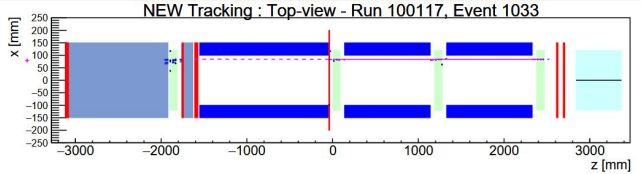
April Update

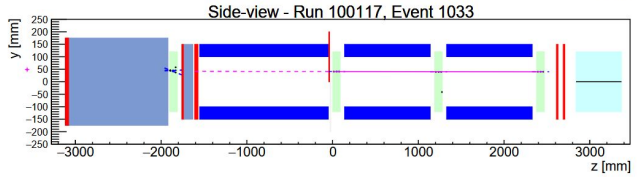
FASER Liverpool - April Meeting

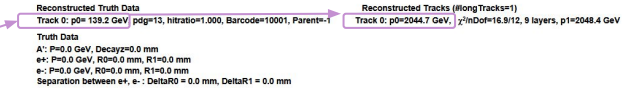
Sinead Eley

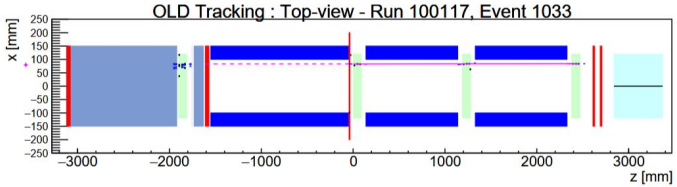
Alma 9

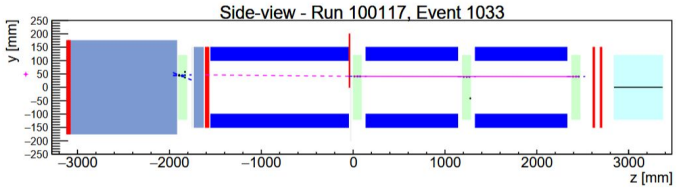
- After last meeting:
  - Pawan sent me Brian's event viewer code
- Used this to look at events that had their charge misidentified in the new tracking but was correctly identified in the old tracking
- One key point from these events:
  - When charge misidentified :
    - Tracking seems to have poorly reconstructed momentum of the track
      - I.e. Truth momentum of 139.2 GeV reconstructed as 2044.7 GeV

