PRELIMINARY CLICPIX2 + PLANAR SENSOR RESULTS

July DESY test-beam 2019

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DATA TAKEN

- Data quality checked for many runs during the TB itself (thanks to the efforts of the test-beam crew!)
- Problems discovered so far:
    - 2nd time reset: in some runs a T0 at the beginning of the run is received, but then much later in the run (say 300s later) a second reset is received and the next CPX2 pixel time is approximately 0. Afterwards the CPX2 times increase from this low value with the shutter length as normal. In event building these pixels are 'BEFORE' therefore are skipped.

- Assembly 19: 4 x longer statistics runs at nominal conditions in ToT+cnt mode
- Assembly 22: long statistics run at nominal conditions in ToT+cnt mode

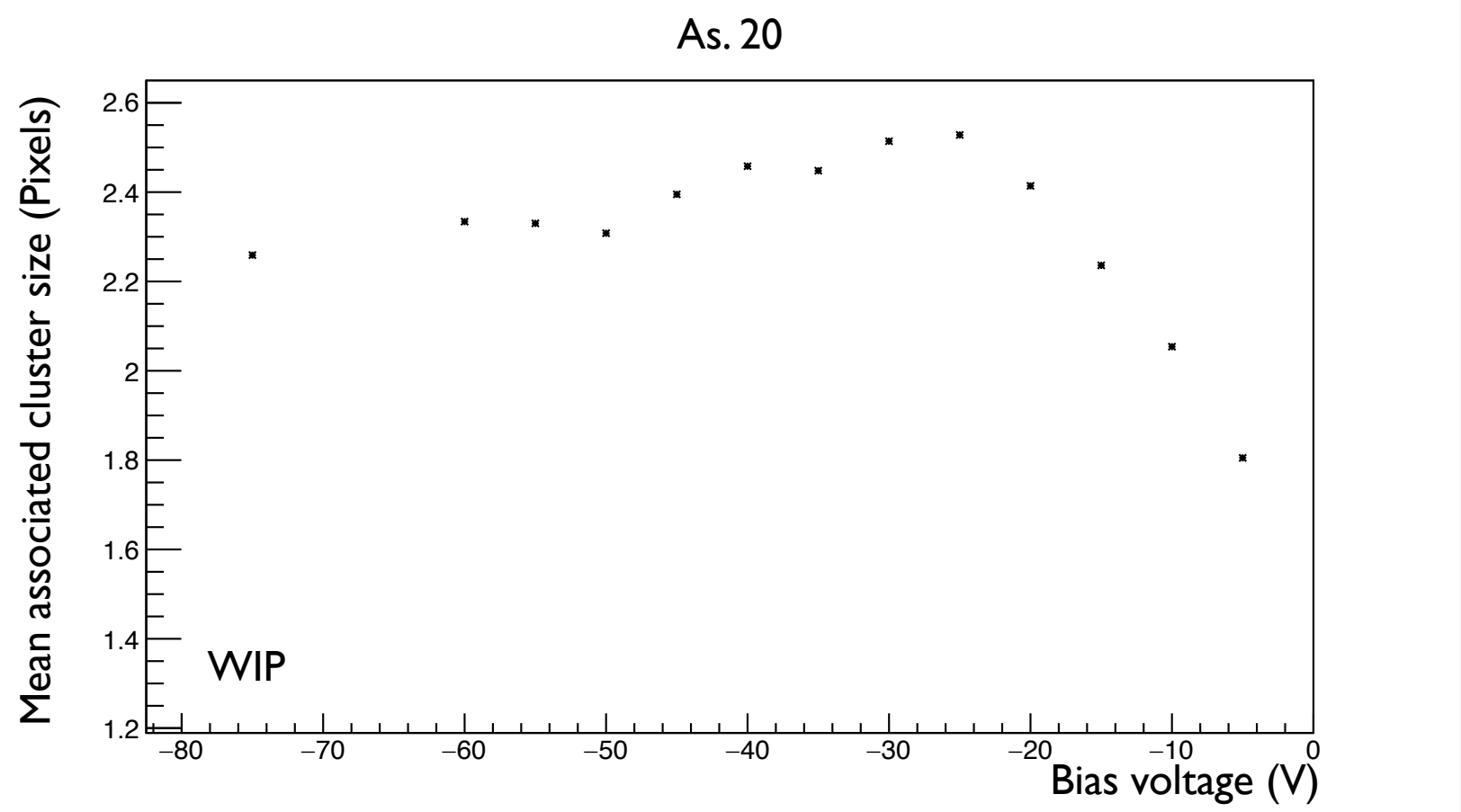
DATA TAKEN

- Assembly 20:
  - 4 x Longer statistics runs with ToT+cnt
  - 3 x Longer statistics runs with ToT+ToA
  - THL scan at -60V with ToT+cnt
  - THL scan at -25V with ToT+cnt
  - Bias voltage scan with ToT+cnt (0 to -60V steps of -5, -75V)
  - Coarse voltage scan with ToT+ToA (0, -25, -60V)
  - Run without fan for cooling
  - Power pulsing data: runs with shutter open delays of 40us and 5us

