

# 2016 alignment: search for improvements

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# 2016 alignment: search for improvements

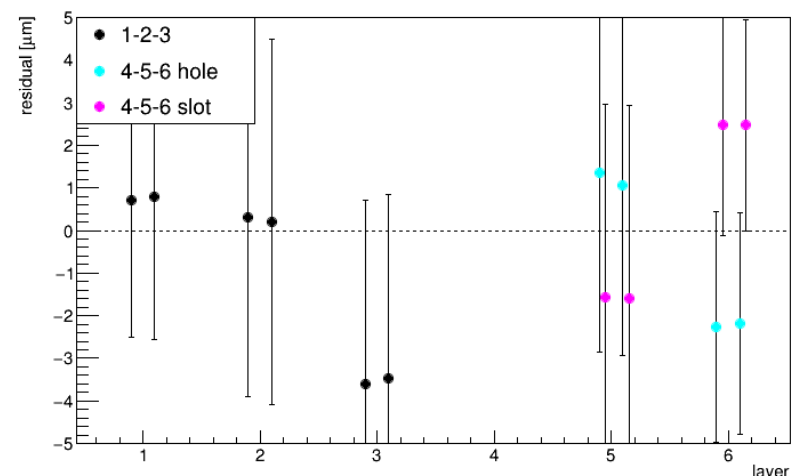
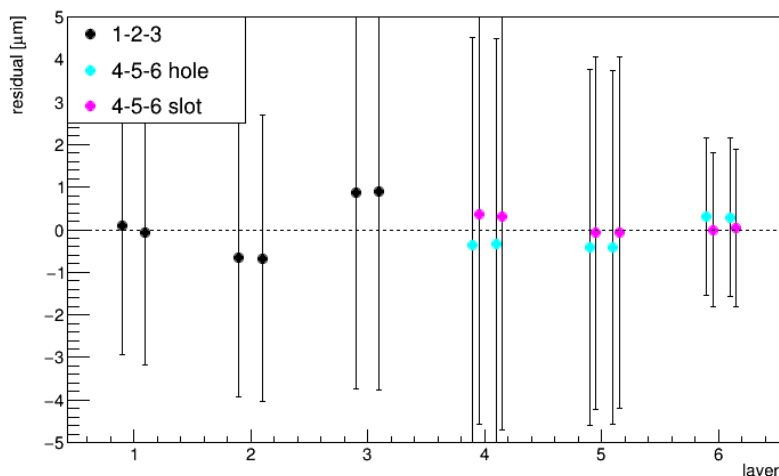
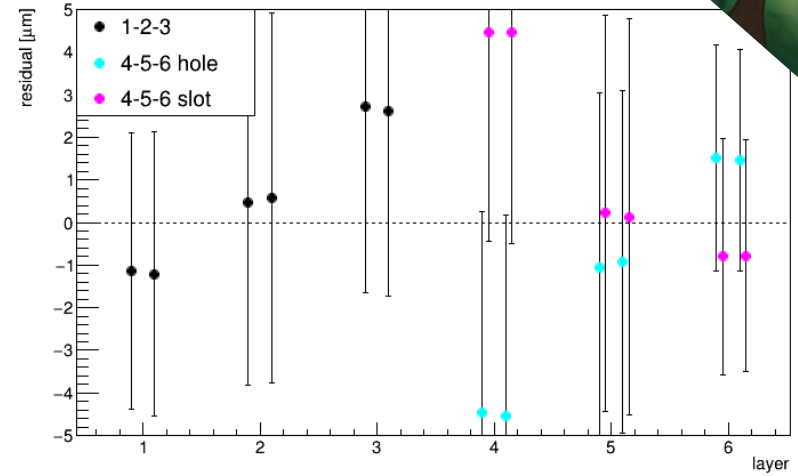
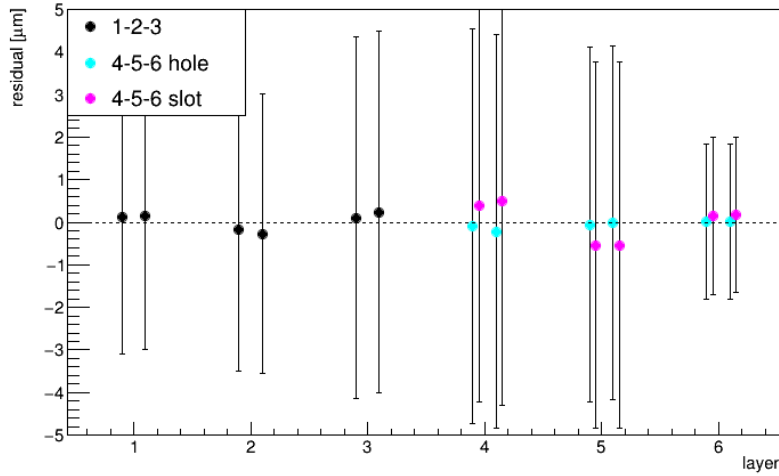
- Current production version: v5-0 pass 6
- Satisfactory, but could be improved
- Custom version based on better (custom) geometry found for 2015 data
- Smaller reconstruction efficiency when condition on ghost hits is imposed
- First tests made on a limited sample (100000 events)
- Now: full field-off events statistics
  - Run 8100, straight tracks (the only one available!)
  - Run 7800, curved tracks – execution time: ~2 days/file
  - For minimization/MP purposes: 600K straight tracks (less than 2015: less available straight tracks data) + equivalent curved ones
- Purpose
  - Tuning of internal alignment for straight+curved tracks samples
    - Release of u+w translations for groups of sensors
  - Tuning of global alignment and test of momentum calibration

