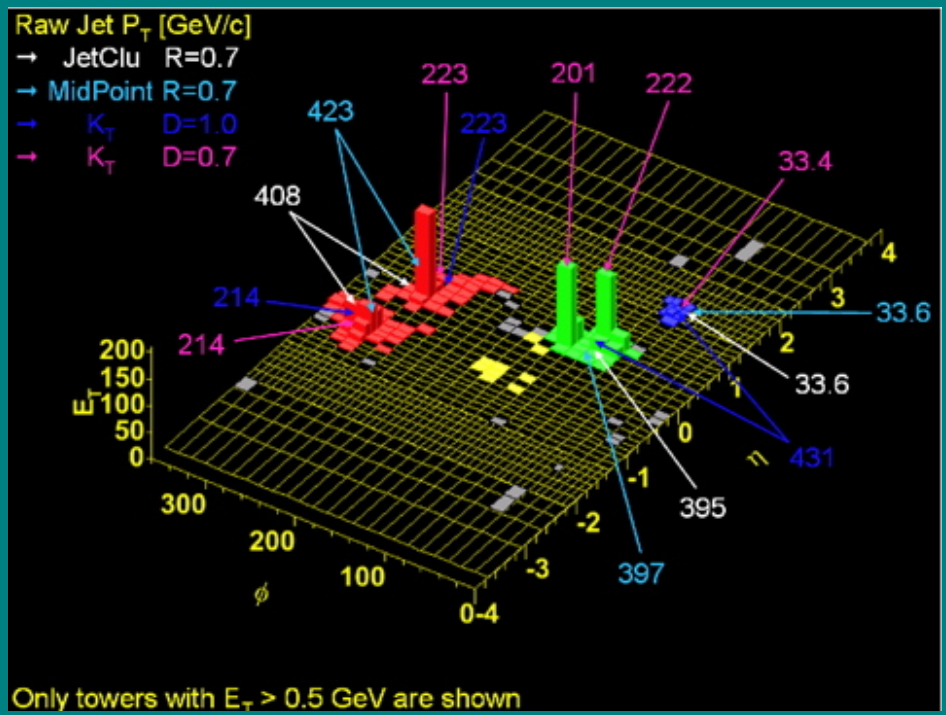
L2CAL Latency and Clustering



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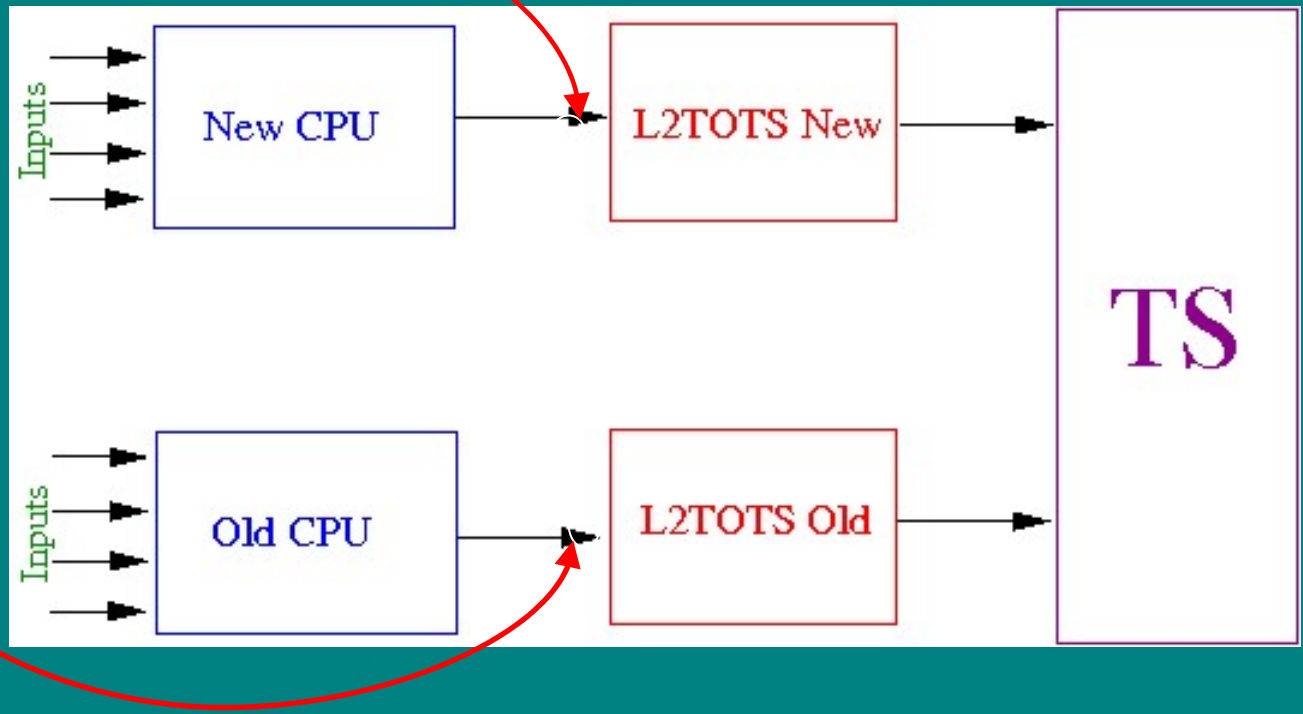
Overview

