Detector and Magnet Alignment

C Hunt

MICE Analysis Workshop

15-05-2018

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Contents

Not too many plots yet, but the foundations are there.

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Current Status

- Straight Track Alignment
  MICE note under review, can be referenced. (F. Drielsma)
  Possibly reproduce analysis on latest data and recon, but very stable and tested.

- Field to Tracker Alignment
  MICE note under development (75%). (C. Hunt)
  Data processed for 07469 data, MC tests complete.
  Probably requires better field maps (J. Langlands)

- SSU-AFC-SSD Alignment
  Concept under discussion.
  Probably be transfer matrix based algorithm. (P. Jurj, S. Middleton)
  Possibly need iterative MC approach with new field maps (J. Langlands)
  Also need to tie into the TOF reconstruction

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Path Forward

1. Finish and circulate the alignment algorithm MICE note,

2. Liaise with Jo, RE: Field maps and field modelling,

3. Produce new field maps for the simulation geometries,

4. Generate Tracker-Field alignment numbers,

5. (Generate straight track alignment numbers),

6. Develop Tracker-TOF Alignment method,

7. Develop and implement the AFC alignment method,

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Algorithm Note

- Tested with uniform solenoid fields, and it works perfectly.

- Statistically consistent in all measures,

- Systematic effects seen in non-uniform fields,

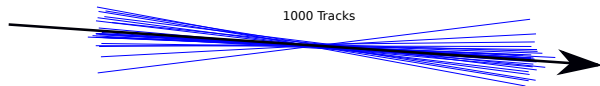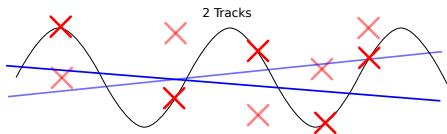- I have a plan to address this using MC - just needs testing,

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Algorithm Note

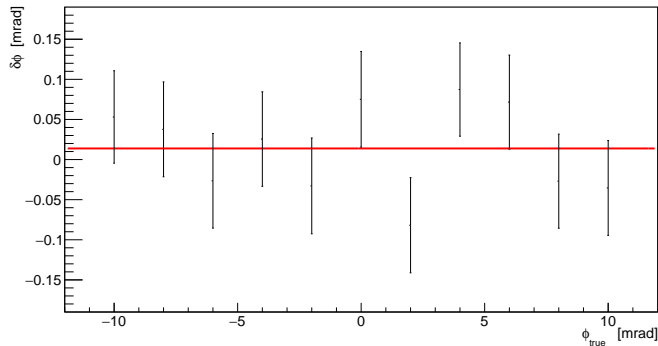## Effect of field rotation on reconstruction.
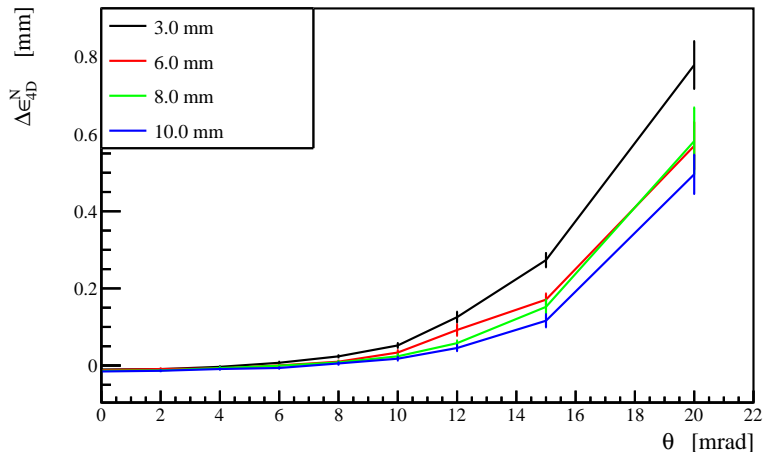
Algorithm Note
The Concept

- Seen this before,
- Fit straight tracks to low-r helical tracks,
- Mean gradient converges to field alignment.

Algorithm Note

ϕ_{tot} residuals with perfect field

$\chi^2 = 9.15$

$N_{\text{DoF}} = 10$

$\langle \delta\phi \rangle = 0.014 \pm 0.018 \text{mrad}$

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Tracker-TOF Alignment

- Probable going be based on tracking through the field,

- Look at residuals between TOF Spacepoint and Extrapolated track,

- Do we need a Raynor Reconstruction?

- Conceptally not too difficult, but will take some work.

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SSU-AFC-SSD Alignment

The missing piece as it stands.

Several options to choose from:

- Transfer matrix fitting (S. Middleton)

- More constrained transfer matrix fitting (P. Jurj)

- Global tracking Data-MC iteration?

- Any other ideas? Send me an email!

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Conclusions

- Ball has begun rolling,

- Still a bit to do however.

- Basics are in hand,

- Really need to make a start on getting the SSU-AFC-SSD alignment underway.

So Stay Tuned. . .

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