

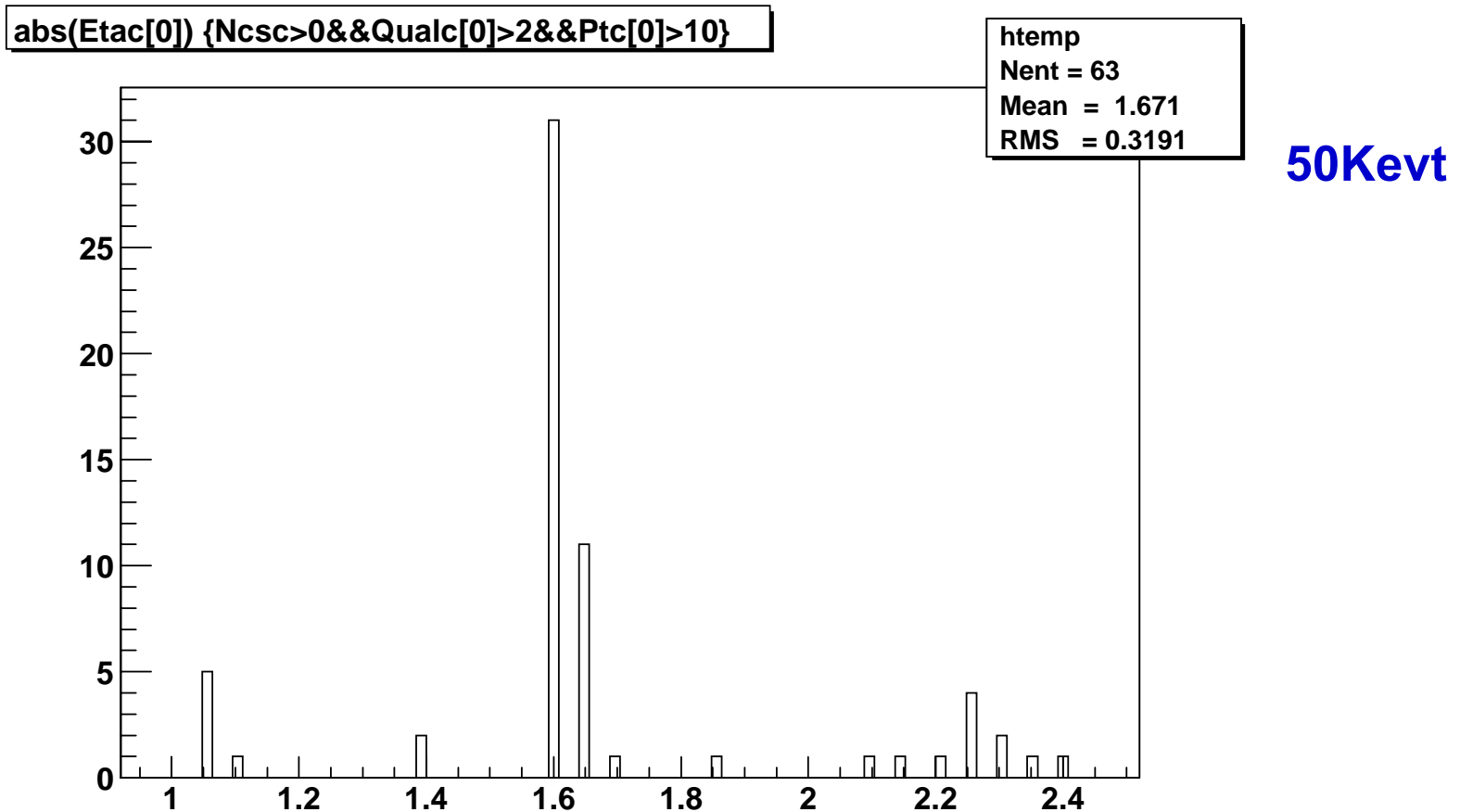
# **Performance of L1 CSC Trigger (and strange geometrical effects)**

