Test of new geometry on 2016 data

Alessandra Filippi

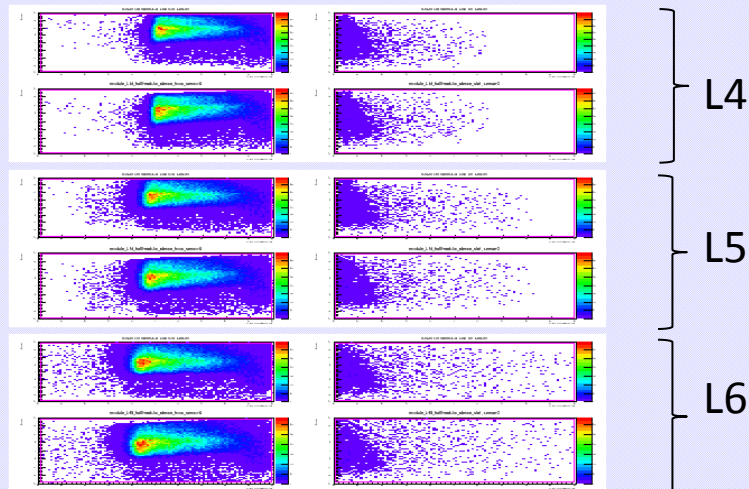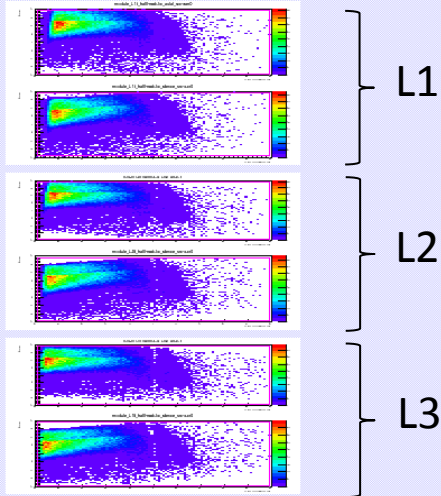Feb 26, 2017

Test of new geometry on 2016 runs

- A new version of geometry with global alignment performs well on 2015 data, both curved and straight tracks
  - New SVT offsets applied to v5-0 geometry $\rightarrow$ v5-1 (custom)
  - But: systematic offset on momentum
    - Tracks are softer than expected, about 20 MeV less than nominal value

- Purposes
  - Test the geometry with 2016 data
    - Different coverage, but should work if no macroscopic move occurred to SVT
      - Straight track geometry should be ok
    - Curved tracks: test momentum peak, everything ok?

