

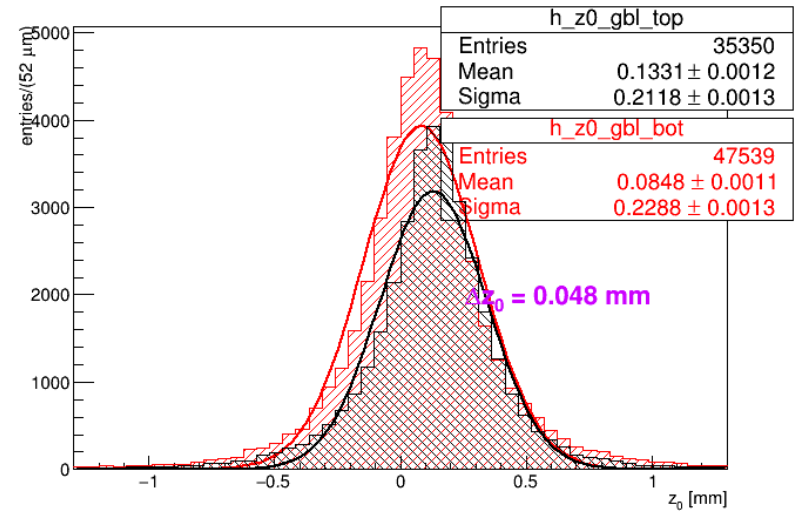
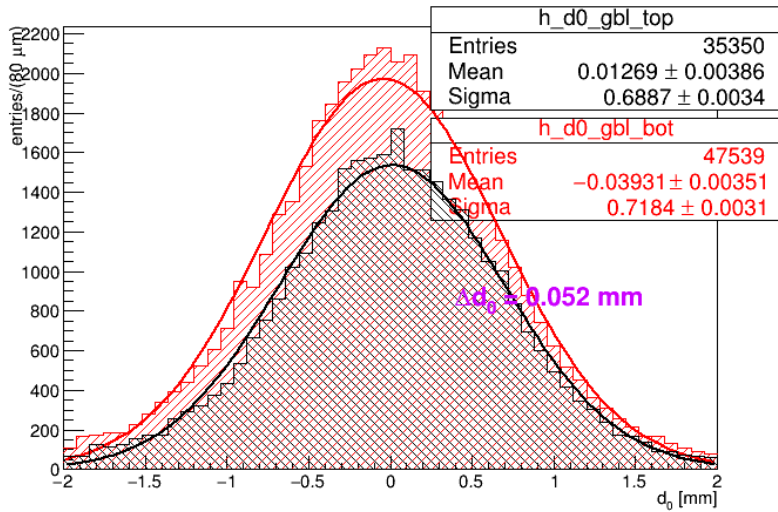
# New alignments updates 2015 1.5 mm alignment

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January 22, 2018

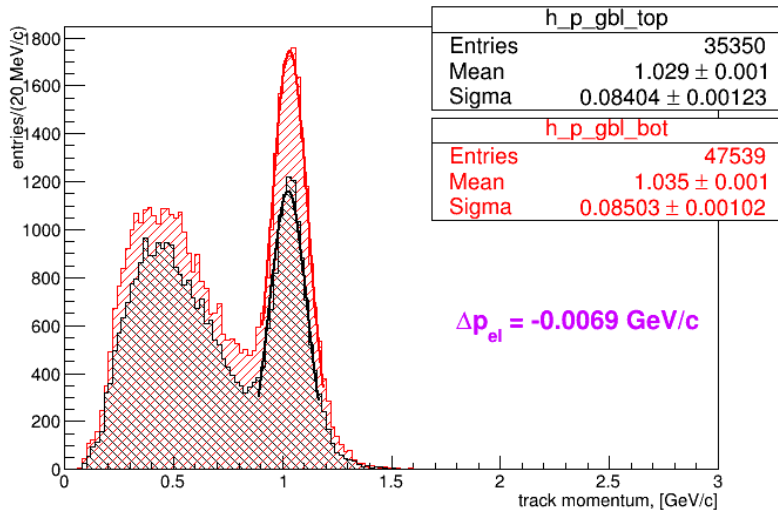
# 2015 data @ 1.5 mm alignment

- Test of v6.0 detector with opening angles
  - Test on run 5412 (100000 events, some problems running at slac)
- The opening angles are hardcoded in the compact.xml file as millepede parameters
  - 13100 (top): 0.0031 (radians? I suppose...)
  - 23100 (bottom): - 0.0033
- These are global alignment parameters
- They are NOT derived running millepede
  - There is no code doing such operations (these parameters are dummy in the MP procedures)
  - They have to be provided from outside, and added as offsets when the detector is set
  - Millepede operates on sensor parameters only
    - If these offsets are reasonably small, no effect is visible on the internal alignment
    - If they are macroscopic, the internal alignment... goes bananas