PRELIMINARY RESULTS

Largest charge sharing at -25V

Curve not fully smooth, found to be due to small change in DUT y position therefore can be improved with run-by-run alignment



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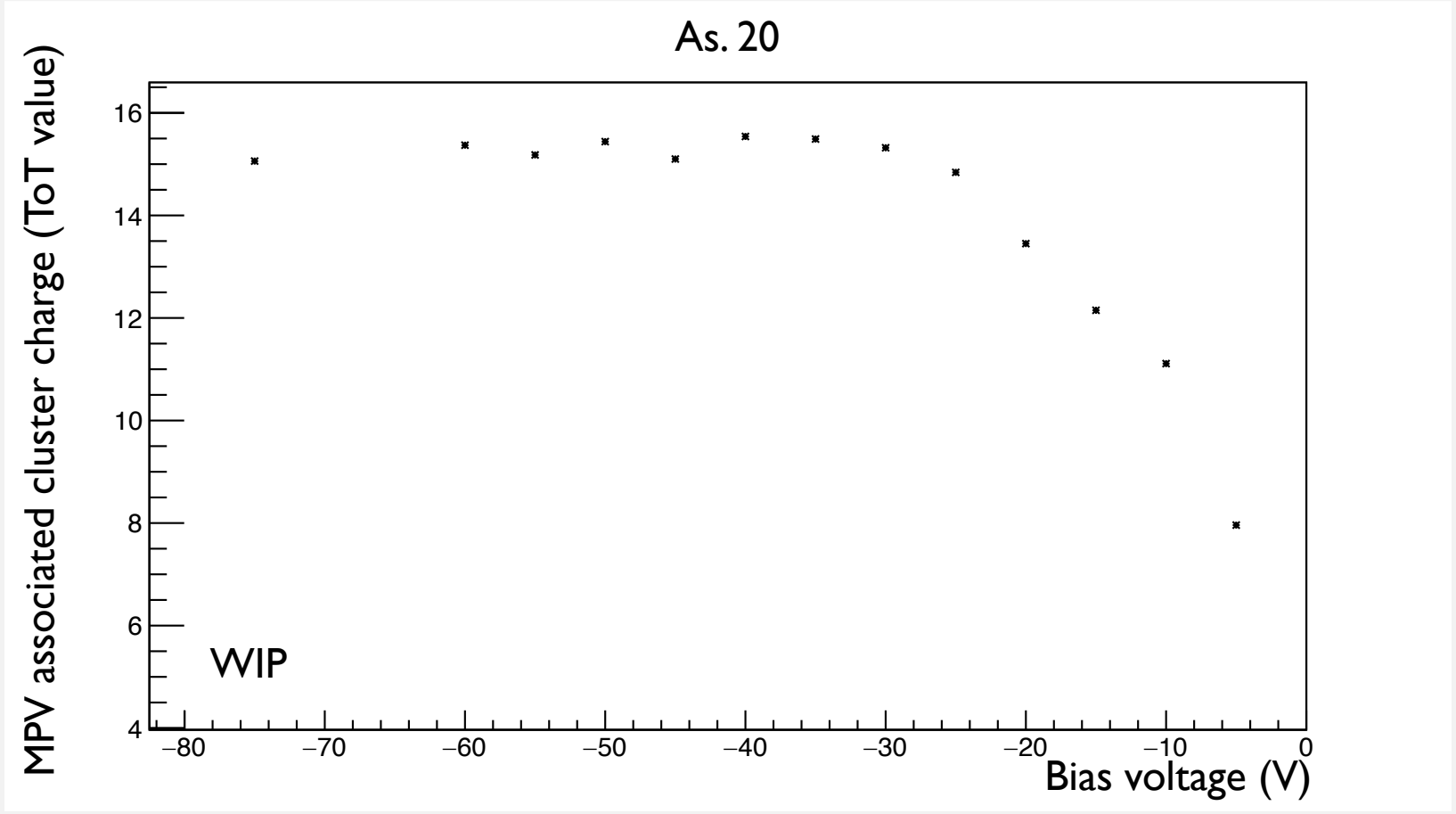
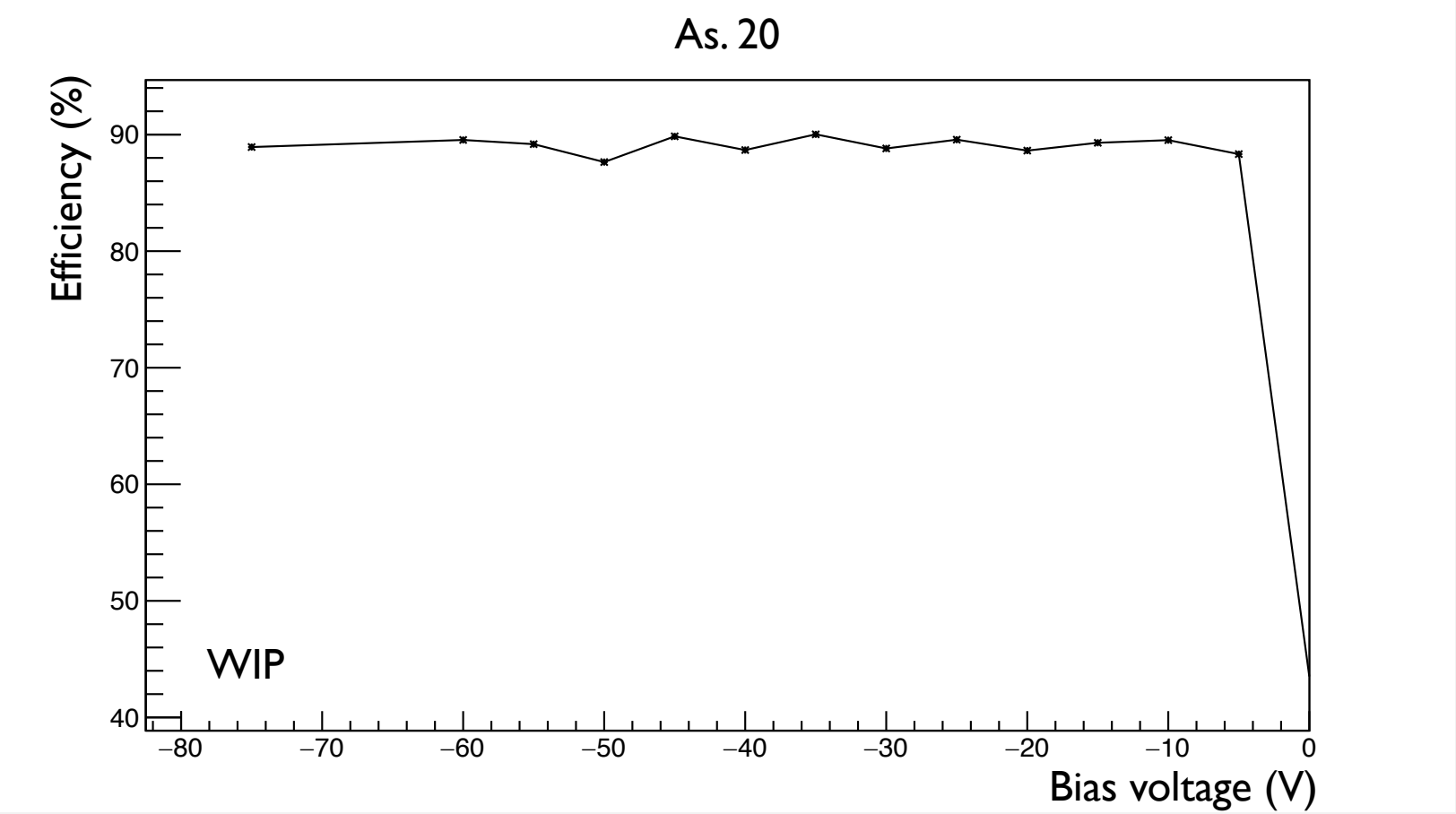


