TOF Calibration

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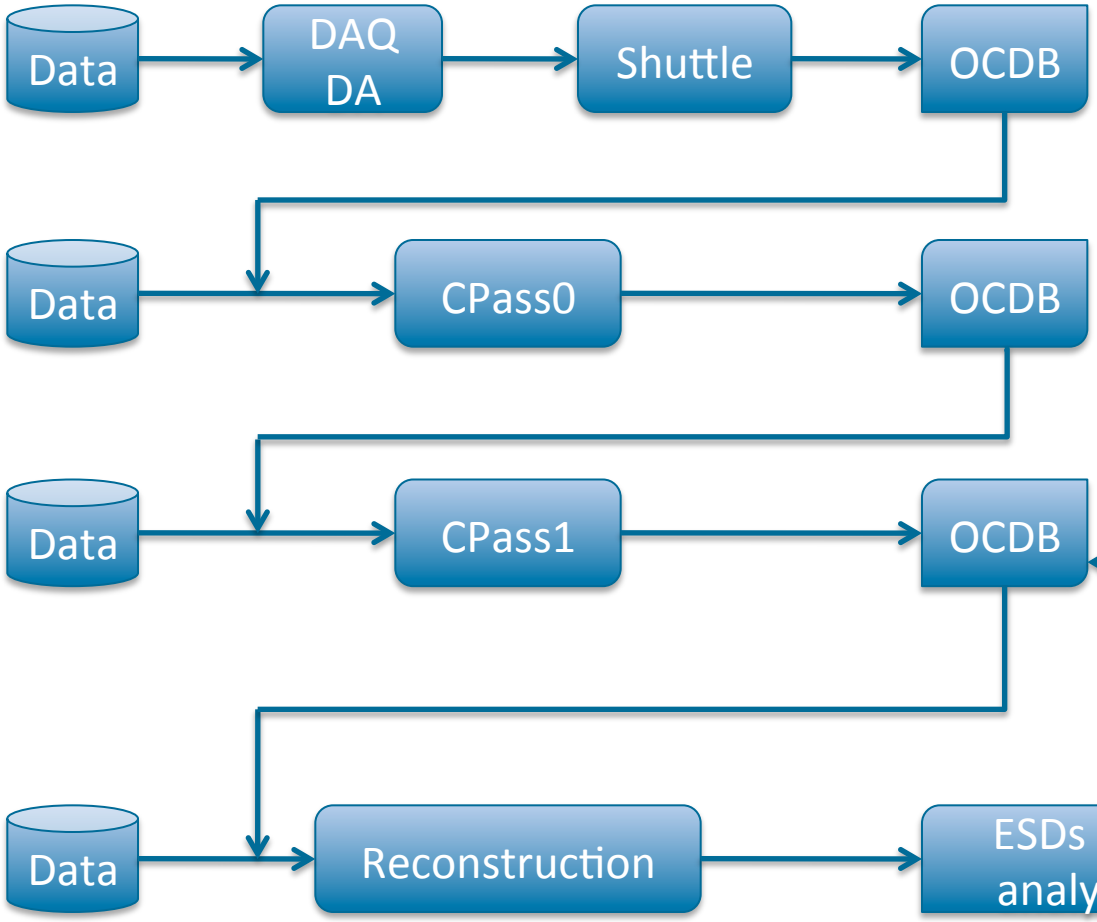
Calibration forum @AOW, 24/11/2015

TOF current Calibrations



Shuttle:
- OCDB: Status (noisy channels, HV, LV), ReadoutEfficiency (channel efficiency)
- Reference: CalibNoise, FEEDump, DCSData, ReadoutInfo, FEEData

CPass0:
- RunParams: T0-Fill (RunParams) based on reco tracks, with calibrated (online) TPC
- uses clock phase info by BPTX (from GRP)

CPass1:
- T0-Fill (RunParams) based on reco tracks, with calibrated (cpass0) TPC
- Clock phase subtracted from data (GRP)

Manual calibration
- ParOffline (channel-by-channel offset)
- Problematic (problems with HW, seen in measured times)
- ParOffline (Time slewing)

Credits C. Zampolli, https://indico.cern.ch/event/228415

TOF manual calibration

See this morning presentation:
https://indico.cern.ch/event/460232/session/8/contribution/56/attachments/1193298/1732920/TOF_20151124_manualCalib.pdf

