

APA Gap Crossers

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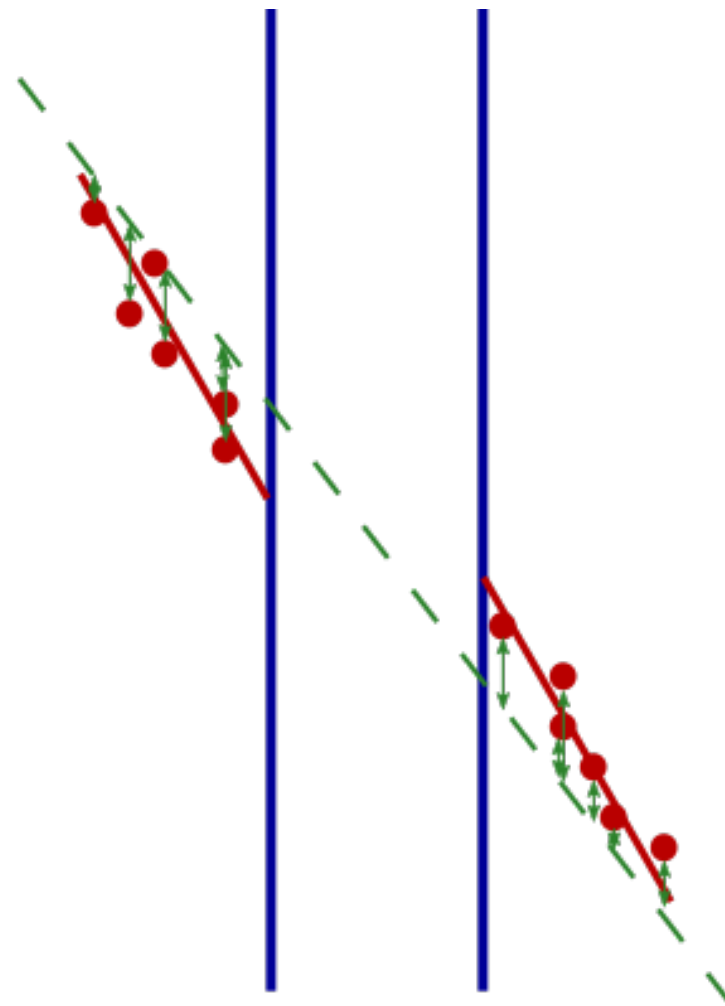
15/2/2017

Intro

- As I've now reached the end of the APA crossing muons study, Mark, Tom and I spoke at CERN and decided it would be good to apply the same ideas to the z-gap crossers.
- Animesh has worked on this for a while now (see previous talk!) so it is currently just cross-checking results.
- Small print: I'm $\geq 90\%$ writing at the moment, anything I do will be in spare time out of interest (and I am interested in this!).
- Disclaimer: I'm sure the previous talk will have much much better results in than this, this is the output of $\sim 2/3$ day's work.

Measuring APA Gaps

- The most obvious thing that needs to be considered is measuring the gaps in between the APAs using crossing tracks.
- I'm using the exact same code I used on APA crossers; fit linear regression, vary gap, minimise the residuals.

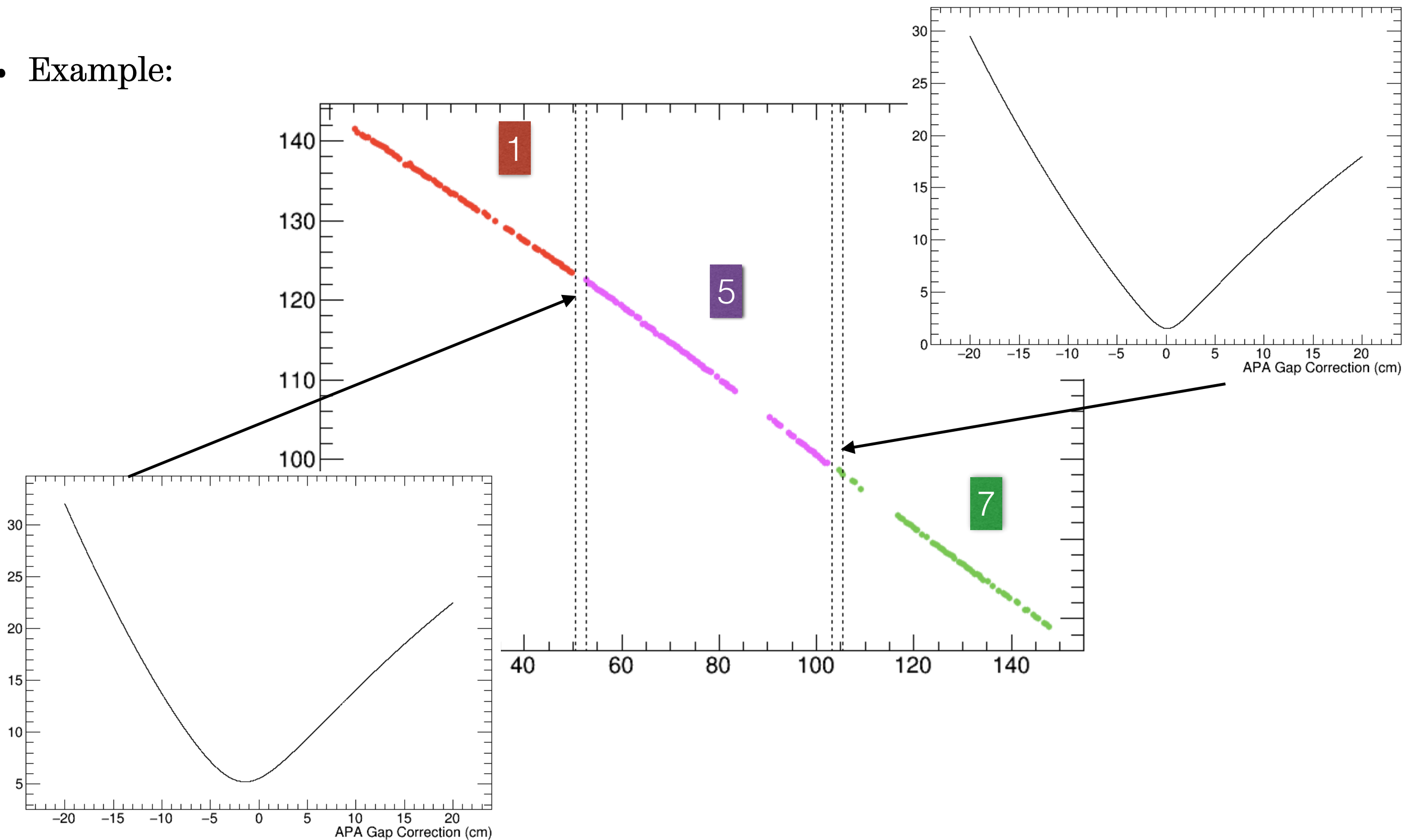


$$\sum_i^{nhits} \left(\frac{O_i - e_i}{\sigma_i} \right)^2$$

Minimise this 'chi-square'