- Measuring timing.
- New cluster latency.
- Latency at low & high luminosity.
- Test triggers.
- Preliminary efficiencies & cluster properties
- Conclusions

Measuring Timing

Times measured here

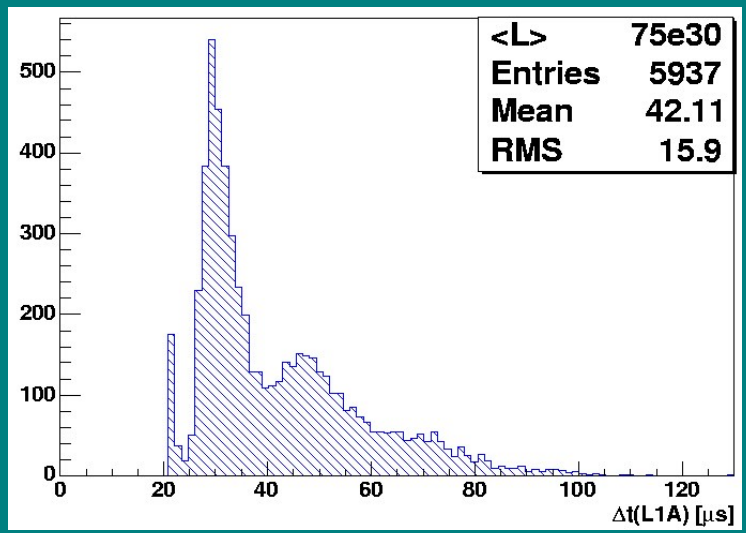


- Use latency timers on L2TOTS boards.
- Start=L1A ; End=Beginning of fragment.

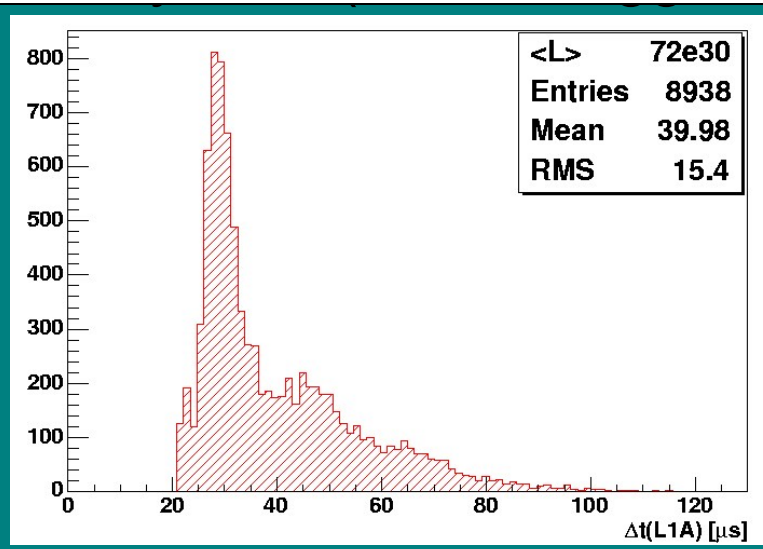
Latency at Low & High Luminosity

Low $\mathcal{L}$

Old System



New System (w/ test triggers)



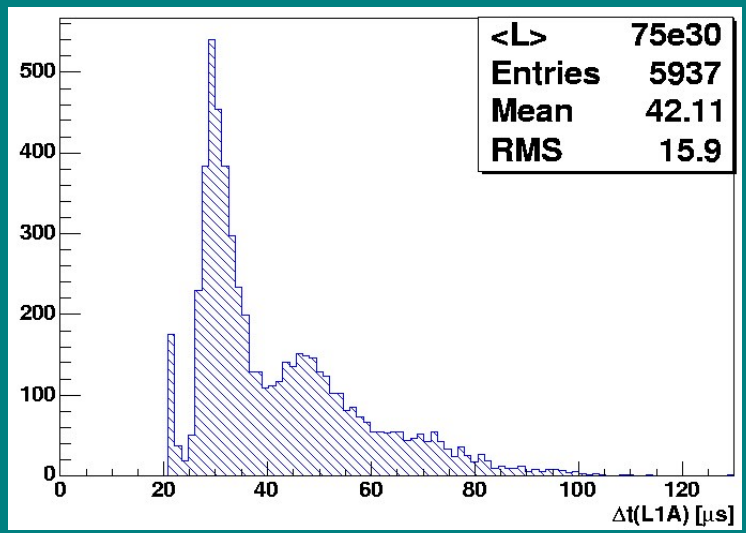
- Looking at the timing of the previous event.
  - Not biased towards L2.
- These are mostly L2 rejects.
  - We are faster at low luminosity mainly because of input polling and faster CPU.