- How it works
  a) a task runs over the ESDs from cpass1 to produce a tree (TOFCalibTree.root)
  b) Trees are merged over a period
  c) The merged tree is the input for a macro which extracts the residual (wrt cpass1) offsets channel-by-channel (if statistics is sufficient) and the list of problematic
  d) A manual update of the OCDB is requested if necessary

- Performed typically over one LHC period due to the high statistics required for the channel-by-channel calibration

- Moving toward automatisation:
  – Since 2015, the task that we used to run by hand (based on CPass1 ESDs output), has been added to cpass1 to produce the trees used for the manual calibration
  – To do: merging trees run by run (in place for other cpass outputs, TOF to be added)
  – To do: merging trees over period (in place for TPC QA, to be extended to TOF calib)

- Time it takes (if nothing else is in the way)
  – 3 days to run the merging + prepare the calibrations (with some safety margin)
  – Automatisation of merging could speed this up to 1 day (with some safety margin)

TOF calibration – time dependence

- List of problematic channels may change in time
  - hardware related, may appear/disappear if boards are replaced
  - If understood, a solution could be attempted at the hardware level

- channel-by-channel offset should not change in time
  - to be investigated (hardware related)
  - If understood, channel-by-channel offset could be obtained once for all!
    - 1 Calibration less
    - Very useful also for run 3

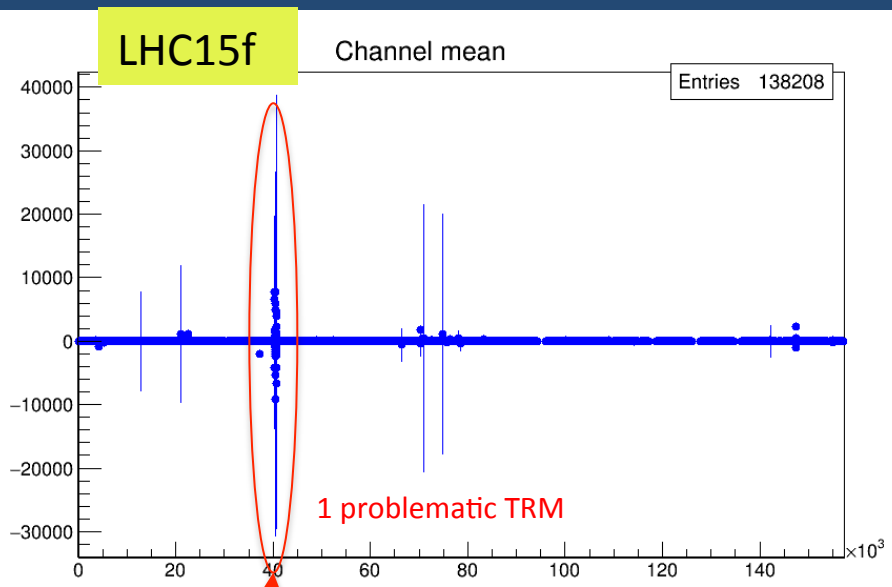
- channel-by-channel time-slewing should not change in time
  - to be investigated (hardware related)
  - If understood, channel-by-channel time-slewing could be obtained once for all!
    - 1 Calibration less

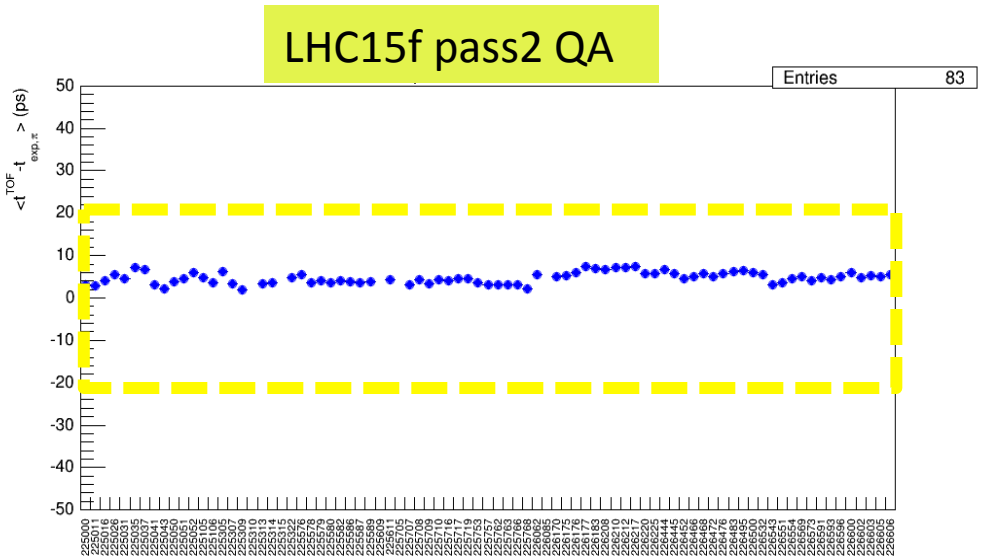
- gas-pressure calibrations change in time
  - Could be parameterized, and done once for all