PRELIMINARY RESULTS

Lower efficiency values than expected. Narrowed the cause of this down to the reconstruction tuning, which is underway.

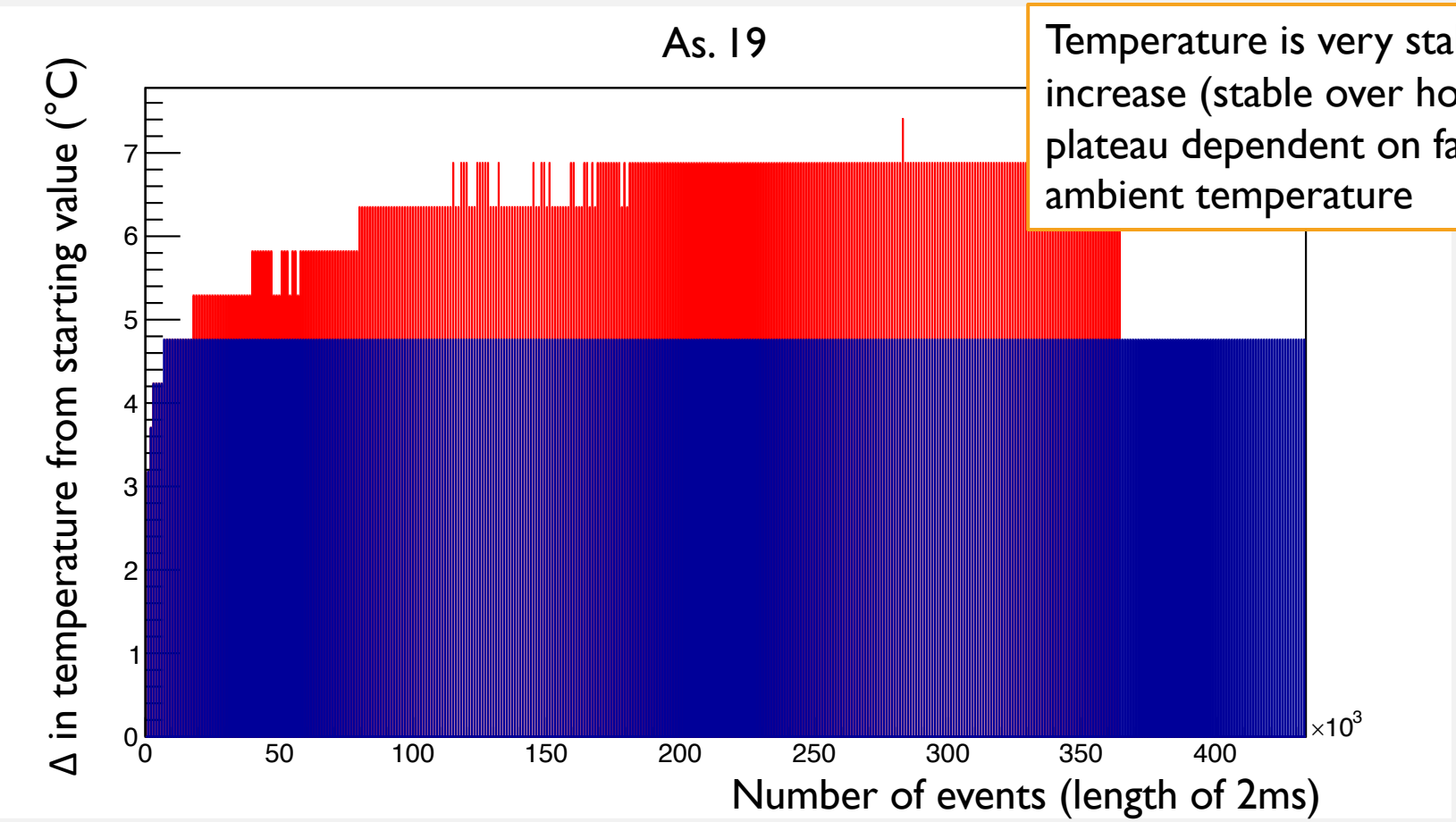


TEMPERATURE STUDIES

- CLICpix2 voltage DACs contains resistor with poor temperature coefficient, causing variation in voltage with temperature (~1.5mV/°C).
- Aims for test beam data:
  - Determine how stable the temperature recorded from CLICpix2 is over time at DESY TB