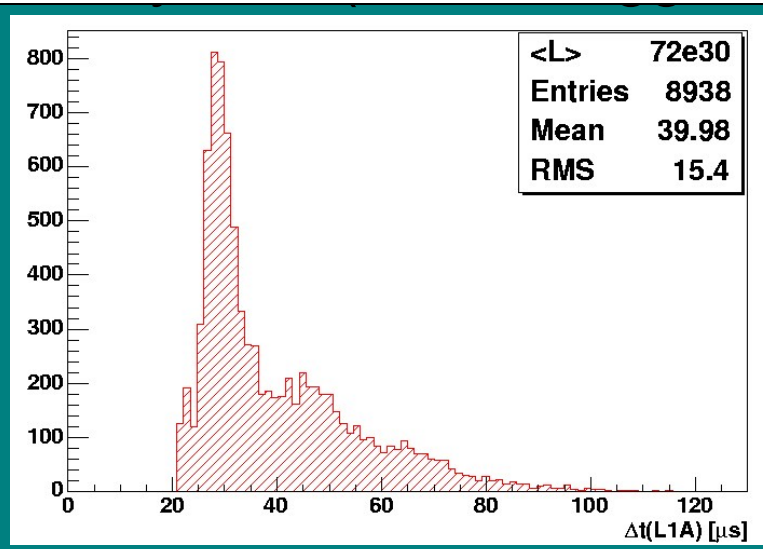
Latency at Low & High Luminosity

Old System

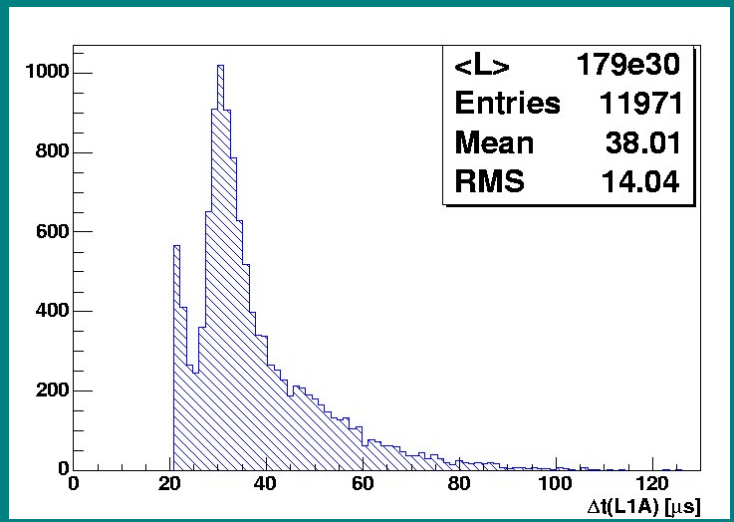
New System (w/ test triggers)