# Current geo 2016 internal alignment (v5-0)

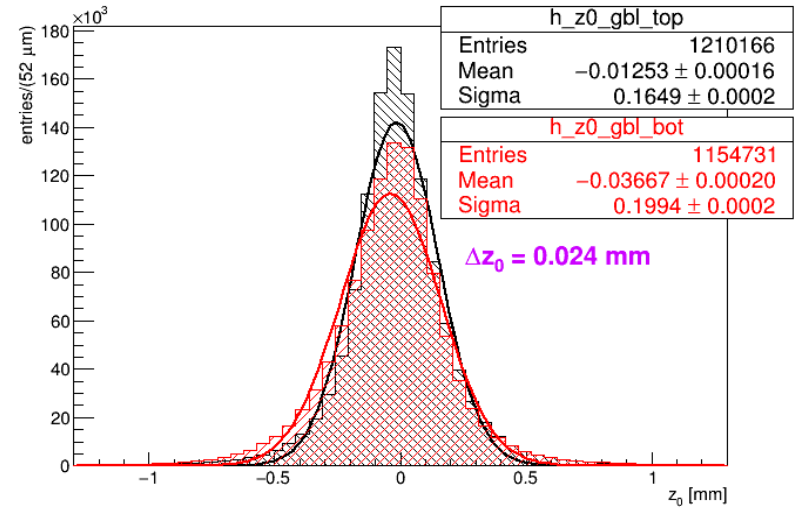
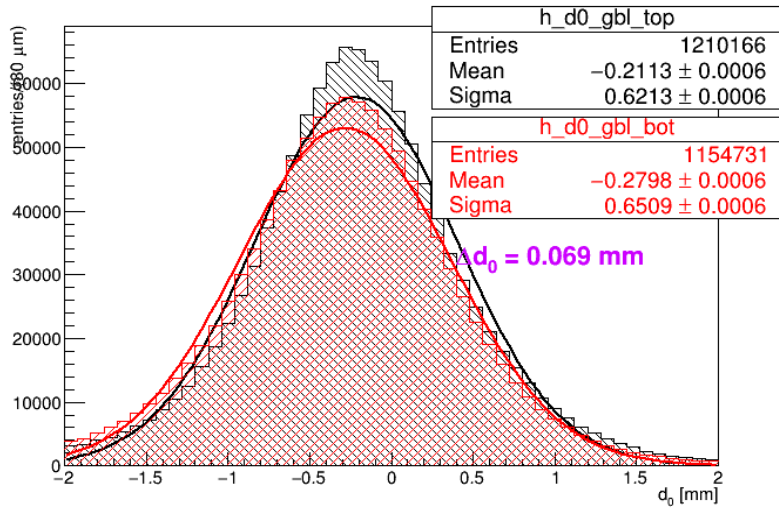