Measuring APA Gaps

- Example:

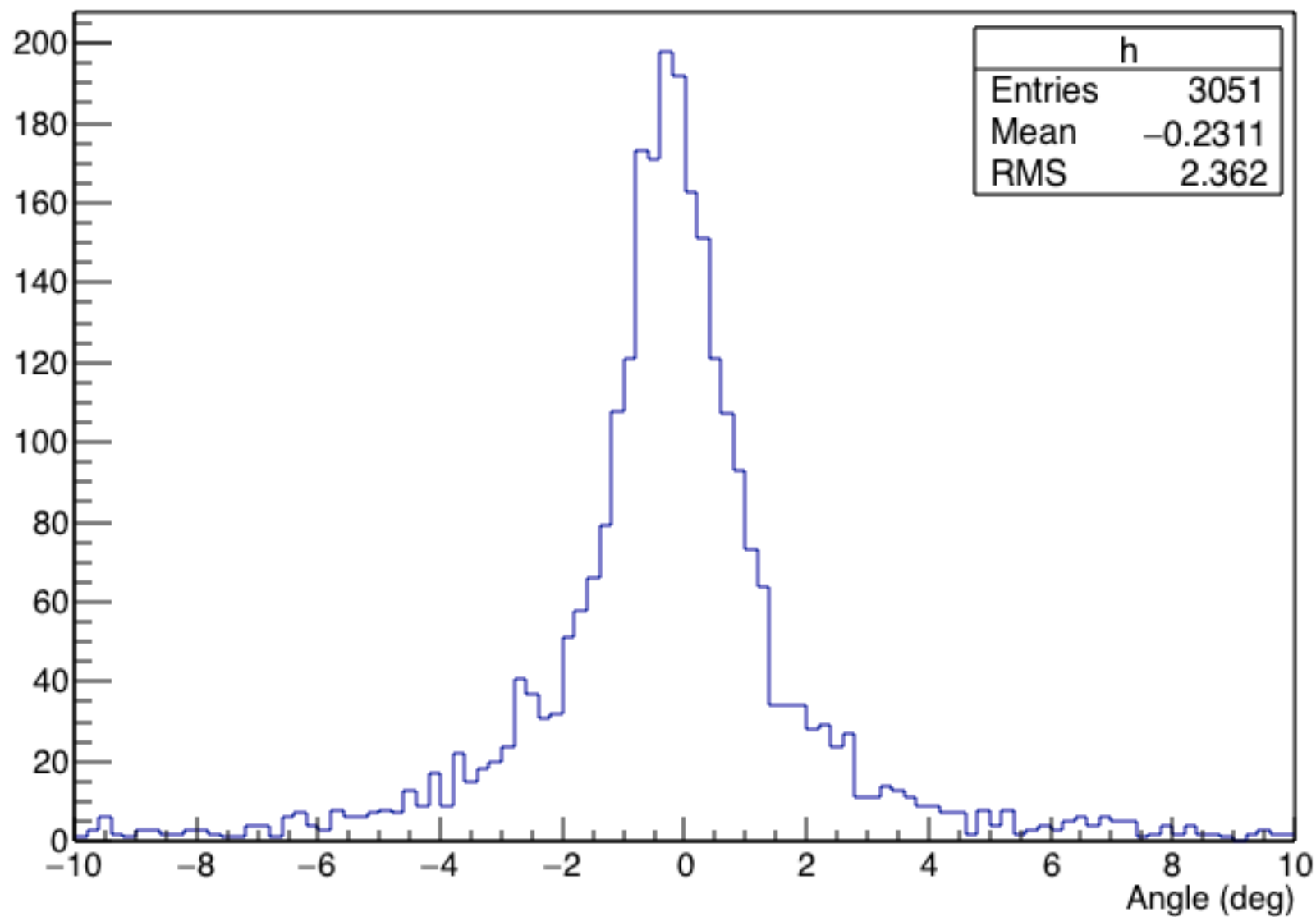


Track Selection

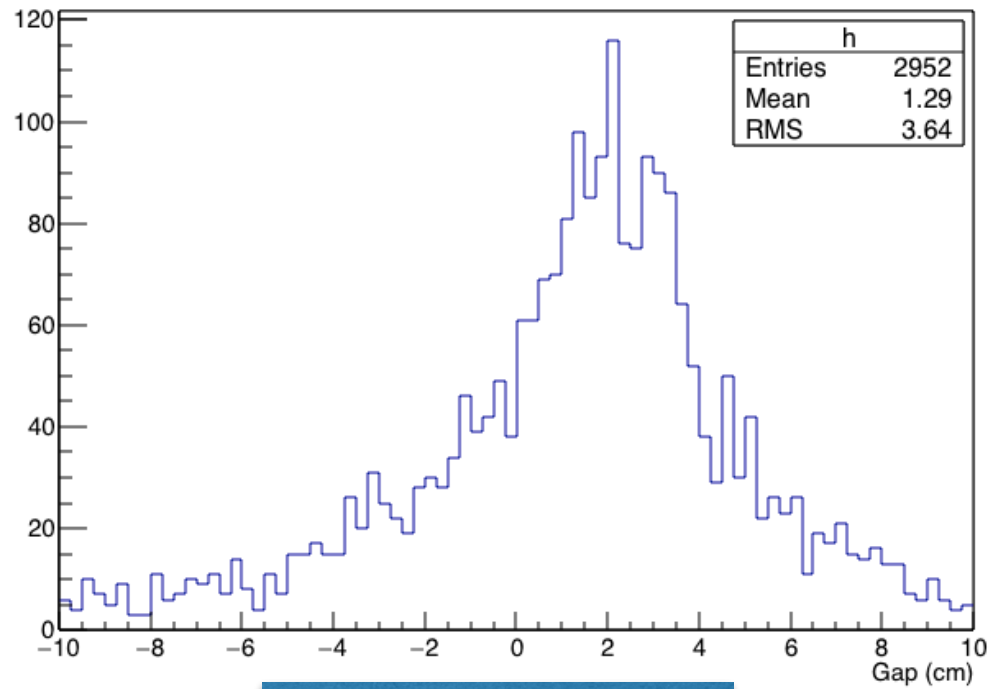
- Number of criteria to consider:
 - The angle of the particle wrt the APA planes as it passes through the TPCs;
 - Whether or not it's an APA crosser (I'm too used to these...!);
 - How many hits are in each TPC;
 - The angle between the fitted tracks.
- Haven't really got a good handle yet about what's best — sort of been doing it by eye!

