



Timing Monitoring (with simple method) in Collision Data 2011

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24th of March 2011



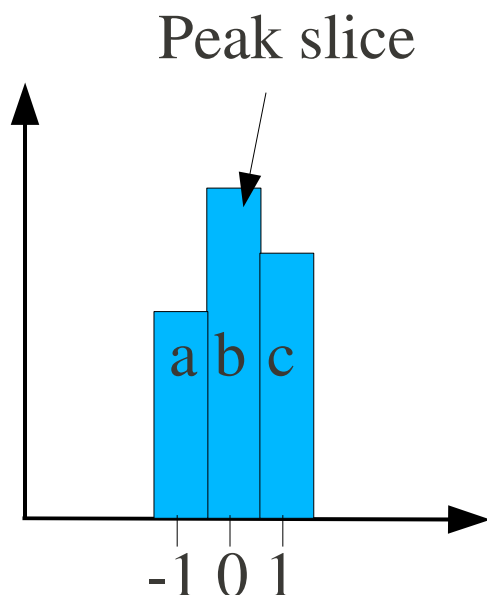
Aim

- Look at the average timing using the simple fit method to see if the trigger tower timing looks sensible in collision data since the shutdown.
- Look at the variability of this timing by calculating the standard deviation on each trigger tower.

(Started using unstable collision data, but pulses looked very strange. Fortunately stable collisions turned up soon after.)



A new fit technique – presented in June



$$finetime = \frac{c - a}{2(2b - c - a)}$$

Worked examples (given as a proportion of 1 BC = 25ns)

1) $b = c$

finetime = 0.5

2) $a = b$

finetime = -0.5

3) $a = c$

finetime = 0

4) $a = 45; b = 55; c = 50$

finetime = 0.17

etc.

finetime is then corrected for the possibility that the peak was not in the central slice, and converted to nanoseconds.



Triggered data

Pulses > 70 ADC counts

Adjacent slices > 40 ADC counts

If peak is in first or last slice of sample, no fit done

If slices either side of peak are same size, no fit done

'dead' and 'badCalo' towers *included*

No need for GRL – I just need the pulses

Analysis based on version 16.6.2 of 'Athena Example' code written by John Morris and run on the GRID.



Data

What 2011 data is available?

- Not as much as we hoped, limited stable beams
- Streams unreliable due to problems with magnets
- Production of DESDs slower than I would like!

14-16 March -

data11_7TeV.00177***.physics_JetTauEtmiss.merge.DESD
_CALJET.f348_m761 *** = 539, 540, 593, 682

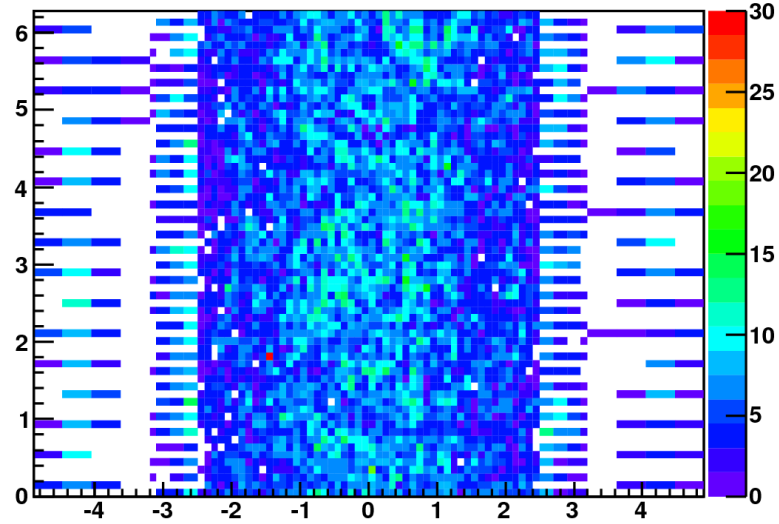
- But 539, 540 have a hole in EM coverage
- Some timing changes on out of time towers between 540 and 593



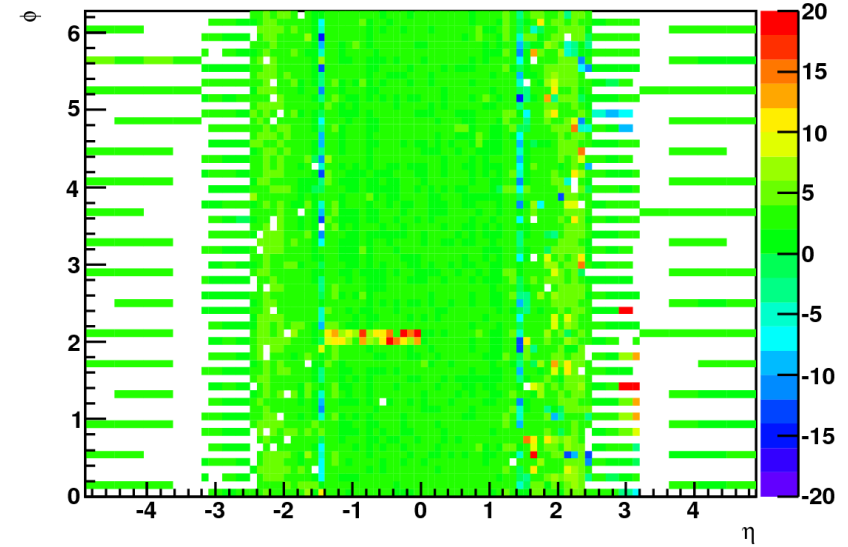
Average tower timing (EM)