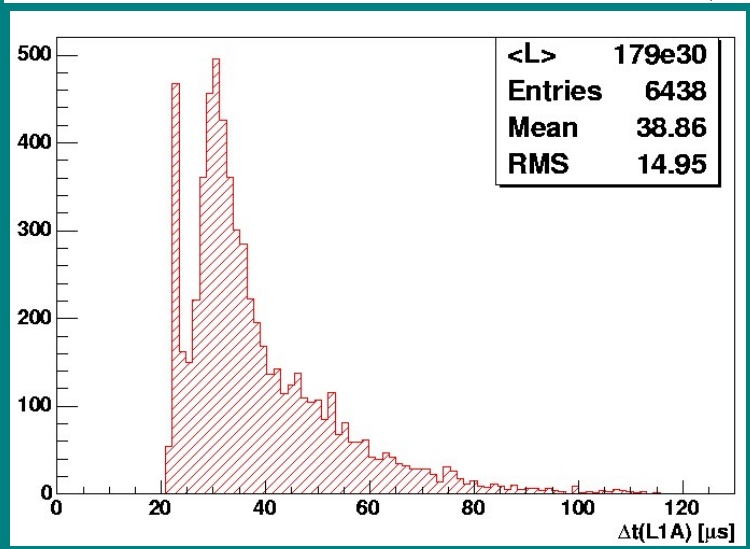
Low $\mathcal{L}$





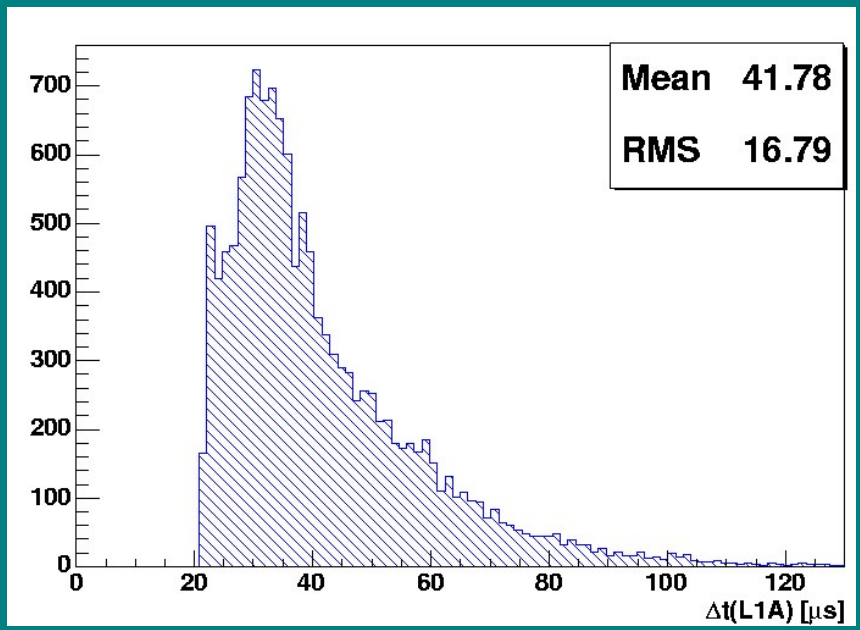
High $\mathcal{L}$



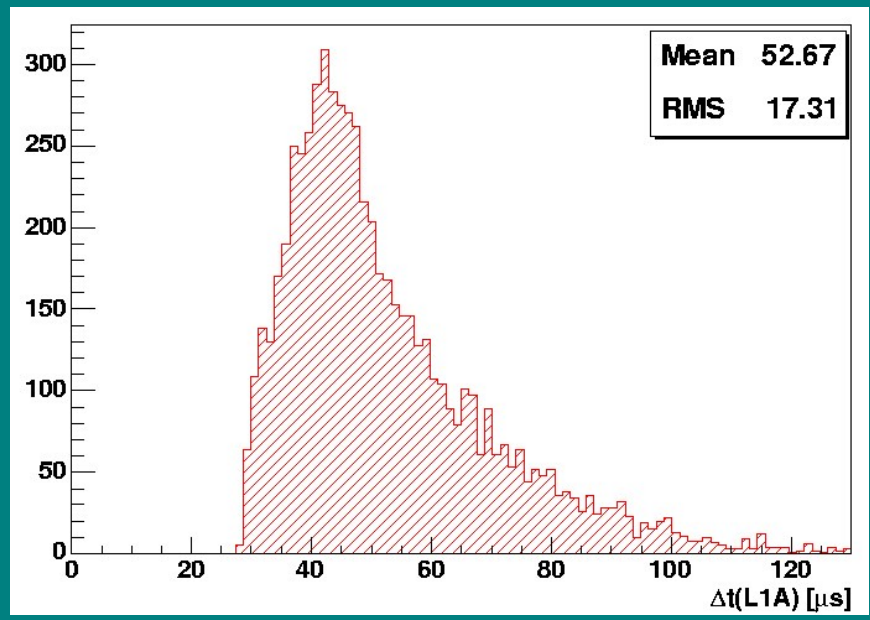


Maximum New Clustering Latency

No Algorithms



With Algorithms



- Above are L2 biased events.
  - New clustering on L2A (and these are all L2A).
- Shift ≈ +9 μs

DaqError Filter Results

- L3 DaqError filter was run for weeks before the introduction of new triggers.
  - Looking for decision mismatch between old & new L2.
- Only decision mismatches were in rate-limited triggers (expected).
  - Previously saw mismatch on COT_SPIKE bit, but have not seen that in weeks.
- Typical result:
  - Run 243033: 13M L2A, 1 rate-limited bit mismatch.