Angle Resolution

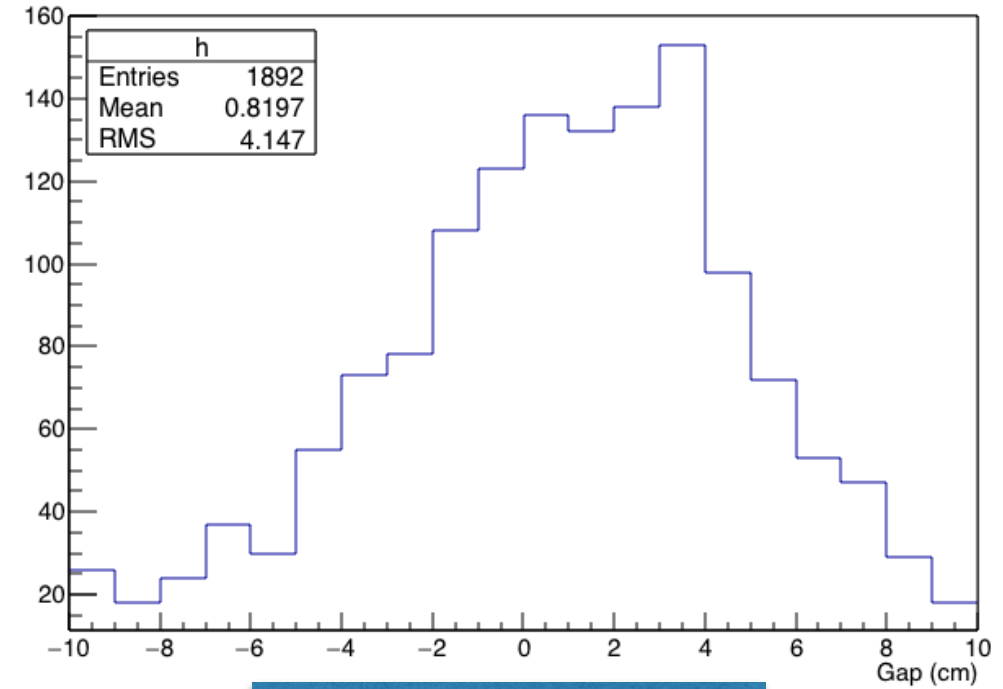
- TPC5/TPC7



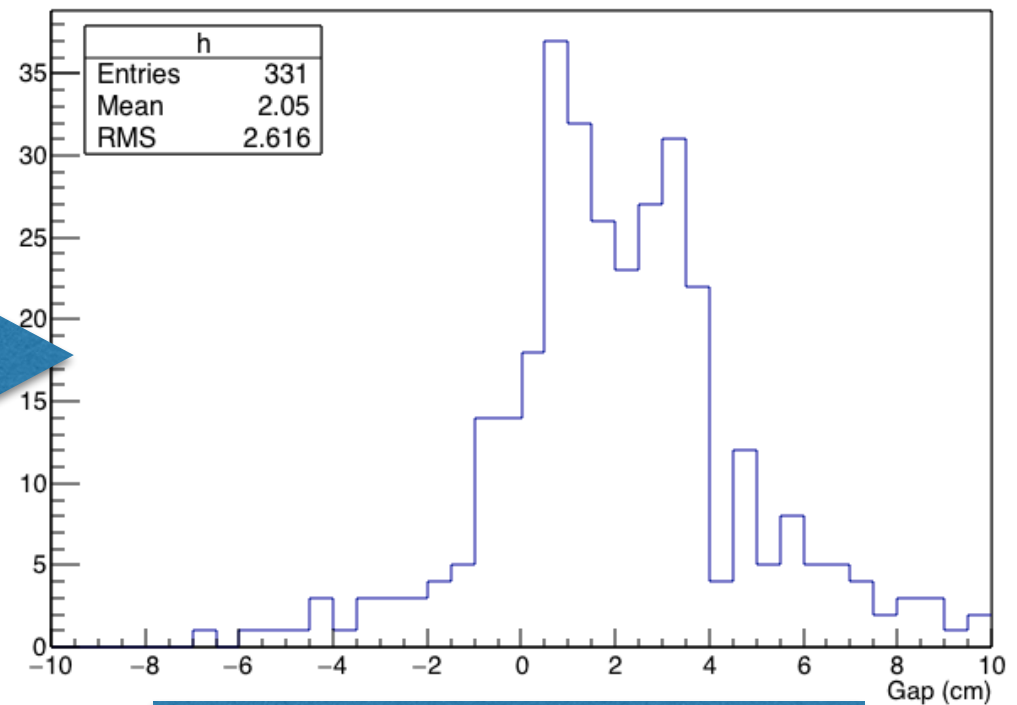
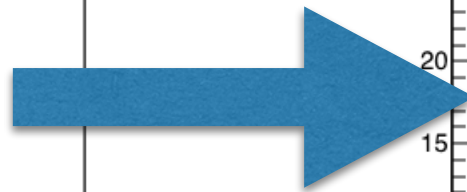
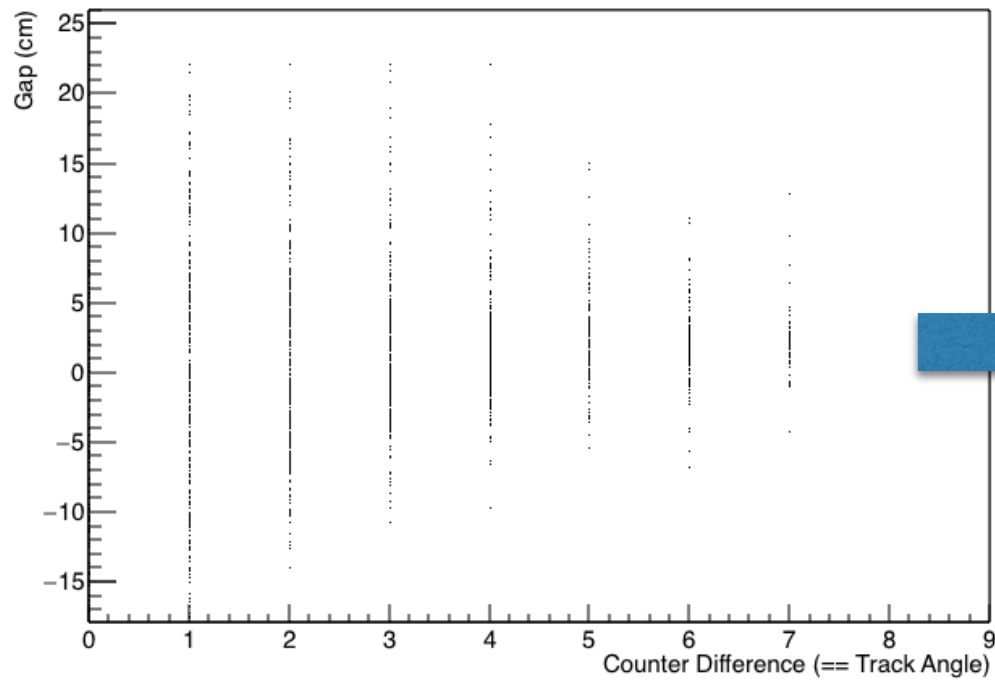
TPC1/TPC5