- Same lcsim file used for reconstruction
  - Straight tracks: should be ok
  - Curved tracks: steering lcsim from hps-java bundle + condition on rejected ghost hits: much slower (and less efficient)
    - With the same steering lcsim and on the same amount of events
      - execution time: 3x for 2016 data
      - Reconstruction efficiency: 0.5x for 2016 data
    - Only partial results over a small amount of tracks (50000 reconstructed events: about 18000 tracks $\rightarrow$ factor 20 wrt to study samples)
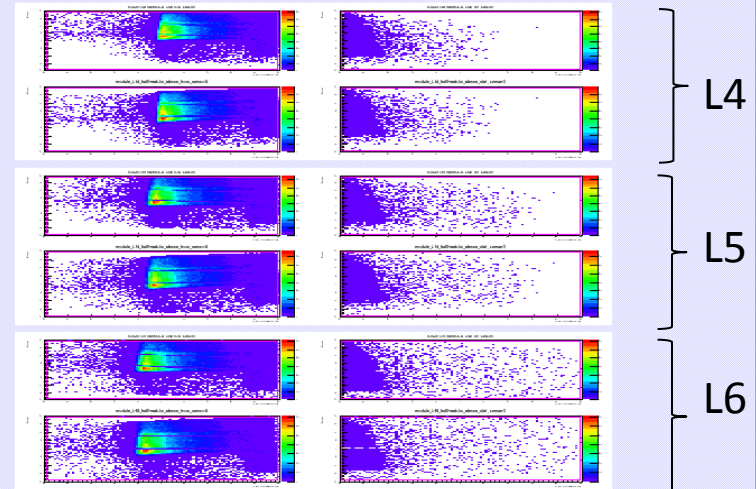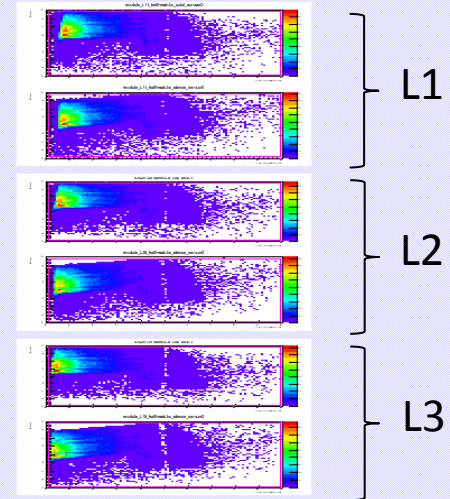
2015-2016 straight tracks: hits distributions
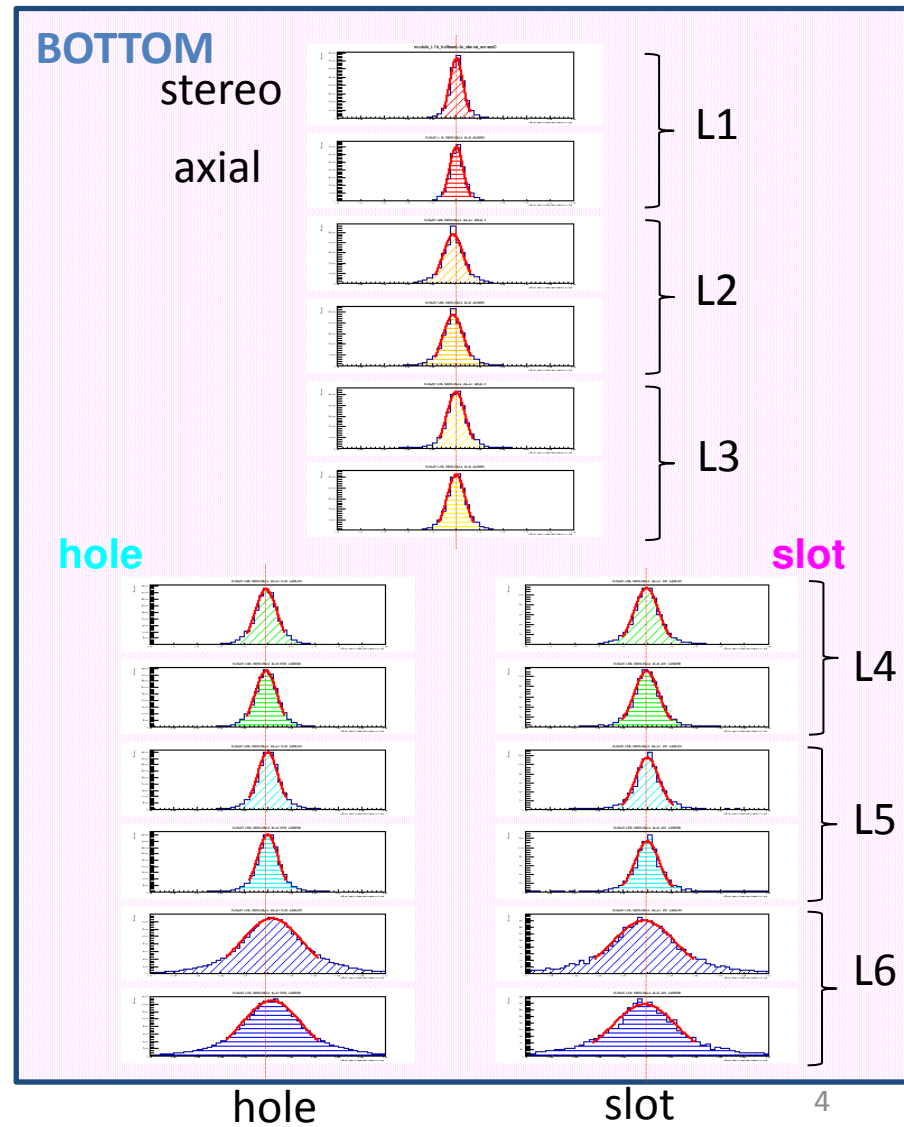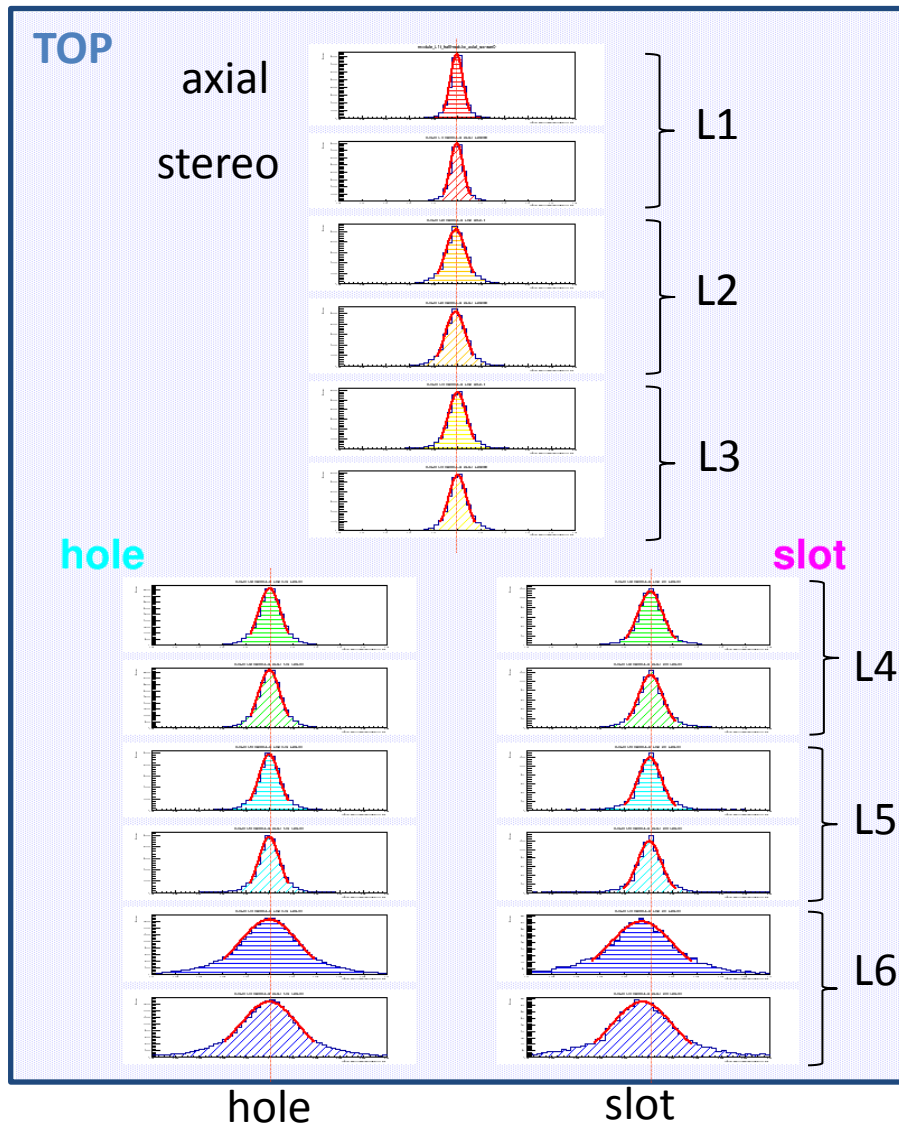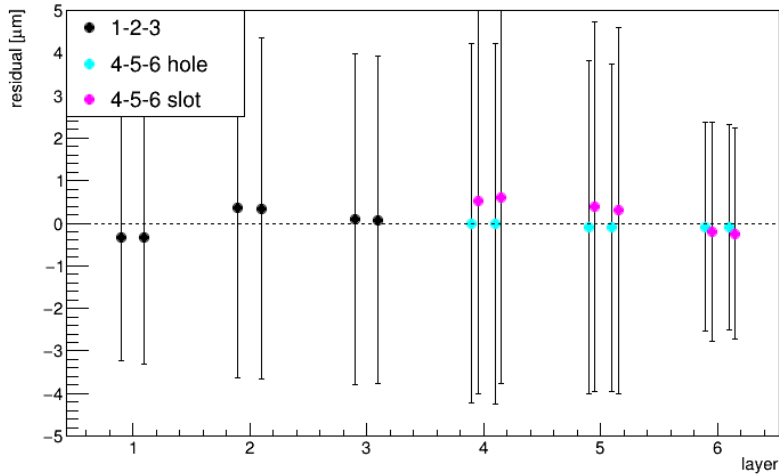
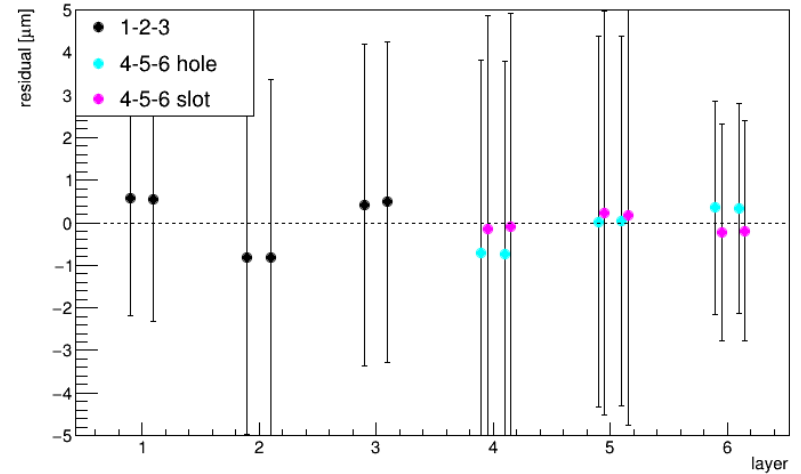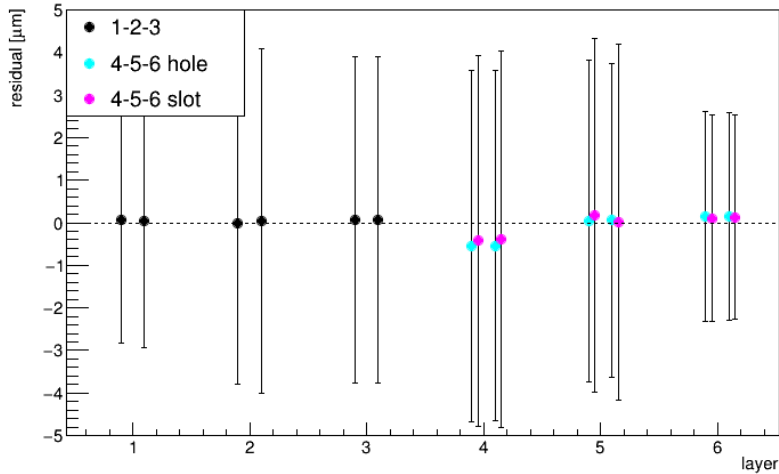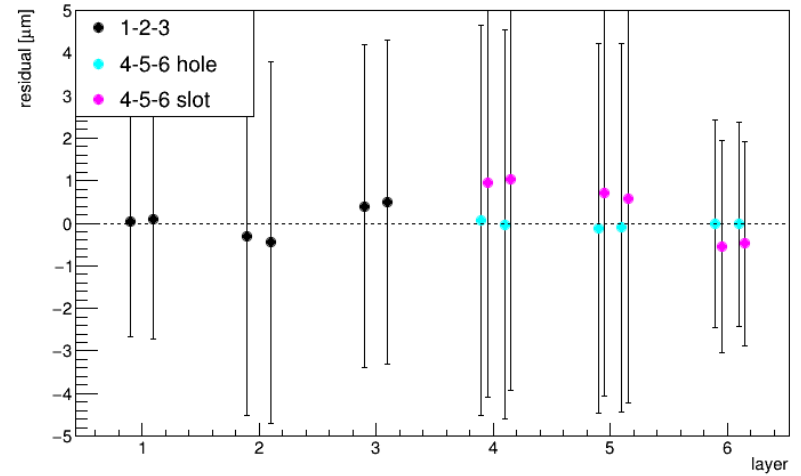# Straight tracks 2016 (run 8100): GBL-u residuals quality