Curved tracks

Straight tracks



# Current geo 2016 data global alignment

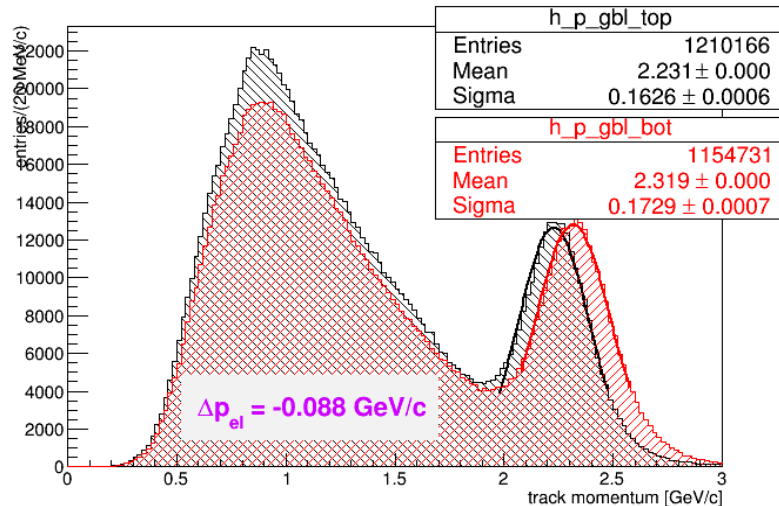


2015 reference

Global alignment offsets: as for best 2015

T/B diff  
 $\Delta d_0 = 69 \mu\text{m}$   
 $\Delta z_0 = 24 \mu\text{m}$   
 $\Delta p = -88 \text{ MeV/c}$

T/B diff  
 $\Delta d_0 = 28 \mu\text{m}$   
 $\Delta z_0 = 0 \mu\text{m}$   
 $\Delta p = -2 \text{ MeV/c}$

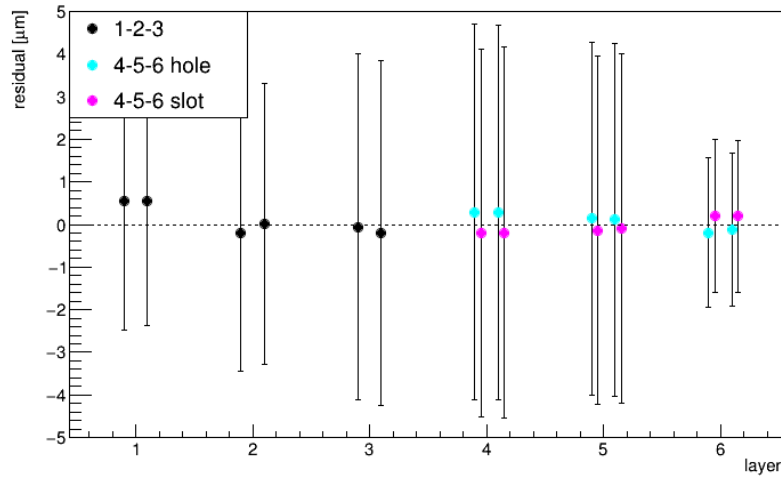


$p_{top} = 2231 \text{ MeV/c}, \sigma = 162 \text{ MeV/c}$   
 $p_{bot} = 2319 \text{ MeV/c}, \sigma = 173 \text{ MeV/c}$

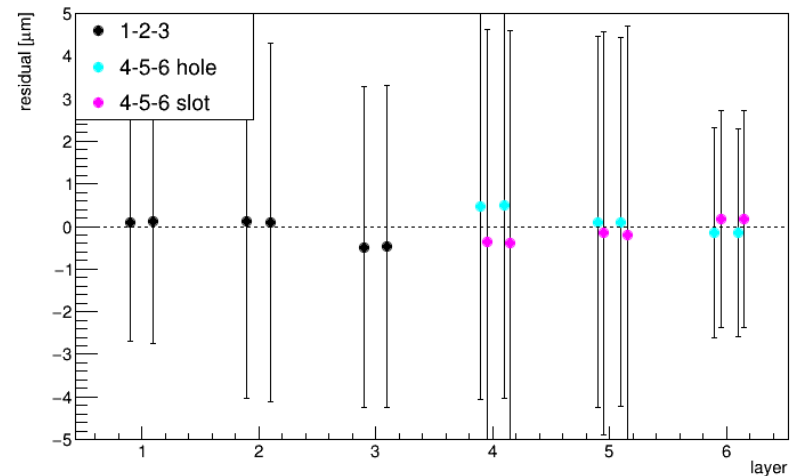
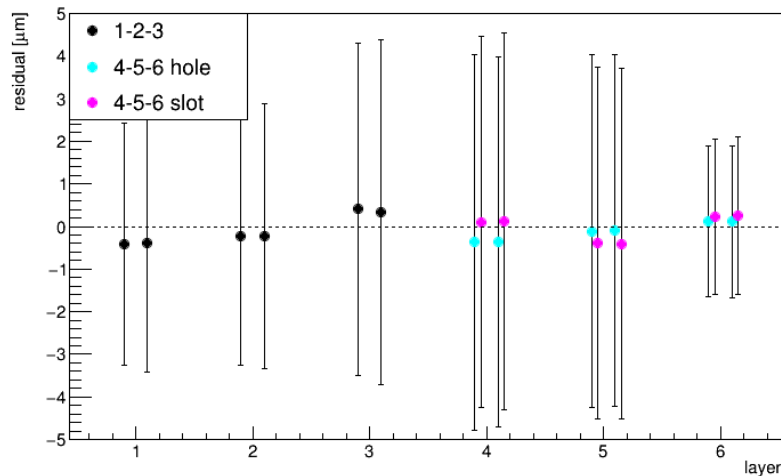
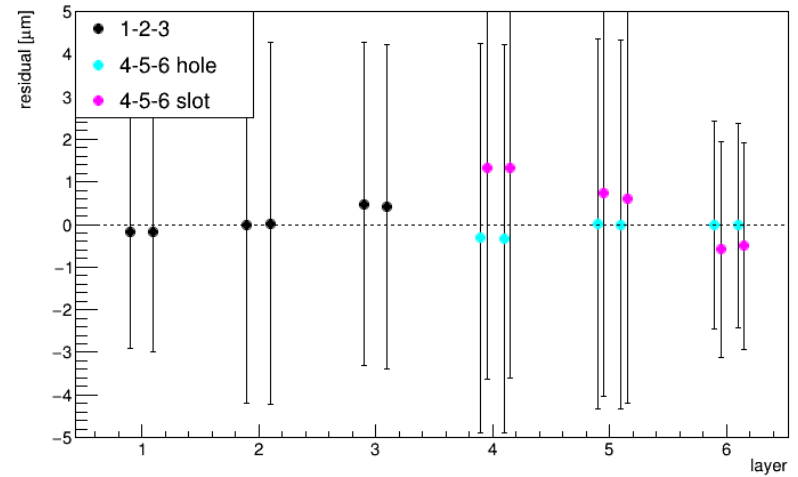
- Large difference between top and bottom

