Study of mp **best** geometries on straight/curved tracks (run 5784+5772)
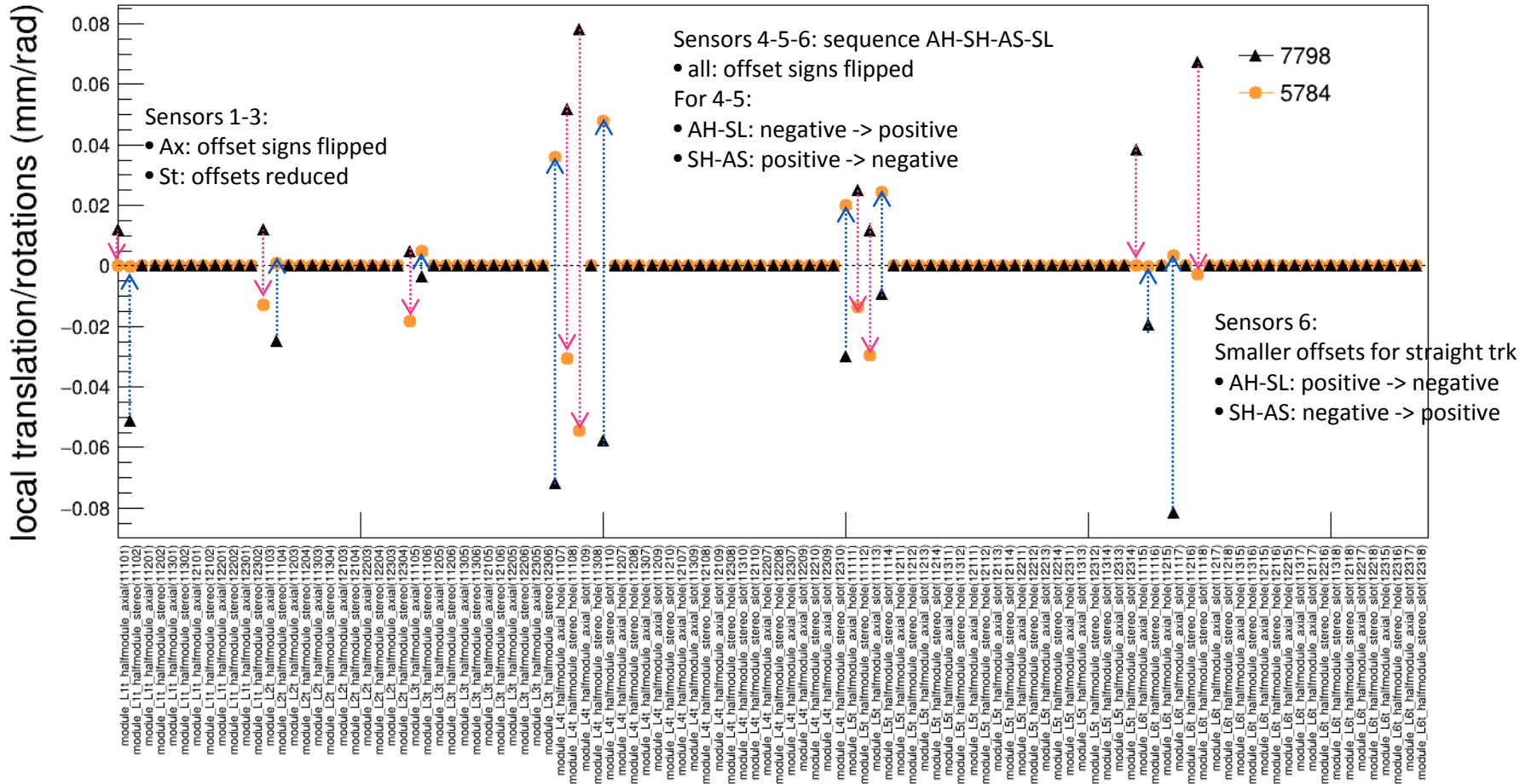
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Comparison of "best geometries"

- The best geometry (v4.4) for curved tracks does not work properly with straight tracks
  - **Tweaks + MP offsets**
  - Tweaks involve only u-trans offsets

- New geometry ok for straight tracks (v1-dev1):
  - produced floating the same parameters as v4.4
    - ALL u translations, for both axial and stereo sensors
  - Start from optical survey (as v4.4)
  - **No tweaks** (compensated by MP offsets)

- Compare the offsets chosen by MP in the two cases

Comparison of MP offsets: TOP

translations only

Millepede corrections per sensor, top

Sensors 1-3:
- Ax: offset signs flipped
- St: offsets reduced

Sensors 4-5-6: sequence AH-SH-AS-SL
- all: offset signs flipped

For 4-5:
- AH-SL: negative -> positive
- SH-AS: positive -> negative

Sensors 6:
Smaller offsets for straight trk
- AH-SL: positive -> negative
- SH-AS: negative -> positive

Legend: ▲ 7798 ● 5784

- Comparison of geometries as MP outputs starting with the same floating degrees of freedom (all u translations for axial+stereo sensors)
  - **V4.4 geometry** vs
  - V1+ same floating parameters (NO TWEAKS) -> v1-dev1

Comparison of MP offsets: BOT

translations only Millepede corrections per sensor, bottom


More difficult to find systematic flips

What if we swap geometries?