4 runs with JetTauEtmis streams

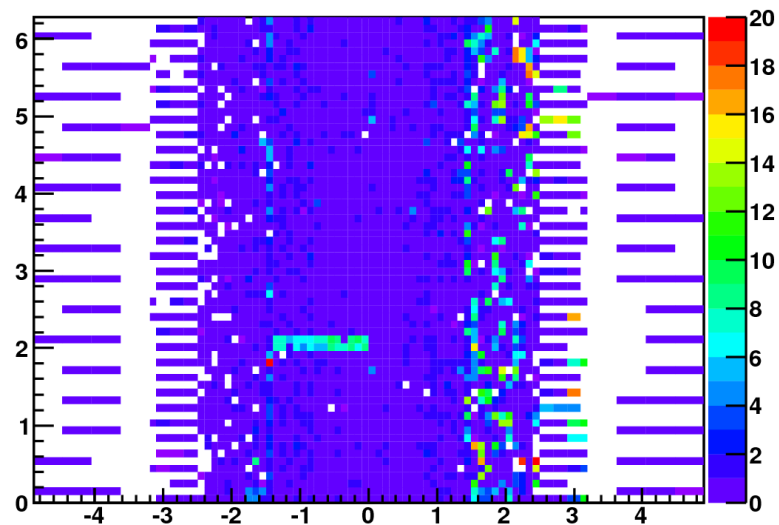
PPM Em Eta Phi Pulses with finetime



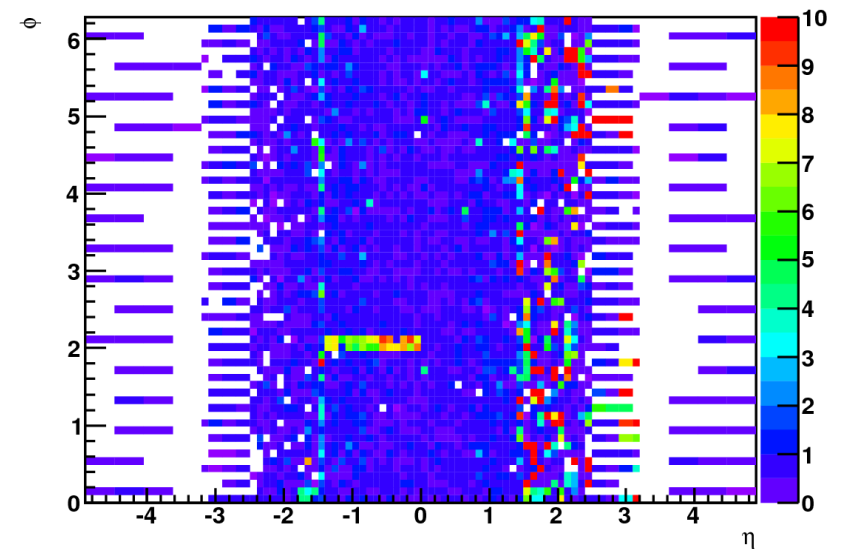
Average of fine timing



Standard Deviation of fine timing



Standard Deviation of fine timing (zoomed)

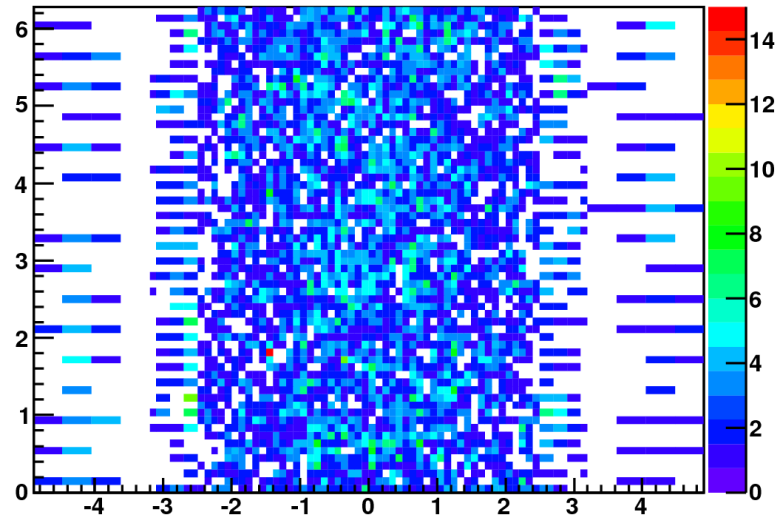




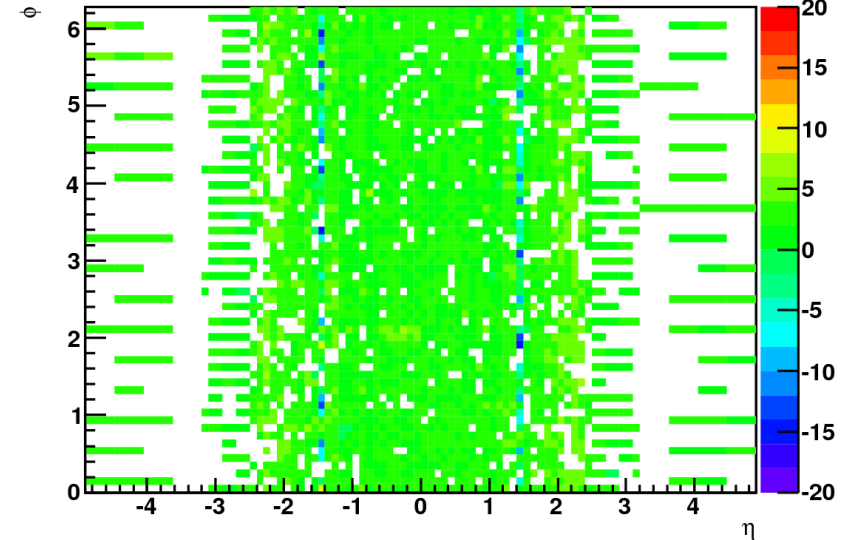
Average tower timing (EM)