# New-geo 2016 internal alignment further tuning (u+w translations only)

Curved tracks



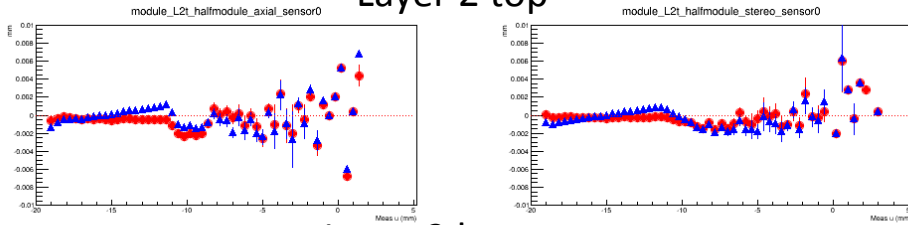
Straight tracks



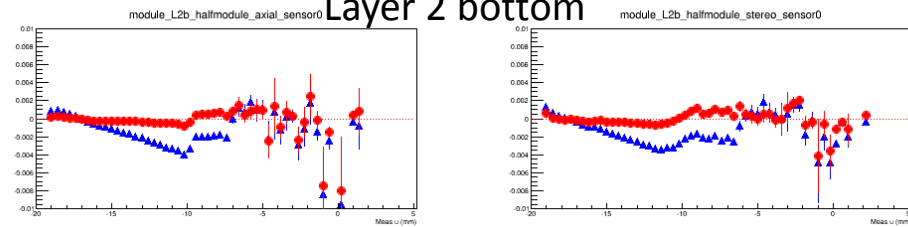
# Current vs aligned 2016 geo, curved tracks