- V4.4 applied to straight tracks: bad
- V1-dev1 applied to curved tracks: even worse ☹
  - No tweaks

- 4 reference geometries:
  - **V4.4 applied to curved tracks (BEST curved)**
  - V4.4 applied to straight tracks
  - V1-dev1 applied to straight tracks (BEST straight)
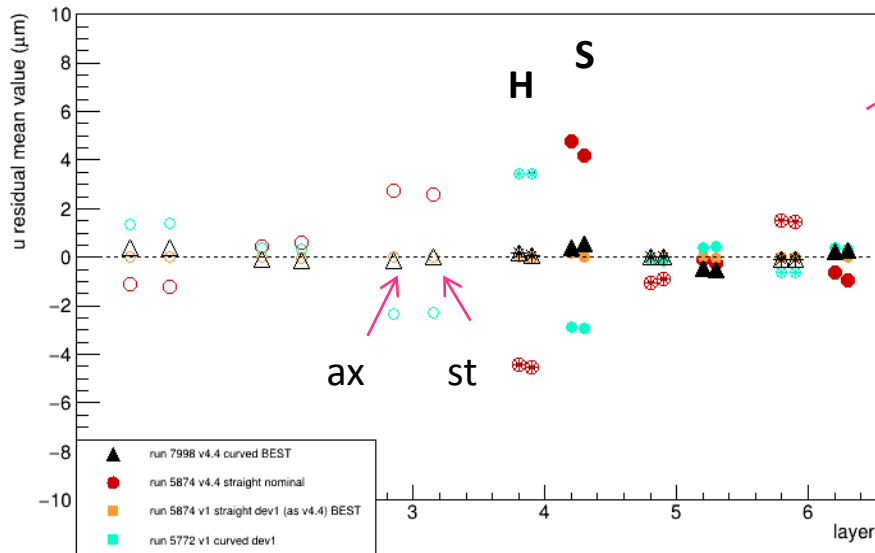 - V1-dev1 applied to curved tracks