Post-timing change run only (177682)

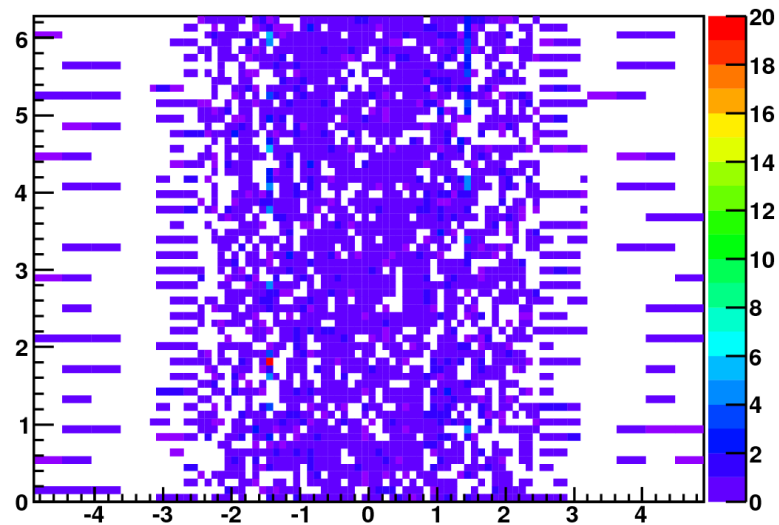
PPM Em Eta Phi Pulses with finetime



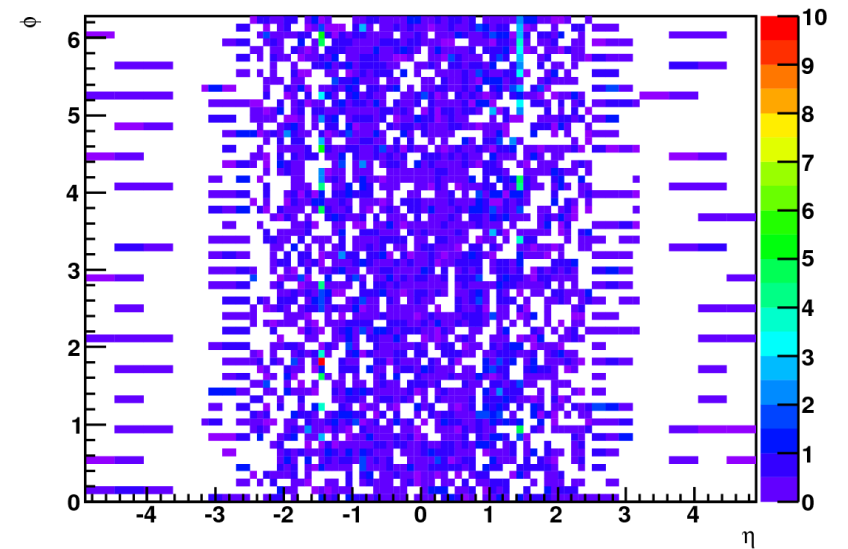
Average of fine timing



Standard Deviation of fine timing



Standard Deviation of fine timing (zoomed)