  - Determine the effect of having a fan on the CLICpix2 assembly
  - Measure how the MIP peak moves with temperature

TEMPERATURE STUDIES

Red = without fan
Blue = with fan



Temperature is very stable after an initial increase (stable over hours). Temperature of plateau dependent on fan → depends on ambient temperature

TEMPERATURE STUDIES

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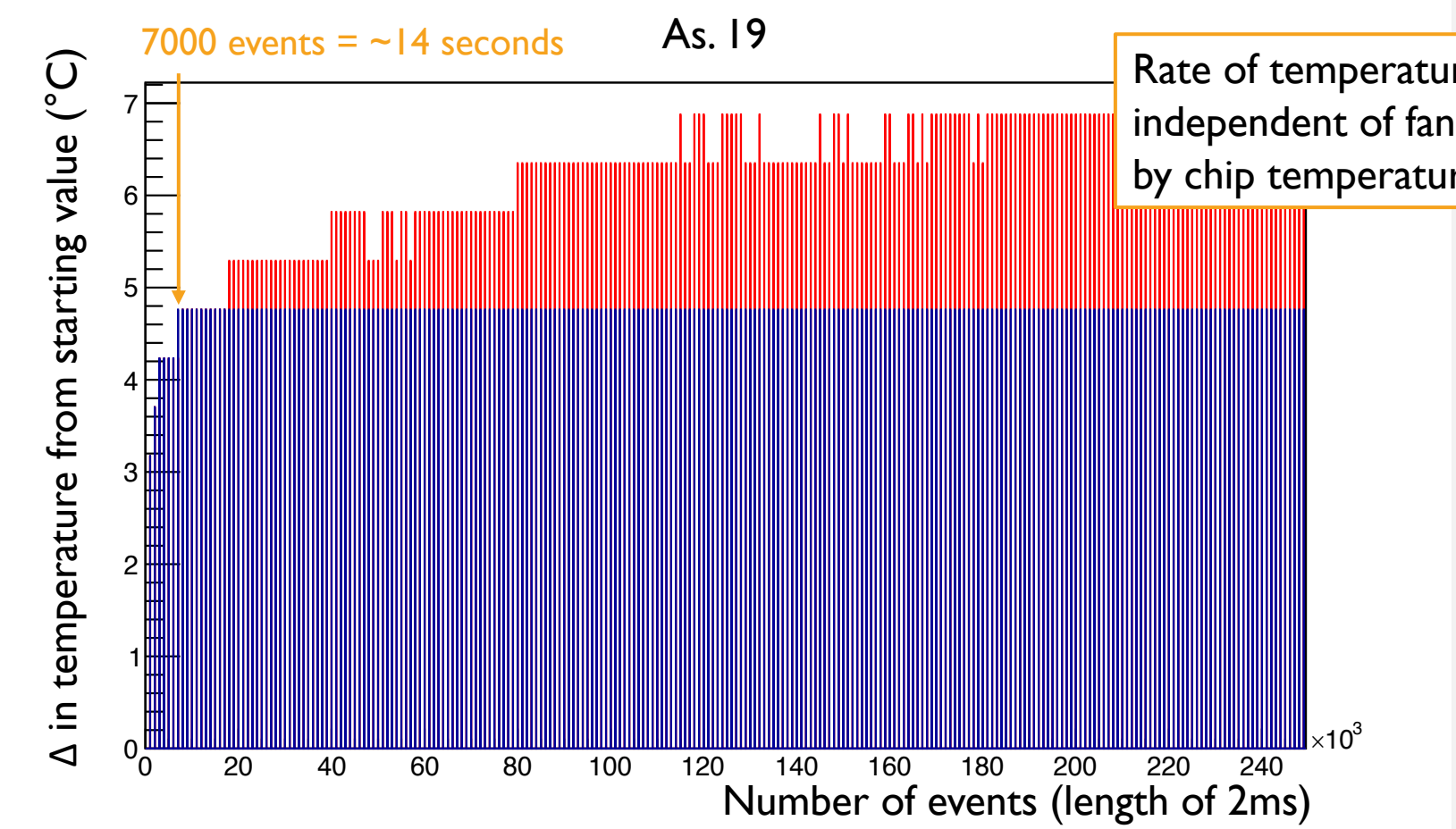
Blue = with fan