## ures vs u coordinate

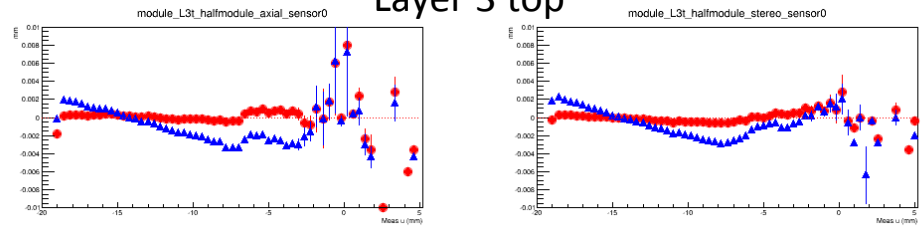
Layer 2 top



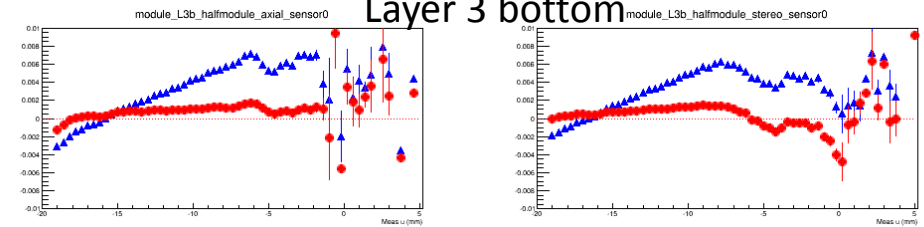
Layer 2 bottom



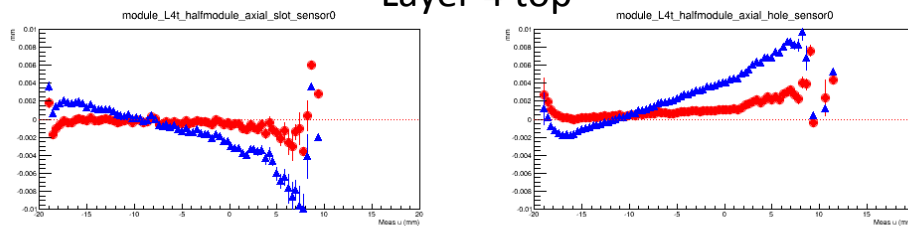
Layer 3 top



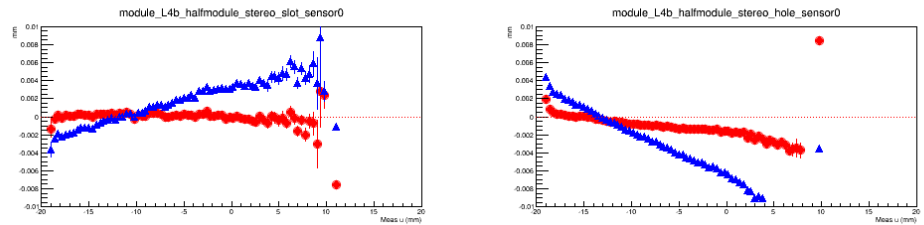
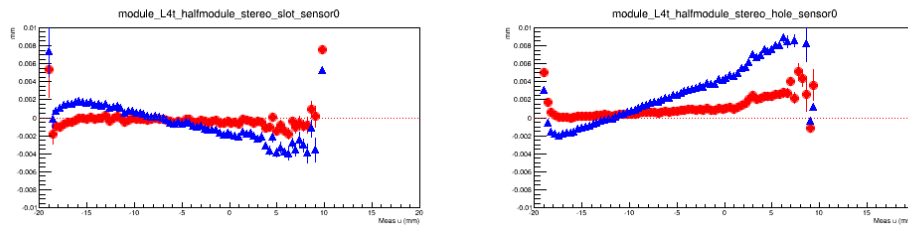
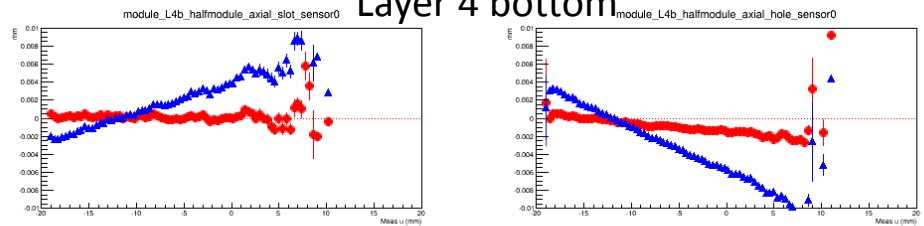
Layer 3 bottom



