

Tracker Space-point Efficiency

- GOAL: Would like to measure the trackers space point finding efficiency. To validate the H/W is performing to spec.
- I'm looking at runs 7515-7547 here.
- Code at <https://github.com/e-overton/mice-analysis-scripts>

Doublets & Triplets

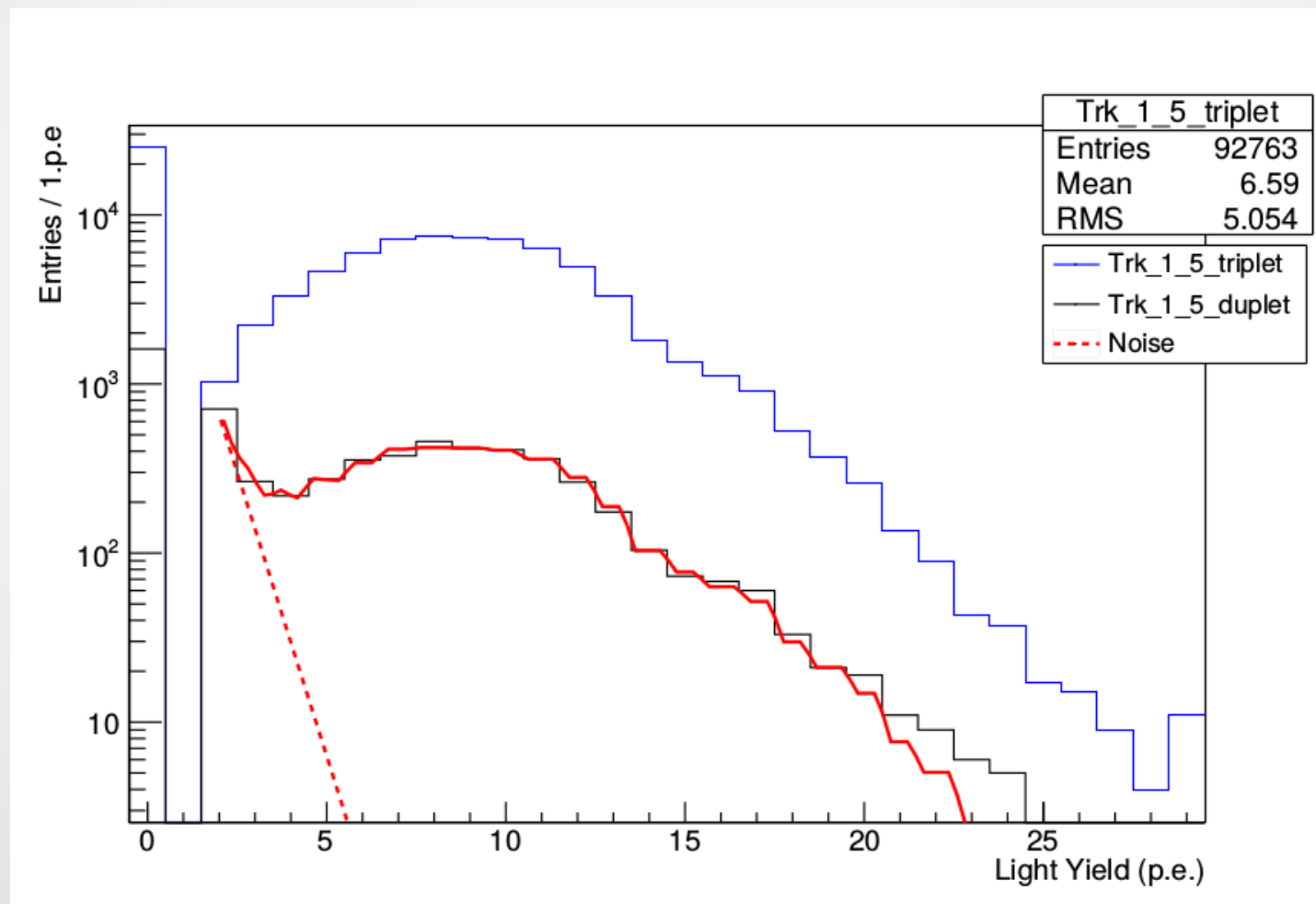
- 3 planes of scintillating fibres.
 - Require at least a hit in two different planes to determine an x-y.
 - Three plane hit = Triplet, Two plane = Doublet/Duplet.
 - Don't always generate triplets from real hits with perfect tracker:
 - 99.4% triplet probability.
 - 0.6% doublet probability.
 - Only made worse from dead channels.
- Noise
 - A Doublet from noise prob: 3.6%
 - A Triplet from noise prob: $7E-4\%$
- Must consider both doublets and triplets in efficiency.
- Would like to subtract noise hits.