Test Trigger Efficiencies

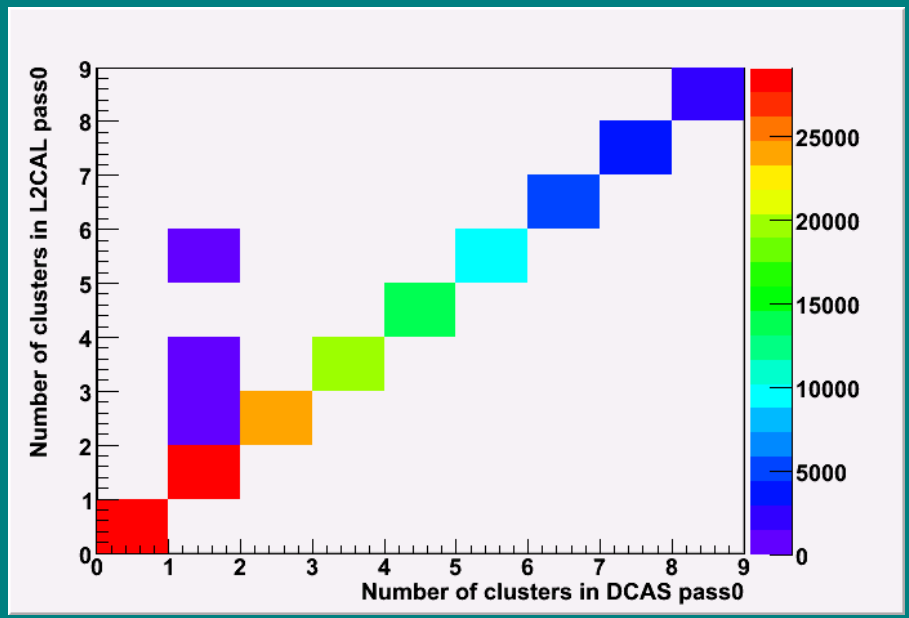
- Require the old L3 path and see how often new test triggers fire.

Object	N(old L3)	N(new L2)	Efficiency
Photon	4772	4608	97.6%
Electron	4832	4824	99.8%
Met	1233	1231	99.8%
Jet	748	733	98%

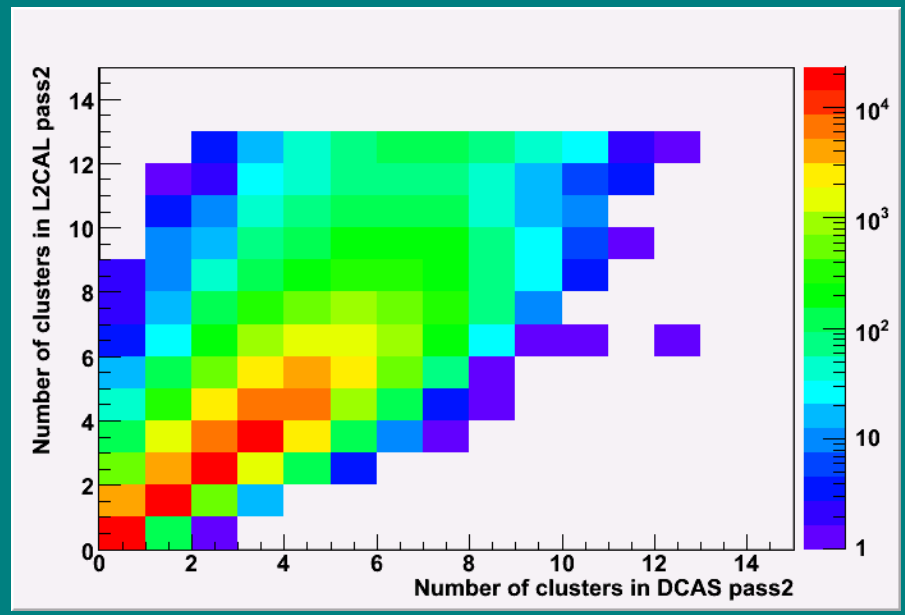
- We expect efficiencies to improve as our understanding grows…