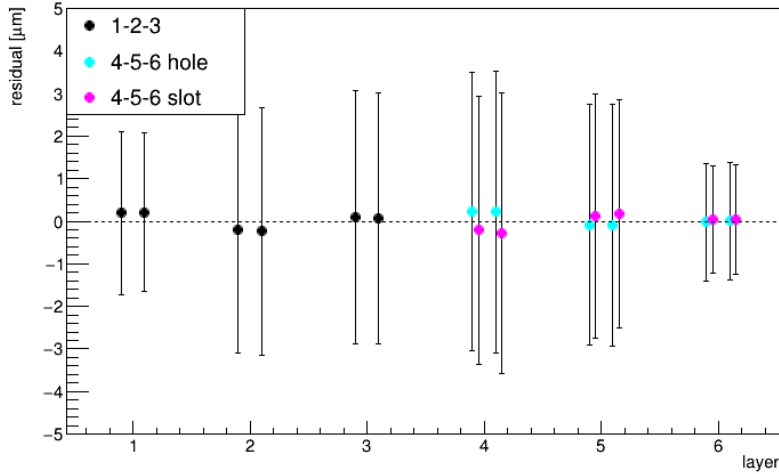Looks satisfactory, overall

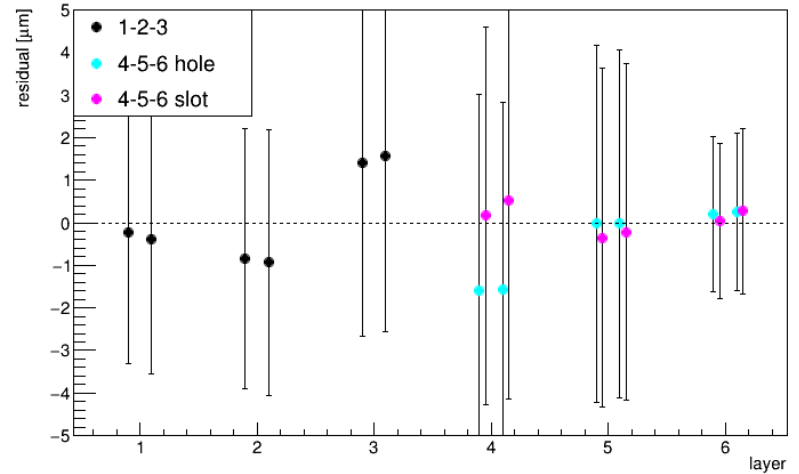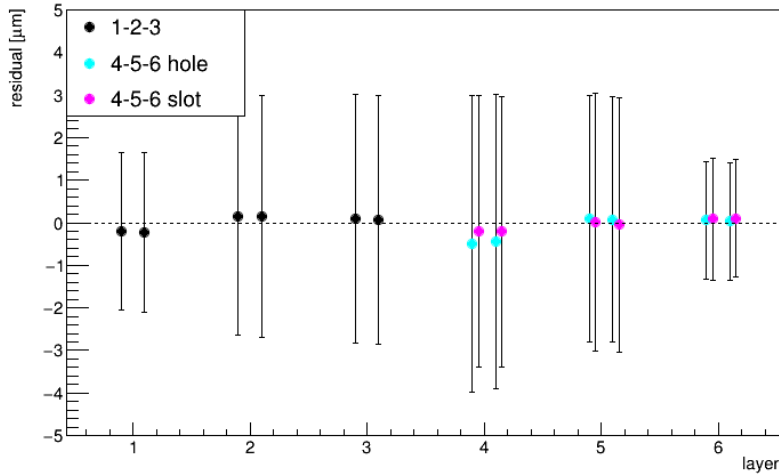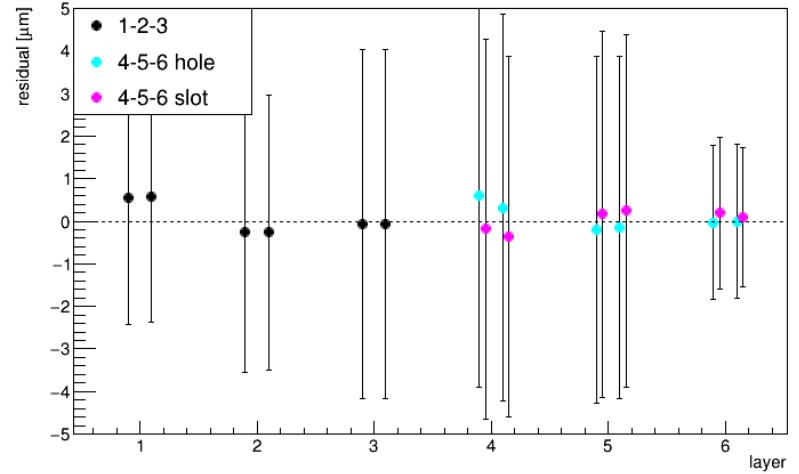# 2015 straight vs 2016 straight tracks u residuals

Some more refinements could be attempted – top slot layers, bot 1-2-3
May I mix the samples? (I suppose so…)

2015 vs 2016 **curved tracks** u residuals – 100000 evts
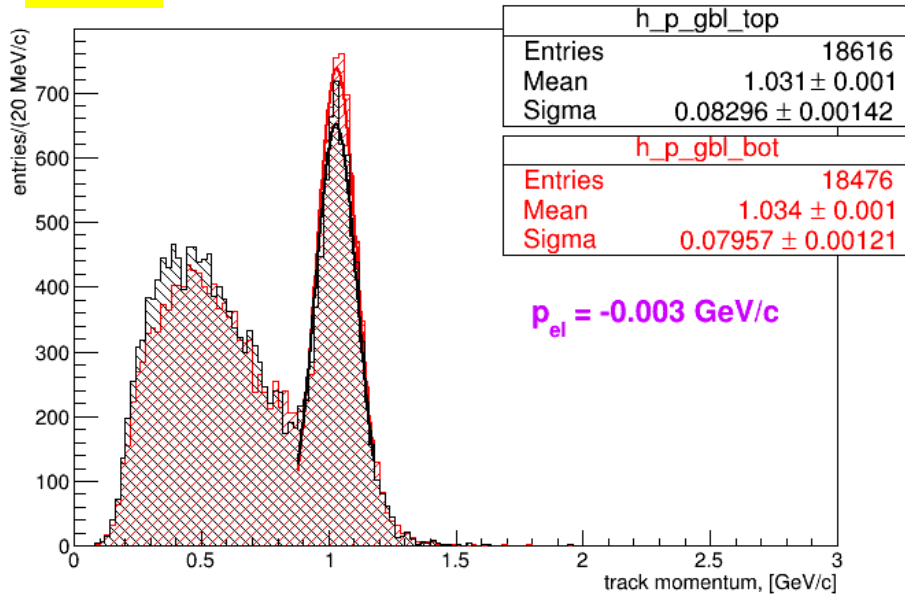
2015