# V 6.0 geometry w fieldmap, 1.5mm – 2015 data

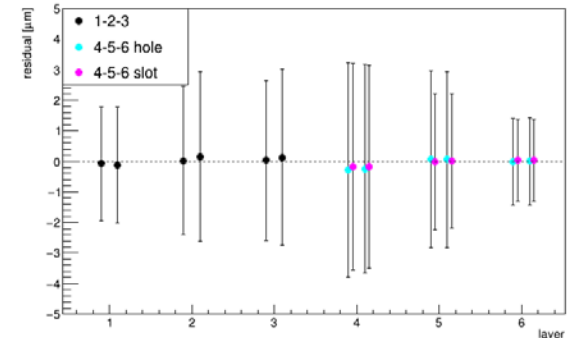
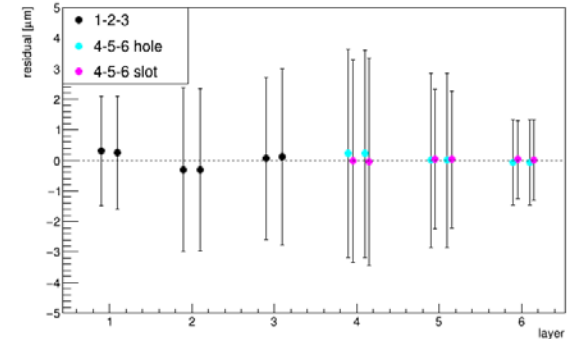