Comparing Number of Clusters

Pass 0



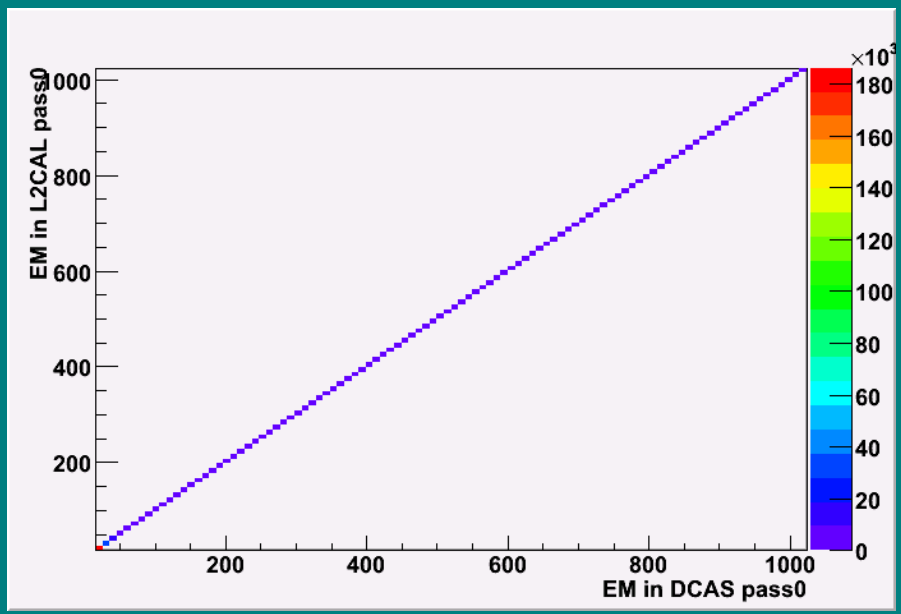
Pass 2



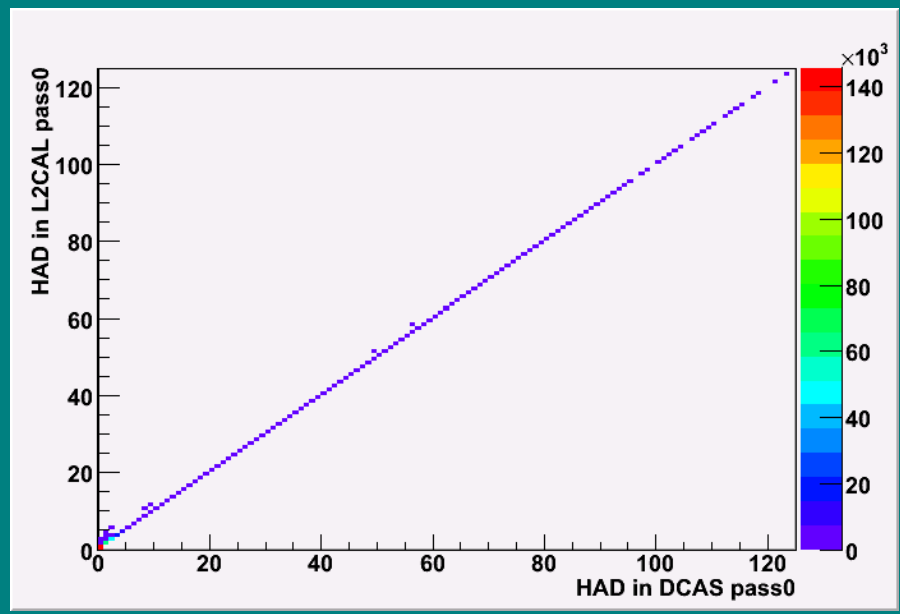
- Pass 0 – 6 disagreements out of 140k.
- Pass 2 – differences expected.
  - Pacman vs. cones