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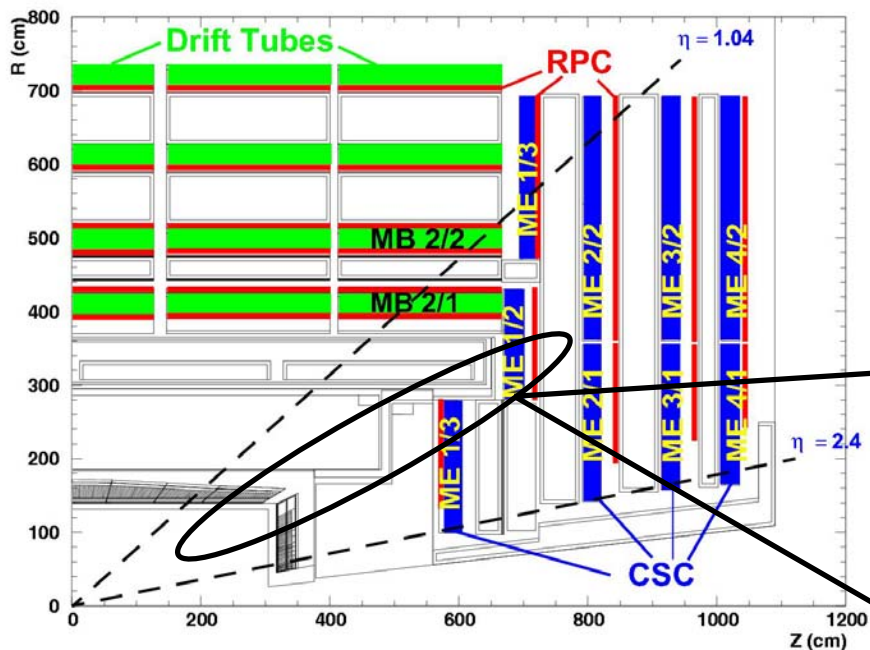
# Eta = 1.6 Region

- As reported by Hannes, a large number of high quality muons reported by L1 CSC trigger originate from PT1 sample
- Contribute ~1 kHz to L1 rate