Cut on track  $\chi^2: \chi^2 < 20$



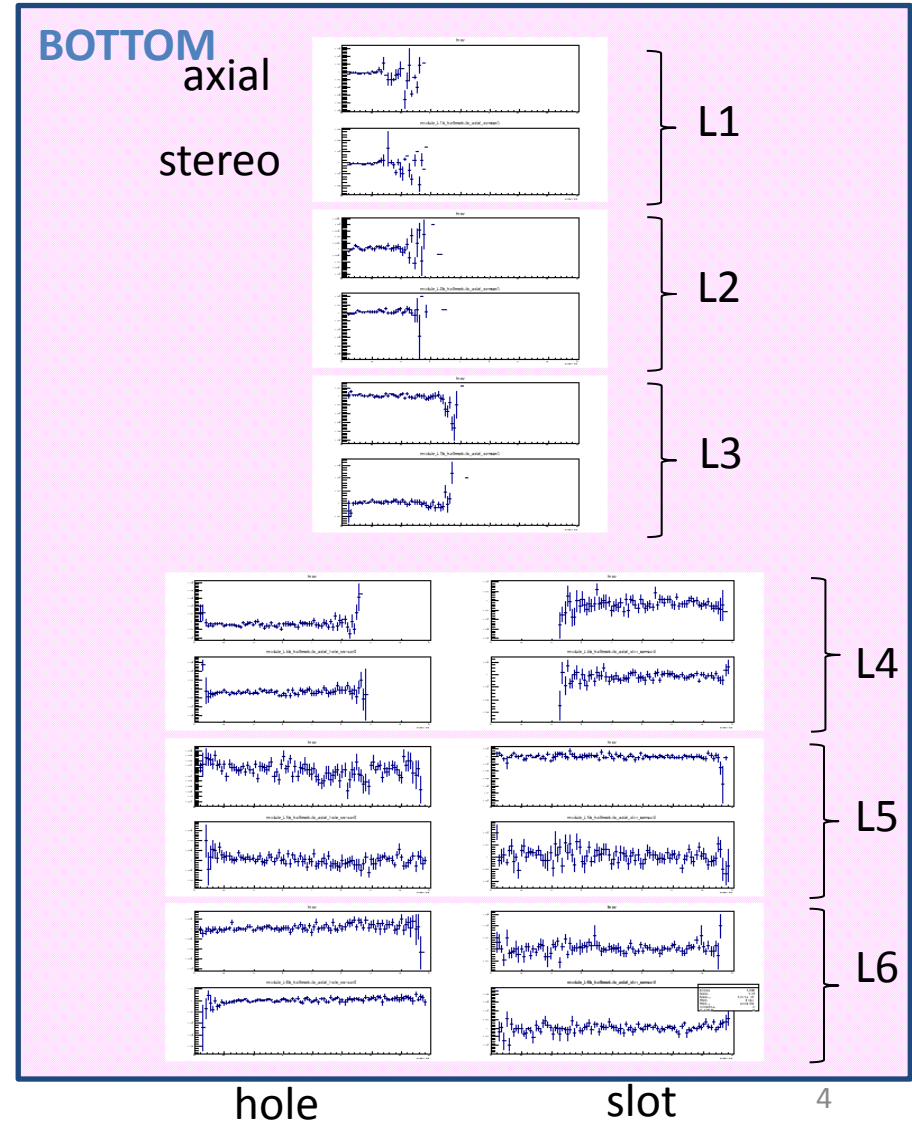
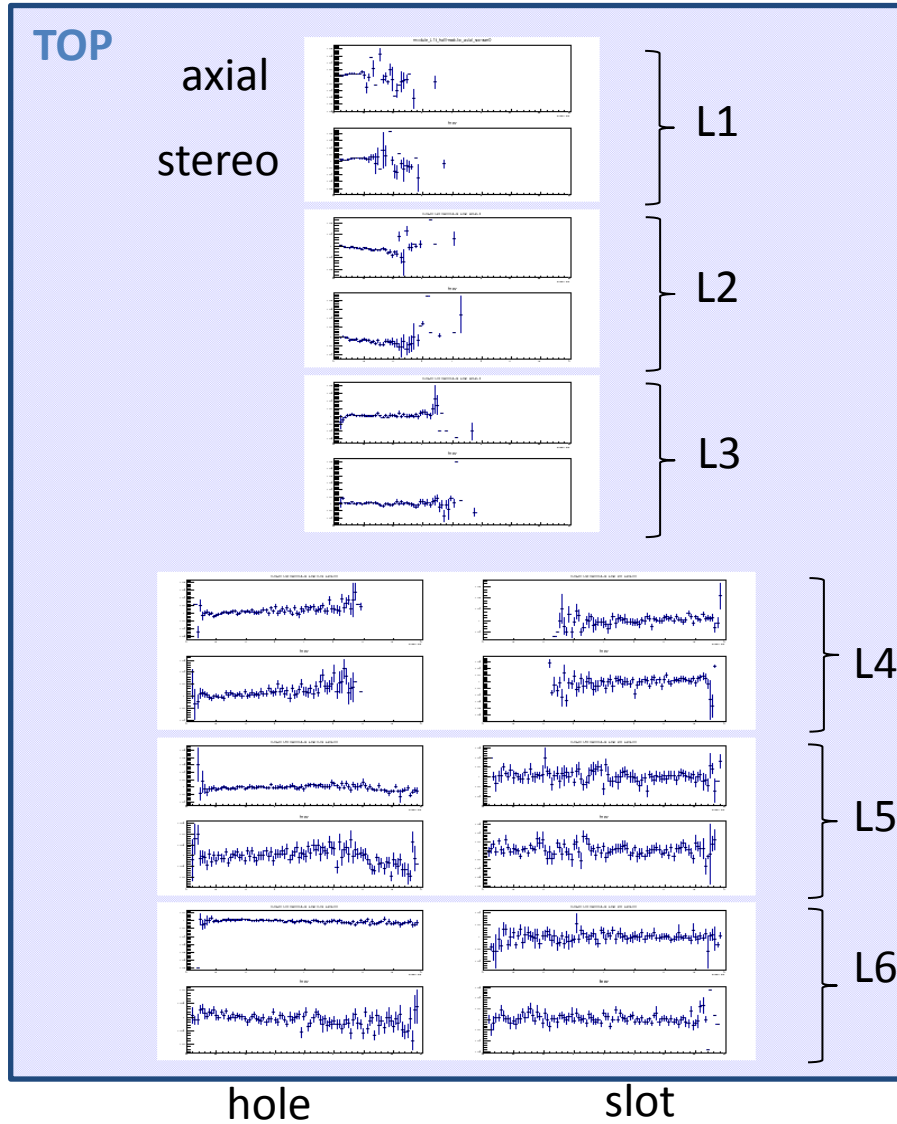
T/B diff  
 $\Delta d_0 = 52 \mu\text{m}$   
 $\Delta z_0 = 48 \mu\text{m}$   
 $\Delta p = -7 \text{ MeV/c}$