Method

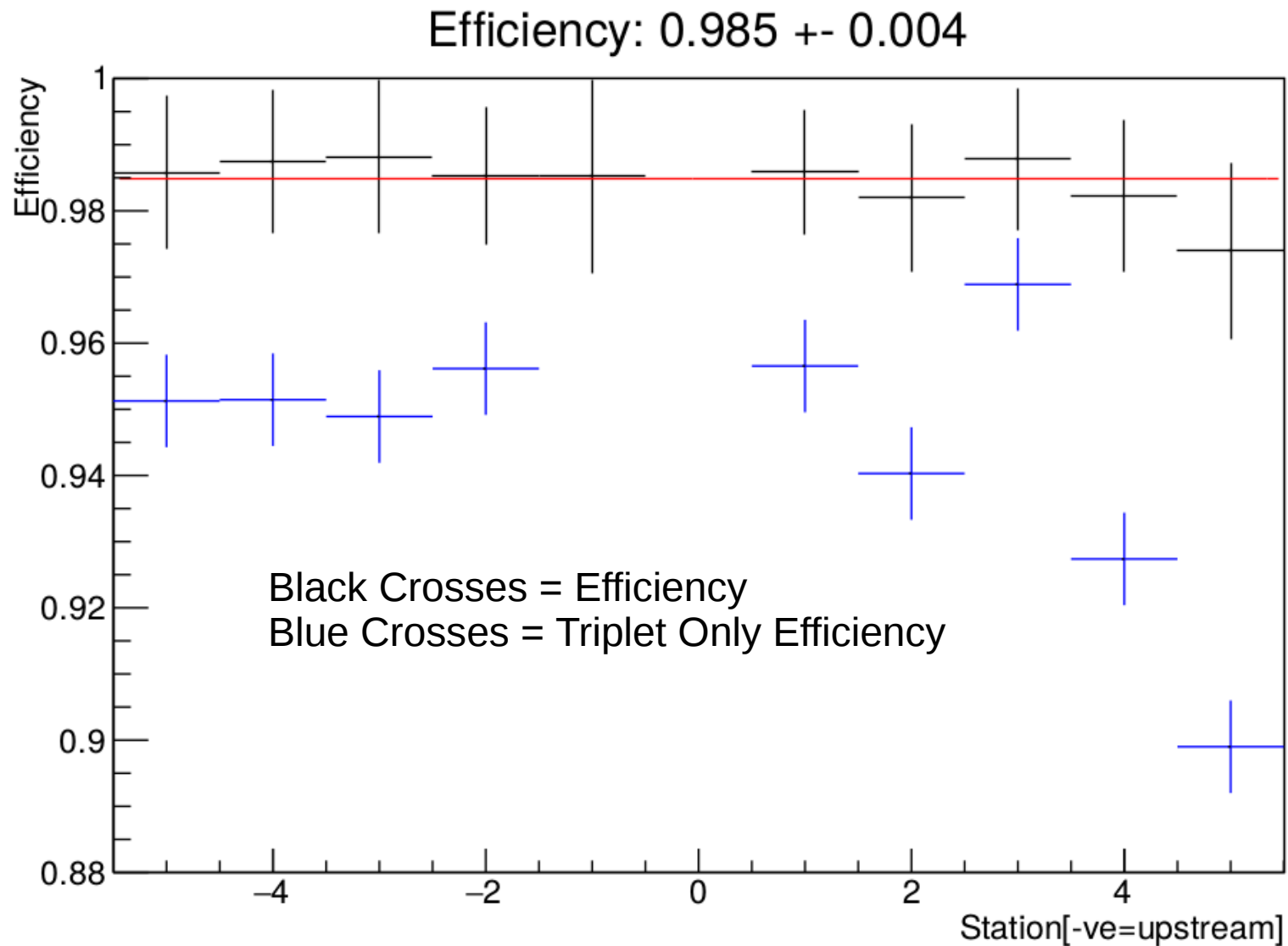
- Select particles which generate a hit in both TOF1 and TOF2:
 - 20-50ns time window
 - 100mm*100mm aperture centred on beam at TOF1,2.
- Particles not meeting this are rejected
- In each tracker station:
 - Look for triplet hit, if present count triplet & store cluster light yields from the triplet spacepoint.
 - If no triplet, look for duplet hits, count ALL the hits, and store the ALL the cluster light yields to a doublet light yield histogram.
- Estimate the tracker real hits according to:
 - Hits = Number Triplets + Number Doublets – Number Noise Doublets
 - Efficiency will be Hits / Selected particles.