Layer 4 top

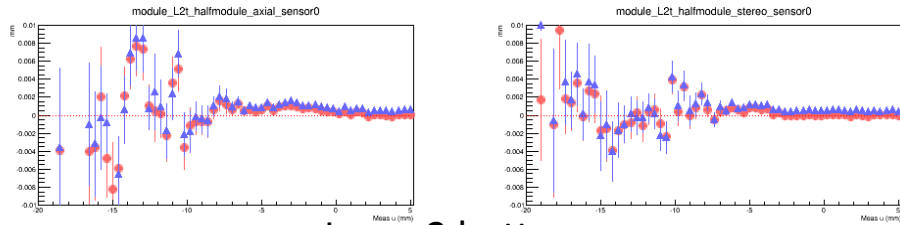


Layer 4 bottom

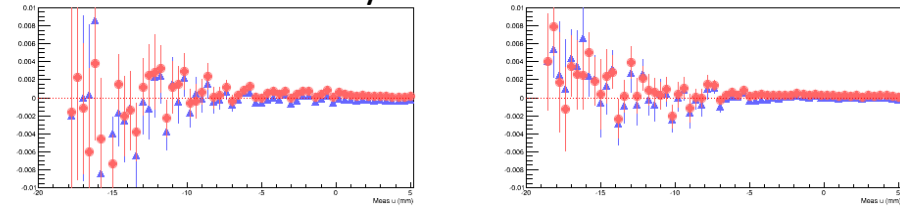


# Current vs aligned 2016 geo, straight tracks ures vs u coordinate

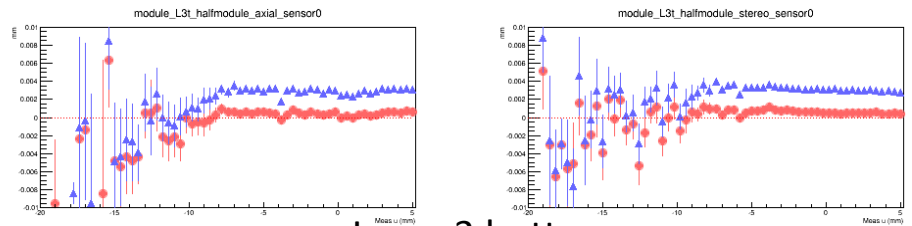
Layer 2 top



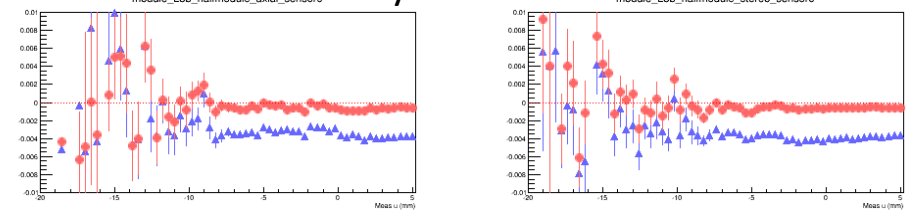
Layer 2 bottom



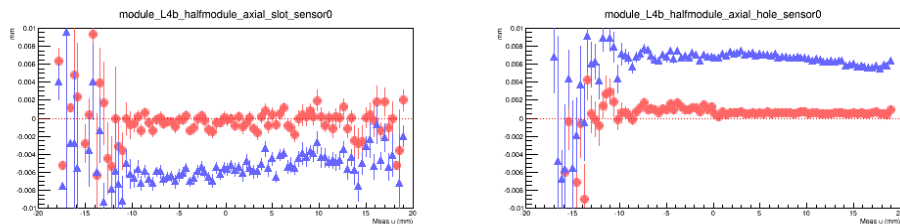
Layer 3 top



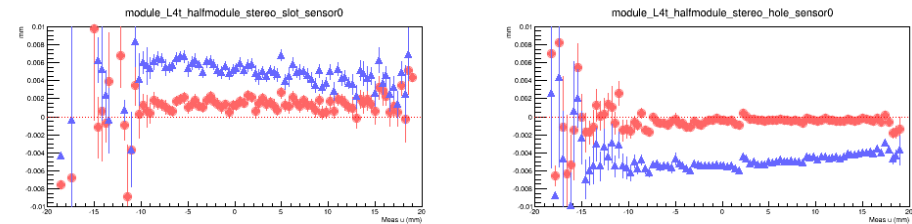
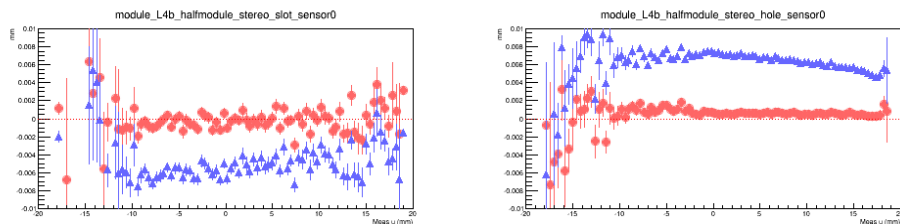
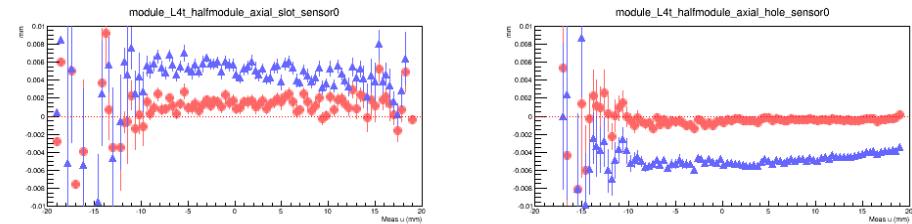
Layer 3 bottom