Comparing Cluster Energies

Electromagnetic



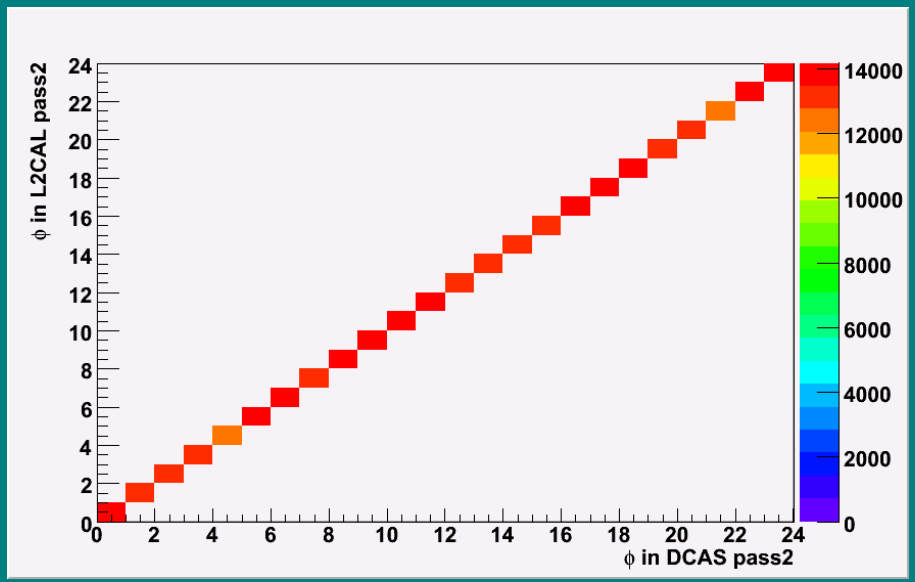
Hadronic



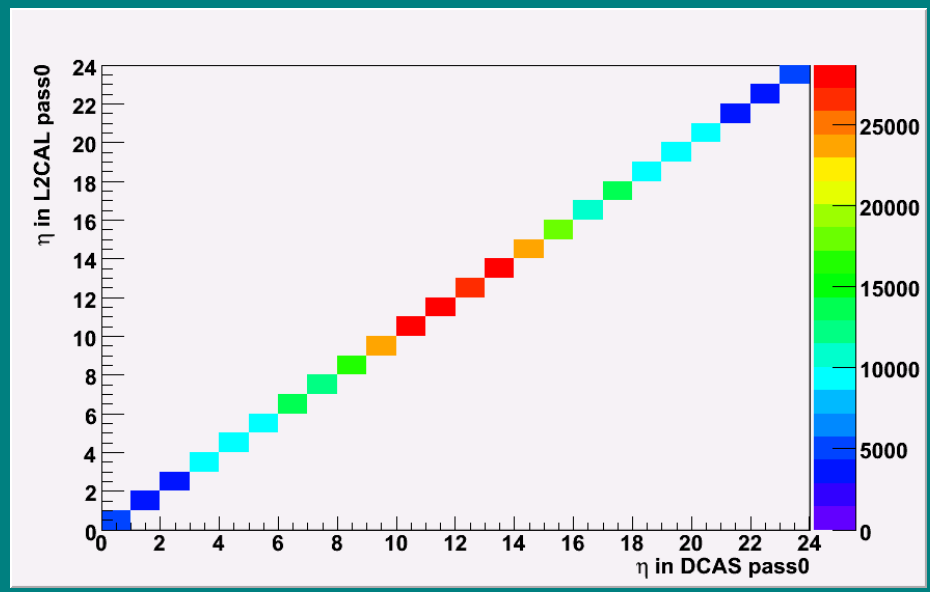
- For pass 0 clusters.
- EM – 0 disagreements out of 325k clusters.
- Hadronic – 114 disagreements out of 325k clusters.

Comparing Cluster Positions

ϕ



η



- For pass 0 clusters.
- No disagreements in ϕ or η for 325k clusters.

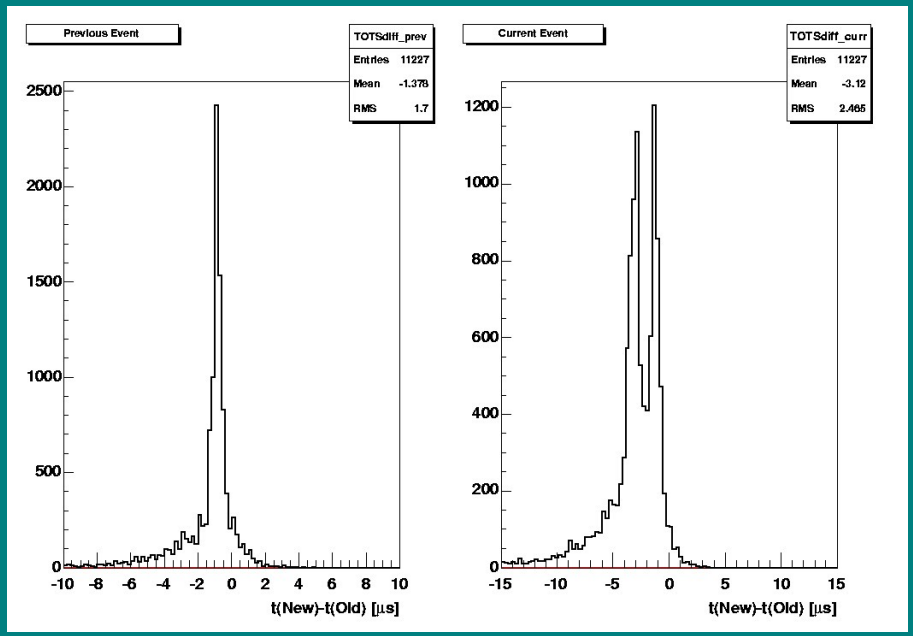
Conclusions

- L2CAL latency has been measured across range of luminosities.
  - Slightly faster for the L2 unbiased sample.
  - Slower (as expected) when running new clustering. Mean difference for L2 biased sample is 9 μs.
  - Monitoring being integrated into official TrigMon.
- Studies of test triggers just beginning.
  - ε(electron,met) > 99.7%
  - ε(photon) > 97%
    - Working on understanding this.
  - ε(jet)>97%
    - Expected to be the most different.
  - Cluster properties look reasonable.