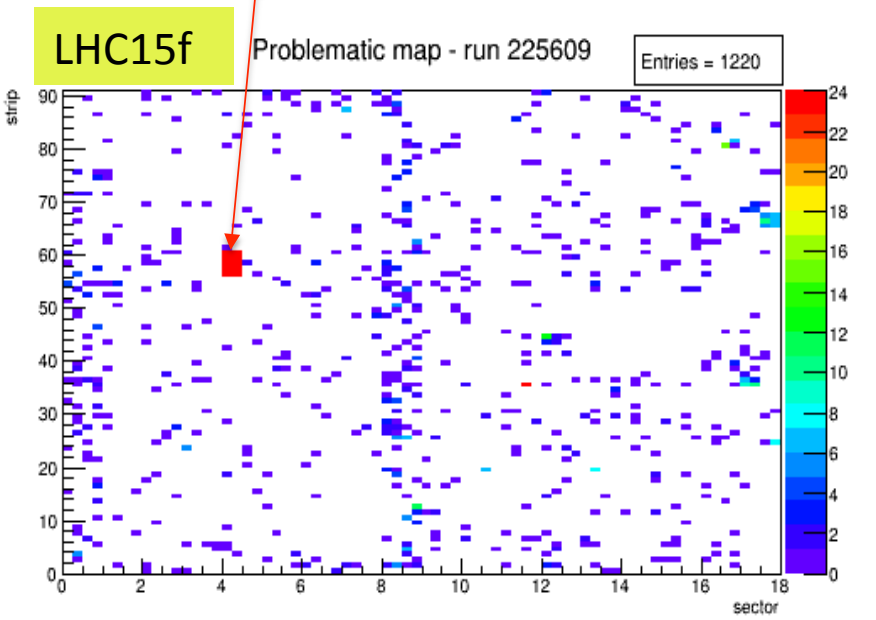
LHC15f fully calibrated for pass2

LHC15f fully calibrated (83 runs with TOF, pass2)

- Statistics (~1k matched hits/channel) allowed manual calibration at the single-channel level
- Time offsets and problematic channel map produced (ALIROOT-6271)
- 4 runs with no matched hits at TOF due to channels flagged as inefficient → see dedicated slide







https://indico.cern.ch/event/442925/

Periods with cpass1_pass1 calibration

Legend: runs **with TOF** / **with pass1** / **with cpass1**,
TS = prod. in technical stop, R = running

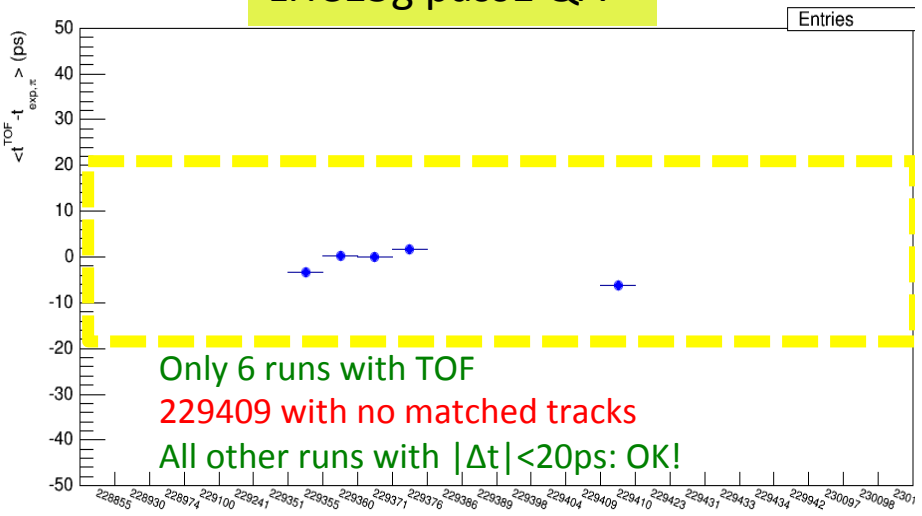
LHC15g (**6**/31/**54**)
LHC15h (**63**/**68**/**68**)
LHC15i (**108**/**108**/**123**)
LHC15j (**143**/**TS**/**146**)
LHC15k (**26**/**TS**/**26**)
LHC15l (**100**/**TS**/**108**)
LHC15m (runs without TPC → TOF cannot be calibrated)
LHC15n (**14R**/**1R**/**30R**)