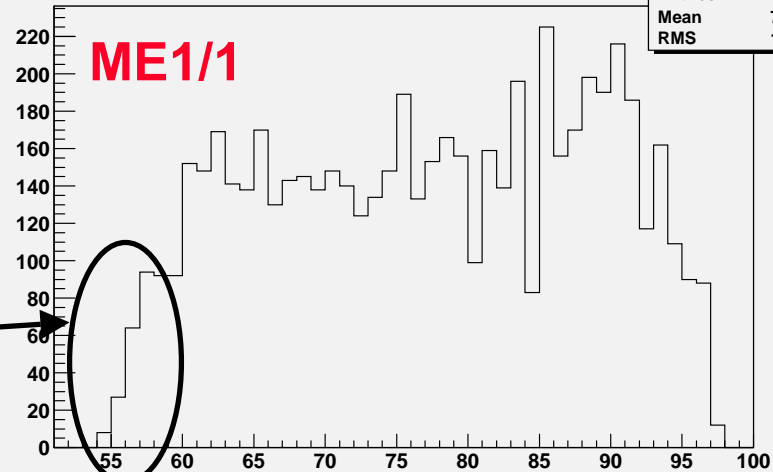




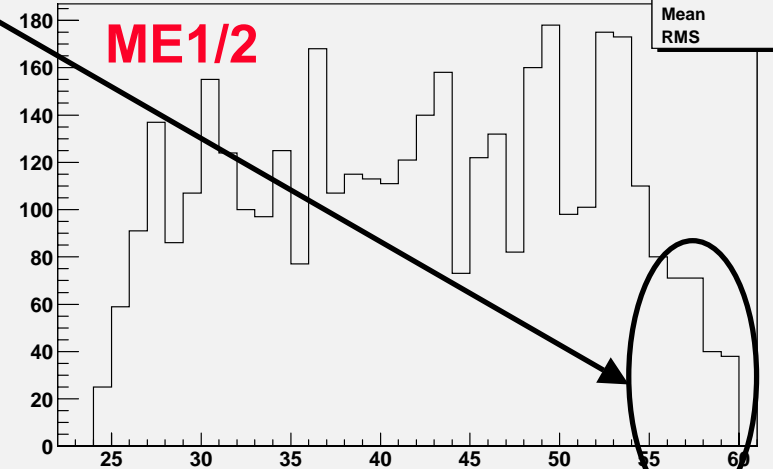
# $\eta$ Distribution of ME Segments



stubeta[0] {nstub>0&&station[0]==1&&Cscid[0]<3}



stubeta[0] {nstub>0&&station[0]==1&&Cscid[0]<6&&Cscid[0]>2}



ME1/1 and ME 1/2 overlap in  $\eta$  somewhat: 1.5875–1.6625

Creates ambiguity as to which station to use in  $P_T$  assignment

Also region of detector cracks

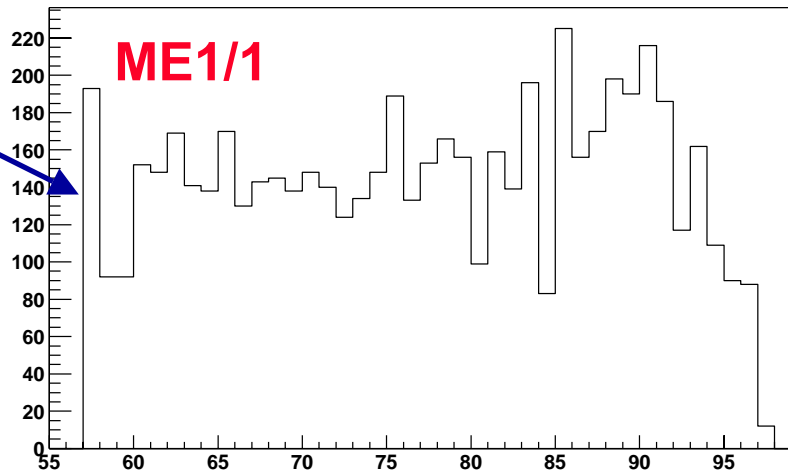


# $\eta$ Distribution after Boundary Creation

stubeta[0] {nstub>0&&station[0]==1&&Cscid[0]<3}