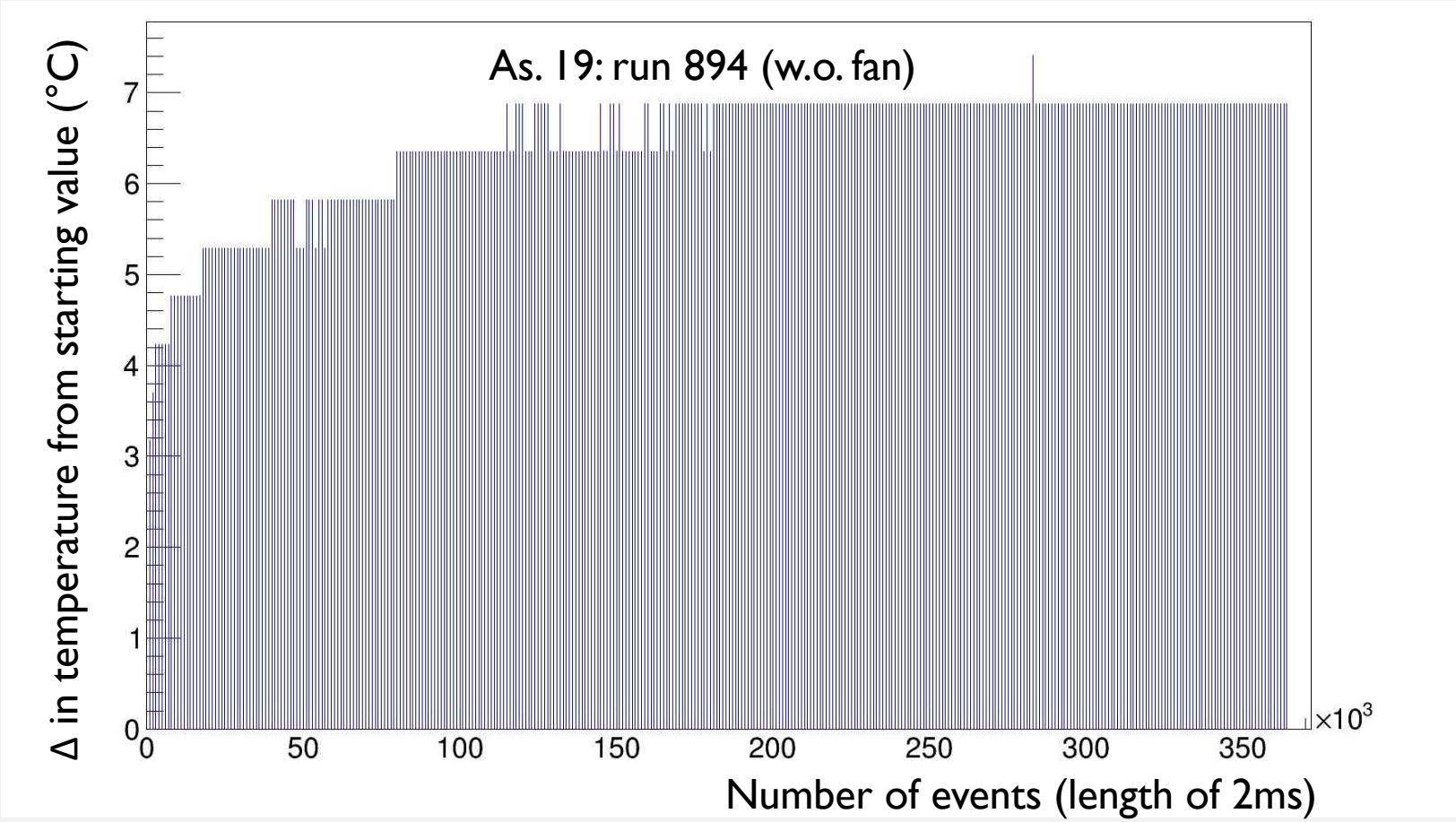
Rate of temperature increase is independent of fan → dominated by chip temperature, not ambient