- Double bands due to problematic channels spotted by the QA in all periods
  - To be identified with manual calibration
- (manual) calibration to be rechecked after space charge calibration of the TPC
- 34 runs with no matched hits at TOF (list of run/periods in backup)
  - due to channels flagged as inefficient and masked in reconstruction
  - HW/readout related → Under investigation
  - Runs **BAD for PHYSICS**, but can be used for TPC calibration

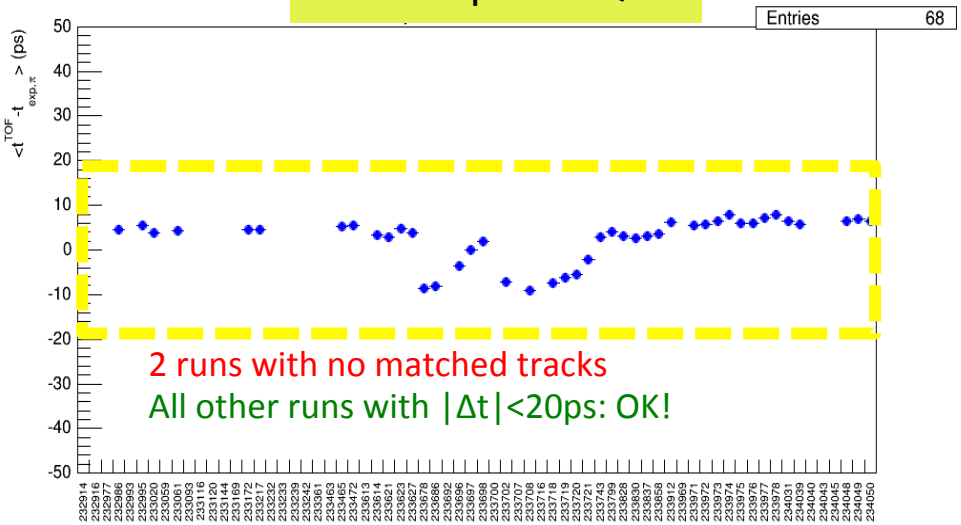