Before any cuts

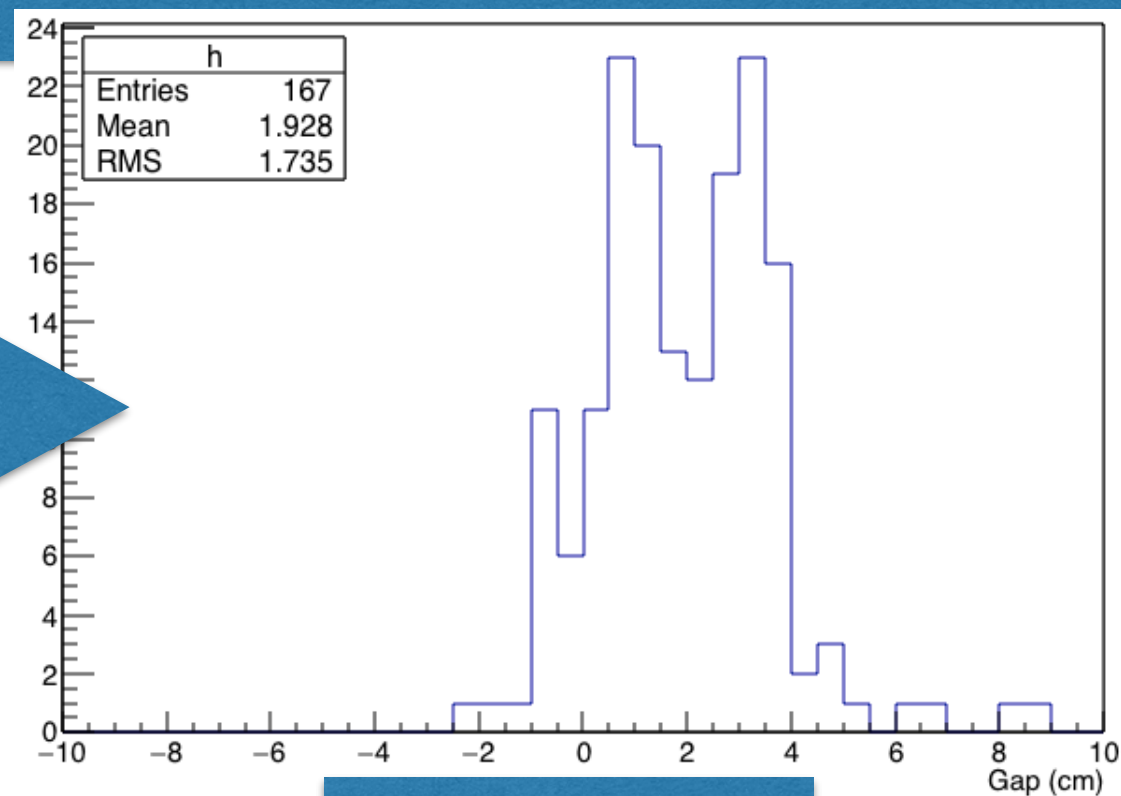
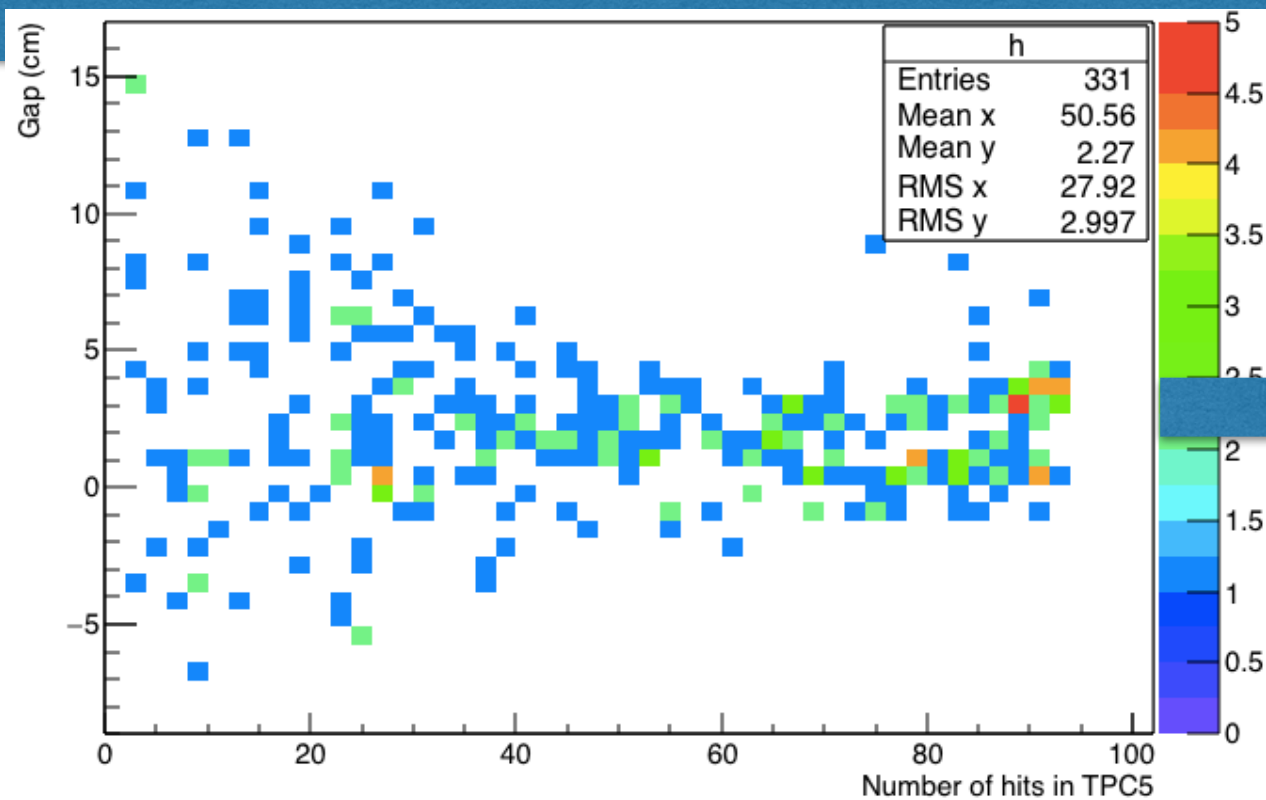


