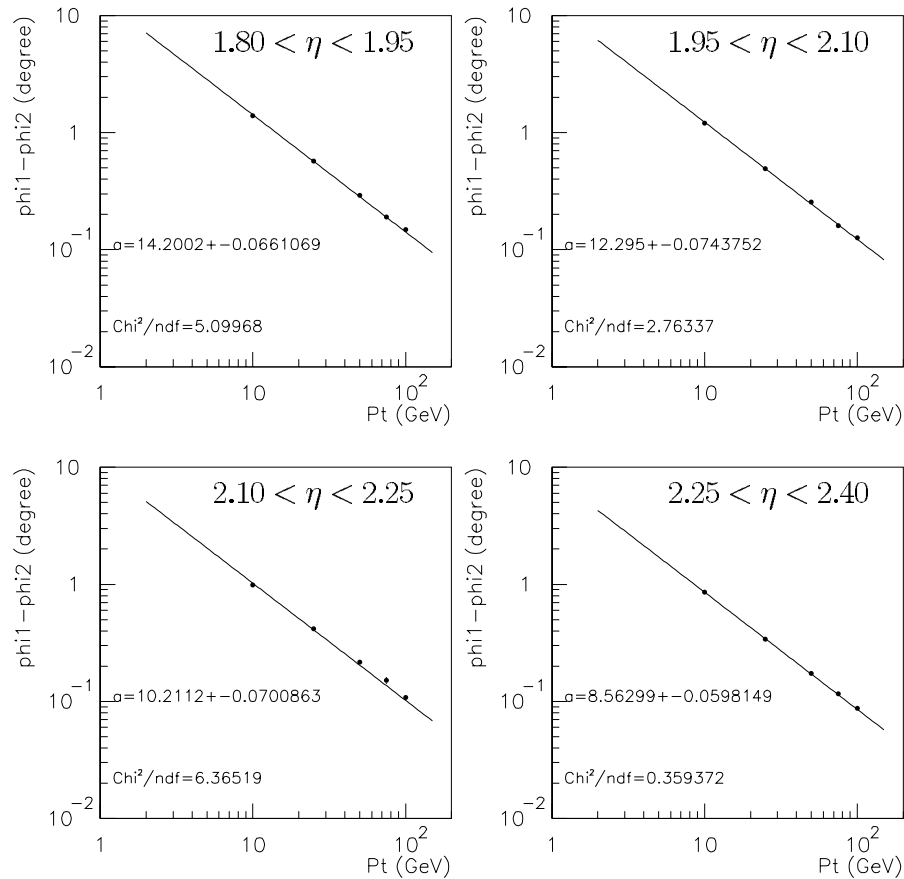


- $\phi$  and  $\eta$  from LCT trigger simulation of single  $\mu$ 's with no backgrounds





