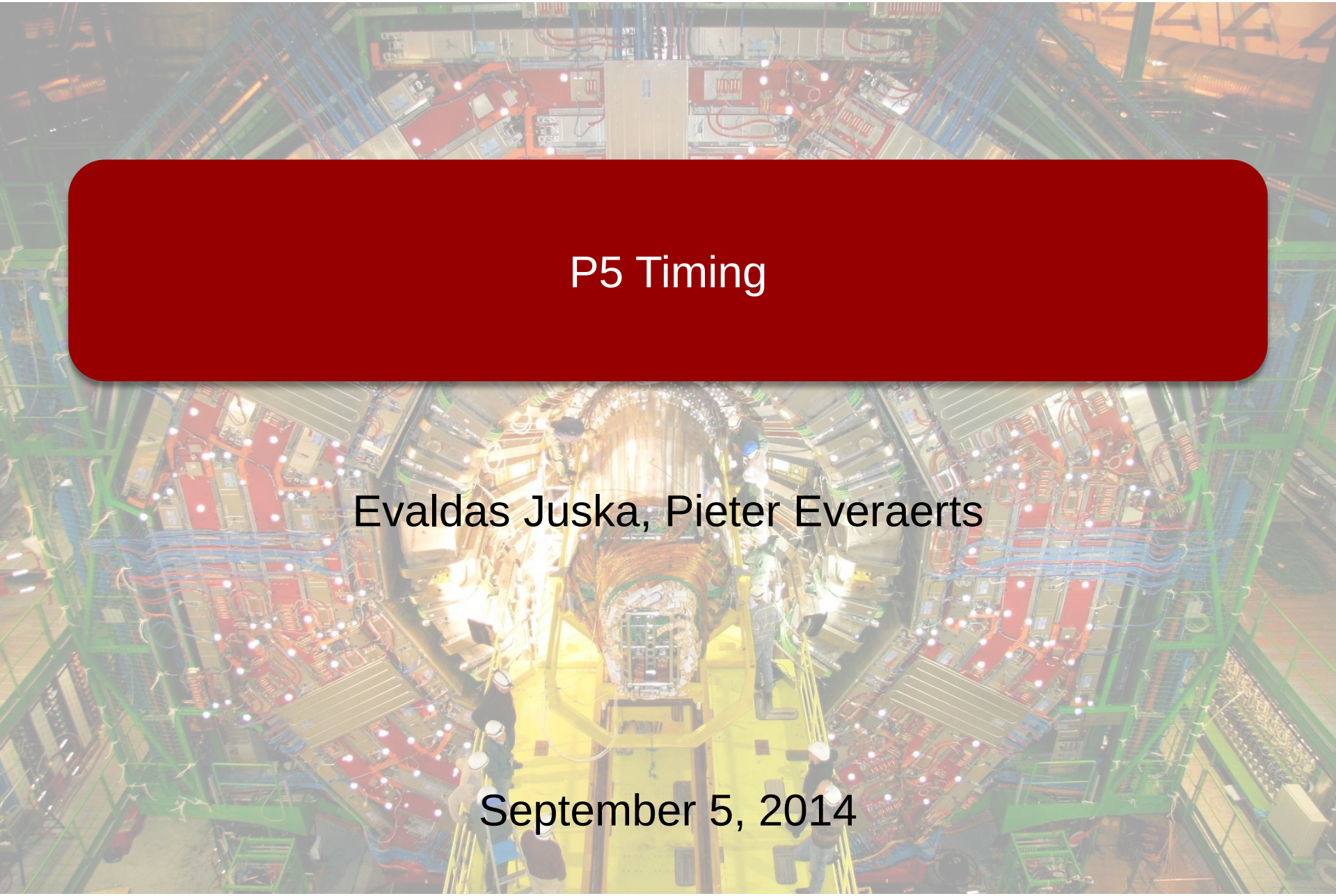


P5 Timing

Evaldas Juska, Pieter Everaerts

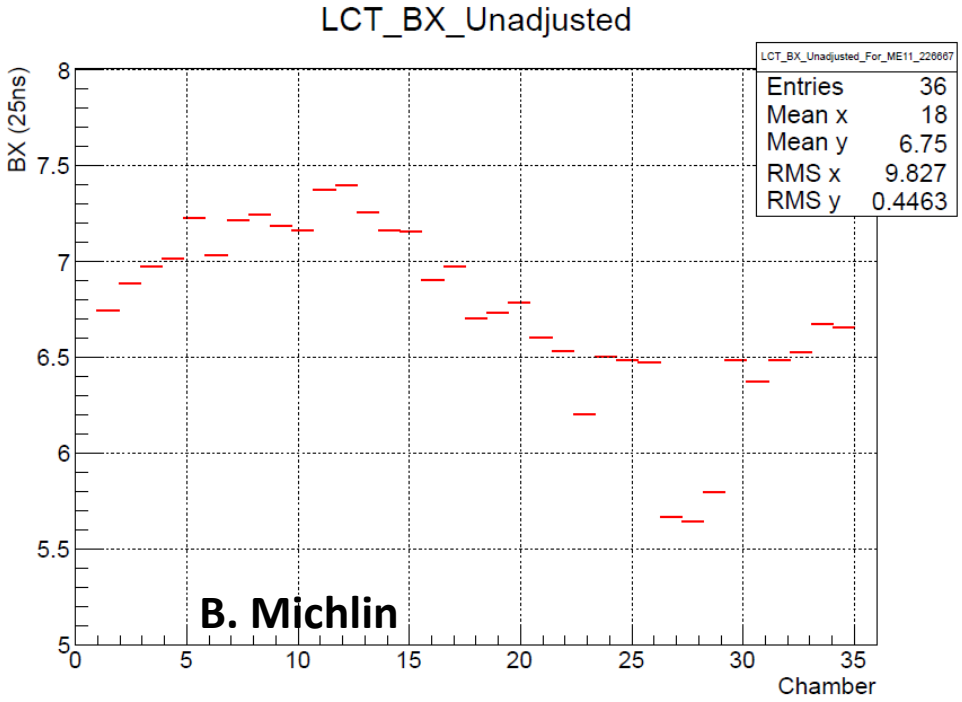
September 5, 2014

TCDS timing

- After changing to TCDS system performed L1A scan
- TCDS system 3 BX early compared to TTC system
  - For local running!
- Changed LPM setting by 3 BX