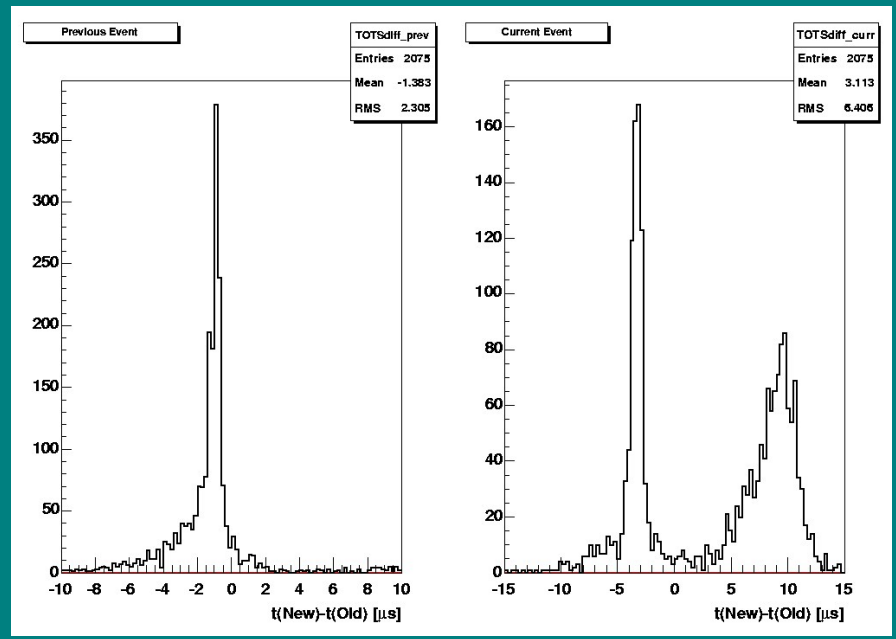
Backups

Timing Difference

No Algo

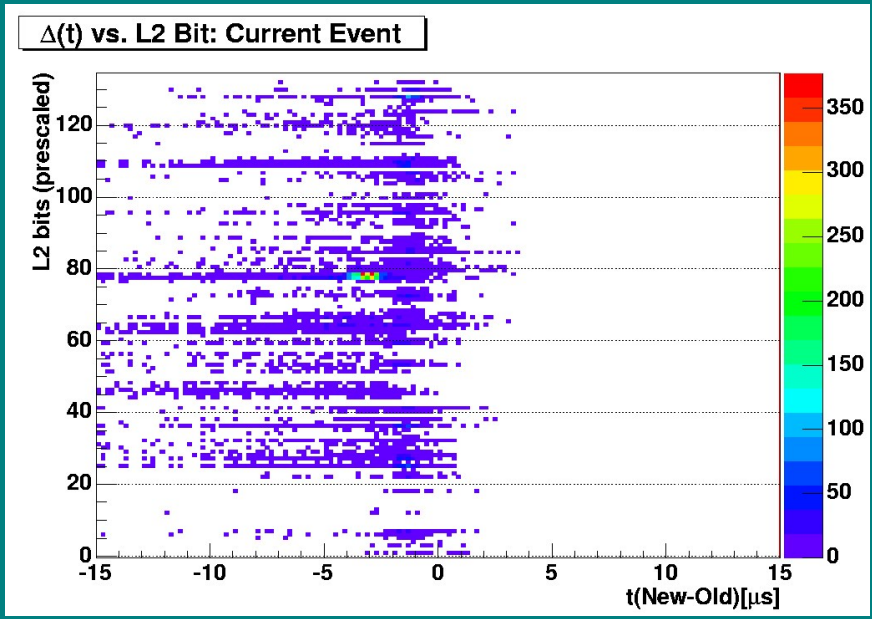


With Algo

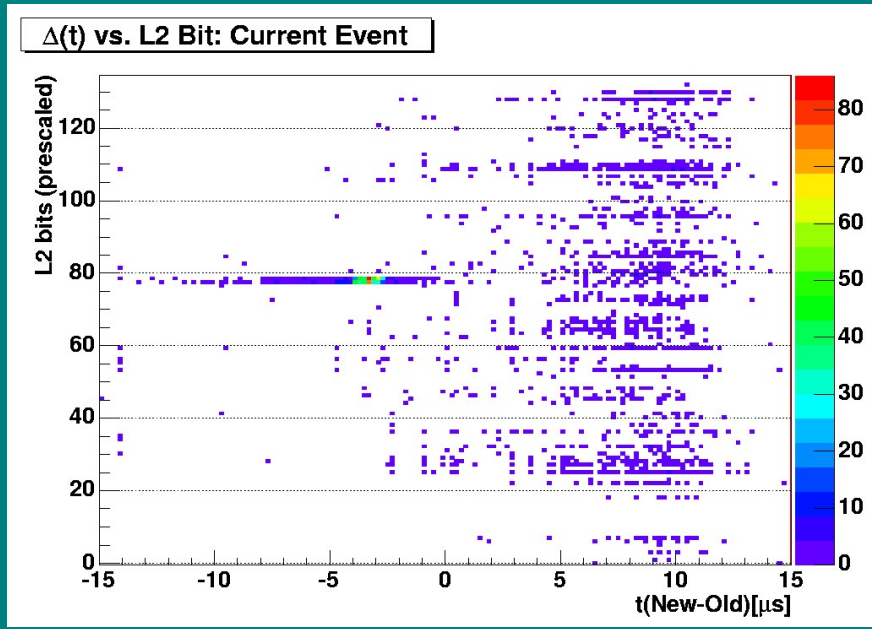


Latency vs. L2 Bit

No Algo



With Algo



- Rate-limited bits (78 & 79) are mostly L2 rejects→ no slowdown from new algorithm.

Other Input Timing