- Compare residuals and kinks

V1-dev1 on curved tracks, GBL residuals

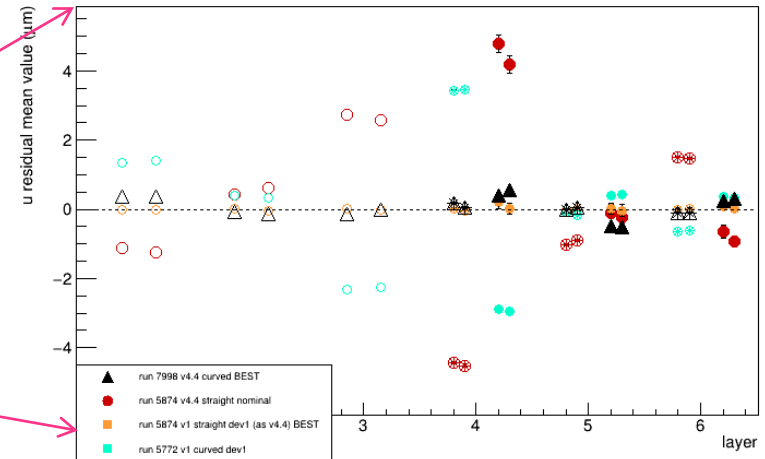Mean values drift away from zero in a systematic way
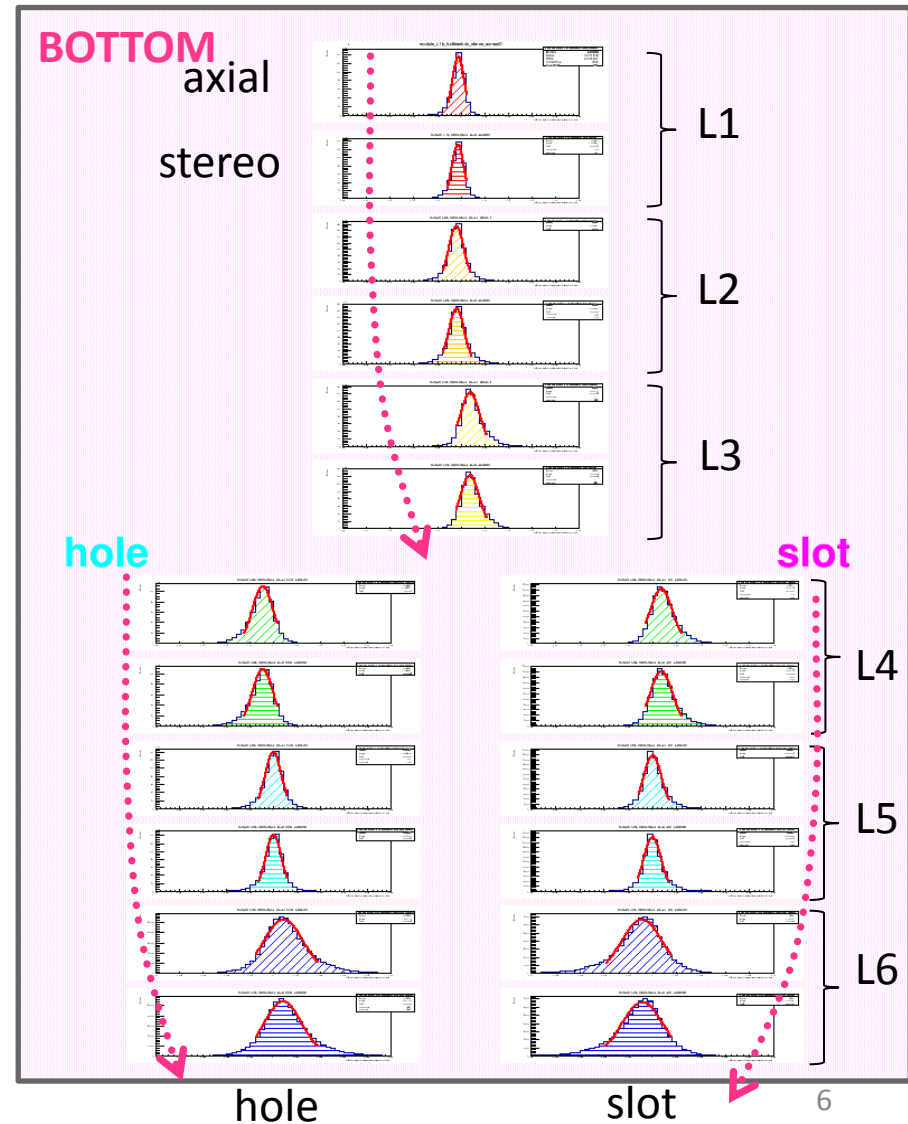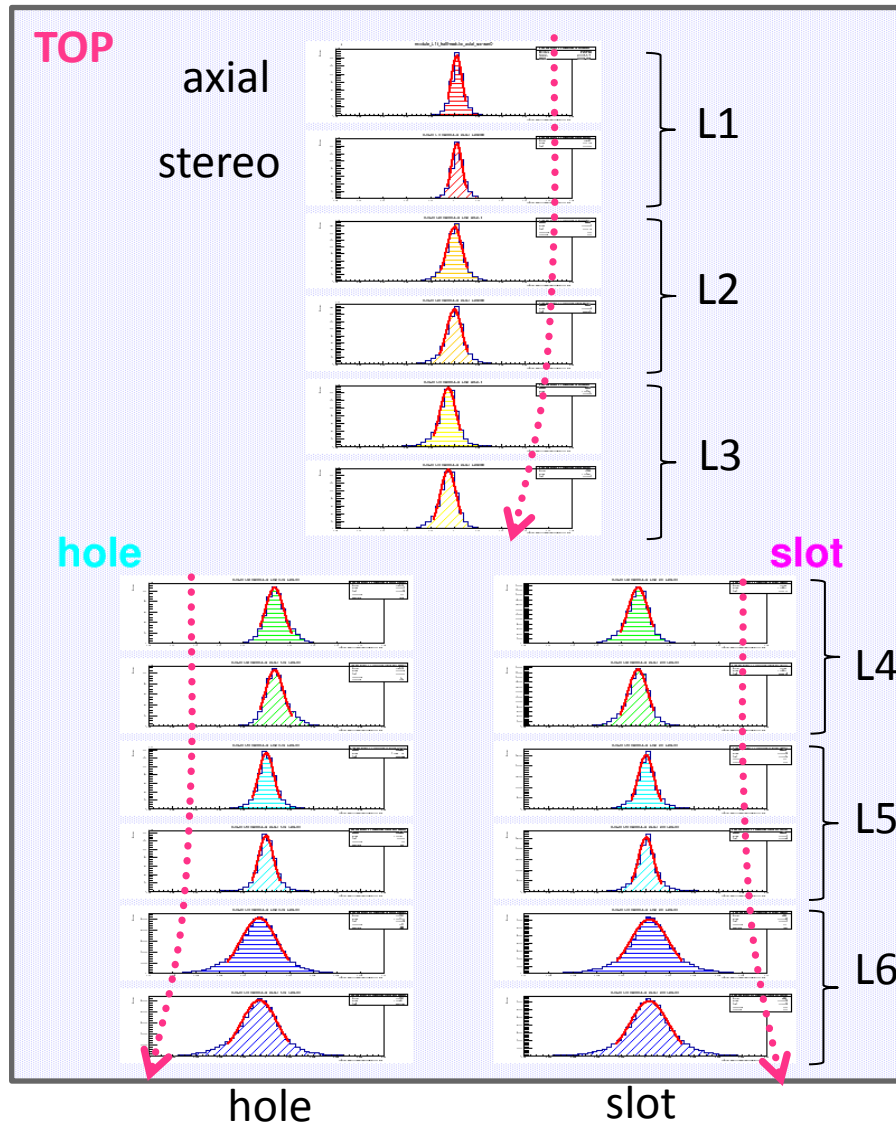
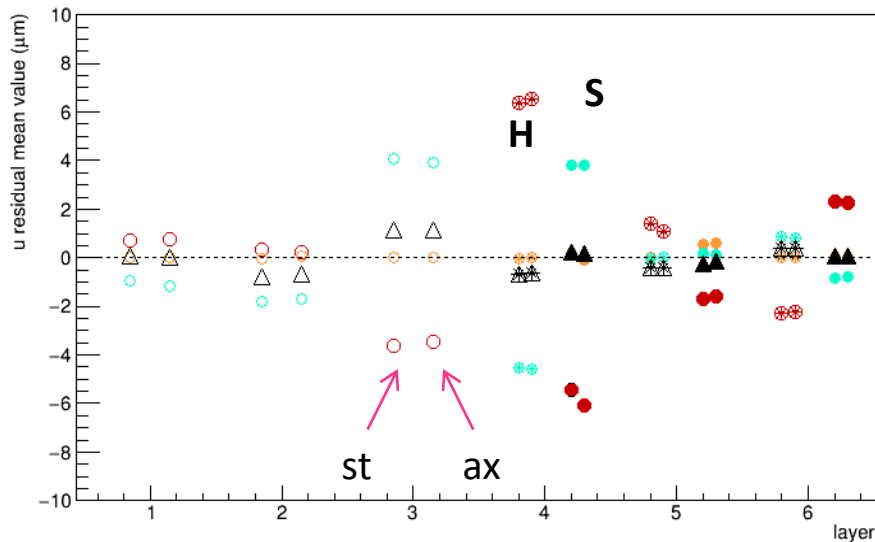# u residuals after GBL, mean