2016

Bottom section looks worse (especially the central sensors)
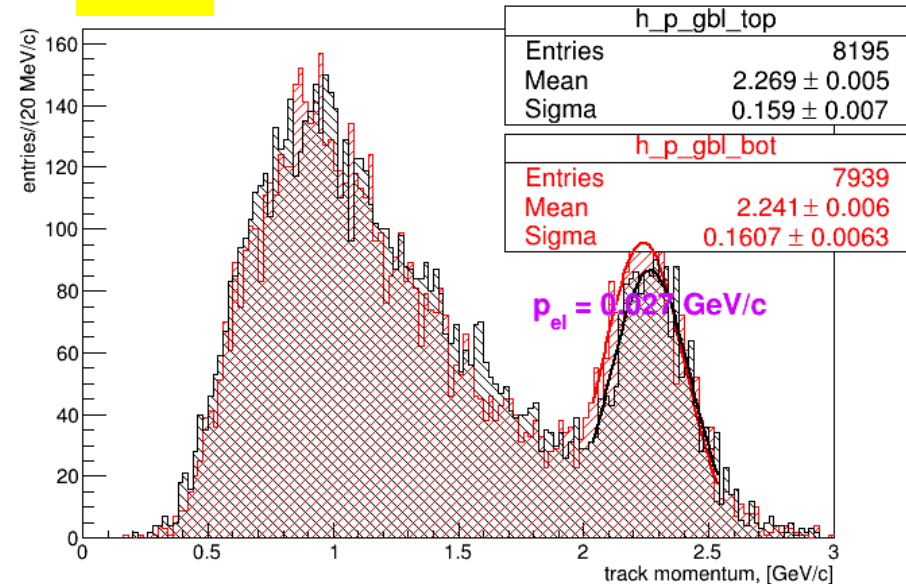
2015 vs 2016 curved tracks – 100000 evts GBL momentum

2015

h_p_gbl_top	
Entries	18616
Mean	1.031 ± 0.001
Sigma	0.08296 ± 0.00142

h_p_gbl_bot	
Entries	18476
Mean	1.034 ± 0.001
Sigma	0.07957 ± 0.00121

p_{el} = -0.003 GeV/c

2016

h_p_gbl_top	
Entries	8195
Mean	2.269 ± 0.005
Sigma	0.159 ± 0.007

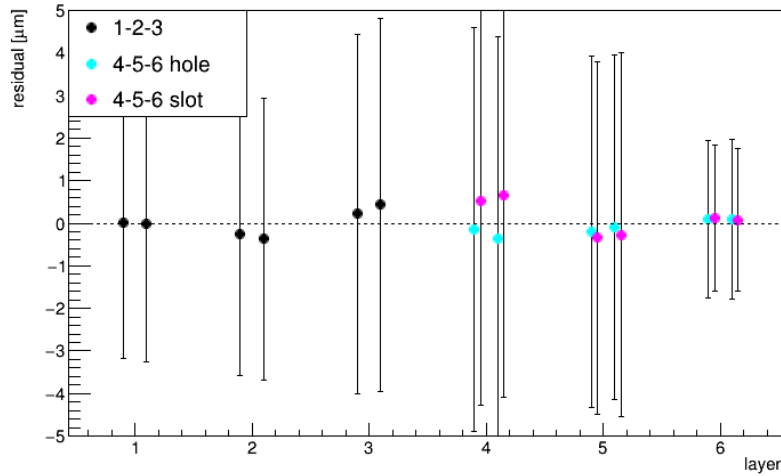| h_p_gbl_bot	
Entries	7939
Mean	2.241 ± 0.006
Sigma	0.1607 ± 0.0063

p_{el} = 0.027 GeV/c

- Lower reconstruction efficiency, factor ~2 (expected?)
- Larger difference between the elastic peak central values top vs bottom
  - 3 MeV/c vs 27 MeV/c
- Broader elastic peak (about twice as large)
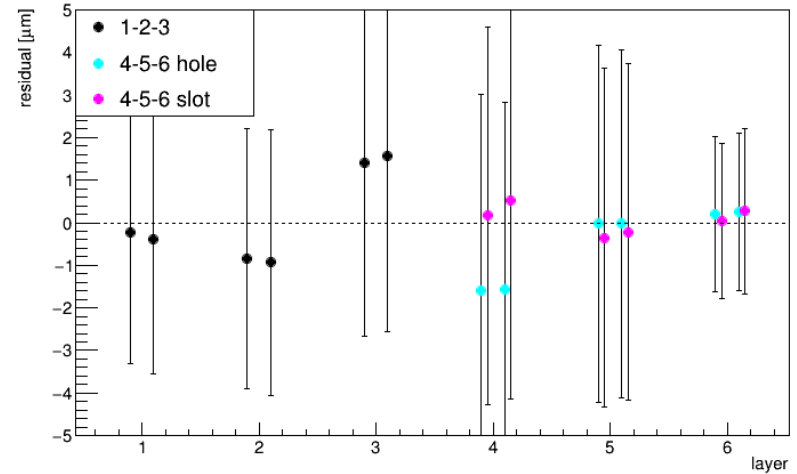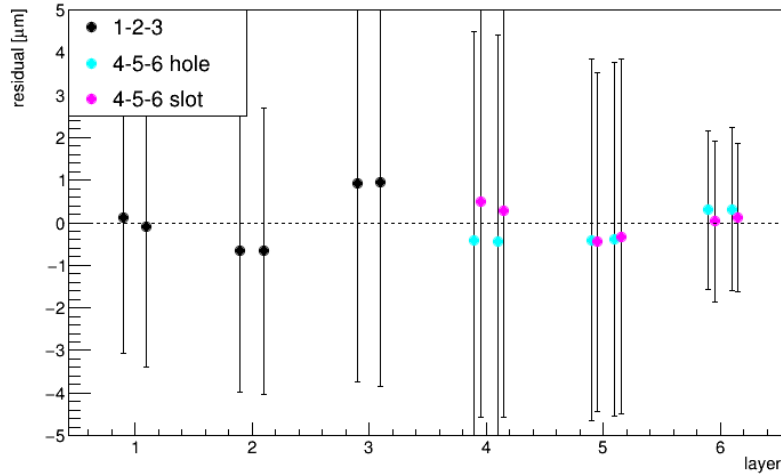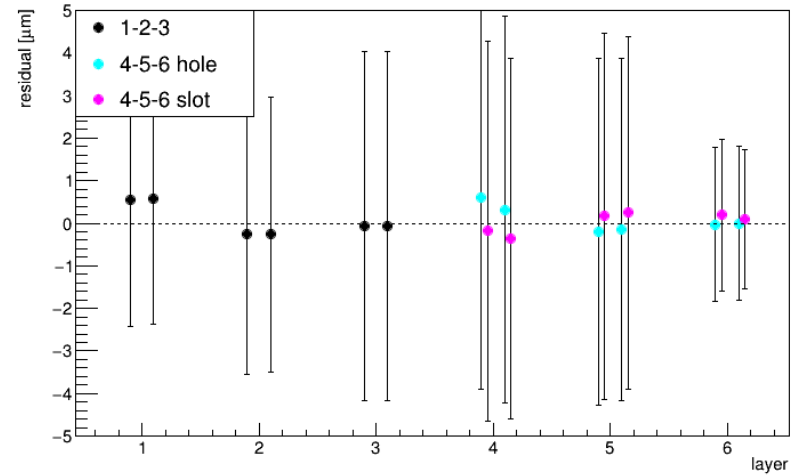- Issues related to small statistics or incorrect alignment?