  - Timing same with TCDS as TTC system
- Still want to perform more checks
- http://cmsonline.cern.ch/cms-elog/824625

Using CSCTF information

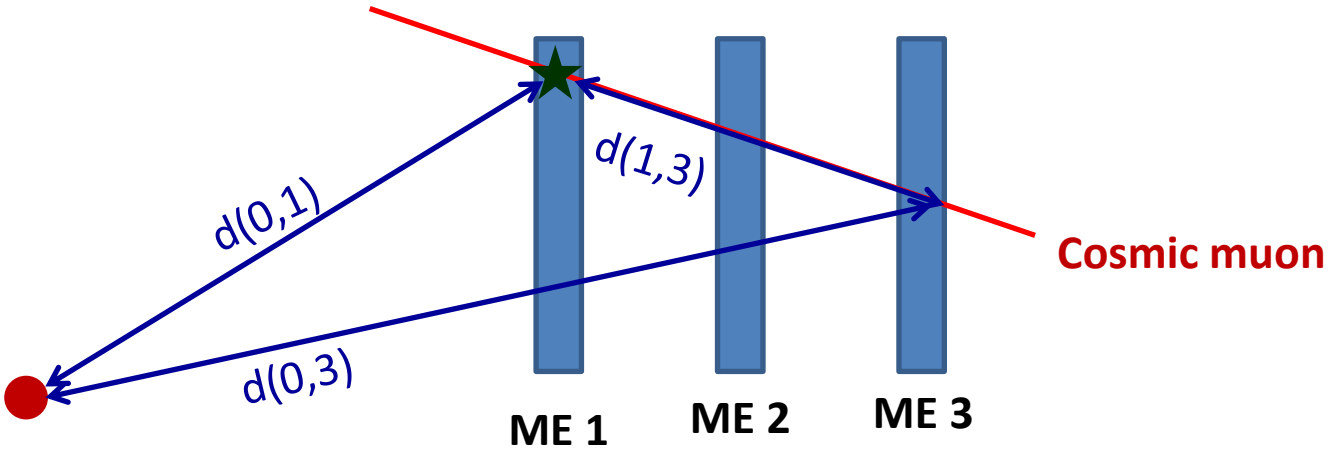
- Pier, Benjamin and Renjie have started producing plots with CSCTF timing



- By sharing the code, applied similar TOF corrections as before on the CSCTF LCT BX