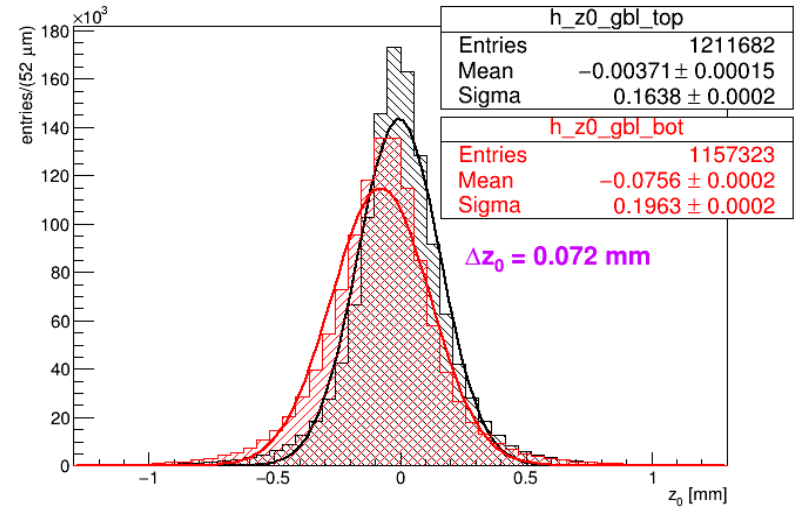
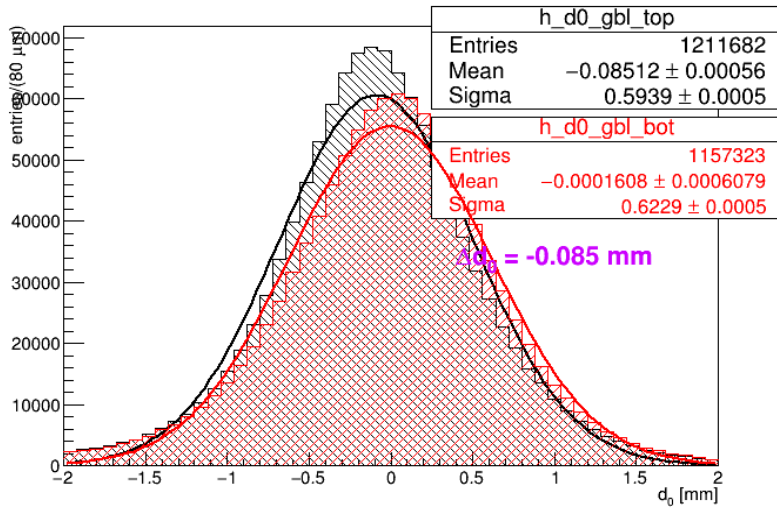
Layer 4 top



Layer 4 bottom

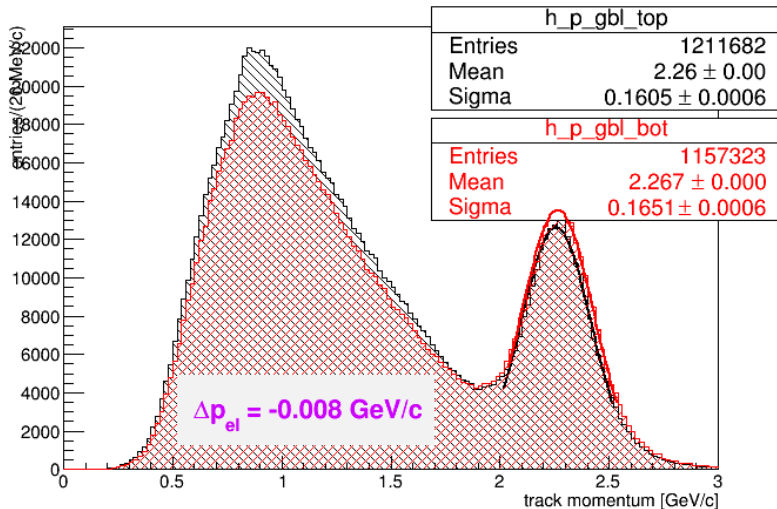


# New geo 2016 data global alignment



Global alignment adjustments for impact parameters as for 2015 data (no further tuning yet)

T/B diff  
 $\Delta d_0 = 85 \mu\text{m}$   
 $\Delta z_0 = 72 \mu\text{m}$   
 $\Delta p = -6 \text{ MeV}/c$



$p_{\text{top}} = 2260 \text{ MeV}/c, \sigma = 160 \text{ MeV}/c$   
 $p_{\text{bot}} = 2267 \text{ MeV}/c, \sigma = 165 \text{ MeV}/c$