Non-APA crosser

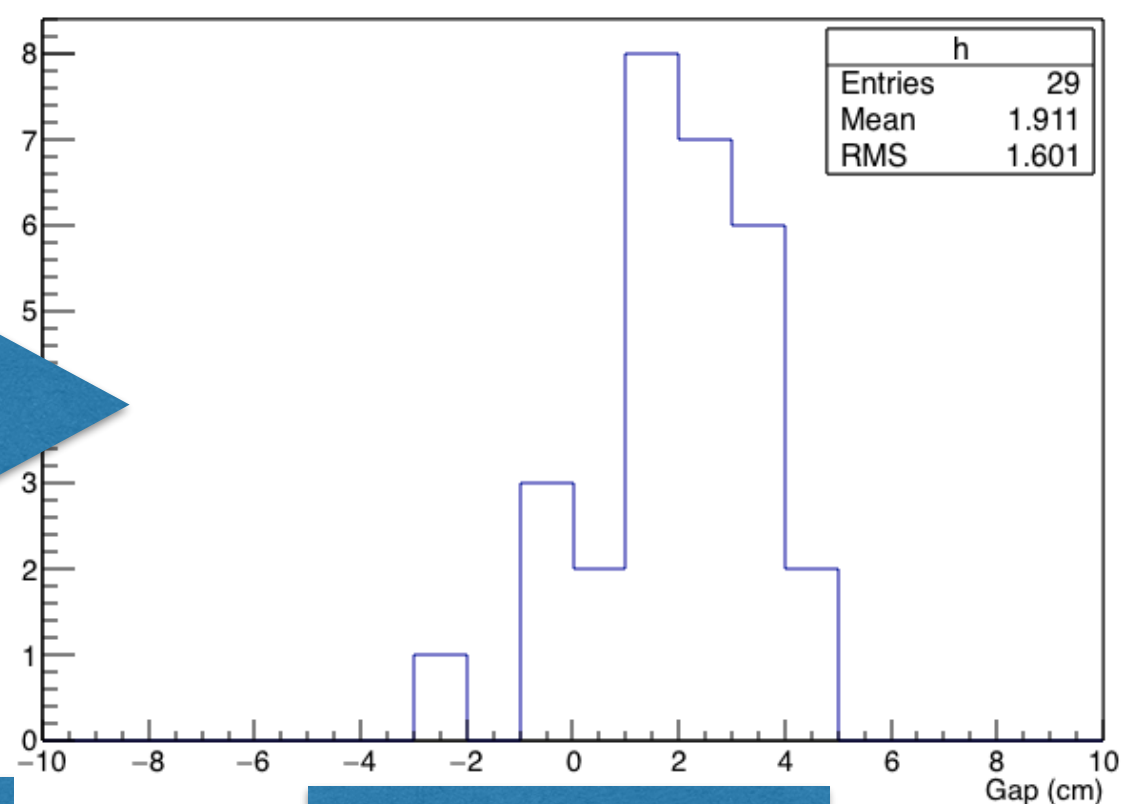
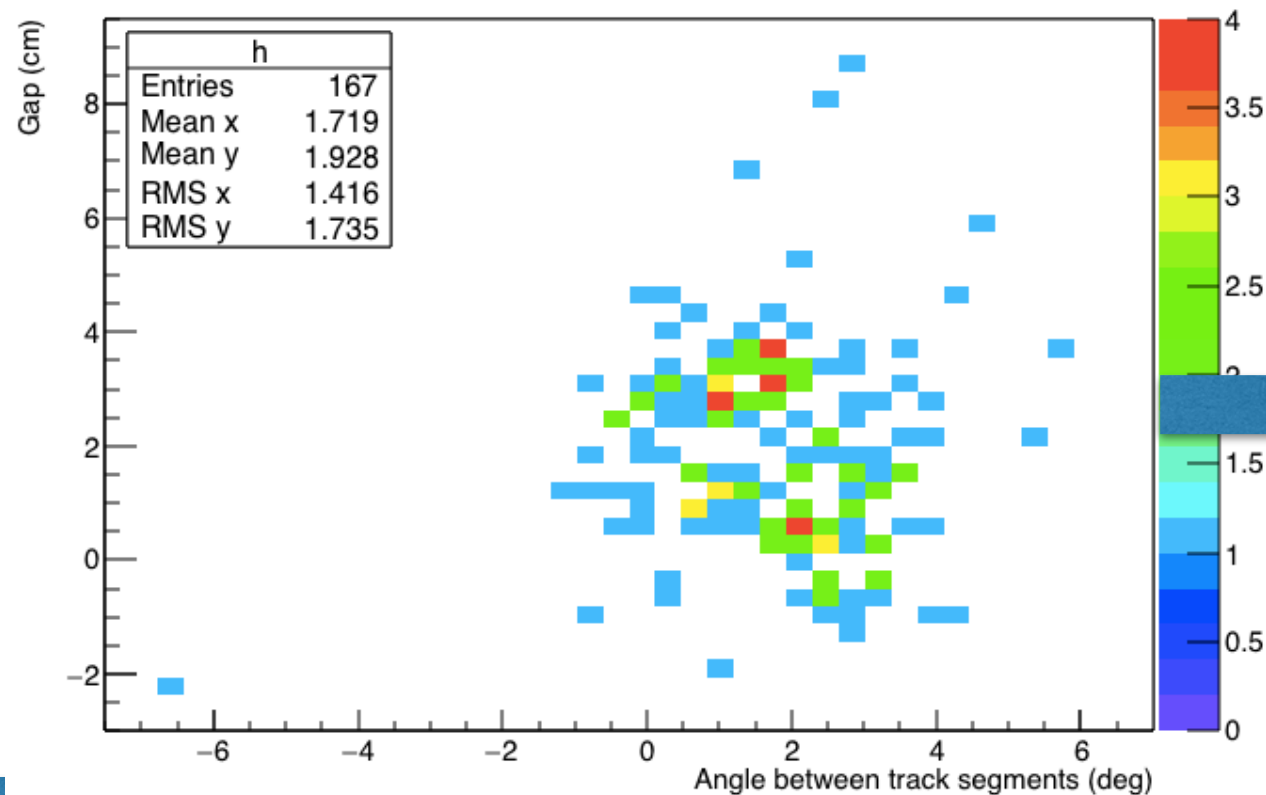