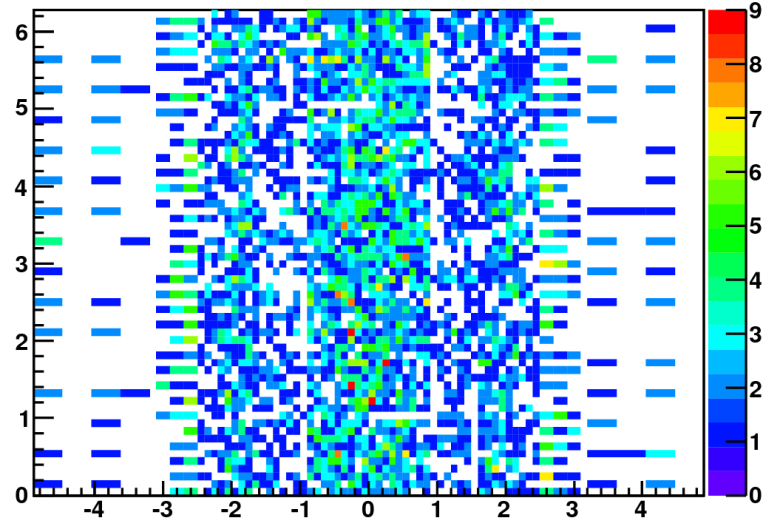




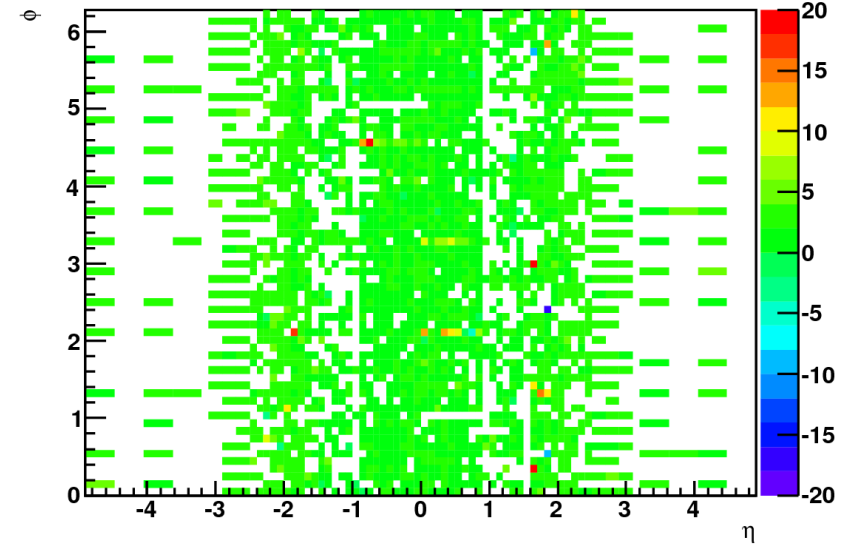
Average tower timing (Had)

4 runs with JetTauEtmis streams

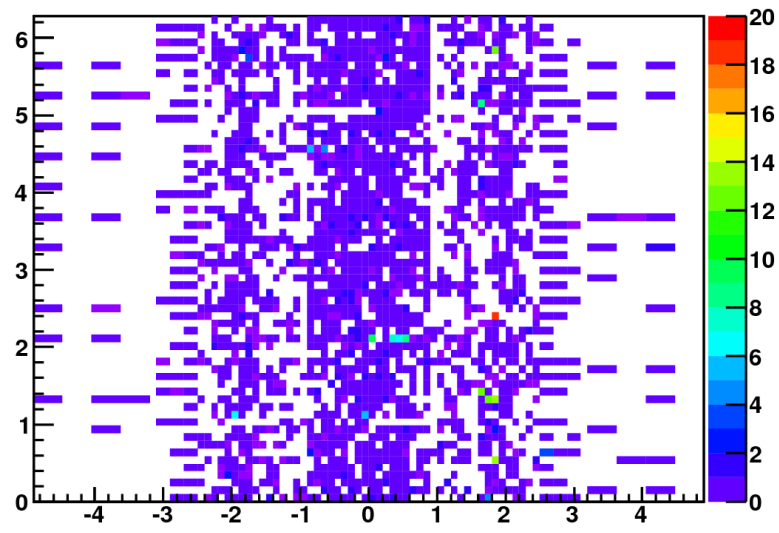
PPM Had Eta Phi Pulses with finetime



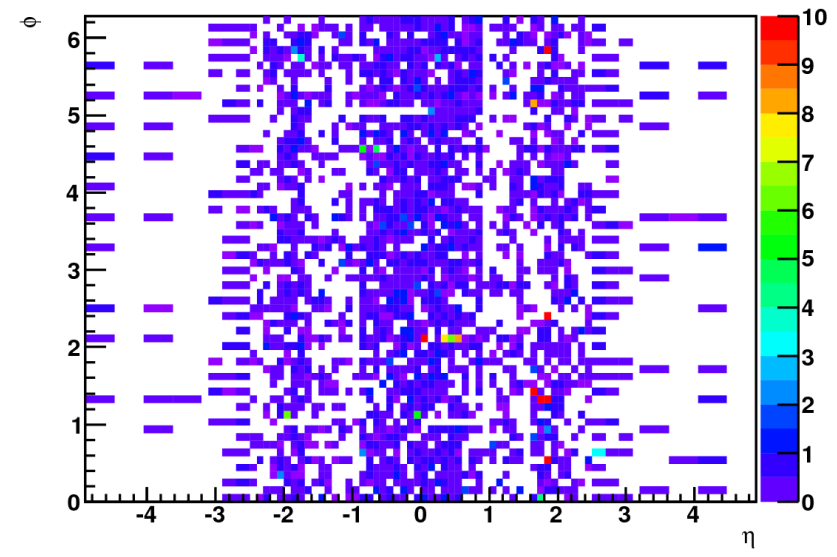
Average of fine timing



Standard Deviation of fine timing



Standard Deviation of fine timing (zoomed)