$p_{top} = 1.029 \text{ MeV/c}$   
 $p_{bot} = 1.035 \text{ MeV/c}$



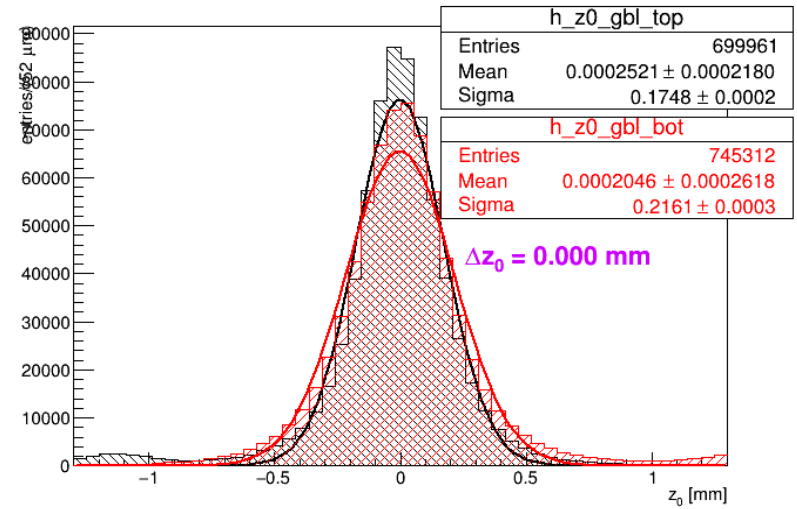
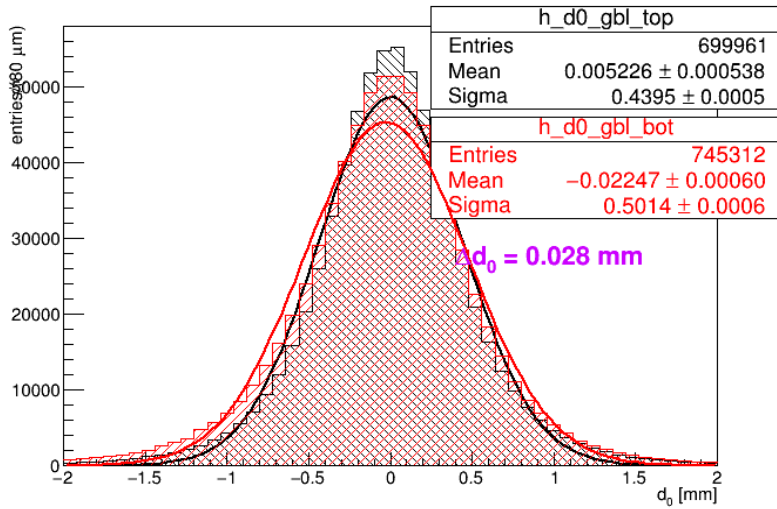
# V6.0 1.5mm: GBL u residuals vs u position