Correct time

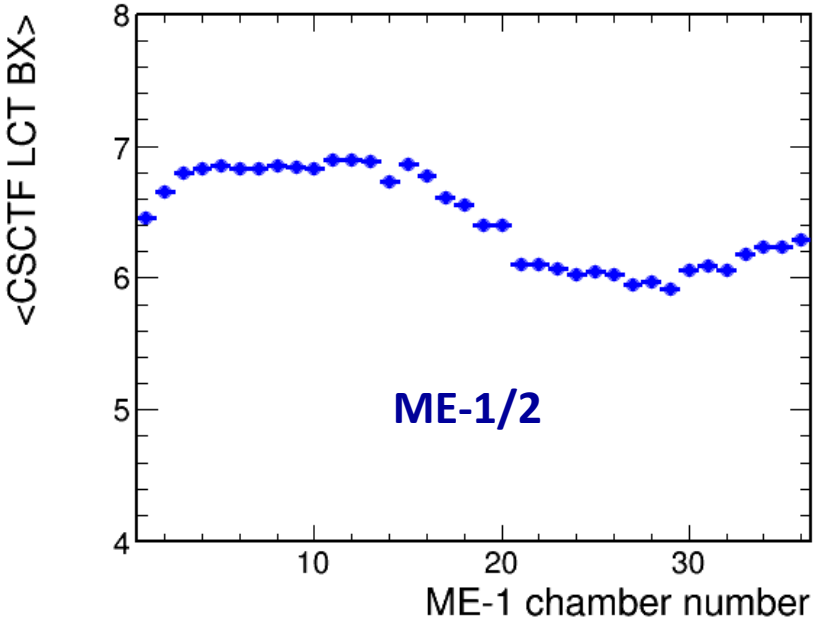
- Using the position information of the different muons and assuming speed of light for the muon
  - Use trigger position in station 3 for muons with higher y in station 3 than station 2, trigger position in station 2 for the others
  - Time changes:
    - d(0,3)-d(0,1) is time difference in flight expected for the two hits
    - D(1,3) is the real time difference
  - For forward moving muons, both complement each other, for backward moving they counteract:
    - Forward: ALCT_Bx-d(0,2)-d(1,2)+d(0,1)
    - Backward: ALCT_Bx-d(0,3)+d(0,1)+d(1,3)

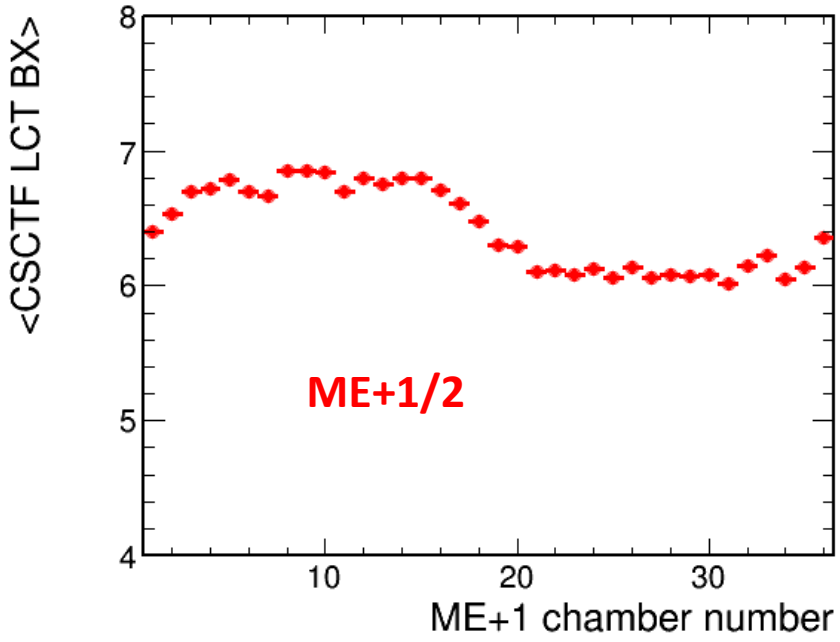


Uncorrected time for ME1/2

- Used two runs to make sure stations ME1/ME2/ME3 were together:
  - 227021 for ME+1
  - 227146 for ME-1
- Also cross-checked runs