Details: LHC15g, h, i

https://indico.cern.ch/event/432926/
https://indico.cern.ch/event/442925/

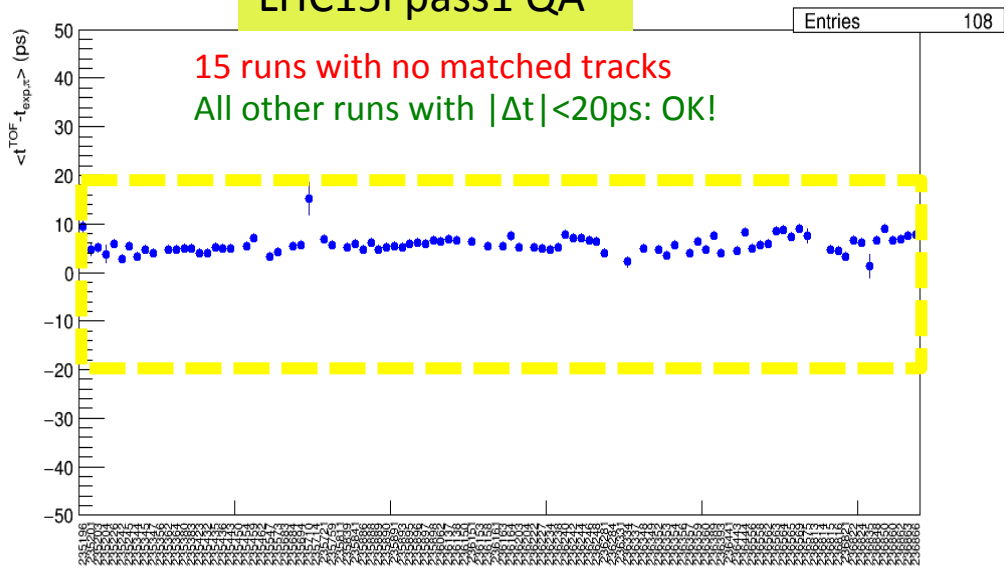
LHC15g pass1 QA



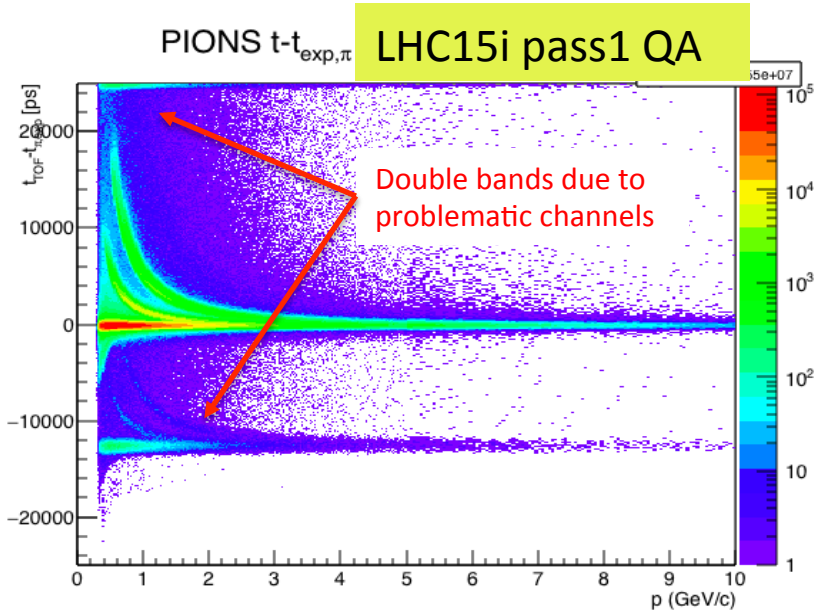
LHC15h pass1 QA



LHC15i pass1 QA



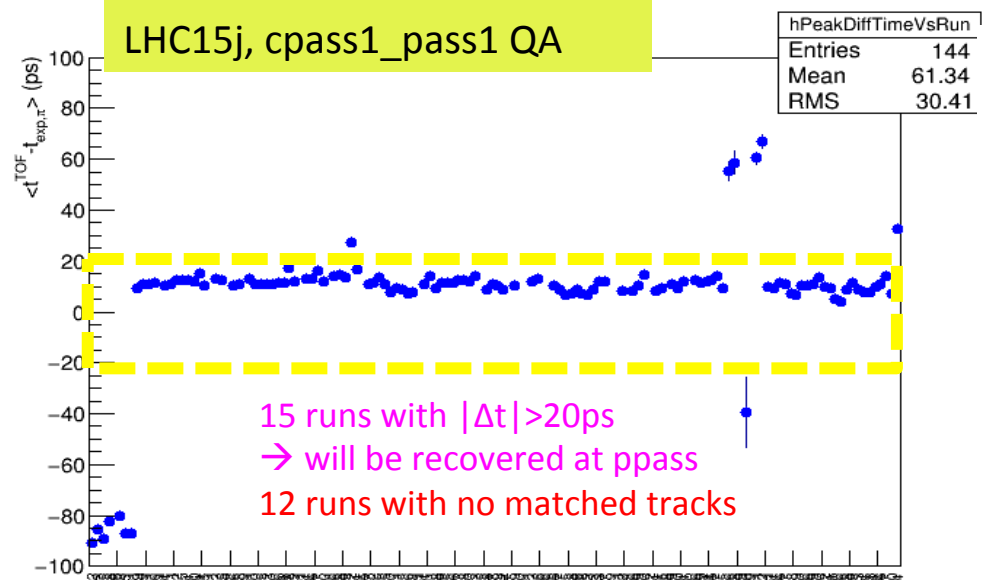
LHC15i pass1 QA



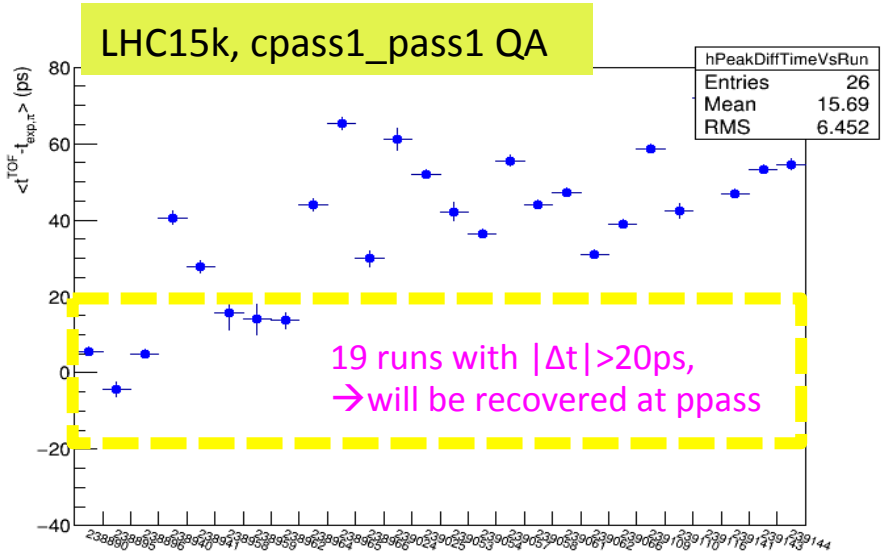
Details: LHC15k, l, n

https://indico.cern.ch/event/462853/
https://indico.cern.ch/event/449375/
https://indico.cern.ch/event/459345/