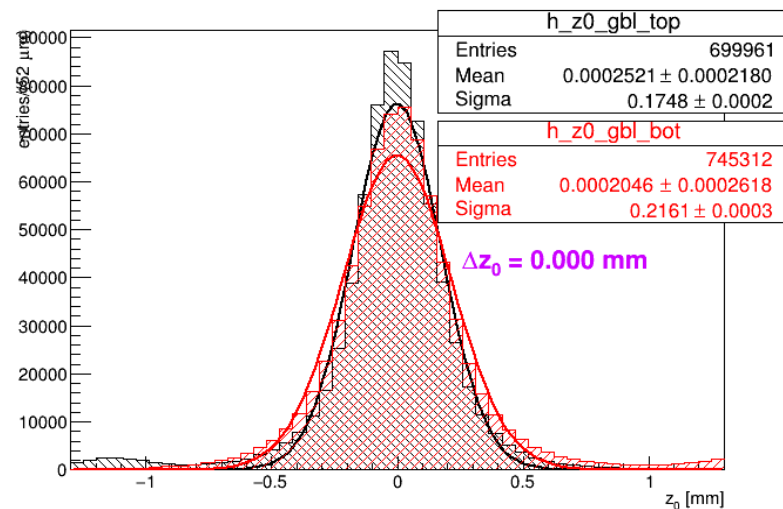
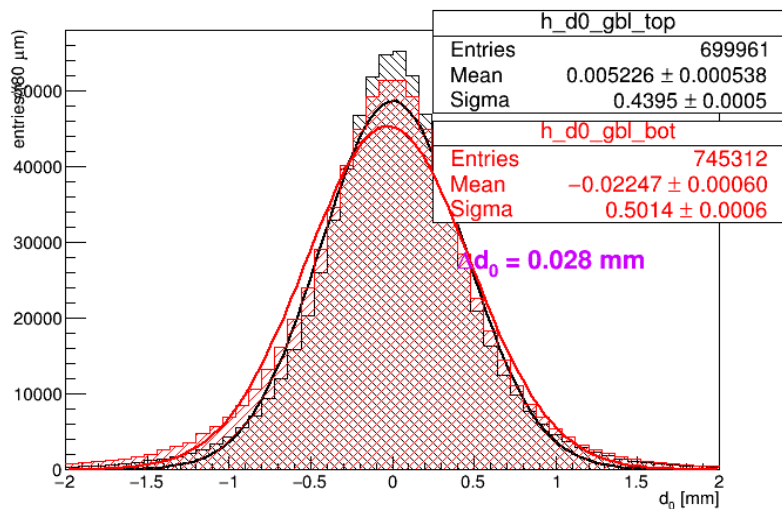
Top/bottom alignment good  
 Broader elastic peaks  
 Still large systematic underestimation of elastic peak:  $\sim 35\text{-}40 \text{ MeV}/c$



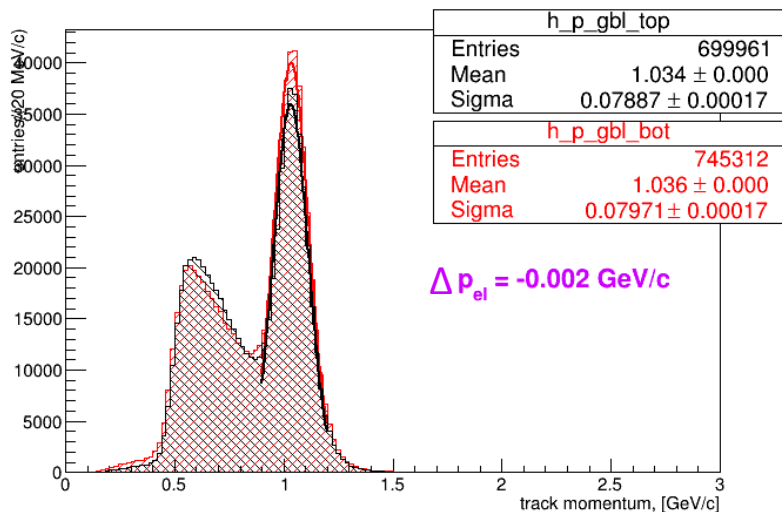
# Summary and todo list

- Momentum calibration:
  - Satisfactory top vs bottom agreement BUT still underestimated
    - 20 MeV/c 2015 data vs 40 MeV/c 2016 data:  $\sim 2x$
    - Almost twice as large peak width
    - Twice as large beam momentum
    - 2015 data: calibration could be adjusted increasing the magnetic field of 45 Gauss  $\rightarrow$  for 2016 data 90 Gauss should be needed?
- Todo list:
  - Few more trials to improve internal alignment for a few single layers (especially re. straight tracks)
  - Impact parameters tuning by imposing convergence to beamspot
  - Further studies on momentum calibration with magnetic field adjustments

# V 5-1 custom geometry w fieldmap – 2015 data



My best alignment - reference



T/B diff  
 $\Delta d_0 = 28 \mu\text{m}$   
 $\Delta z_0 = 0 \mu\text{m}$   
 $\Delta p = -2 \text{ MeV/c}$

$p_{top} = 1.034 \text{ MeV/c}$   
 $p_{bot} = 1.036 \text{ MeV/c}$