PRELIMINARY TEMPERATURE STUDIES

Aim: study how the MIP peak changes with temperature

Produce plots of decoded temperature value vs. event number, and of MIP peak vs. event number

Temperature reading was recorded from CLICpix2 every 1000 events



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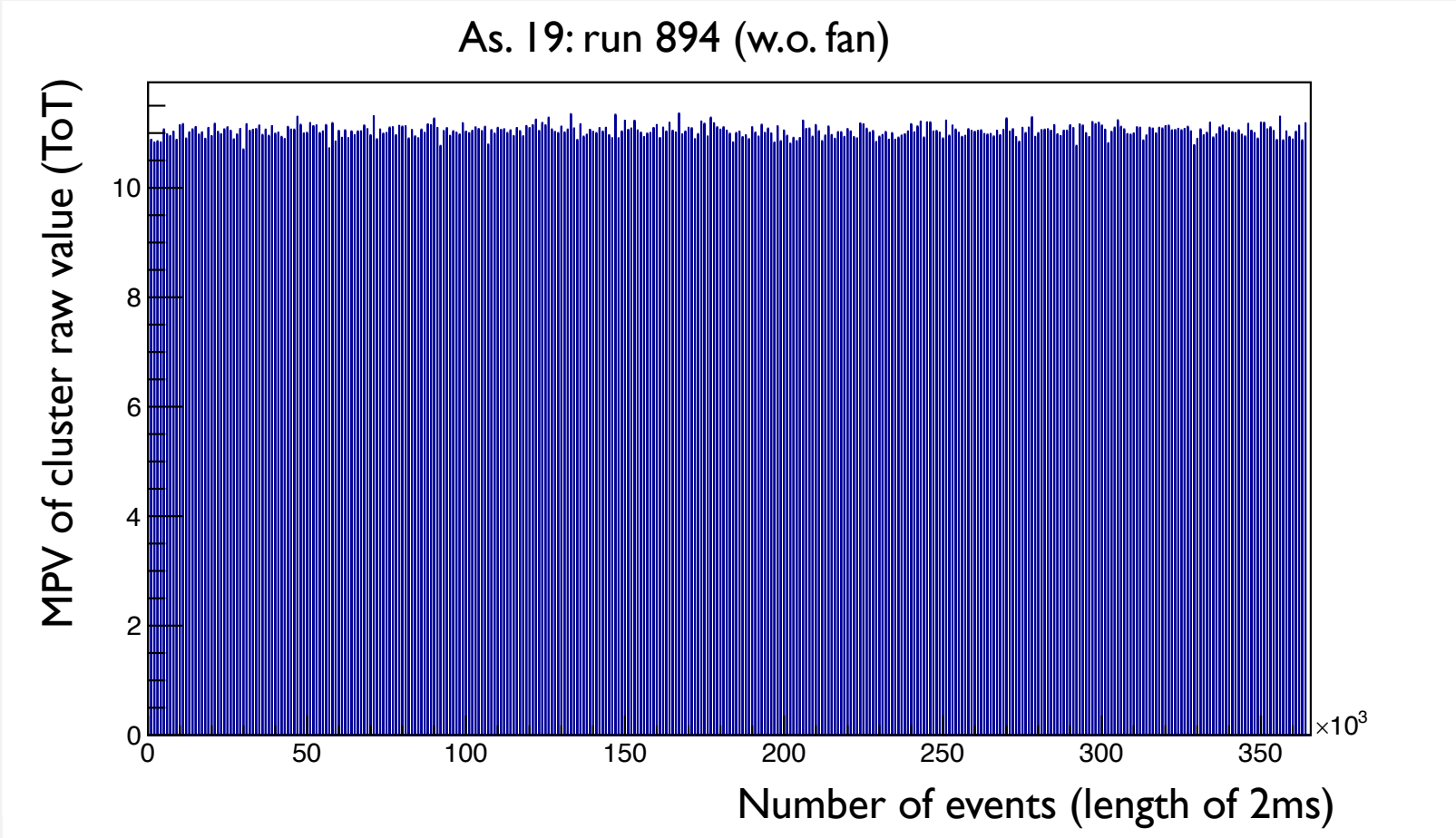
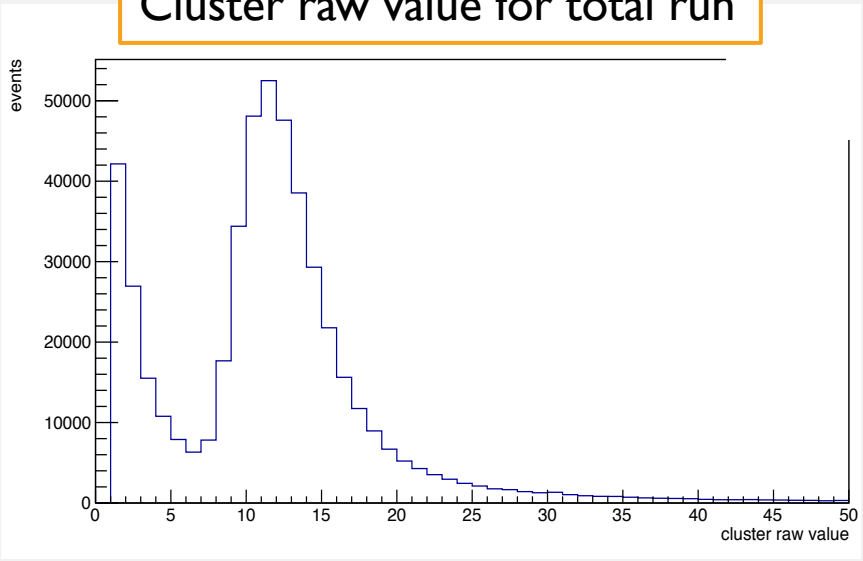