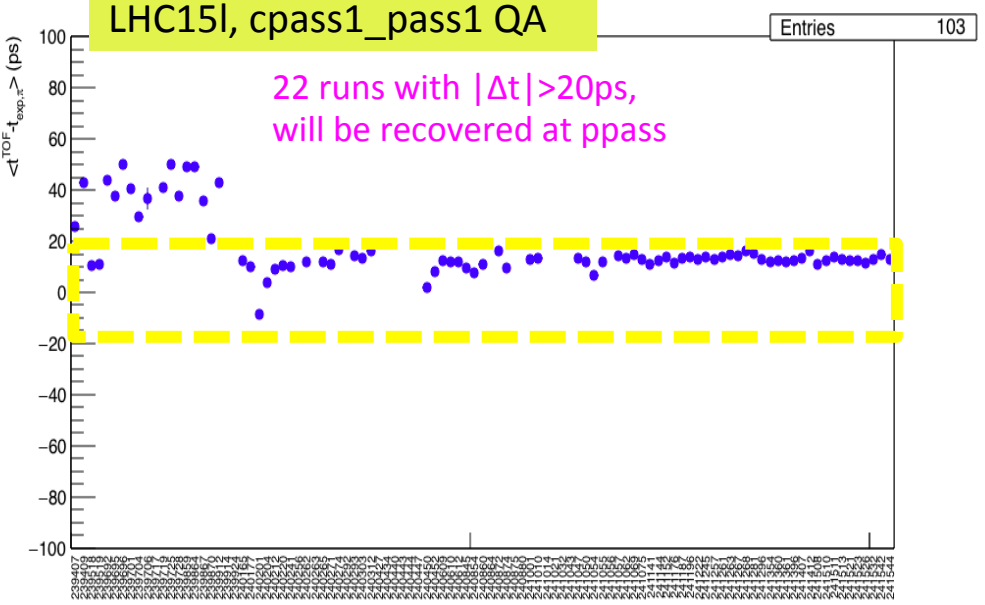
LHC15j, cpass1_pass1 QA



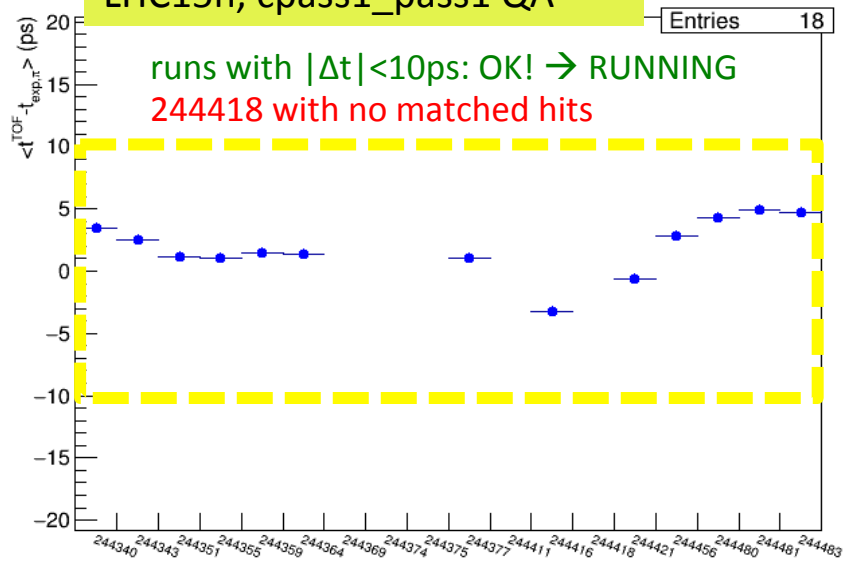
LHC15k, cpass1_pass1 QA



LHC15l, cpass1_pass1 QA



LHC15n, cpass1_pass1 QA



Outlook

- Study of TOF calibration time dependence could improve the calibration process
  - No one assigned so far, plan to have manpower for early 2016
  - Useful to determine Run 3 calibration strategy

- Automatization of TOFcalibTree merging run-by-run and over period

- 2015 calibration:
  - LHC15f fully calibrated (including manual calibration for pass2)
  - LHC15ghijkln to be manually calibrated (problematic + channel-by-channel offsets)
    - Manual calibration for LHC15i ongoing (merging stage completed)
    - Next priority: pp reference (LHC15n) and PbPb runs (LHC15o)
  - 34 runs with no matched hits and inefficient channels under investigation

Runs with no matched hits in reco/QA

34 runs found with no matched hits in reconstruction

LHC15n: 244418

LHC15k, l: none found

LHC15j: 236969, 237259, 237289, 237391, 237505, 237765, 237787, 237790, 237791, 237796, 237806, 238133

LHC15i: 235356, 235450, 235462, 235811, 236150, 236161, 236284, 236331, 236337, 236349, 236356, 236441, 236813, 236814

LHC15h: 233707, 233716

LHC15g: 229409

LHC15f: 225310, 225315, 225609, 225705

- The QA of the cpass1/pass1 finds 0 tracks matched at TOF, because
- the reconstruction finds 0 matchable hits in the TOF, because