Counter difference ≥ 5

TPC1/TPC5



TPC5 hits ≥ 50

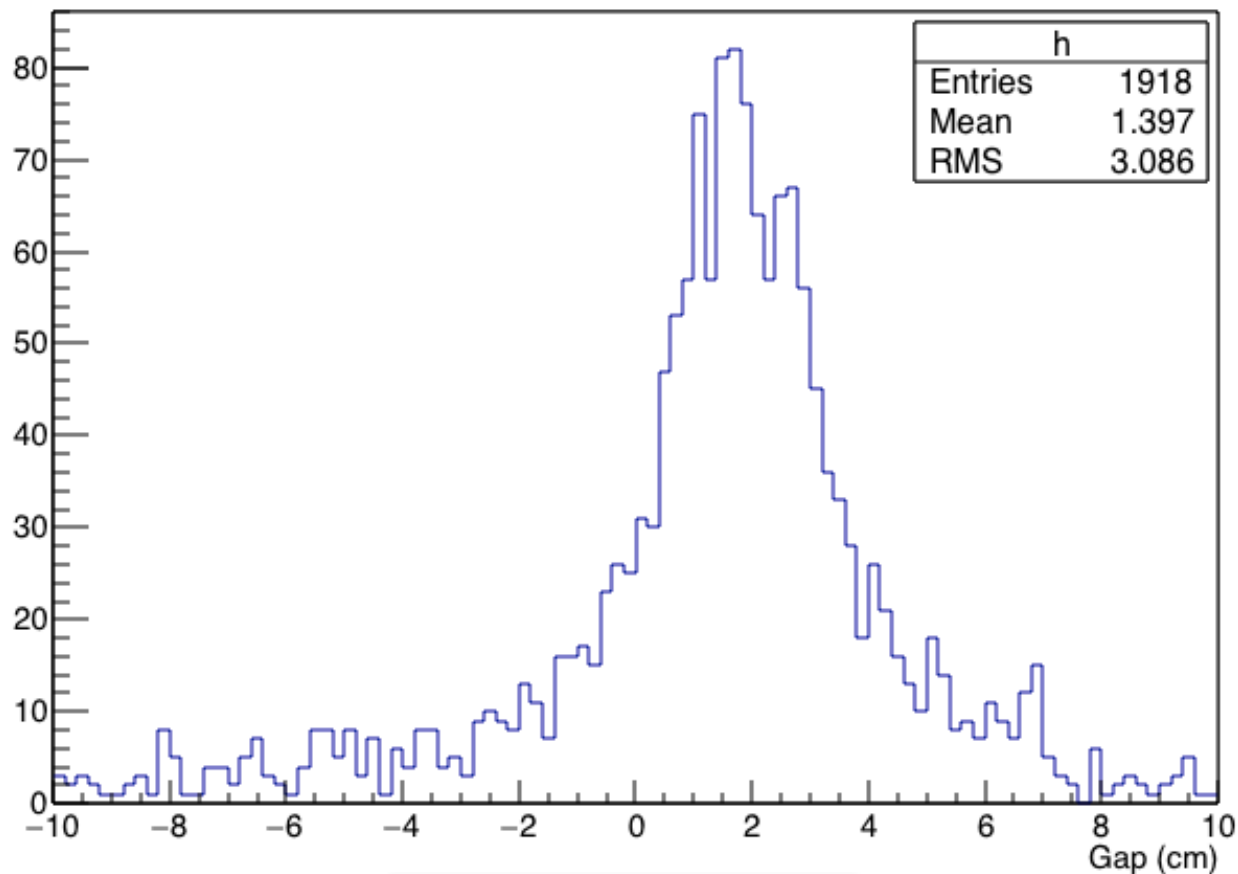


Angle < 0.5 degs

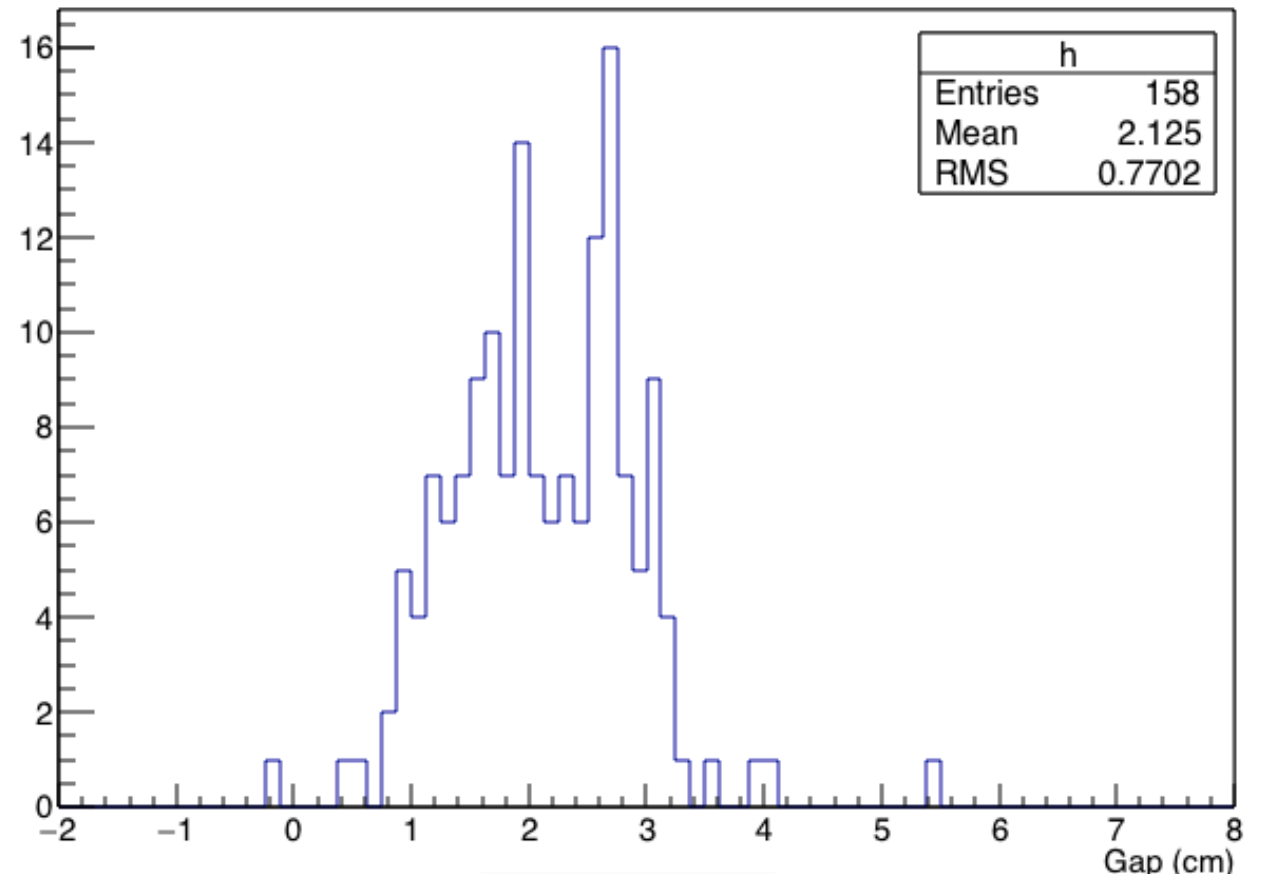
TPC1/TPC5

- These cuts seem too harsh — only 1% of events pass all of them!
- A Gaussian fitted to both the initial distribution and the final distribution is the same though!
 - 1.6 cm.
 - c.f. 2.08 cm.
- Don't know if this is plausible — looking forward to seeing Animesh's!
- Any comments on the method? I've rigorously checked over and over again to make sure it's doing what I think it's doing, because I've been convinced something is up!