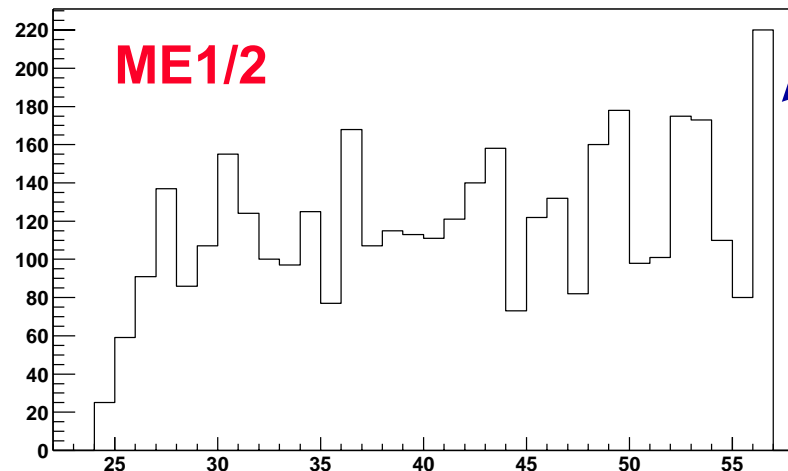


undfl



ovflw

stubeta[0] {nstub>0&&station[0]==1&&Cscid[0]>2&&Cscid[0]<6}



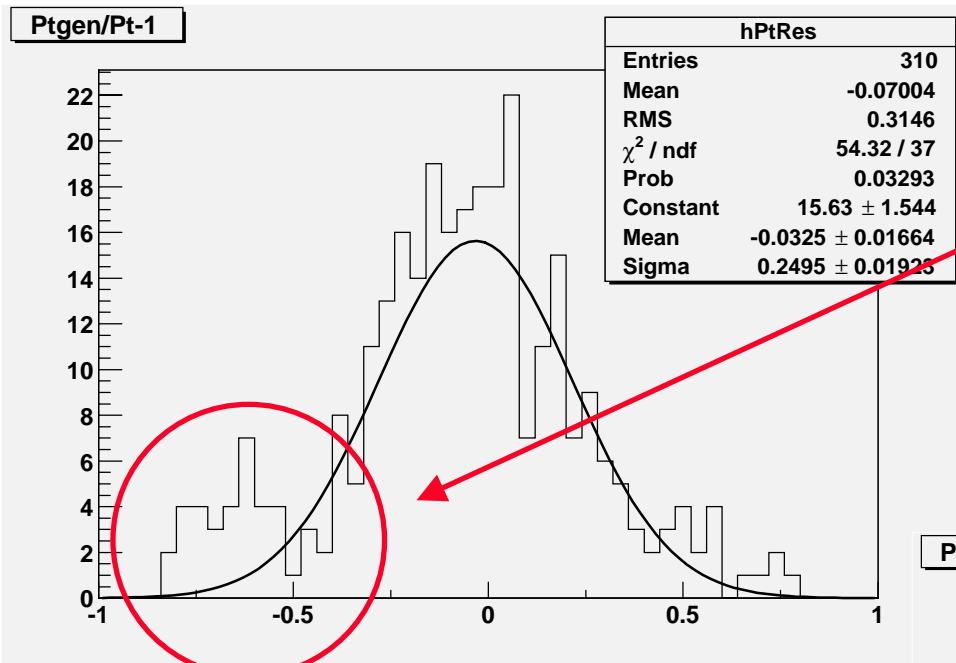
One way to solve ambiguity is to define the  $\eta$  bins so that there is no overlap (even though there is). Define an upper  $\eta$  bin for the ME1/2 chamber and a lower  $\eta$  bin for the ME1/1 chamber (overflow and underflow bins). The deviation from the true  $\eta$  is only 2 bins (0.025 units), which does not affect the L1 CSC Track-Finder efficiency.