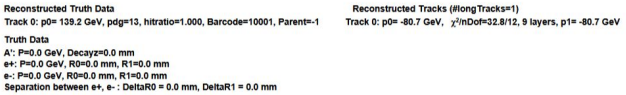












Alma 9

- Using the events that have their charge correctly identified in old tracking but incorrectly in new tracking
  - Looking at the (absolute) difference in reco and truth momenta
  - Did this to compare new to old tracking
- Ratio shows:
  - When difference between reco and truth is low
    - Old tracking is contributing mostly to this
  - When difference between reco and truth is high
    - New tracking is contributing mostly to this
    - I.e. Most of the disagreement between reco and truth momenta comes from being misidentified in the new tracking
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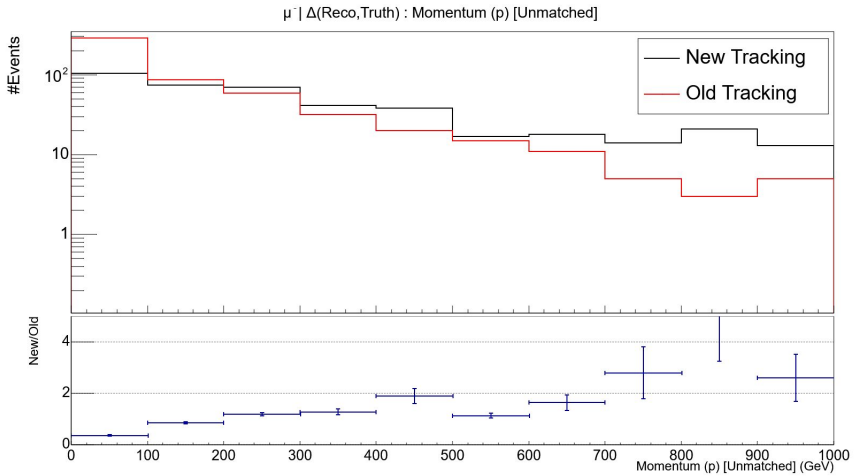
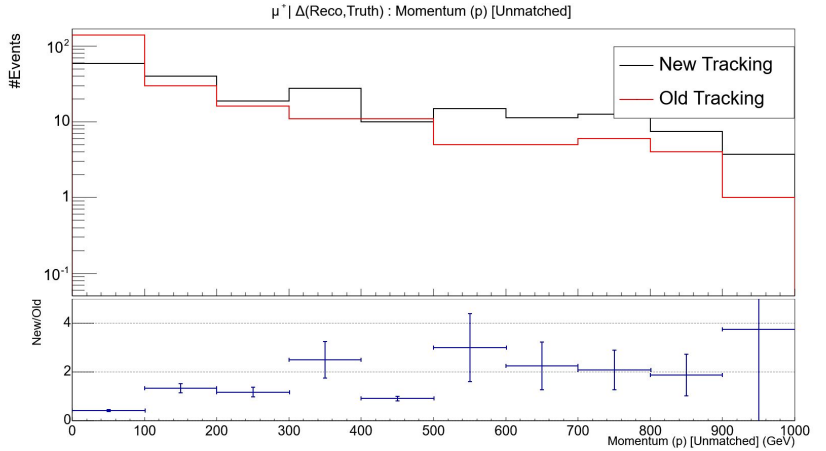
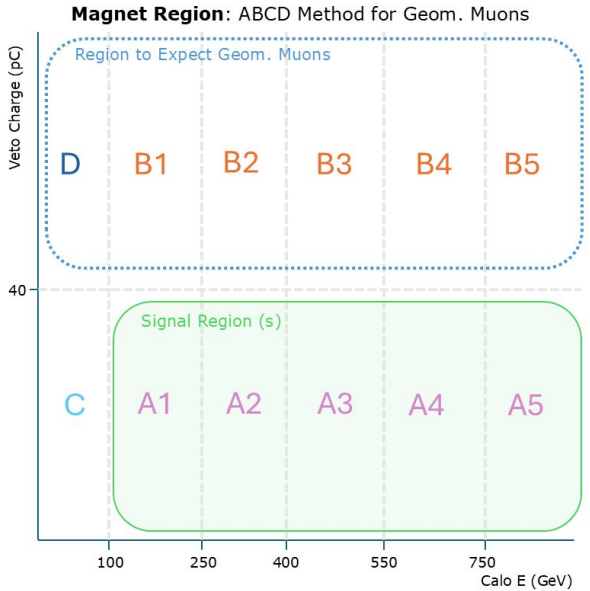




ALPtrino - ABCD

- Using an ABCD (data driven) method to estimate the geometric muon background in the signal region
- As there are multiple regions, with multiple bins in each region
  - Going to be using a binned approach to this
    - Considering each bin in each region as its own signal region for the ABCD and calculating the predicted geom. bkg for each of these
    - I.e. Using A1 as the signal region :
      - A1=B1*(C/D)
- To account for the neutrino signal in each region
  - Using a MC sample :
    - amounts of neutrinos in each signal region can be subtracted from the geom. muon prediction
    - This should give an overall picture of the large-angle muons predicted using this method



ALPtrino - ABCD

- Started on Magnet region for 2023 data
- Signal region encomapasses bins A0-4 with each representing a bin on the below plot
- A nominal neutrino MC sample consisting of 3 mc samples each of 10ab-1 is scaled to the lumi of the 2023 data and subtracted to give an estimated background in the magnet signal region
- This method will be repeated for 22 data
    - This will be then repeated for the different regions (using their respective energy binning)

ABCD Region	Energy (GeV)	Data	Neutrinos	Corrected Count
A0	100	9.584	1.305	8.279
A1	250	2.584	0.326	2.258
A2	400	1.155	0.128	1.027
A3	550	0.794	0.072	0.722
A4	750	0.694	0.058	0.636
B0	100	10221	2.876	10218.124
B1	250	2756	0.719	2755.281
B2	400	1232	0.282	1231.718
B3	550	847	0.159	846.841
B4	750	740	0.127	739.873
C	25	45	8.054	36.946
D	25	47991	3.656	47987.344