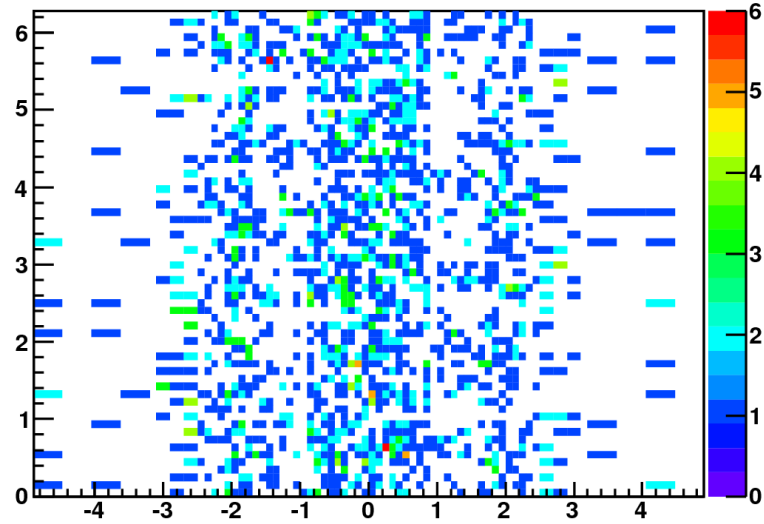




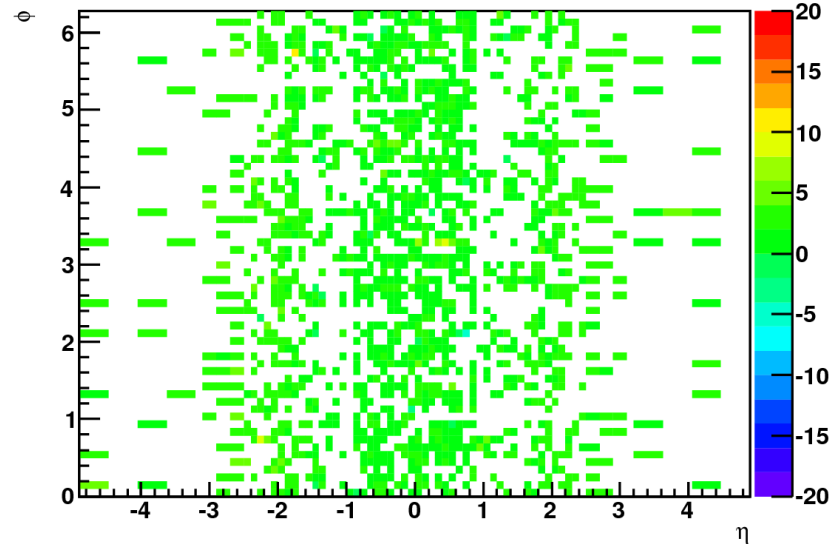
Average tower timing (Had)

Post-timing change run only (177682)

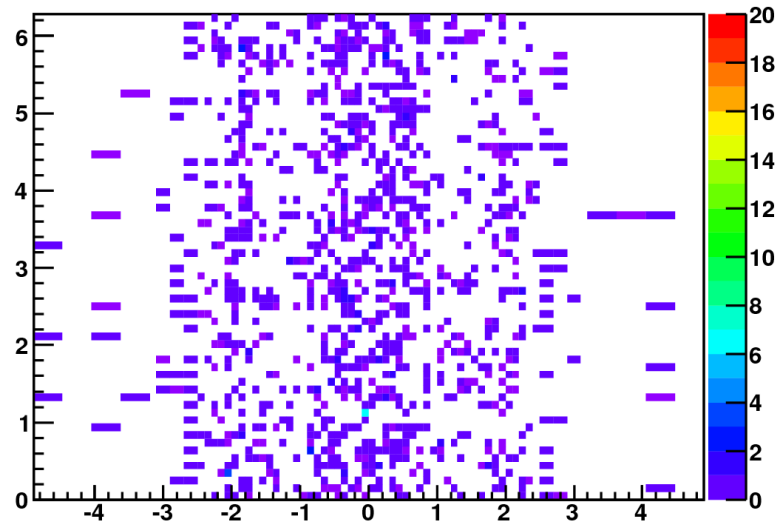
PPM Had Eta Phi Pulses with finetime



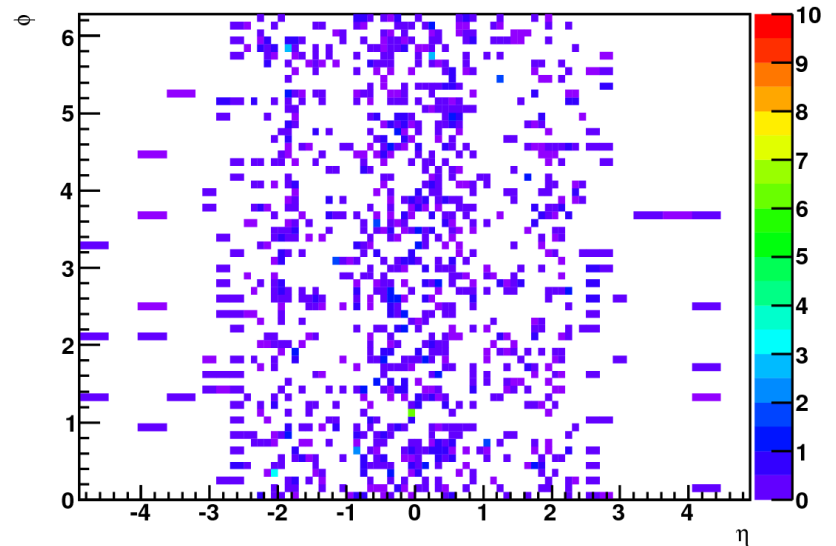
Average of fine timing



Standard Deviation of fine timing



Standard Deviation of fine timing (zoomed)