**Avoids adding more memory chips on board**





# 1/P<sub>T</sub> Resolution



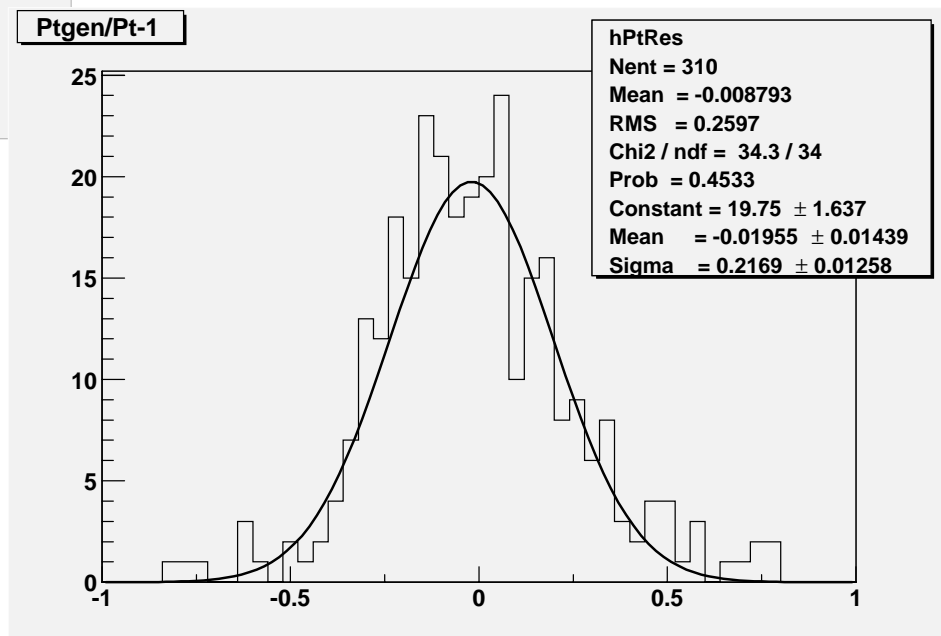
**Before:**

**P<sub>T</sub> often overestimated when wrong ME1 chamber was assumed**

**(less bending between ME1/2 and ME2, so looks like high p<sub>T</sub> if you assume ME1/1 to ME2)**

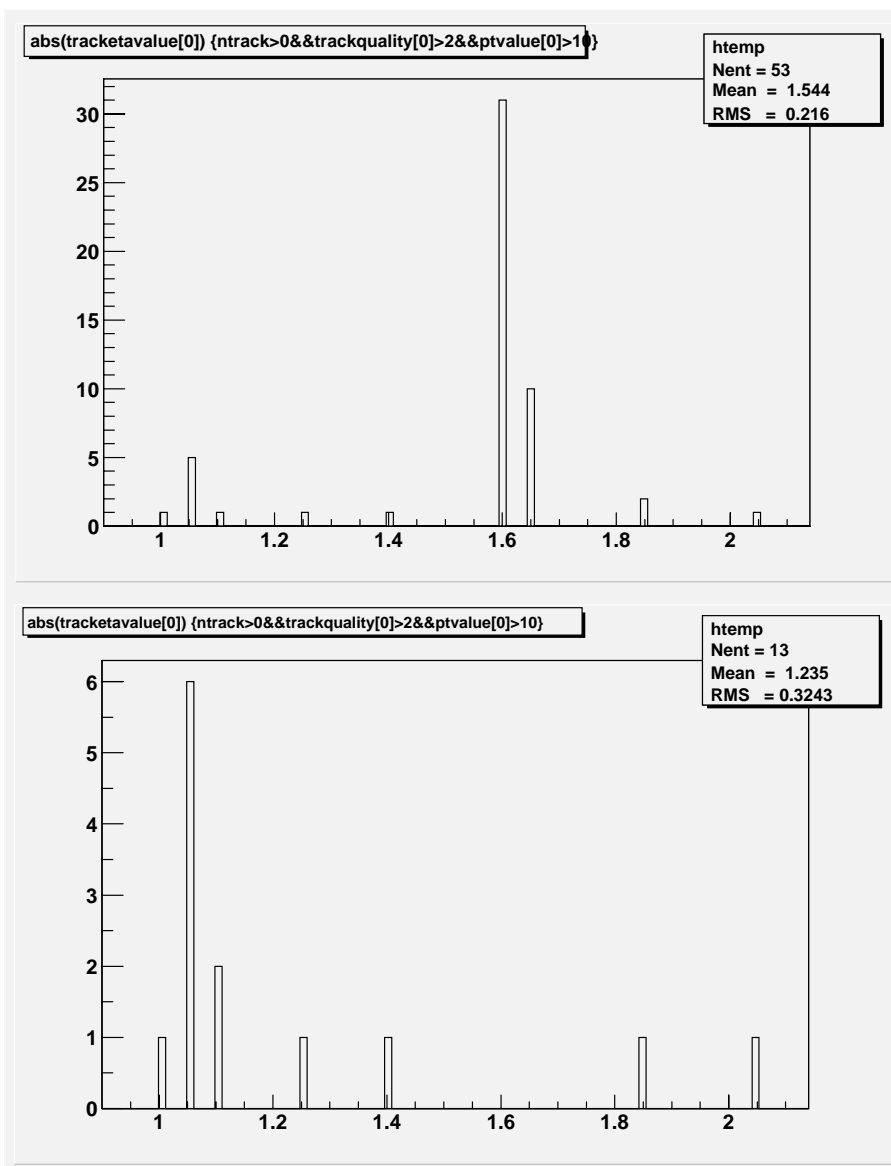
**After:**

**With clean  $\eta$  boundary, tail removed and P<sub>T</sub> resolution improved**





# PT1 Candidates



Before

After:  
low  $P_T$  muons  
removed !