Trends OK

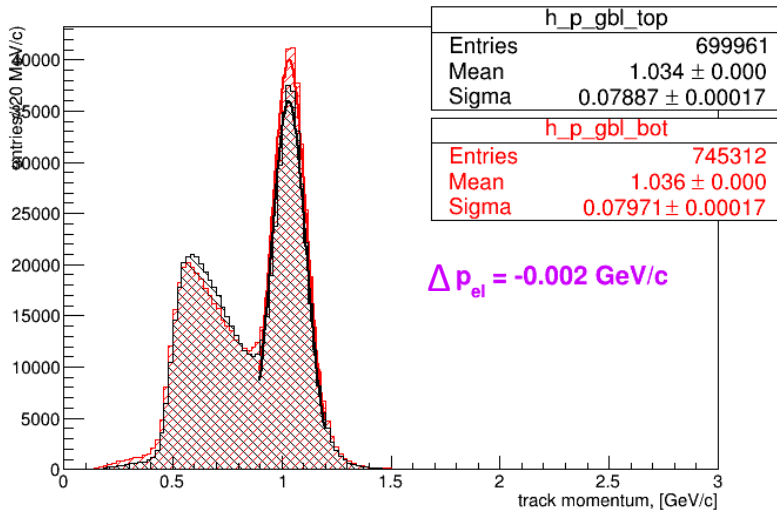


# V 5-1 geometry w fieldmap – 2015 data

## hps-java v.3.11 (~may17)

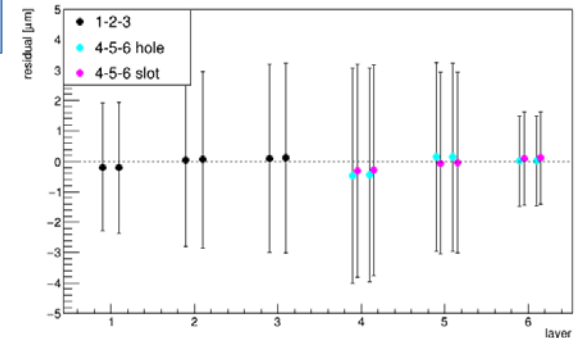
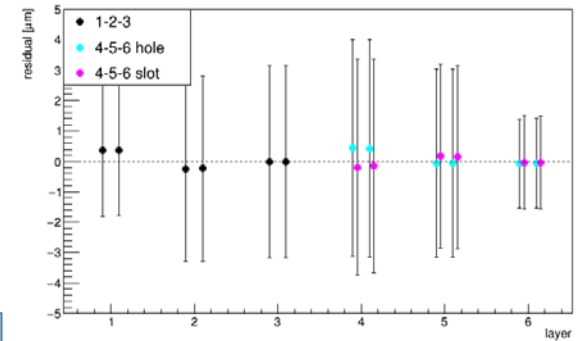


My best alignment - reference



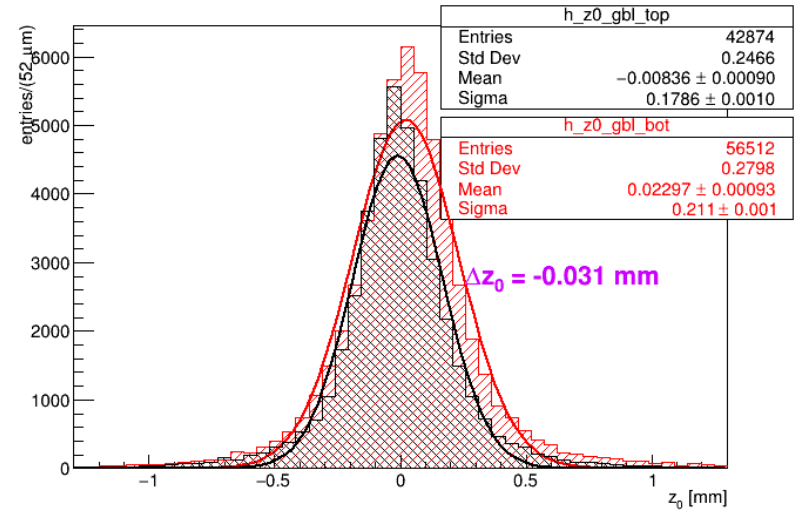
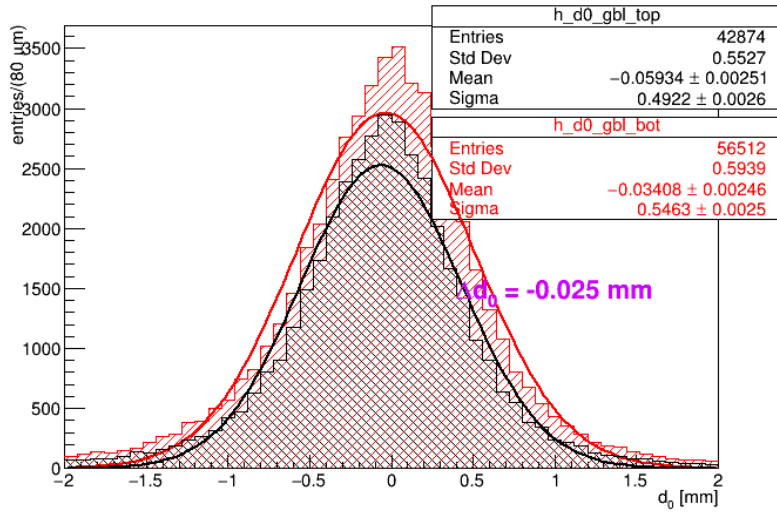
T/B diff  
 $\Delta d_0 = 28 \mu\text{m}$   
 $\Delta z_0 = 0 \mu\text{m}$   
 $\Delta p = -2 \text{ MeV/c}$