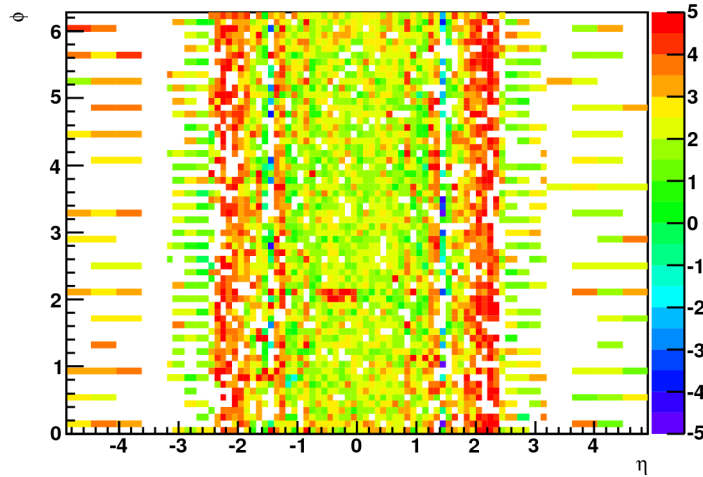


Closer look...average timing

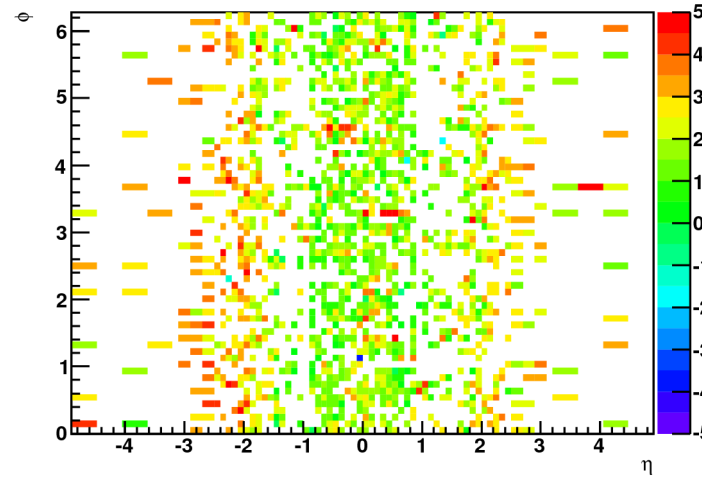
Don't forget – not a rigorously proven method, not necessarily useful to this precision.

Post-timing change run only (177682)

