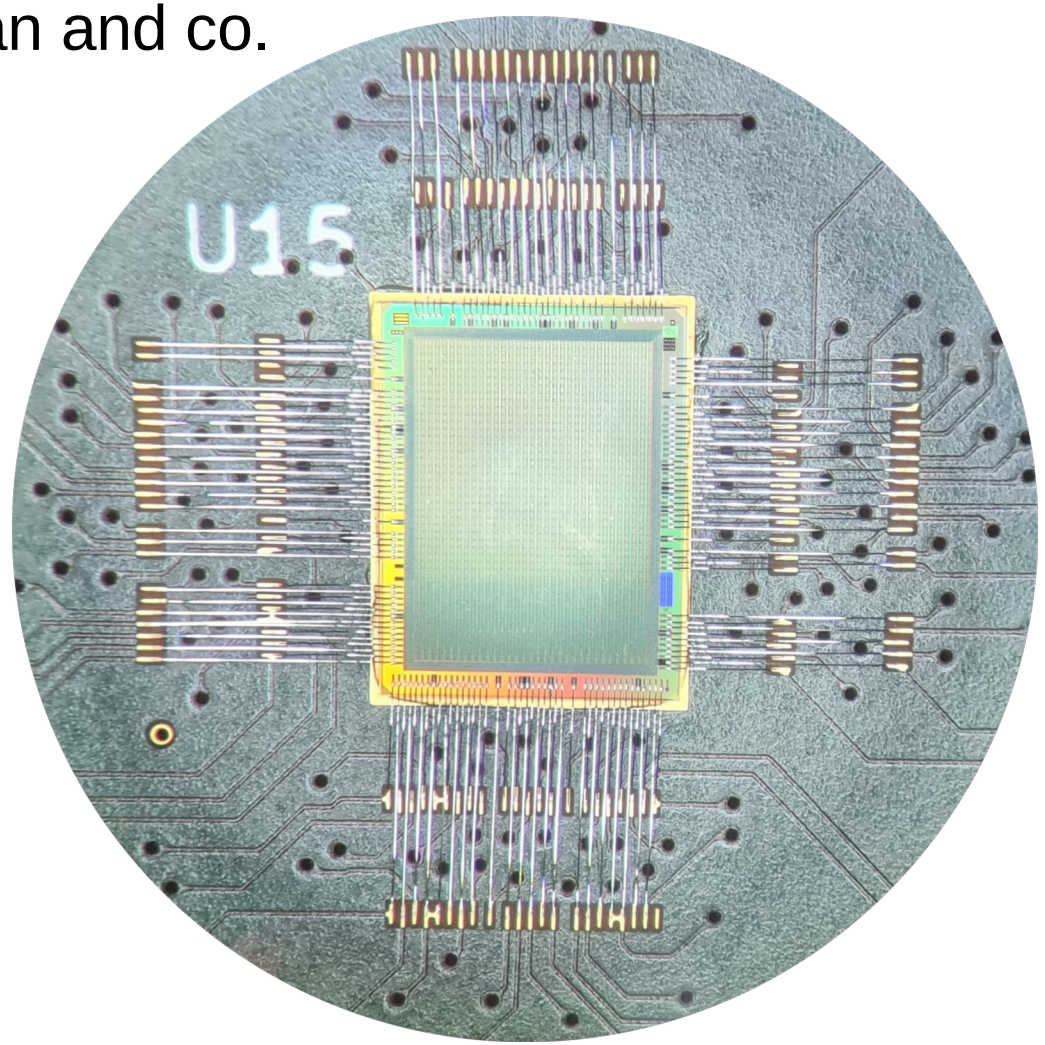
Further Testbeam Analysis

With lots of help and input from
Patrick, Bernhard, Bojan and co.