2016 curved tracks u residuals: comparison with current (v5-0) geometry
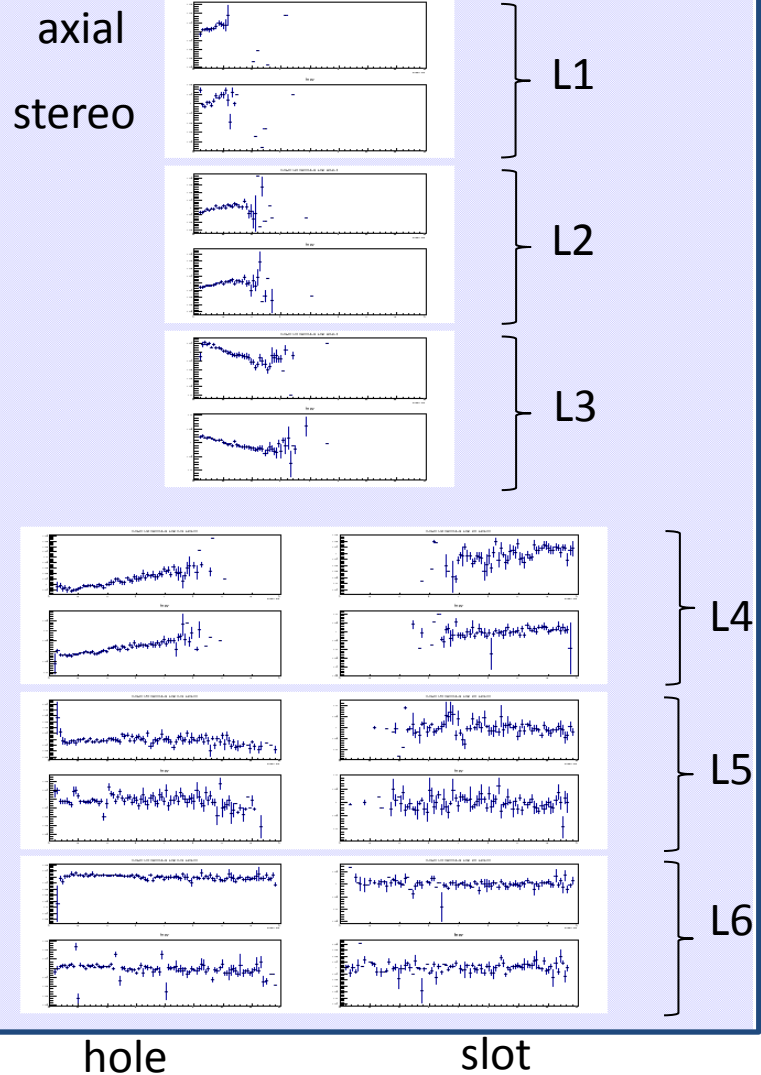
2016 v5-0