TPC5/TPC7



Before any cuts

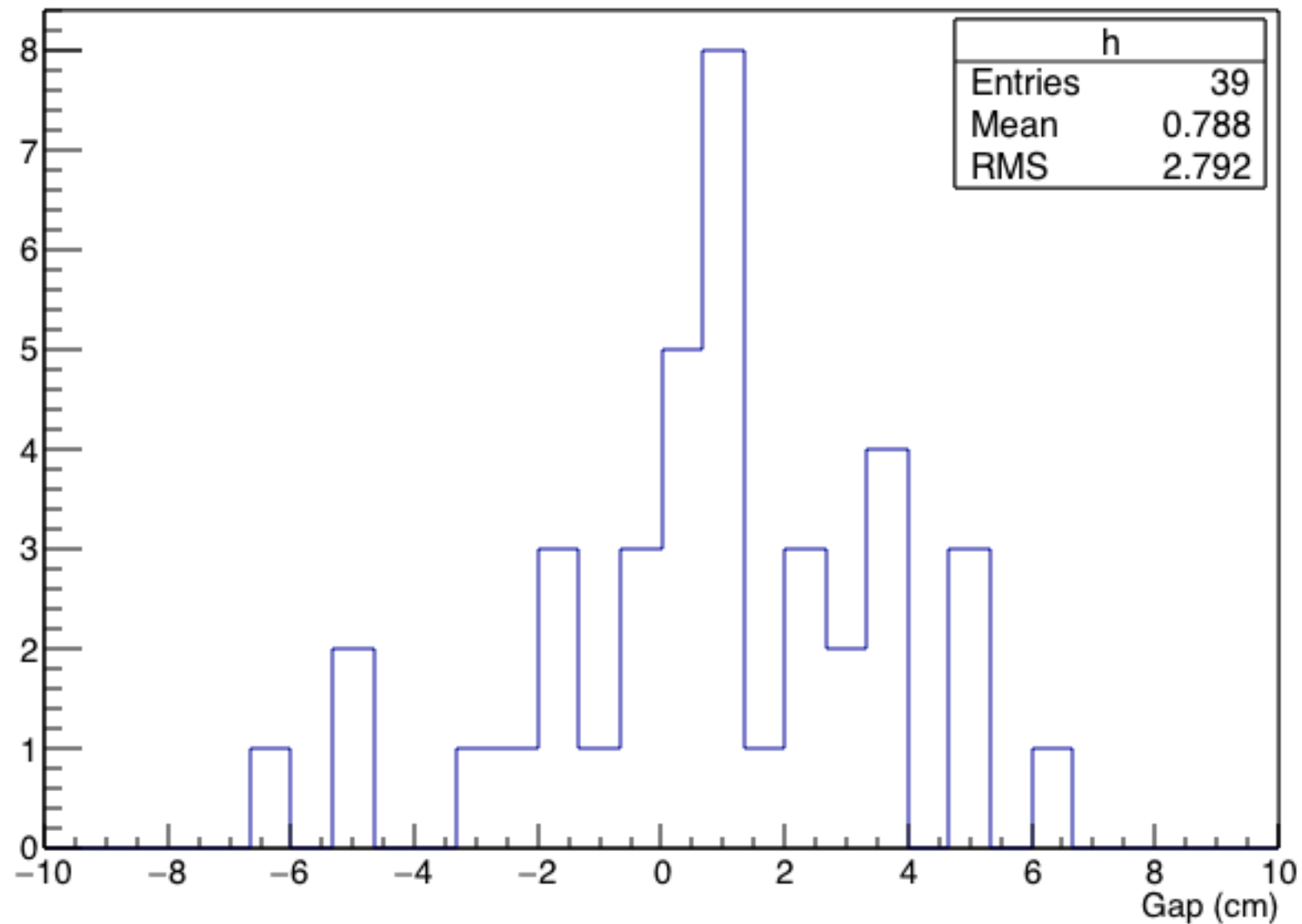


After cuts

- Gap 1.8 cm (c.f. 2.0 cm).
- There appears to be two peaks here — I've spent ages trying to find the cause but haven't managed to yet...

TPC1TPC3

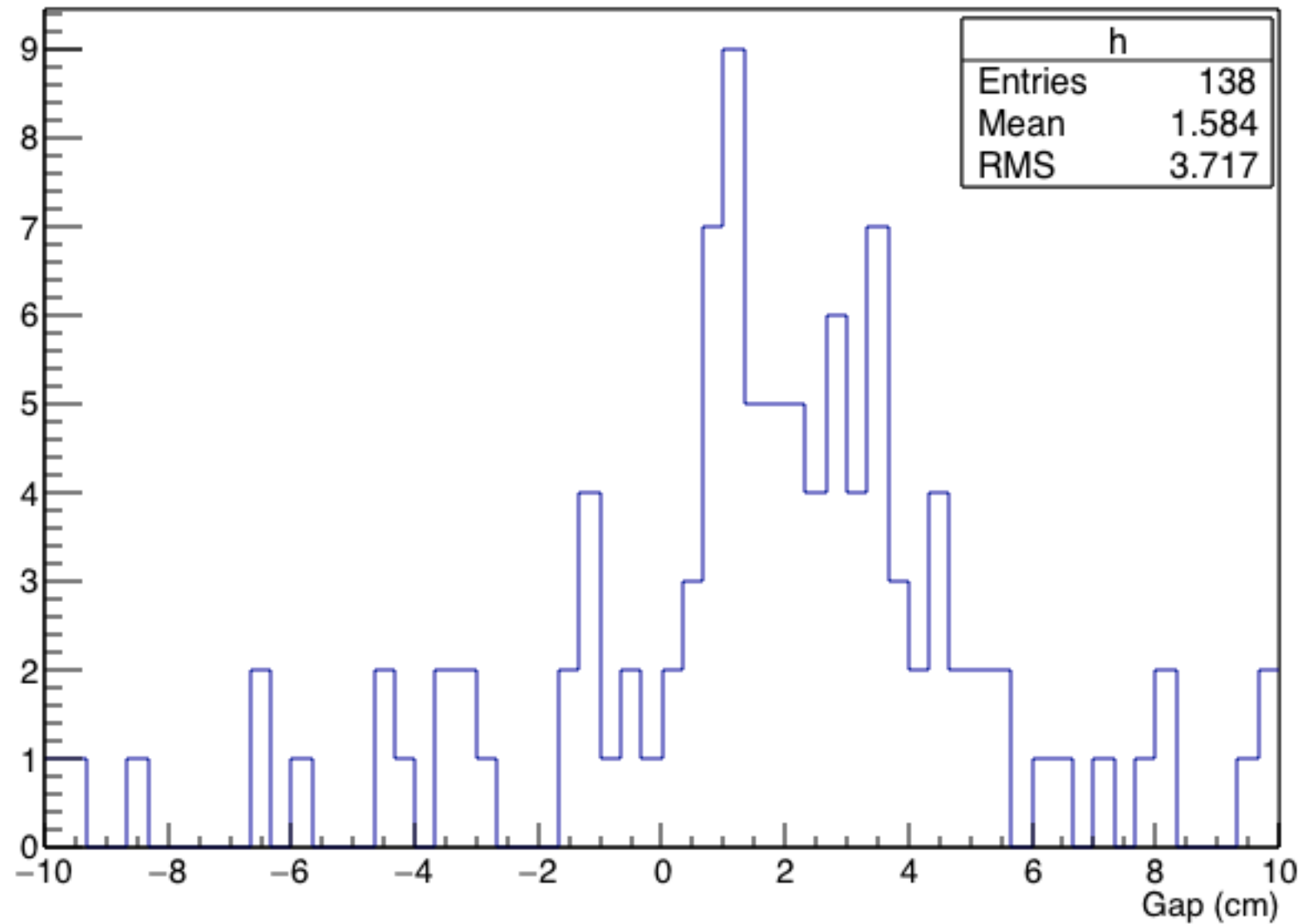
- Low stats for anything involving APA1!