Number Noise Duplets

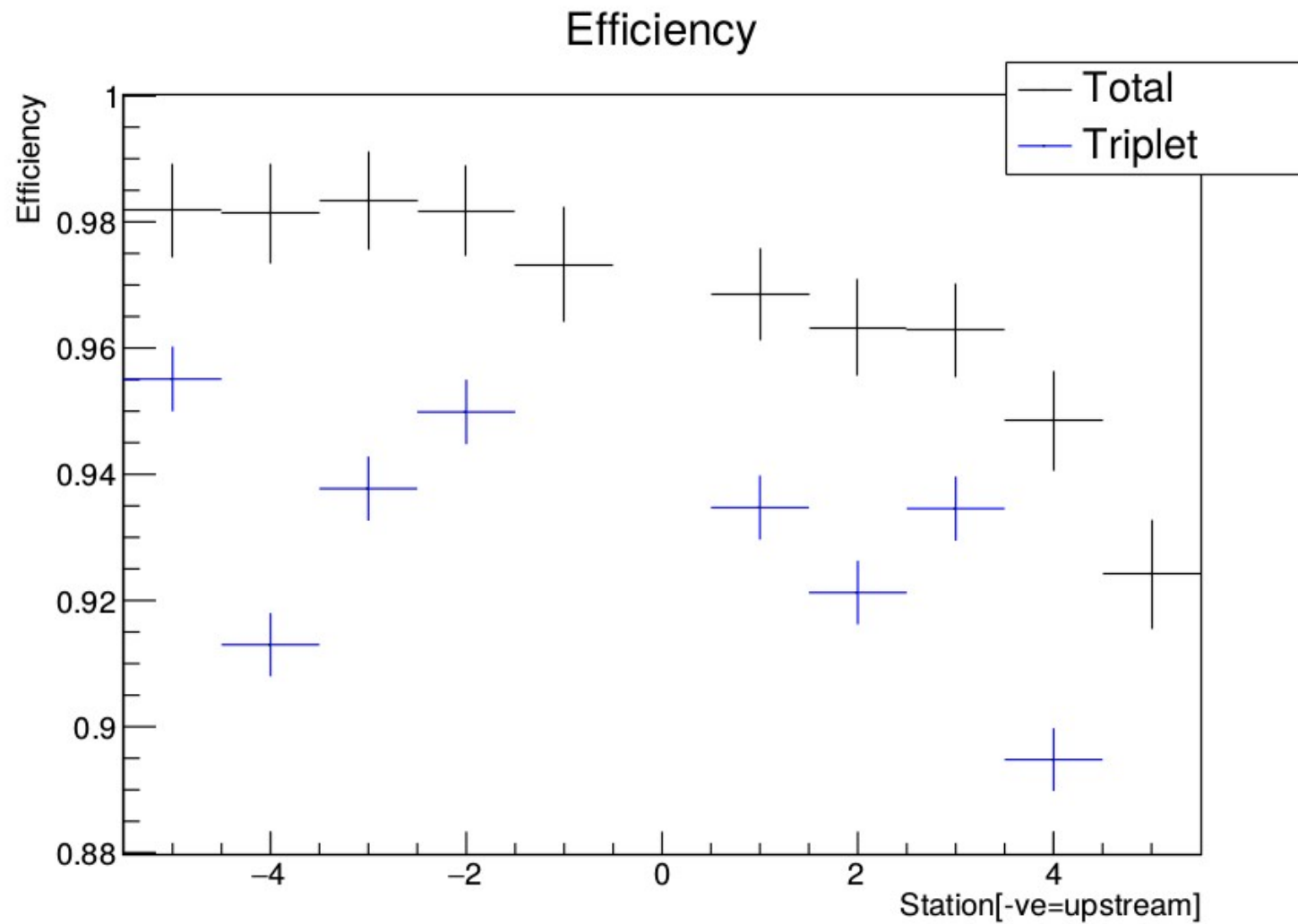
- Use a fit to the light yields to estimate the noise entries (dotted line)



Efficiencies



Efficiencies without TOF Aperture Cut



Conclusion

- Efficiency measured to 98.5 +/- 0.4 %
- Not played much with TOF aperture cuts, however seem to have big impact, (at least no cut does).
- Without aperture cut particles noticeably circumvent station 3 & 5 in the downstream detector.
- Applying too tight cuts focuses on only the centre of the stations...
- Probably some more thinking to be done....