2016 v5-1

About same amount or reconstructed tracks
Bottom seems to be slightly worse

2016 curved tracks: u residuals vs u TOP
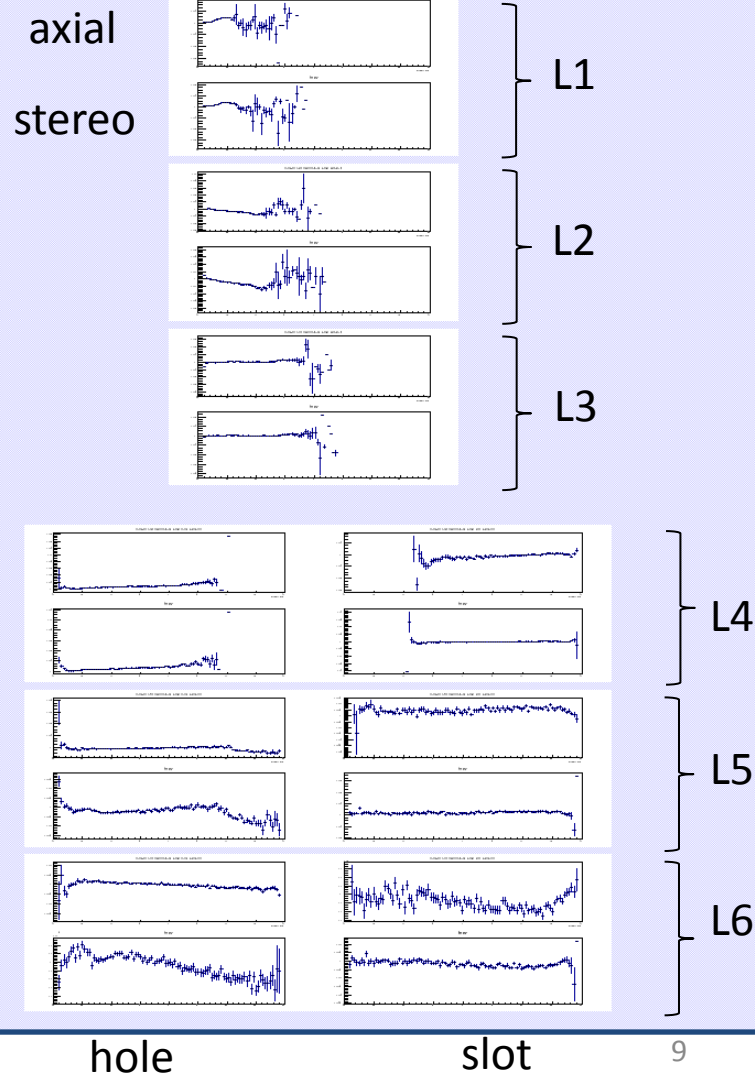## current vs new geometry

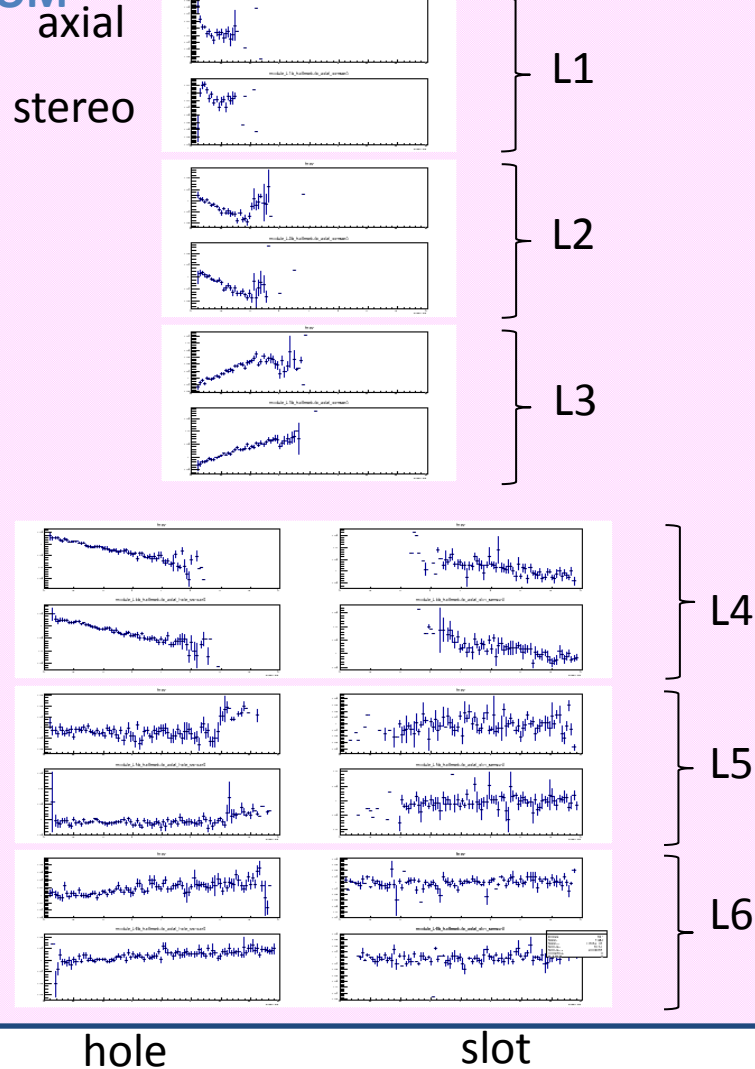2016 v5-0

2016 v5-1

2016 curved tracks: u residuals vs u BOTTOM current vs new geometry
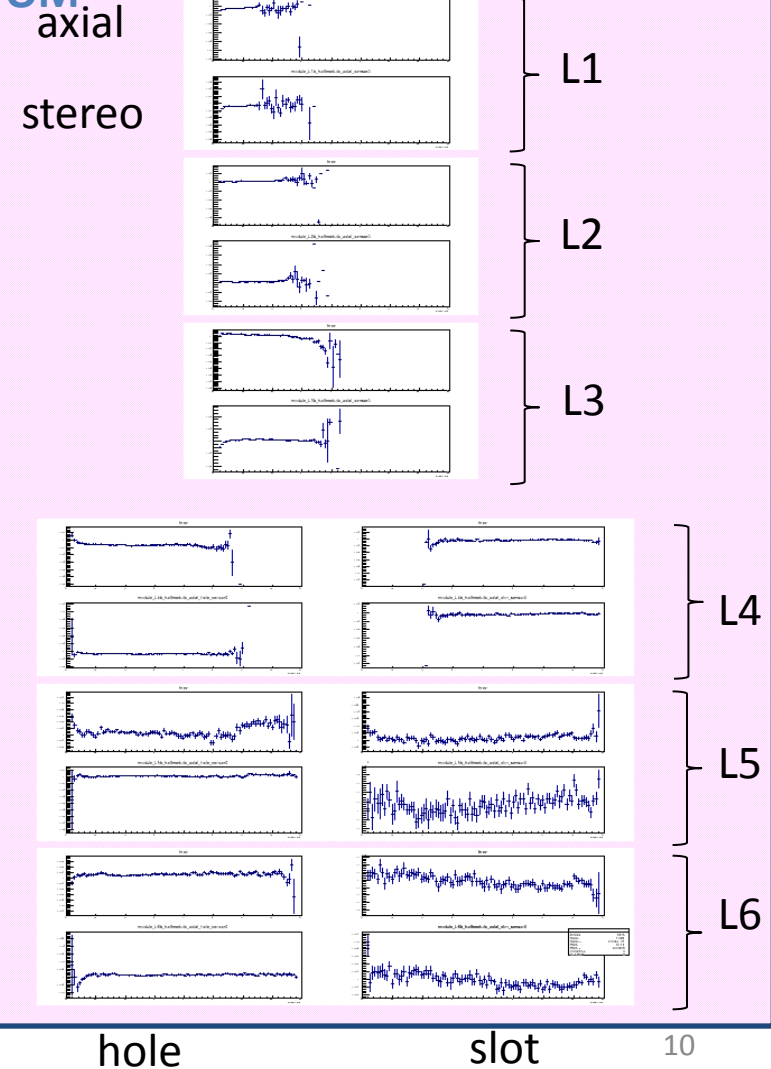