BEFORE CORRECTIONS

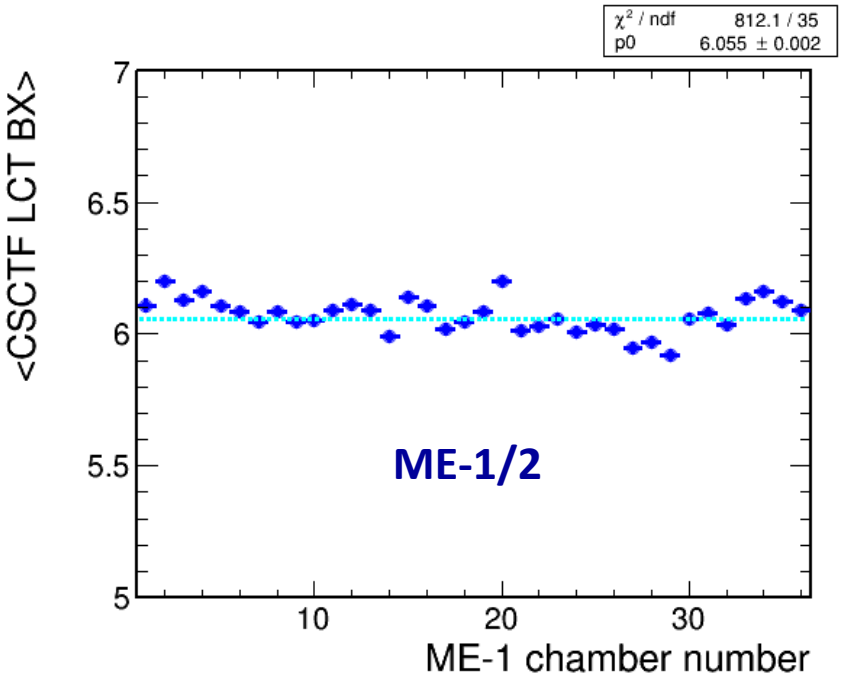


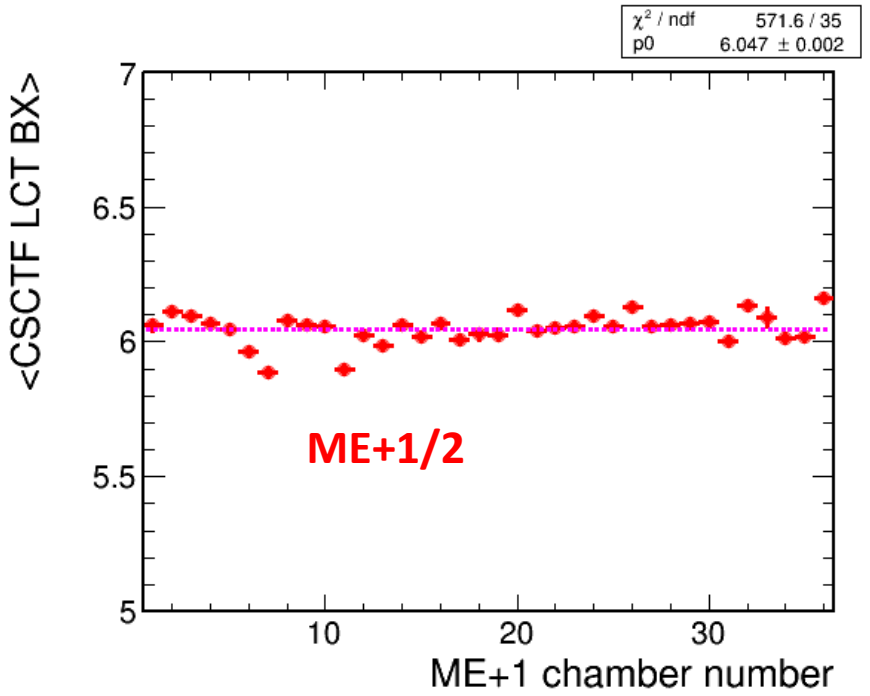


Corrected time for ME1/2

- Corrections give right behavior
- Mean is close to 6.06

AFTER CORRECTIONS