- Gap ~ 0.8 ? c.f. 2.5! Same problem with the two peaks here...

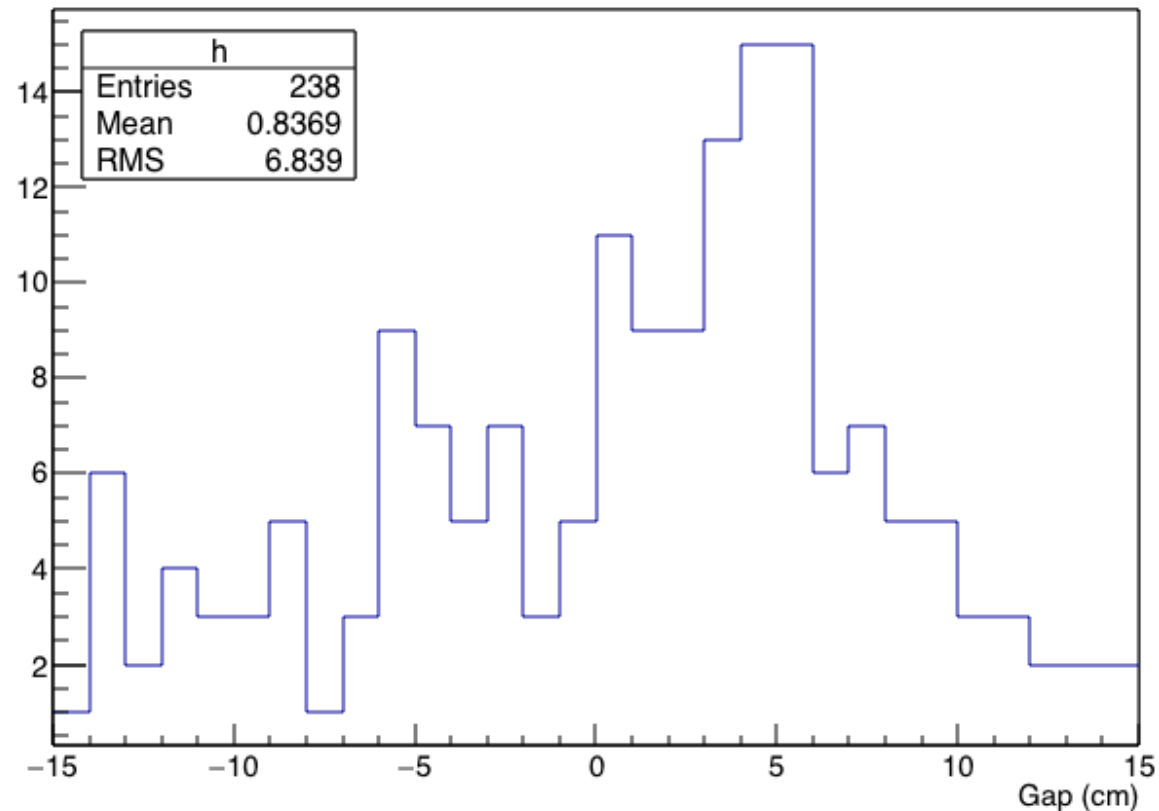
TPC3TPC5

- And again...

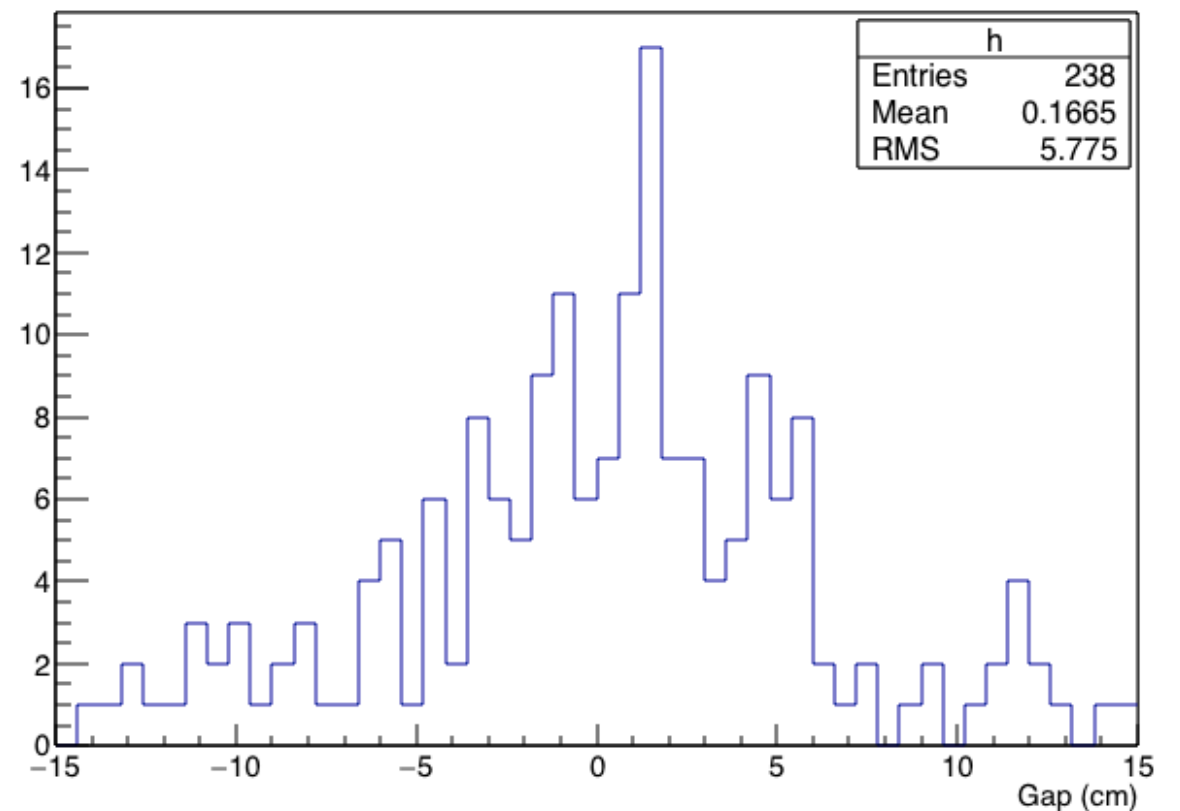


- Would love to know if this double peak effect is genuine or something I'm doing wrong...!

Short Drift...



TPC0/TPC4



TPC4/TPC6

- Looks like measurement may be possible for short drift region, once I've sorted out issues with long drift...!

Thoughts

- Made a start at using the APA crossing code to measure the z-gaps in between the APAs.
- Still very much at the ‘understanding the problem’ stage — there’s a few things I keep seeing in my results which I don’t understand.
 - In particular, the ‘double peak’ seems to be a recurring issue.
- Anything thoughts or comments would be good! Also will be interesting to compare with what Animesh.