2016 v5-0

BOTTOM
axial

stereo

L1

L2

L3

L4

L5

L6

hole   slot

2016 v5-1

BOTTOM
axial

stereo

L1

L2

L3

L4

L5

L6

hole   slot
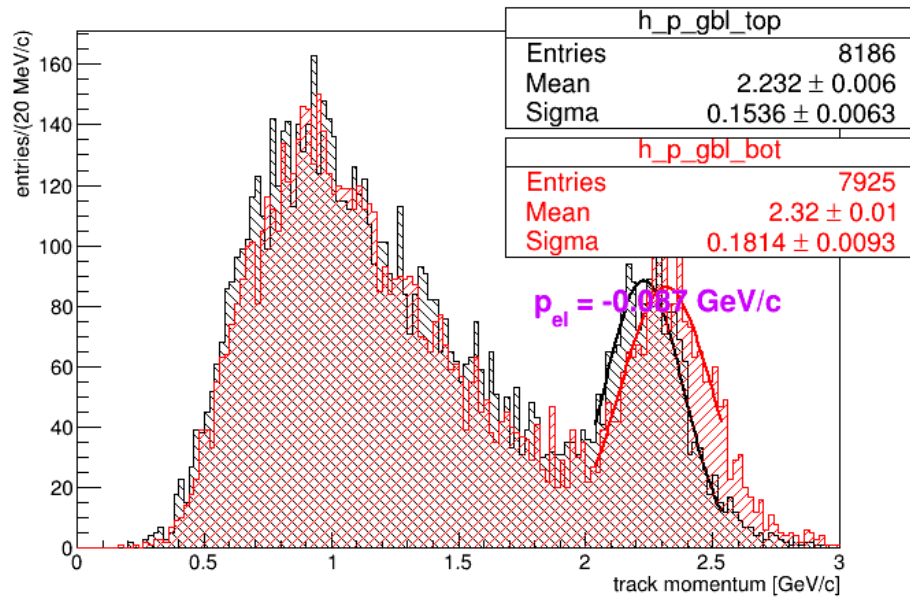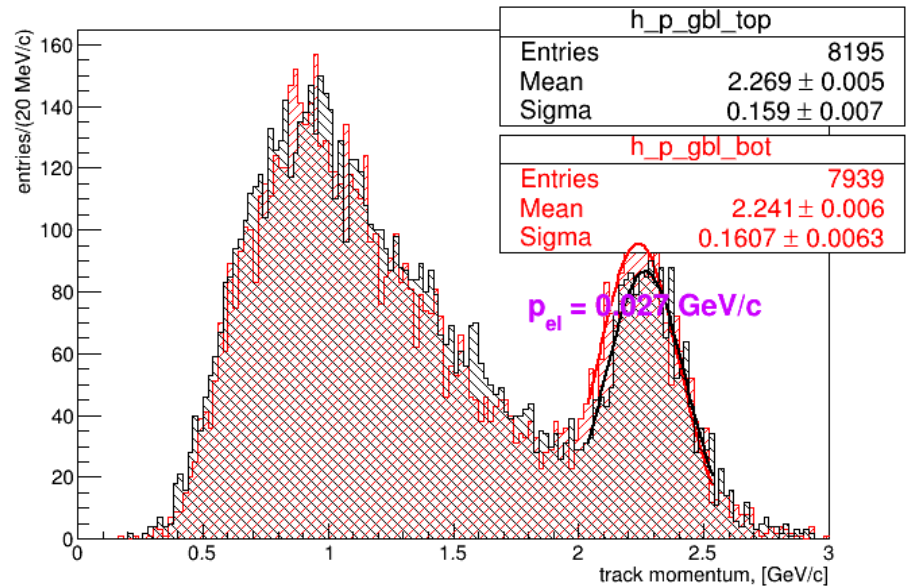
2016 curved tracks − GBL momentum v5-0 vs v5-1 geo

- Larger difference for v5-0 (87 vs 27 MeV/c)
- v5-0 bottom: larger value of elastic peak (closest to nominal value)
- The nominal elastic peak momentum value (2.315 GeV/c) is almost always underestimated

Outlook (for next weeks)

- 2016 straight tracks alignment: satisfactory
- 2016 curved tracks: more statistics needed to assess the quality of v5-1 geo
    - Running …
        - but probably need to revert to a more simplified/shorter version of the reconstruction steering file
        - Check whether the ghost hits removal condition is still appropriate for harder tracks

- Need to check on MC at both momenta which is the minimum systematic spread on elastic peak moment introduced by GBL
    - And if it introduces a systematic underestimation (or it is due to alignment
        - Tracks need to be harder
    - Work in progress, some issues to tune old MC steering files with new readout/reconstruction