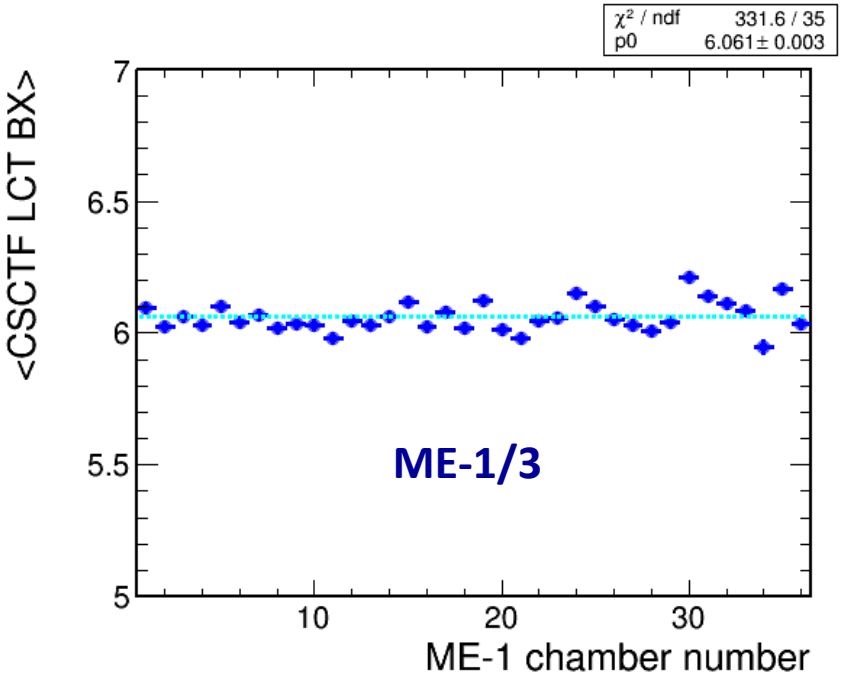


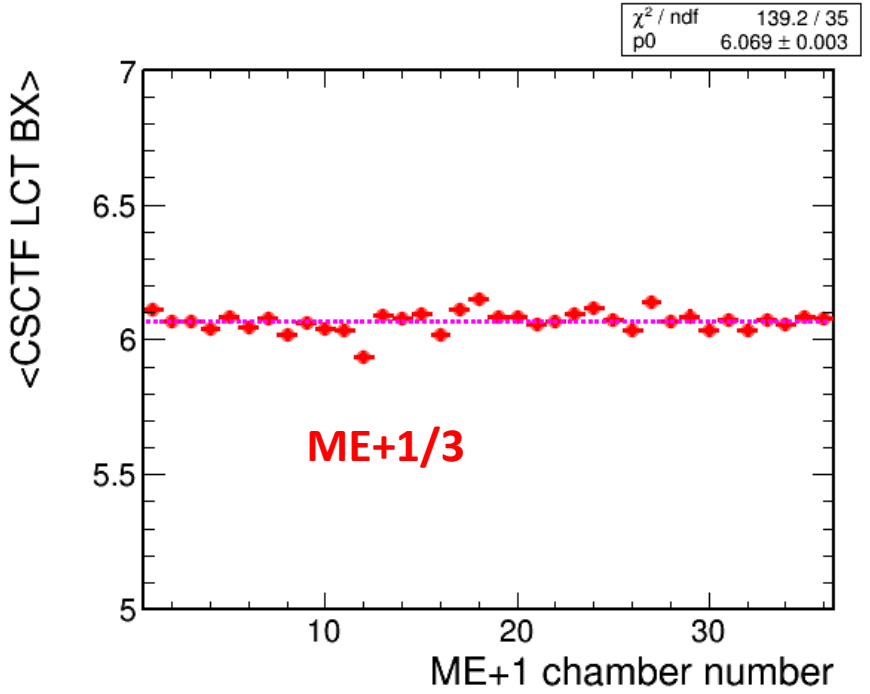


Corrected time for ME1/3

- Similar behavior for ME1/3
- Corrections give right behavior
- Mean again close to 6.06