# Why ?

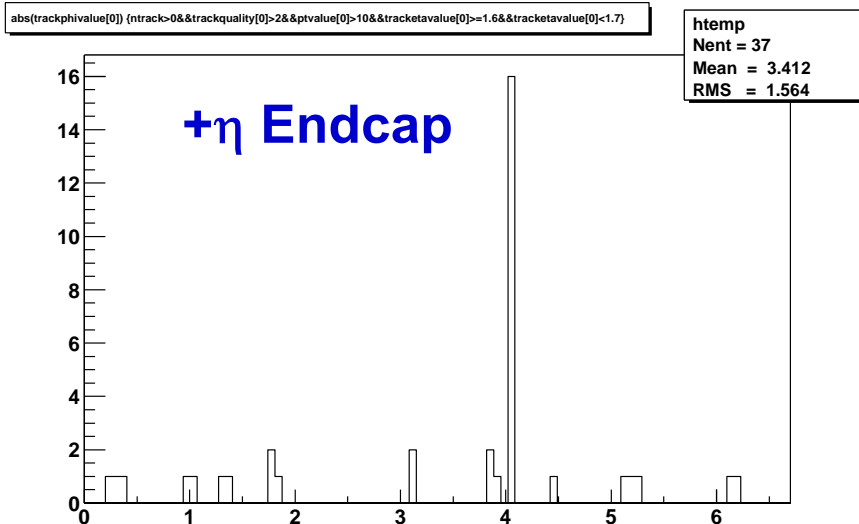
**A little strange that we see a large impact from this effect now, because the ambiguity has been there all along in previous productions**

- ➔ More punch-through in latest production ?**
- ➔ Larger cracks in geometry ?**



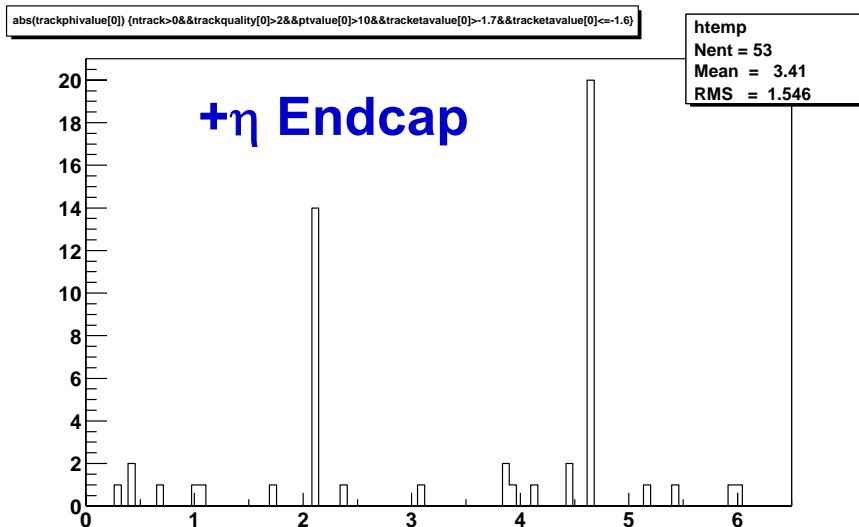


# $\phi$ Distribution of $\eta=1.6$ Triggers



→ Why spikes in  $\phi$  for the  $\eta=1.6$  triggers before fix? Or why the asymmetry for that matter ?

→ Not aligned on any sector boundary



→ About 1/3 are associated with generated muons with  $P_T \sim 3$  GeV (lower limit of ntuple)

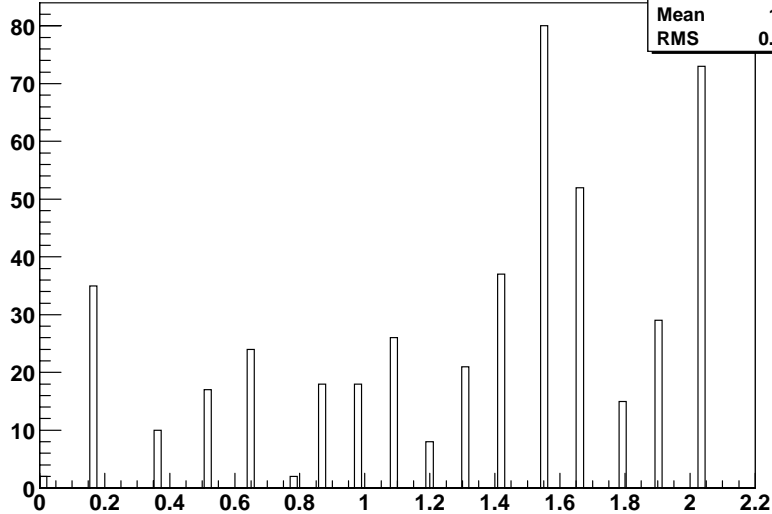
→ About 2/3 of these CSC triggers have RPC confirmation