# Parameterize $\Delta\phi$ vs. $P_T$ and $\eta$

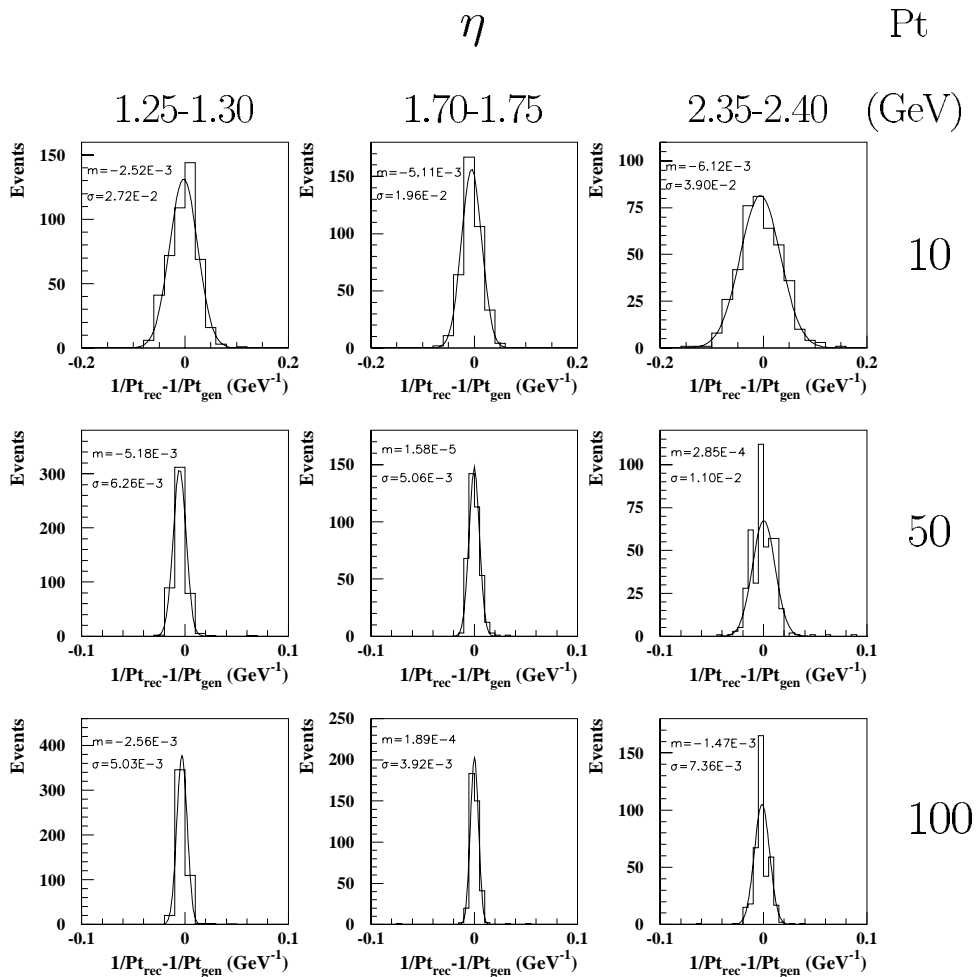


- Fit to  $\Delta\phi = A(\eta)/P_T$
- Invert relation to obtain  $P_T$



# Resolution of $1/P_T$

$\frac{1}{P_{T_{rec}}} - \frac{1}{P_{T_{gen}}}$  Distributions



- Single  $\mu$ 's with no background

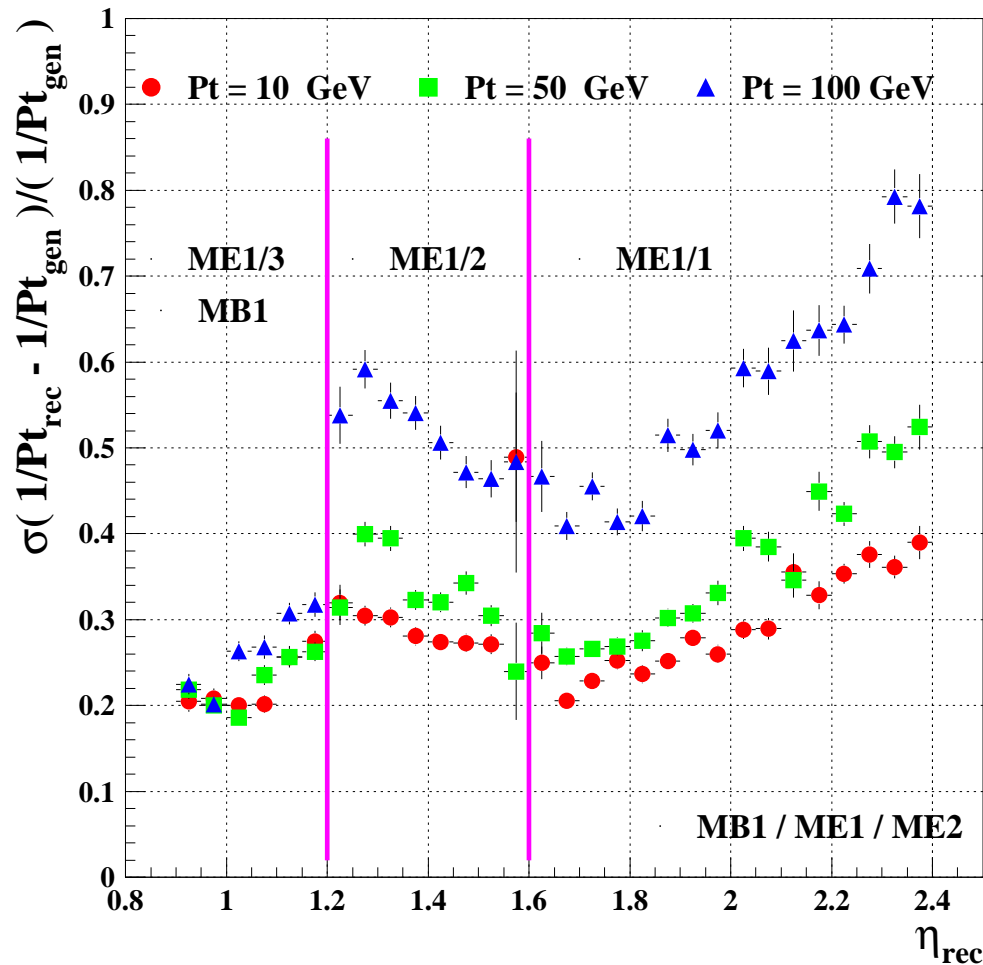
- Distributions are Gaussian