AFTER CORRECTIONS

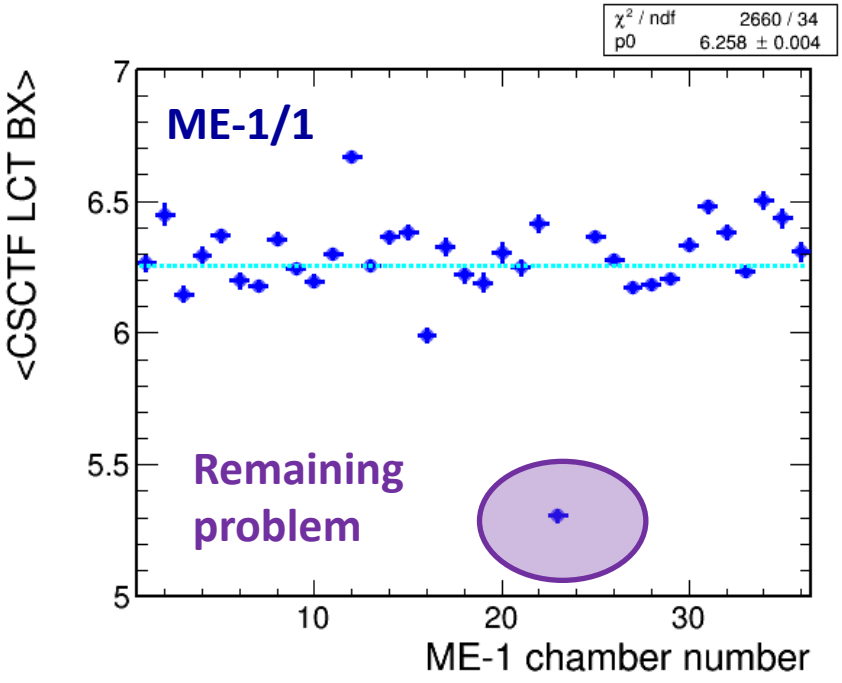


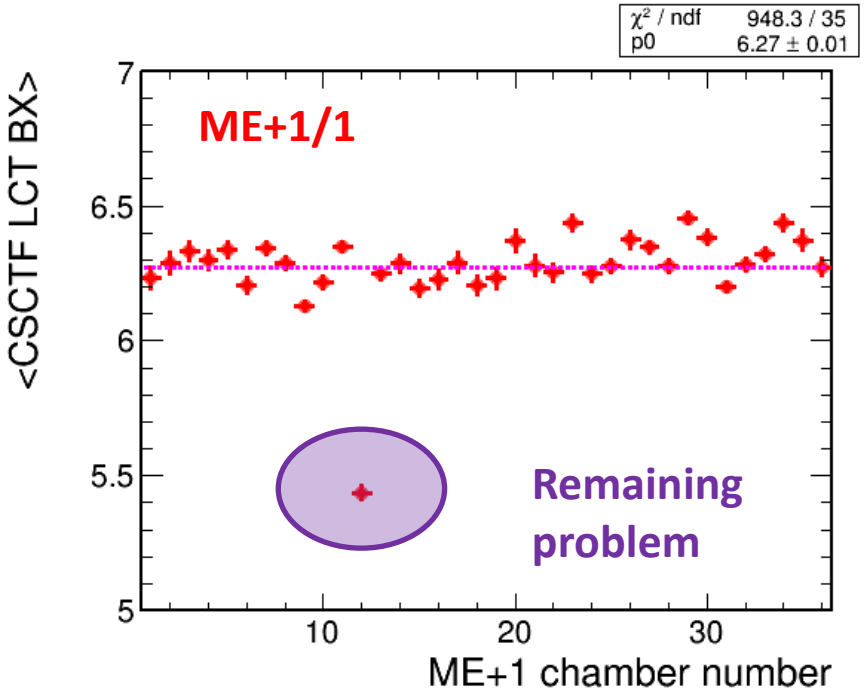


ME1/1 results

- Few problematic chambers
  - Problem during operation or mistake in changing parameters?
- Comparison with earlier run for ME+1
- Overall shift wrt ME1/2 and ME1/3 (mean:6.26)

AFTER CORRECTIONS



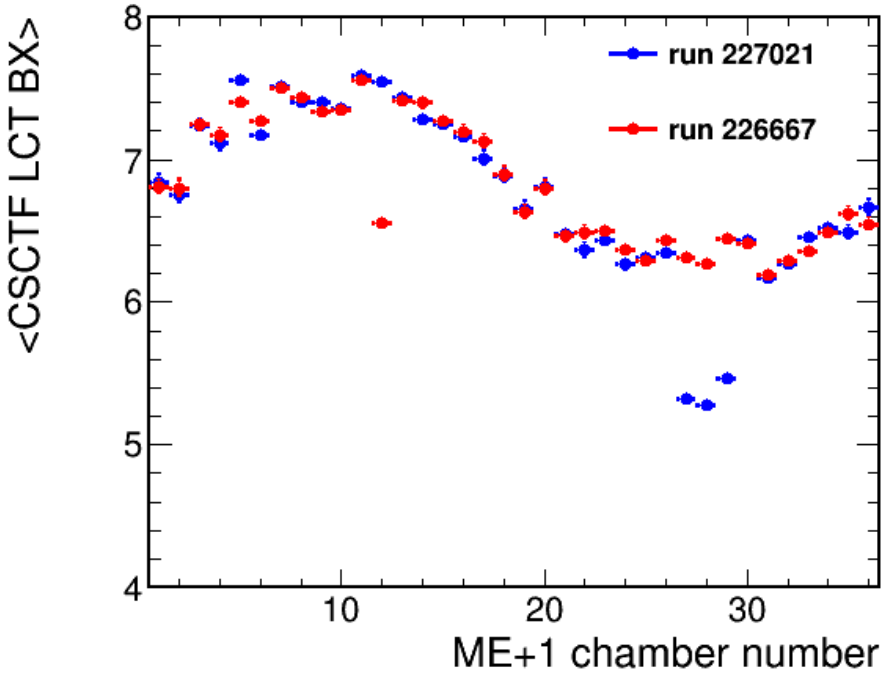


Able to derive detailed chamber-by-chamber corrections (~2-3 ns acc.)