Data with or without buffer

- Question: What happens if pixel hits in my data stream are not time sorted?
- Answer: Any unsorted data will be thrown out due to matching without buffer

1) $T_{evt\text{-}Start} < T_{pixel} < T_{evt\text{-}end}$: Accepted into event

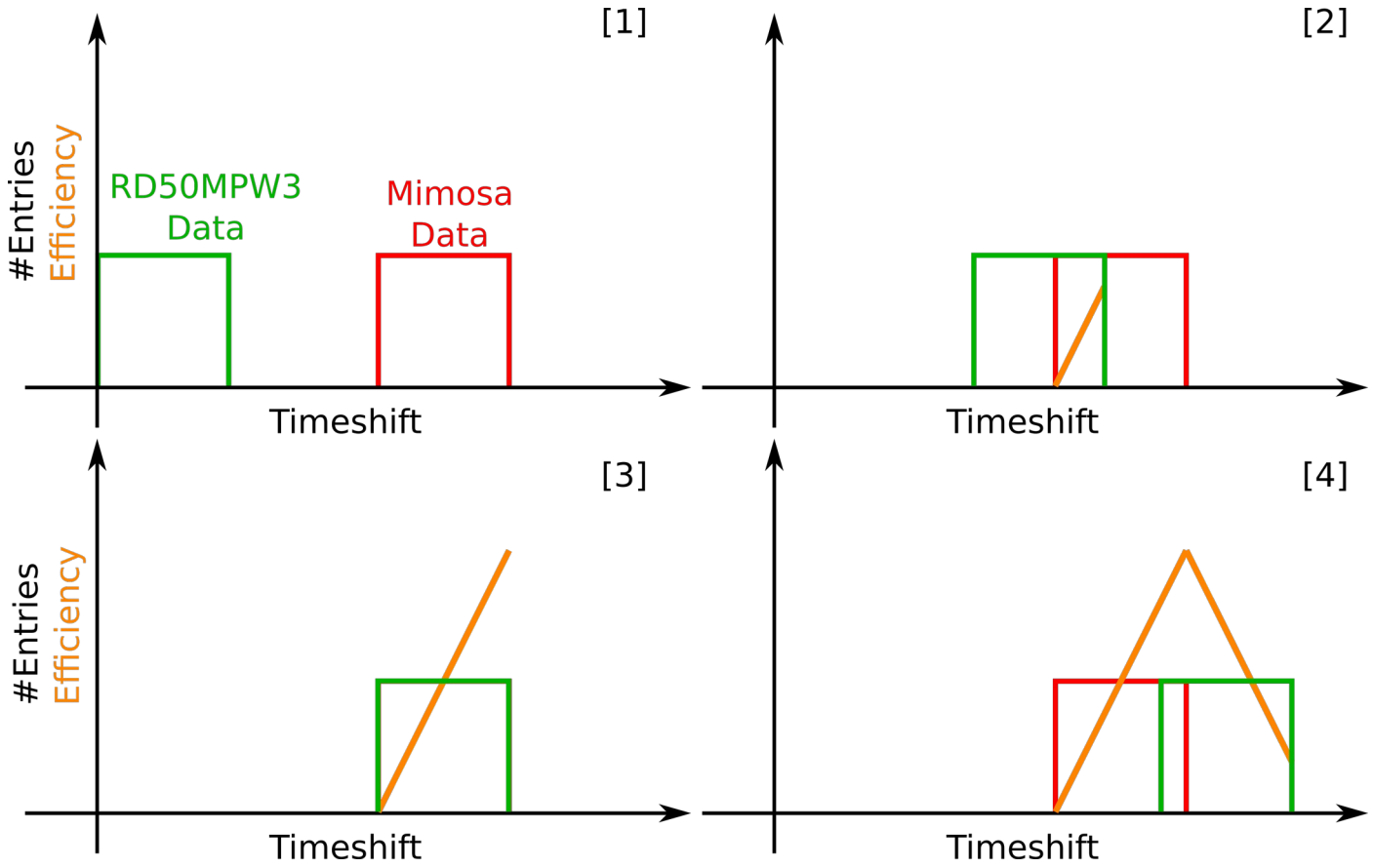
2) $T_{evt\text{-}end} < T_{pixel}$: No more pixels for this event, move to next event

3) $T_{pixel} < T_{evt\_start}$: Pixel should have already been assigned to an event. Since it was not that means it must not have a match and is thrown away.