- all channels are marked as "inefficient" in the OCDB, thus masked in reconstruction.
- Hardware/readout related → experts are investigating possible causes (raw data decoding, HV/ACQbit, PAR procedure, …)
- These runs are BAD for PHYSICS, but can be used for TPC calibration

TOF Current Calibrations

From C. Zampolli, https://indico.cern.ch/event/228415

- Shuttle:
  - OCDB: Status (noisy channels, HV, LV), ReadoutEfficiency (efficiency of a channel – to be > 95%)
  - Reference: CalibNoise, FEEDump, DCSData, ReadoutInfo, FEEData
- CPass0:
  - RunParams: T0-Fill (RunParams) based on reconstructed tracks, with calibrated (after online calibration) TPC
    - Uses also the clock phase information measured by BPTX, reading it from GRP
- CPass1:
  - RunParams: T0-Fill (RunParams) based on reconstructed tracks, with calibrated (after CPass0) TPC
    - Clock phase subtracted from data, reading it from GRP

Used in reconstruction

TOF Current Calibrations – II

From C. Zampolli, https://indico.cern.ch/event/228415

- Manual calibrations from CPass1 output
  - Channel-by-channel offset → ParOffline
    - Every period, ~100 entries/channel (~160000 channels)
  - Problematic channels (problems with HW, seen in measured times) → Problematic
    - Every period, ~100 entries/channel (~160000 channels)
  - Time slewing → ParOffline
    - Every year, ~10k entries/channel (~160000 channels)

Used in reconstruction