- No significant tails





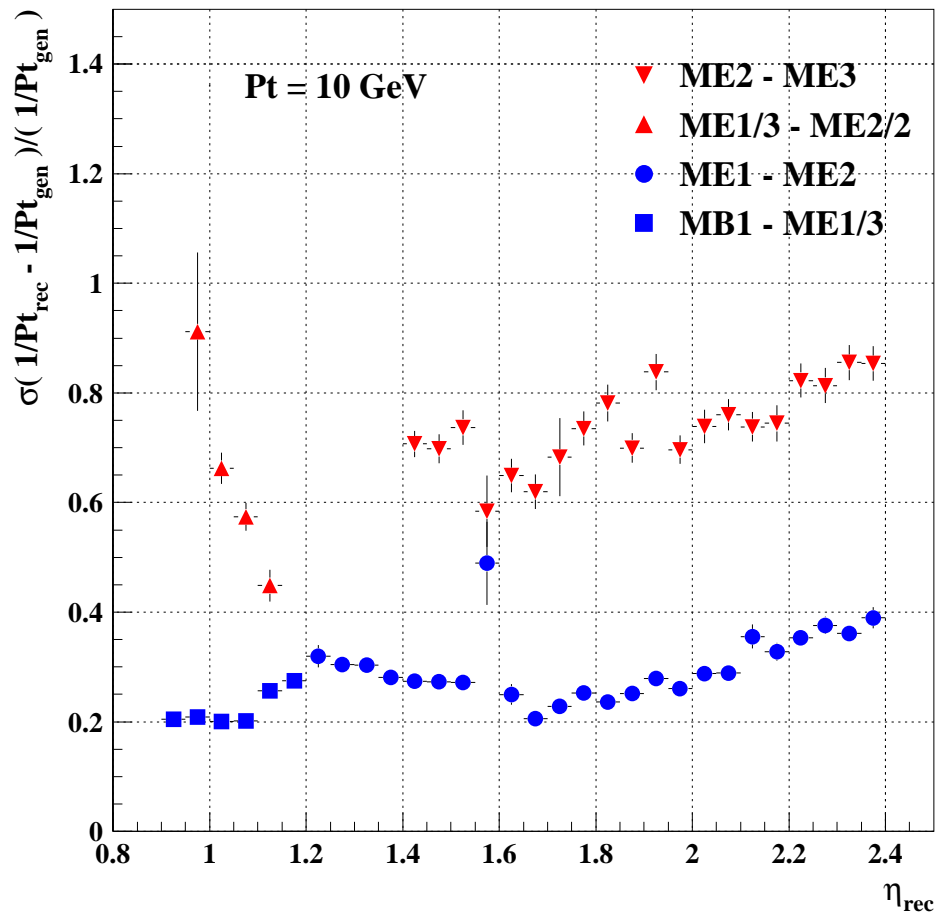
# Expected $P_T$ Resolution from CSC Track-Finder



- $P_T$  obtained from  $\Delta\phi$  measured between MB1-ME1 ( $0.9 < \eta < 1.2$ ) ME1-ME2 ( $1.2 < \eta < 2.4$ )
- Resolution  $\sim 30\%$  at low  $P_T$
- Expected to be improved as Track-Finder design evolves