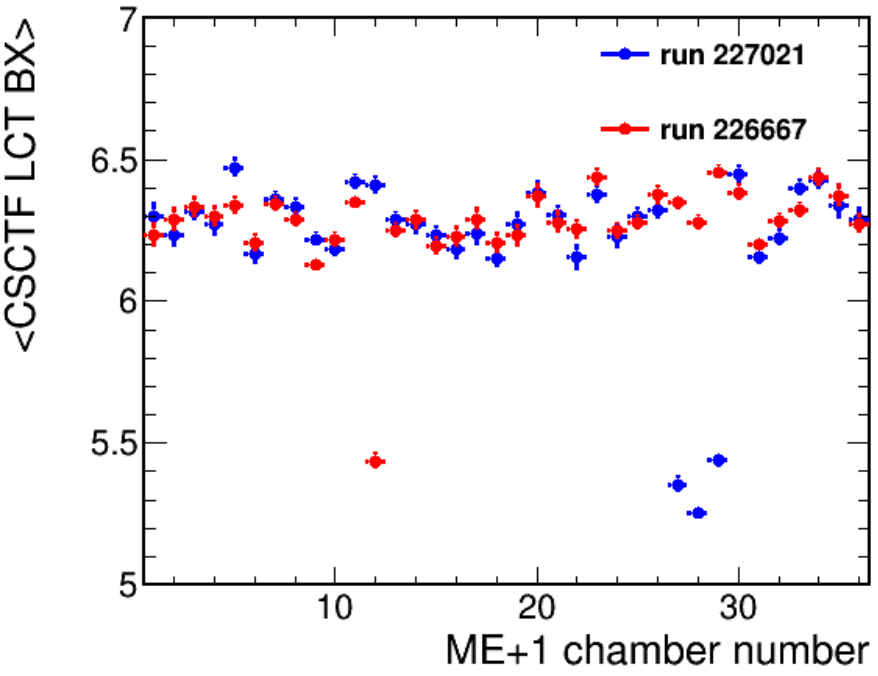
ME1/1 results

- Comparison with old run looks good
  - 3 chambers had a problem during the first run
  - Only question is the one problematic chamber that showed up

BEFORE CORRECTIONS



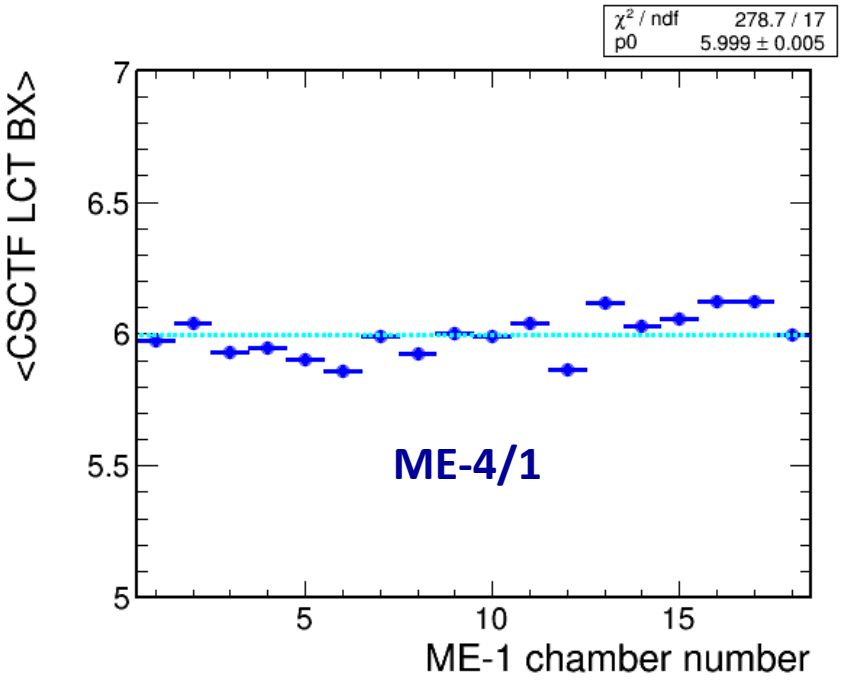
AFTER CORRECTIONS

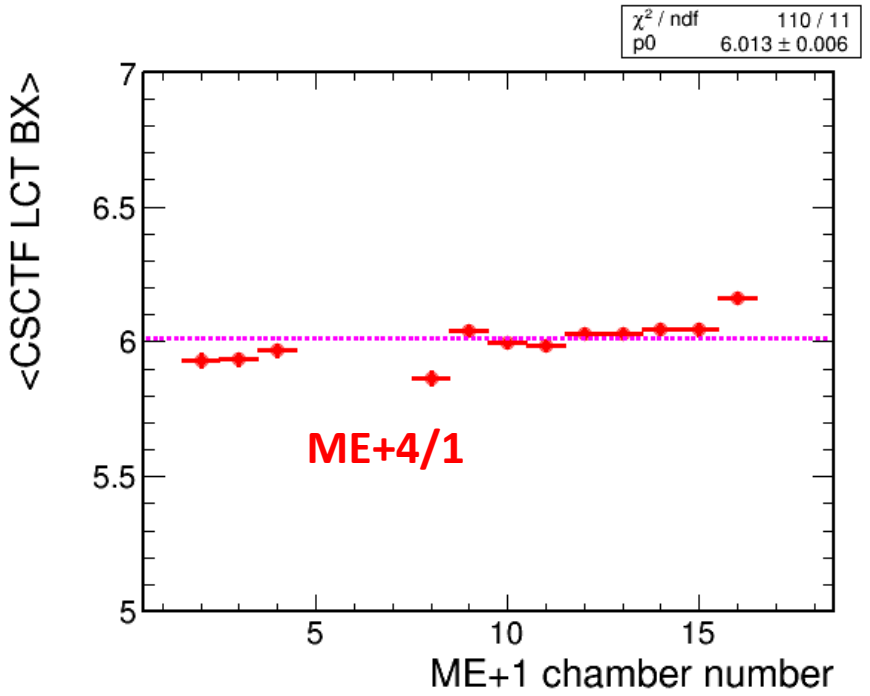


Corrected time for ME4/1

- Corrections give roughly right behavior (maybe 1-2 ns effect?)
- Mean is close to 6.01
  - Slightly (1 ns) different from ME1/2 and ME1/3