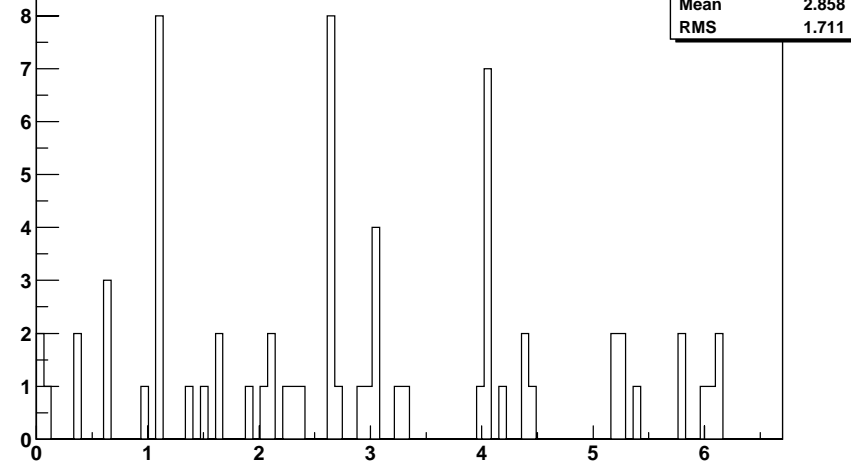


# Distribution of RPC Triggers

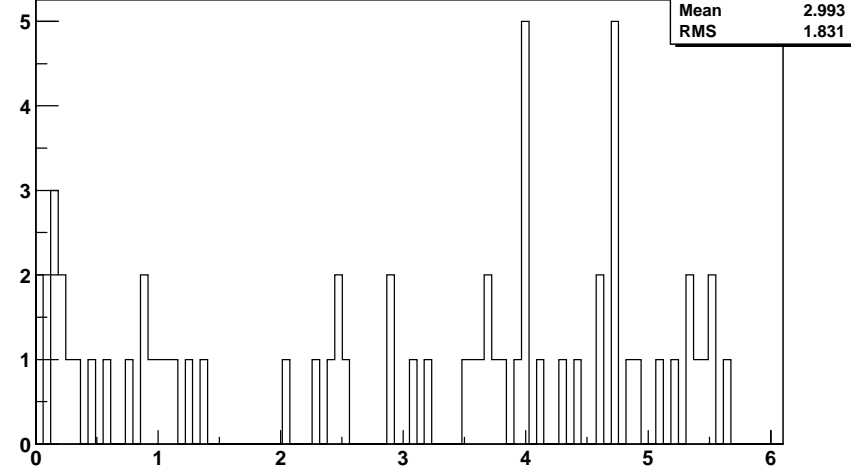
abs(Etar[0]) {Nrpc>0&&Ptr[0]>5}



Phir[0] {Nrpc>0&&Ptr[0]>5&&(Etar[0])>=1.5&&(Etar[0])<1.7}



Phir[0] {Nrpc>0&&Ptr[0]>5&&(Etar[0])<=-1.5&&(Etar[0])>-1.7}



Maximum triggers  
for  $\eta=1.6$

$\phi$  Distribution shows spikes



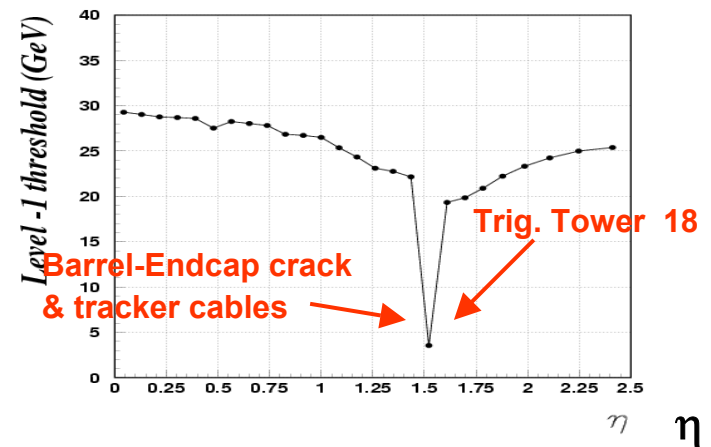


# Correlation with E/Gamma ?

**Chris Seez:**

→ “We deliberately remove trigger tower 18 ( $1.479 < \eta < 1.566$ ) from our fiducial region for precision e/gamma work. This region is strongly shadowed by tracker cables exiting through the barrel/endcap 'corner' (at  $\eta \sim 1.479$ ). On the high side of the corner there are a number of "missing" crystals - but the location of these **small "holes" in the material is/should be 4-fold symmetric** (each quadrant of the endcap is identical).”

→ Possible correlation, or just accidental coincidence ?