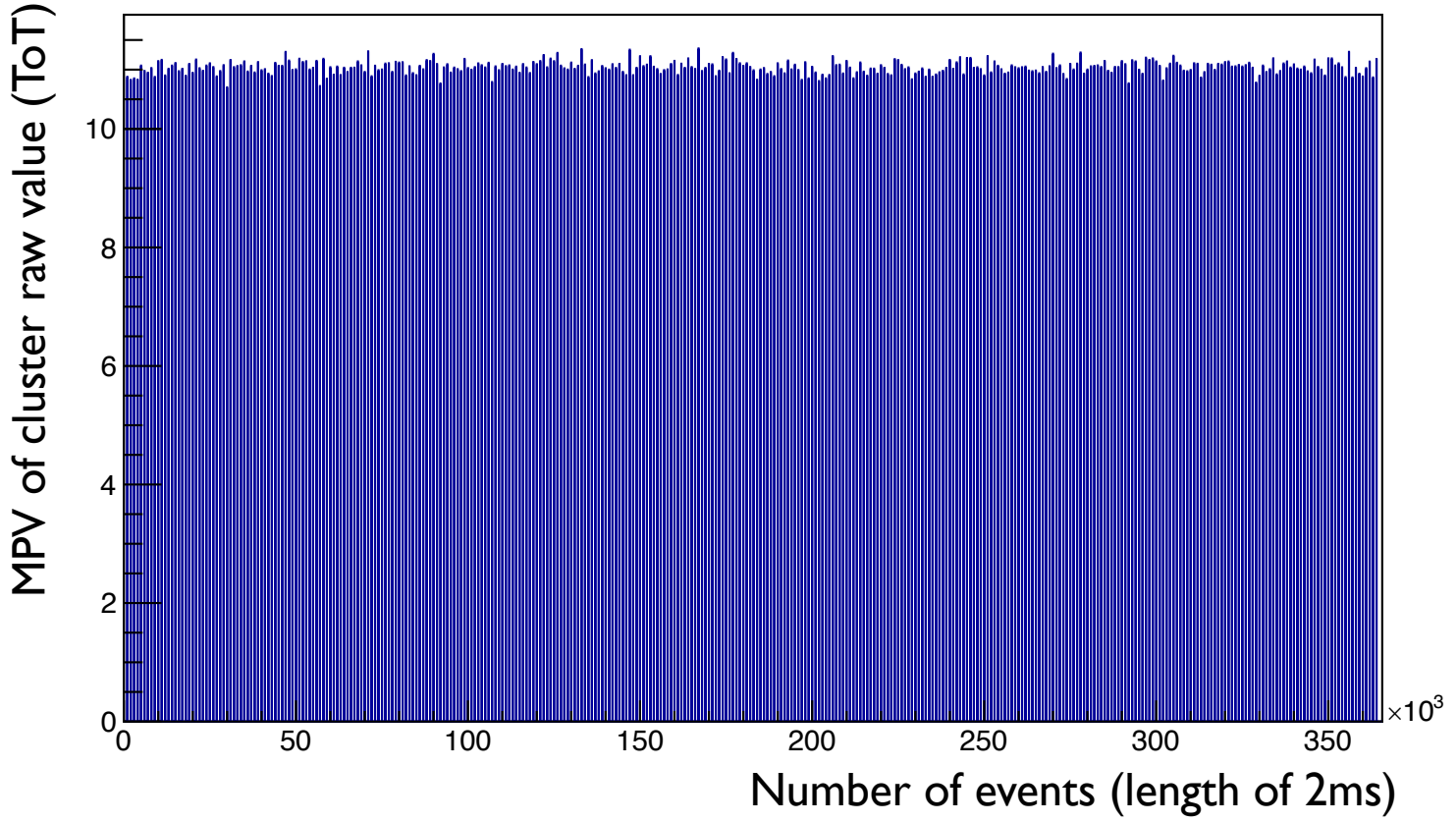
PRELIMINARY TEMPERATURE STUDIES

Extract MPV from landau fit to raw cluster value histogram for every 1000 events. Note: unassociated clusters being used.

Cluster raw value for total run



As. 19: run 894 (w.o. fan)

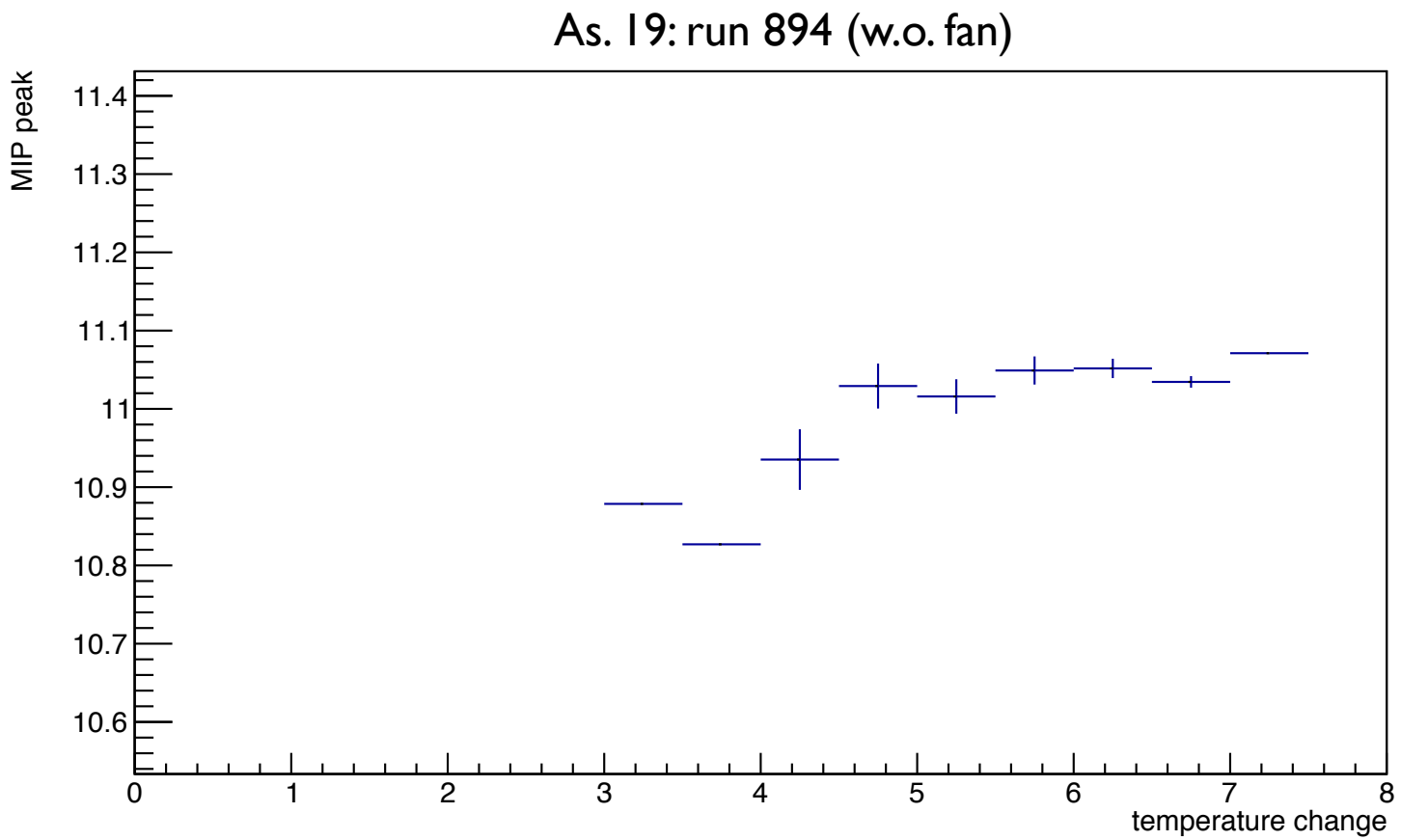


PRELIMINARY TEMPERATURE STUDIES

Can see a small dependence of MIP peak on temperature

Analysis can be made more robust by using a landau-gaus fit to obtain MIP peak

Once reco tuned, associated clusters can be used



Note: lower values have only one entry therefore the error is not properly calculated at the moment