AFTER CORRECTIONS

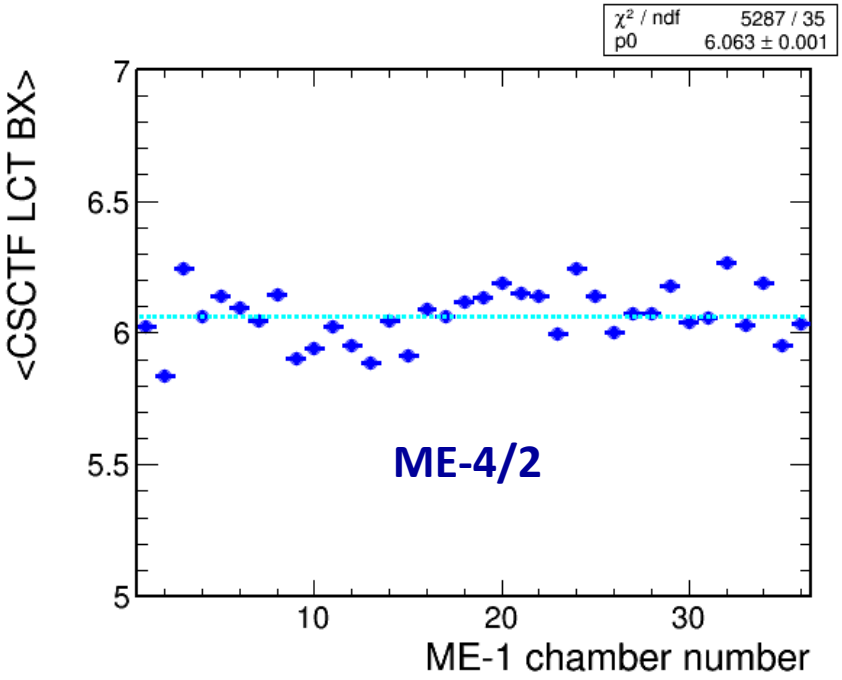


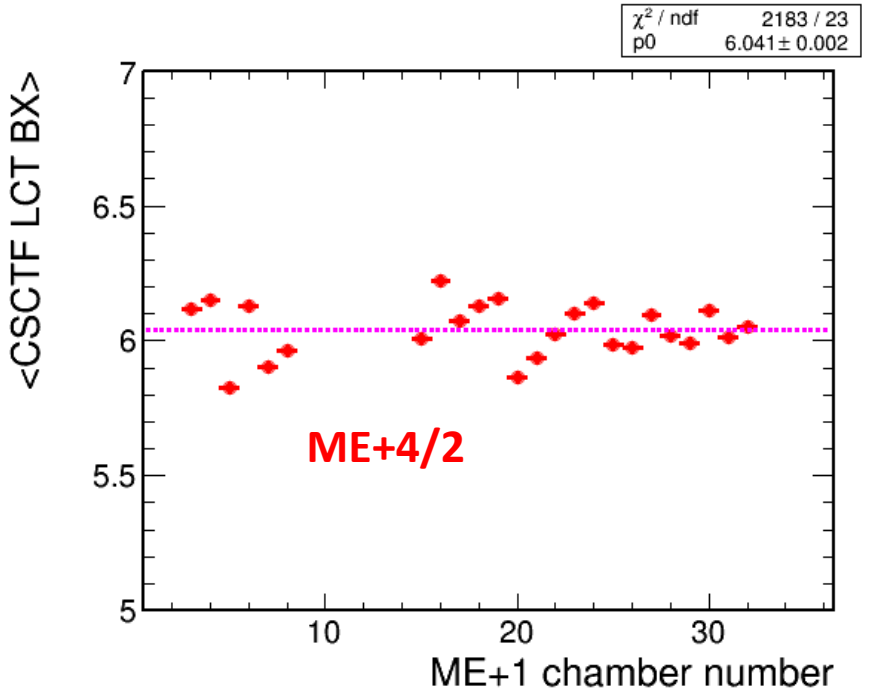


Corrected time for ME4/2

- Quite good agreement
  - Slightly larger fluctuations can be corrected out
- Mean is close to 6.05
  - Close to ME1/2,ME1/3

AFTER CORRECTIONS





Conclusions

- A lot of improvement on the ME1/1 timing
  - Do we expect differences from newer firmware?
- Handle on CSCTF timing thanks to Pier, Benjamin and Renjie
- ME4 timing looks very good out-of-the-box
- Derived first set of detailed corrections for ME1/1 and ME4/2
- Understand the small differences between ME1 and ME4?
  - Of the order of 1-2 ns, so probably not limiting accuracy