→ Anyway, latest CSC simulation removes low  $p_T$  triggers (but need to keep an eye on this region if punch-through is large)



# Other Changes to L1 CSC Simulation

The addition of the  $\eta$  boundary for the CSC trigger is implemented in the head of the L1CSCTrigger and L1CSCTrackFinder packages

→ The ORCA\_6\_1\_1 tagged release is several months old

Many other changes have been made to these packages to bring them up-to-date with prototypes currently being built and tested

→ New anode trigger logic

→ New Sector Receiver look-up table scheme

→ Additional features in Sector Processor logic

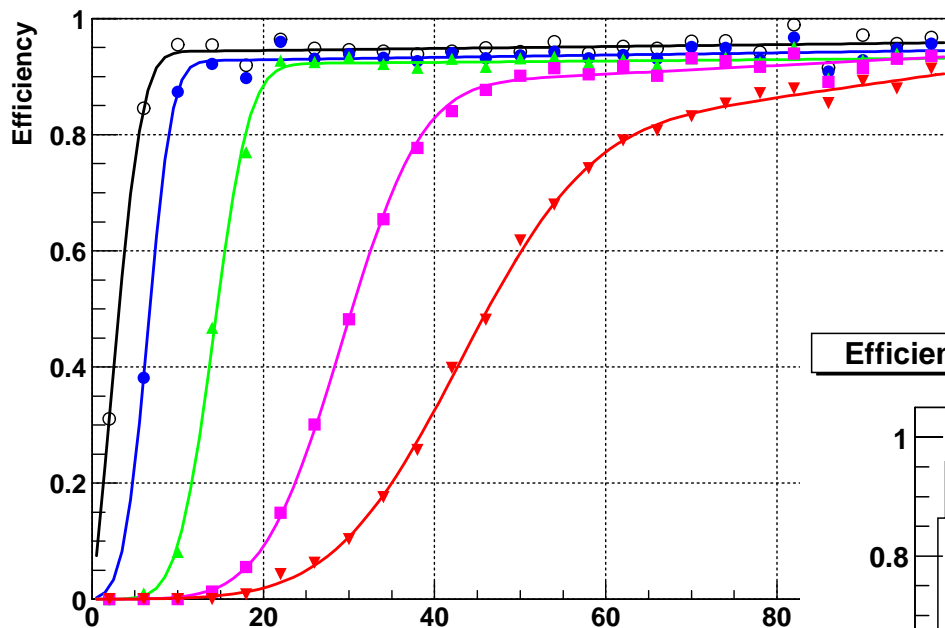
But a few more changes to the default settings need to go in before general release

→ Also to L1DTTrackFinder because of an interface change



# CSC Efficiency with Latest Code

Efficiency vs. Pt



Basically, as good as it ever has been

Need to check for fake di-muon triggers, however

Efficiency vs. Eta