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



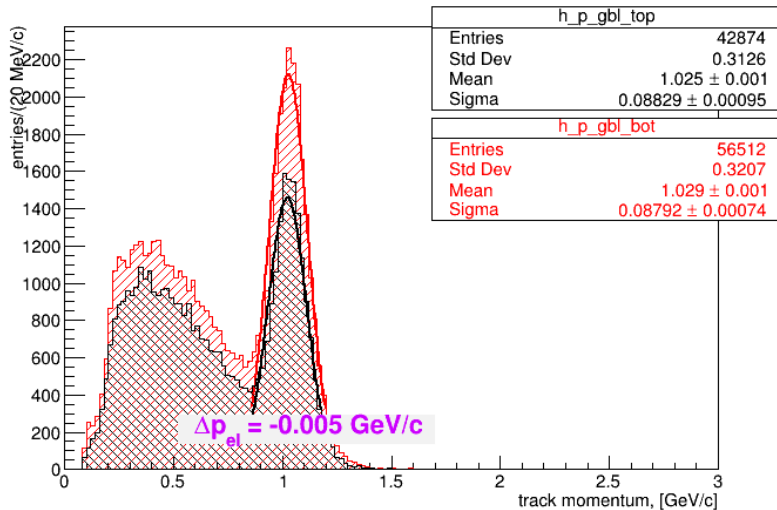
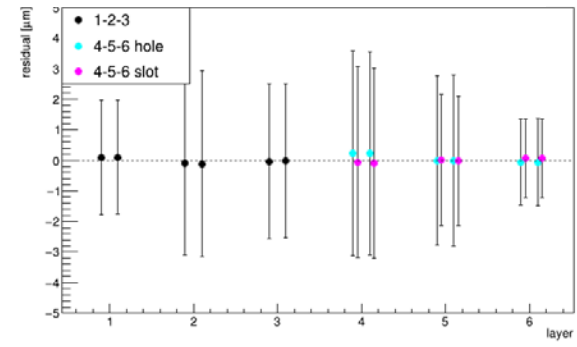
# V 6-0 geometry w fieldmap – 2015 data

## hps-java v.4.0 (dec17)

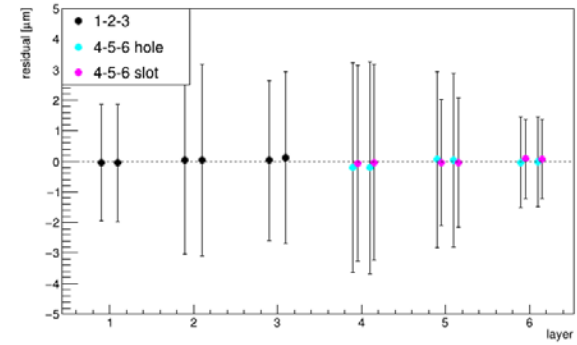


**Top inefficiency!!!**

T/B diff  
 $\Delta d_0 = 25 \mu\text{m}$   
 $\Delta z_0 = 31 \mu\text{m}$   
 $\Delta p = -11 \text{ MeV/c}$



$p_{top} = 1.025 \text{ MeV/c}$   
 $p_{bot} = 1.029 \text{ MeV/c}$



# Comparison 1.5 mm vs 0.5 mm (late/old hps-java version)

- 1.5 mm is worse
  - Good residuals/internal alignment
  - Worse global alignment
- Need to run on more statistics
- At the moment it can be considered as good enough to proceed with some test production

**BUT**

- Large inefficiency of top vs bottom (also seen for 2016 data)
  - When did this appear? WHY?
  - Somewhen between may and december17 (v3.09-v4.0)
  - Nothing to do with alignment

# V6.0 detector, 2015 data, different hps-java releases (stats not comparable)

V 3.09 may17

Pink: positive tracks

V 4.0 dec17