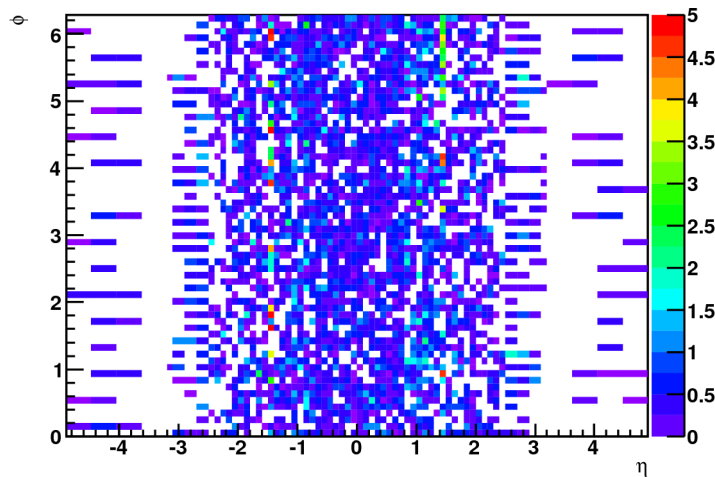
EM average finetime



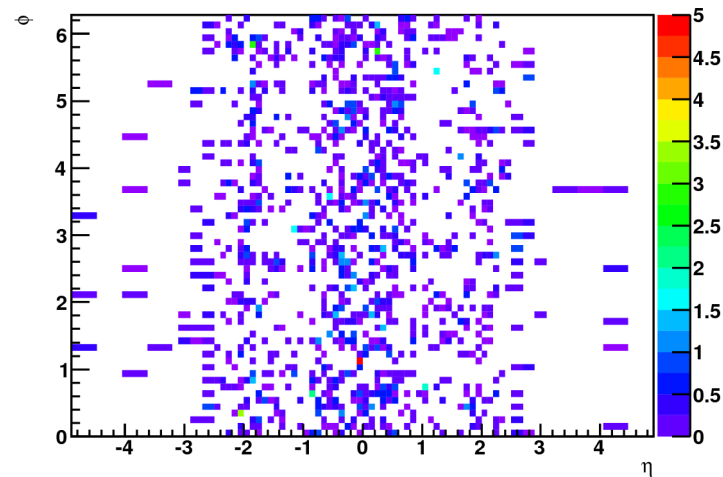
Had average finetime



EM standard deviation

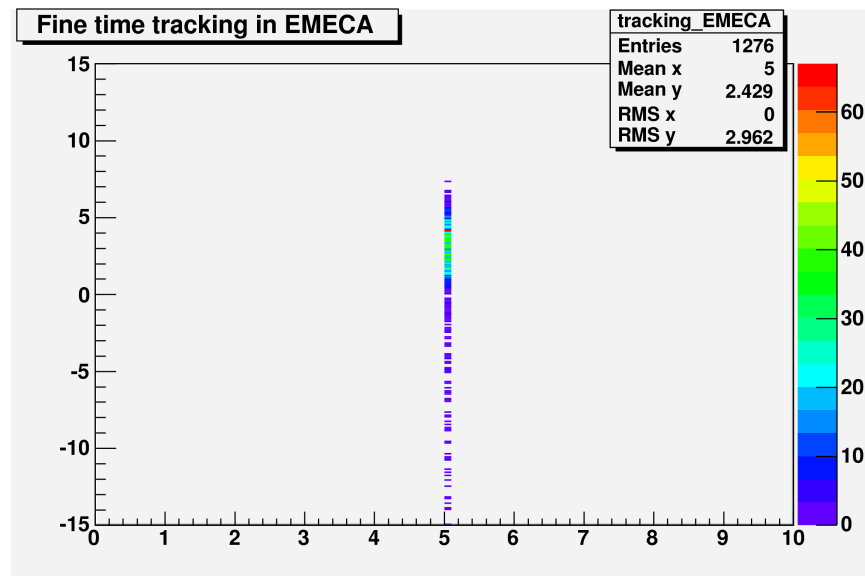
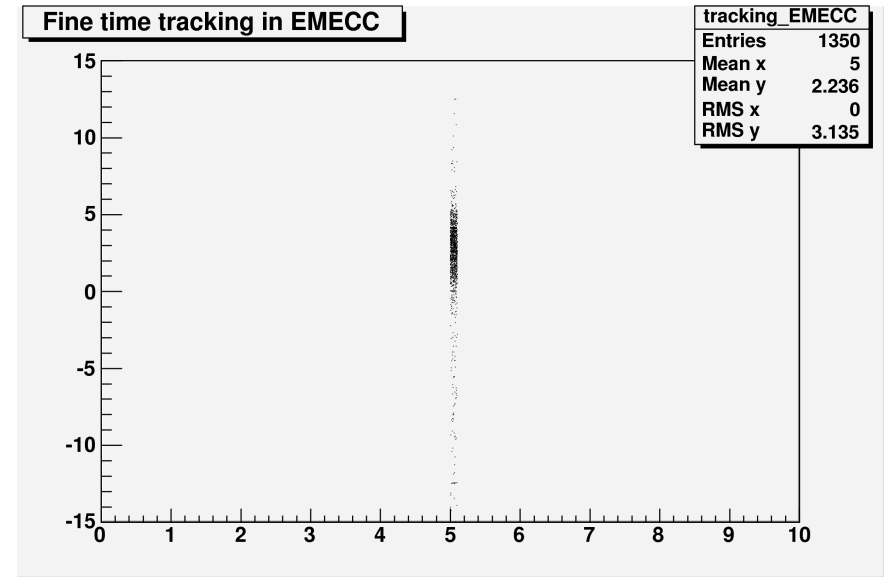
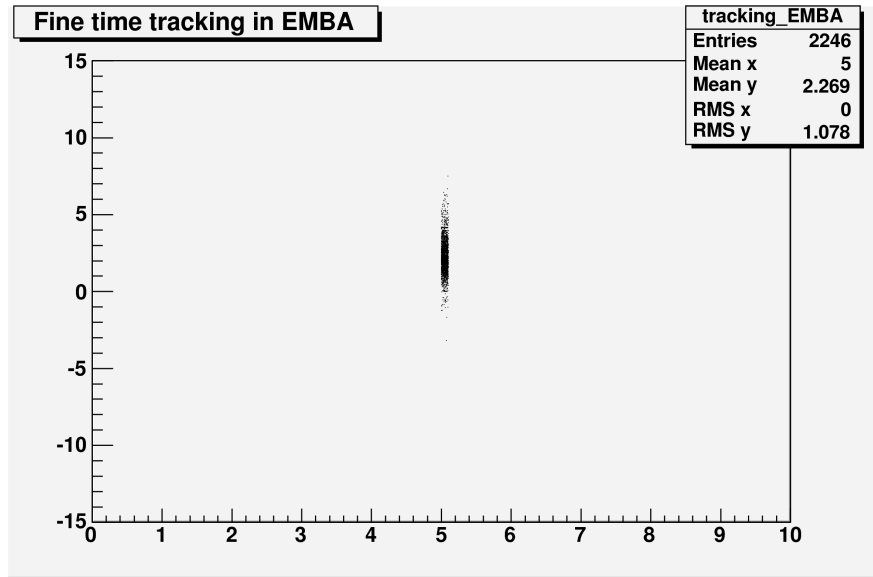