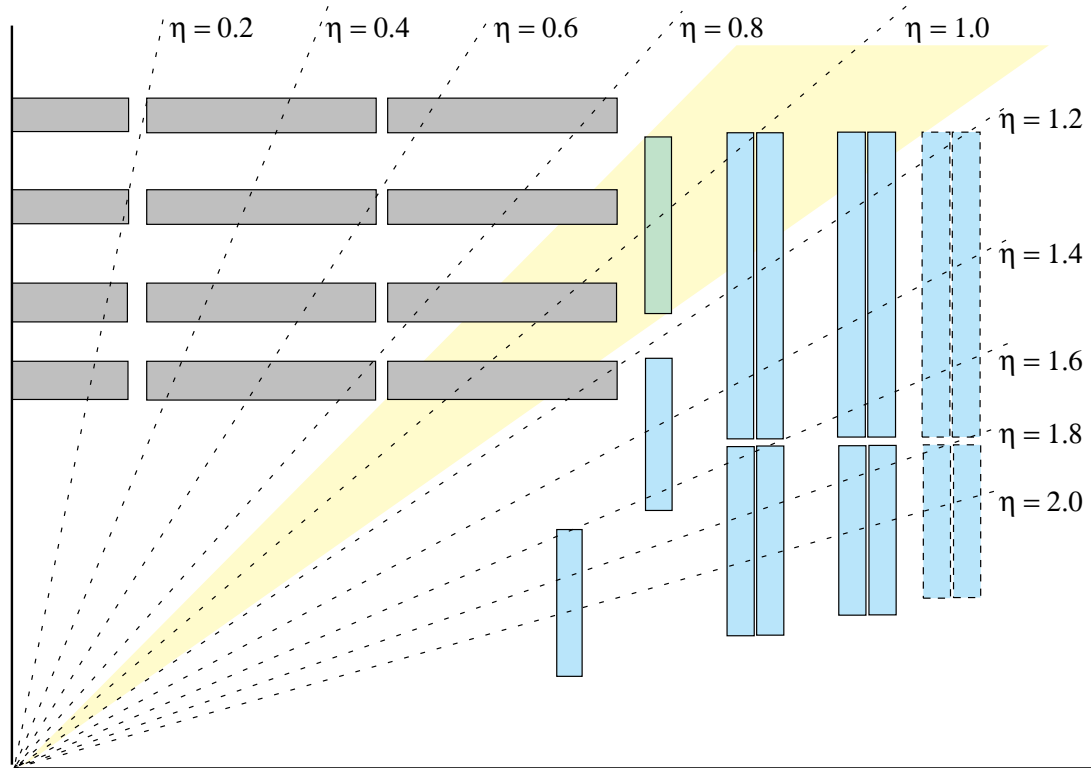
# $P_T$ Resolution with & without Measurement in MB1 or ME1



- $P_T$  Resolution  $\sim 70\%$  without MB1 in overlap region, or without ME1 in endcap
- Cannot satisfy single  $\mu$  rate requirement without station 1



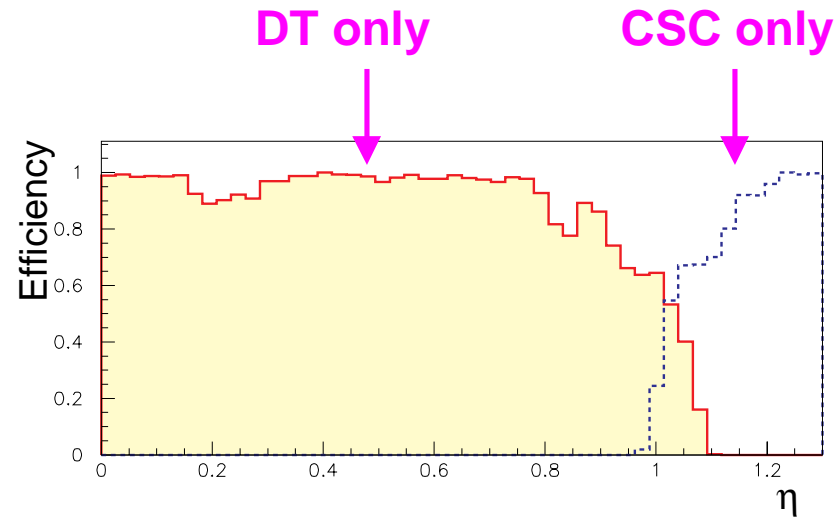
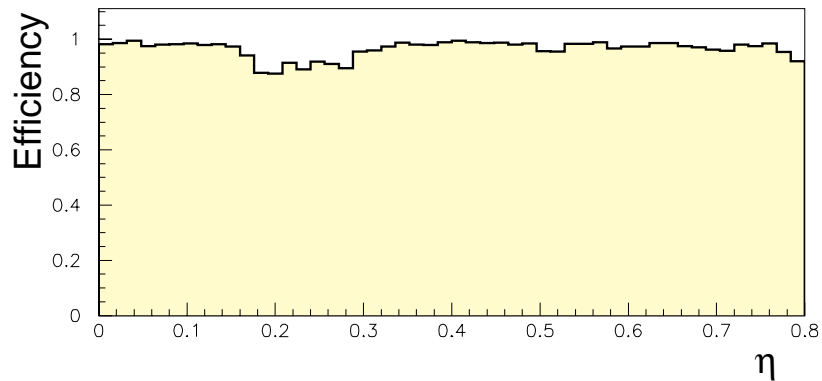
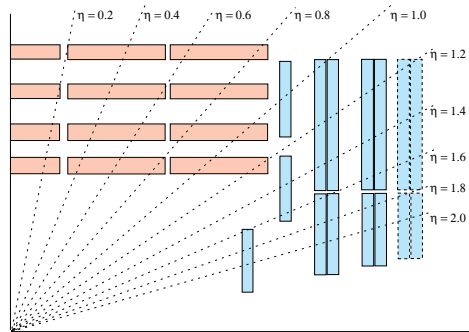
# Efficiency in Overlap Region