- Solution: Add a buffer that stores 1000 events and afterwards sorts them in time to the correct event
- Effect: Large improvements to overall efficiency ≈ 60% total efficiency assuming no double counting

Timeshift scan

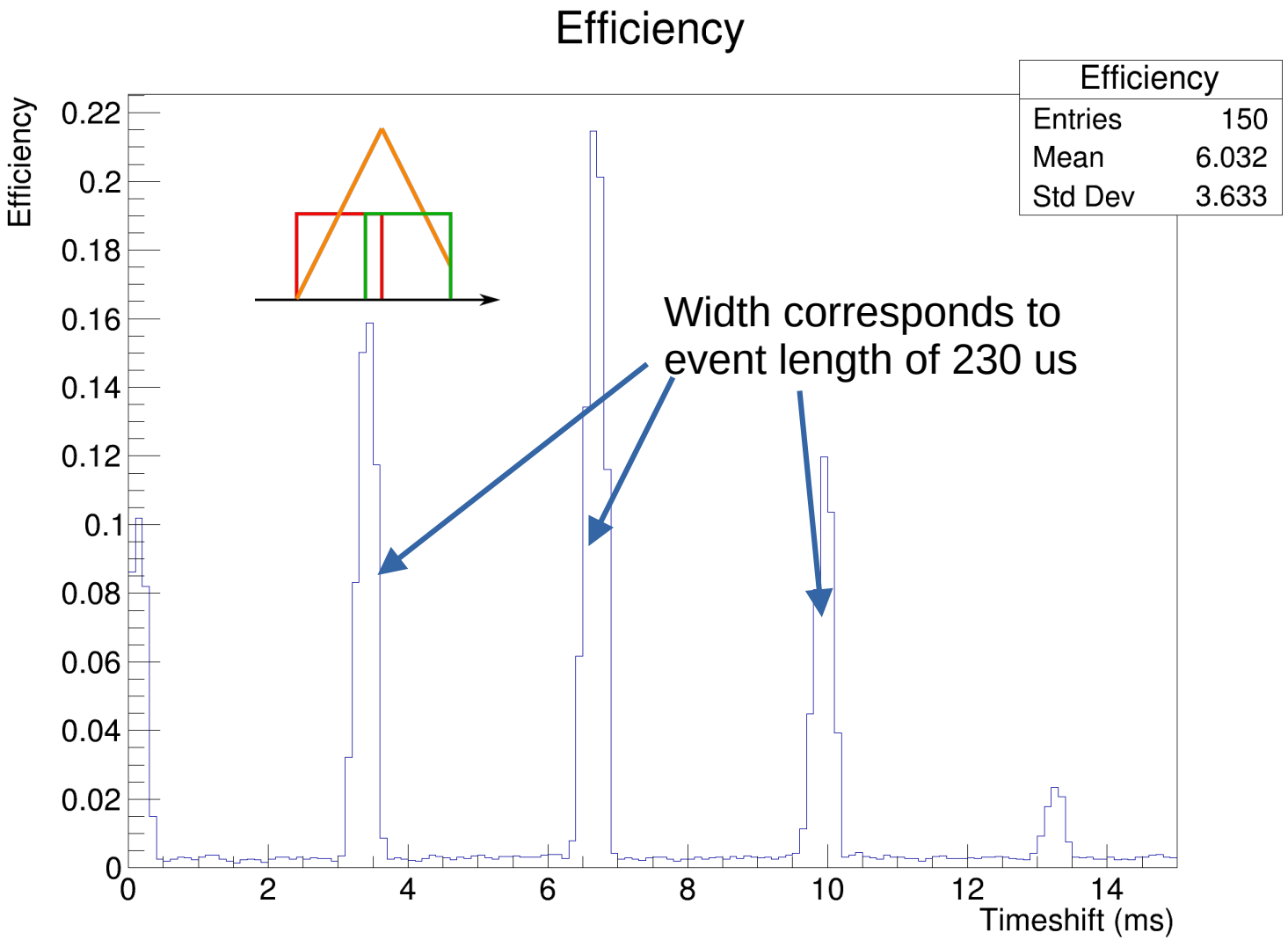
- Scanned over a larger range with newly implemented buffer to:
  - see what the sum of the results are
  - how many events can be matched beyond 3.3 ms
  - determine if there is another offset except for the 16 bit overflow?
- In effect a convolution of the two data distributions



Improved efficiency

- Found clear correlation with the 16 bit TS overflow (3.27 ms)
- Slight offset O(100us) for first peak indicates some inherent offset that needs to be taking into account for the data
  - Most likely the 80 us that Patrick and Bernhard told us in his first talk
- Otherwise just random correlations with very minor contributions
- Total efficiency of the sensor = Sum of the peaks

  ≈ 60%



Backup slides

Testbeam Data Synchronization

- This global pixel timestamp is then used to assign to the correct “event” which is defined by the AIDA TLU + Mimosa Telescope
- No correlations were visible during testbeam as such in offline analysis different time offsets were used to check for correlations