Had standard deviation



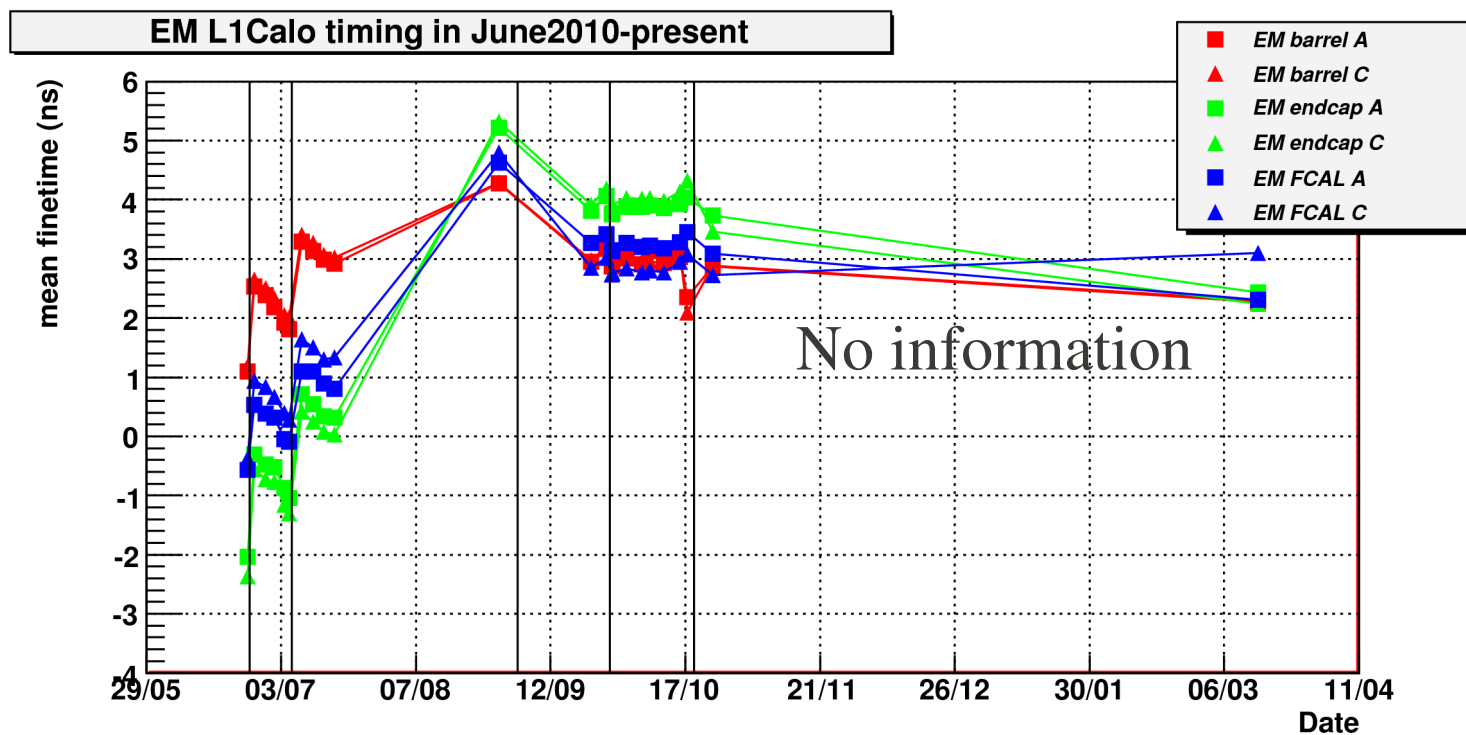


Spread by partition





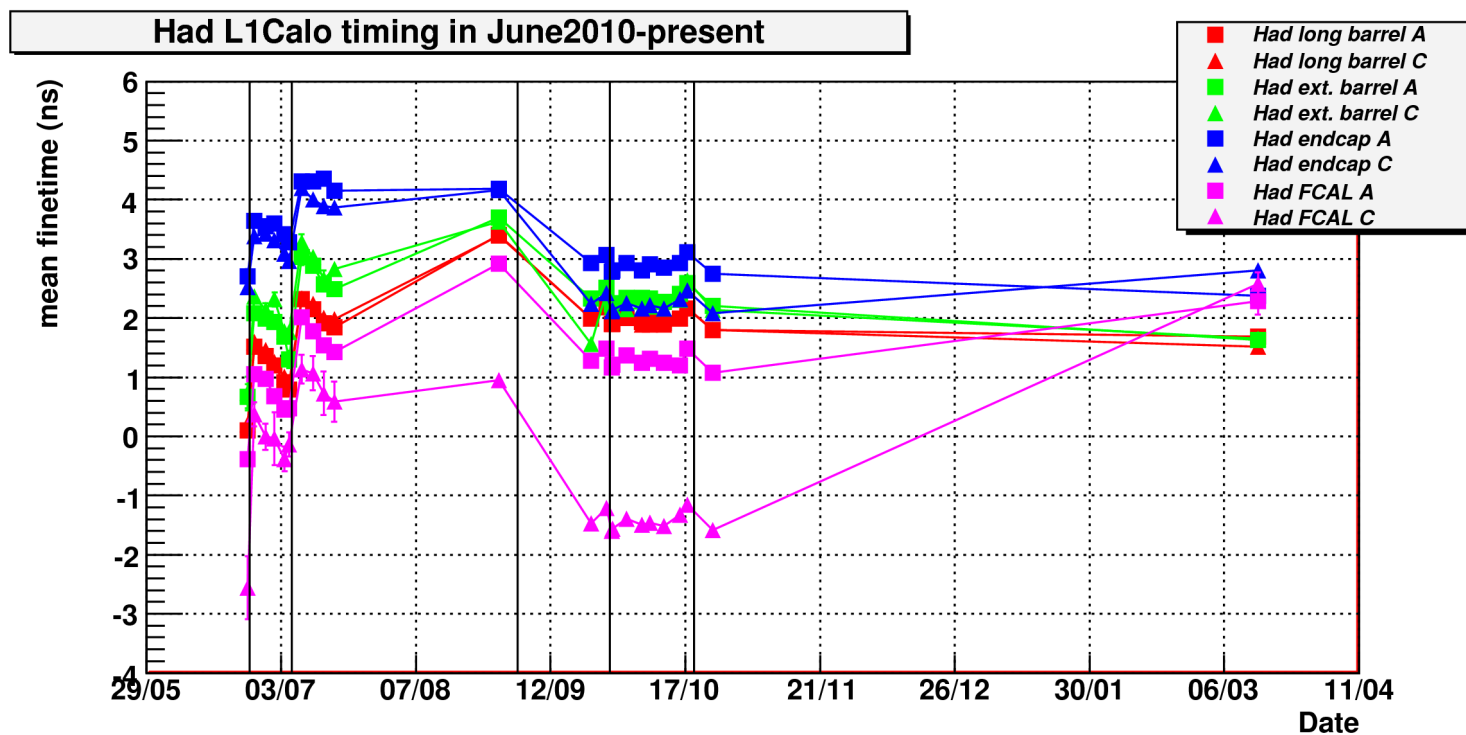
Partition tracking - EM



- Surprisingly good?!
- CTP is being really responsive to the ambient temperature problem.



Partition tracking - Had



- Even more surprisingly good?!
- FCAL-C brought into line with other partitions



More data?

18 March -

data11_7TeV.00177904.physics_JetTauEtmis.merge.DESD
_CALJET.f349_m761

- But lots of different conditions going on while magnets were off
- Opportunity to look at timing differences between layers
- Grid issues!



Back-up