- Barrel and endcap trigger systems share information in overlap region
- Either system can identify muons in this region, but sharp  $\eta$  cut will prevent duplication



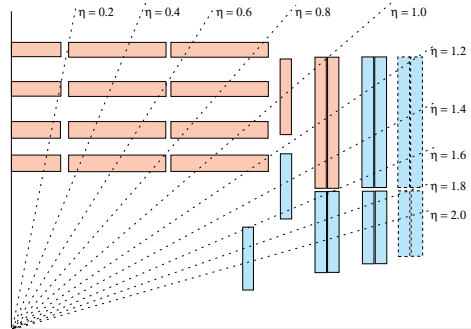
# Overlap Region: No Sharing



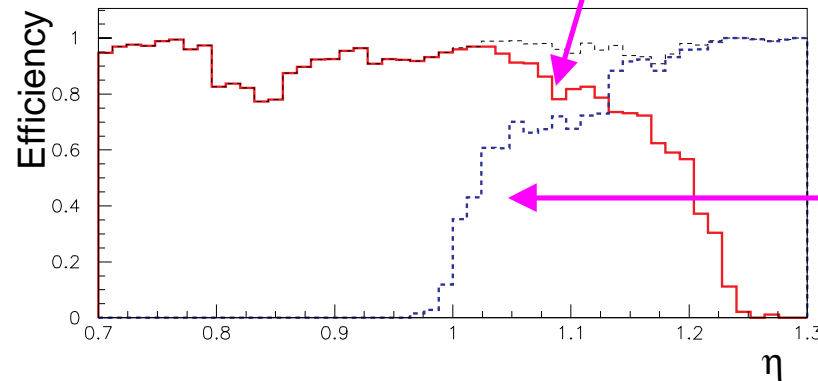
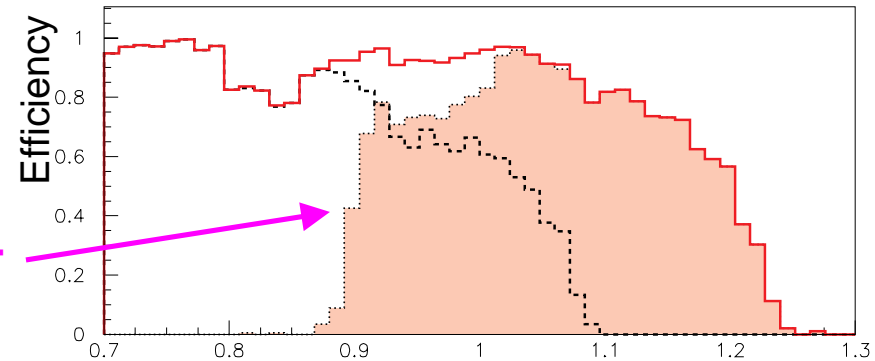
- CMSIM study performed by Vienna
- Poor efficiency around  $\eta=1$  without sharing



# Overlap Region: Barrel+ME1/3+ME2/2



Extended DT coverage



CSC coverage without DT

- Require DT and CSC information in overlap region for efficient coverage
- Will define a sharp  $\eta$  boundary to avoid duplication