top residuals, mean value (μm)
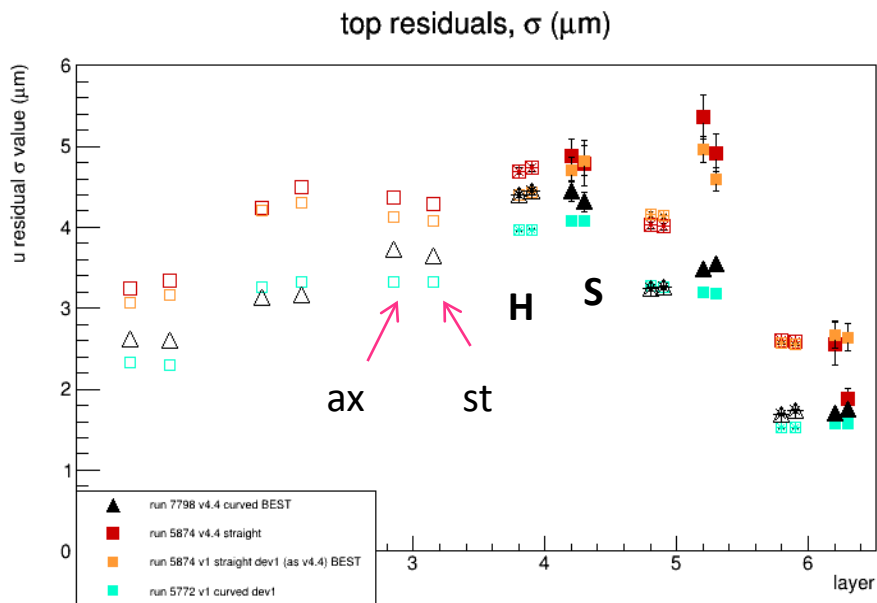

top residuals, mean value (μm)

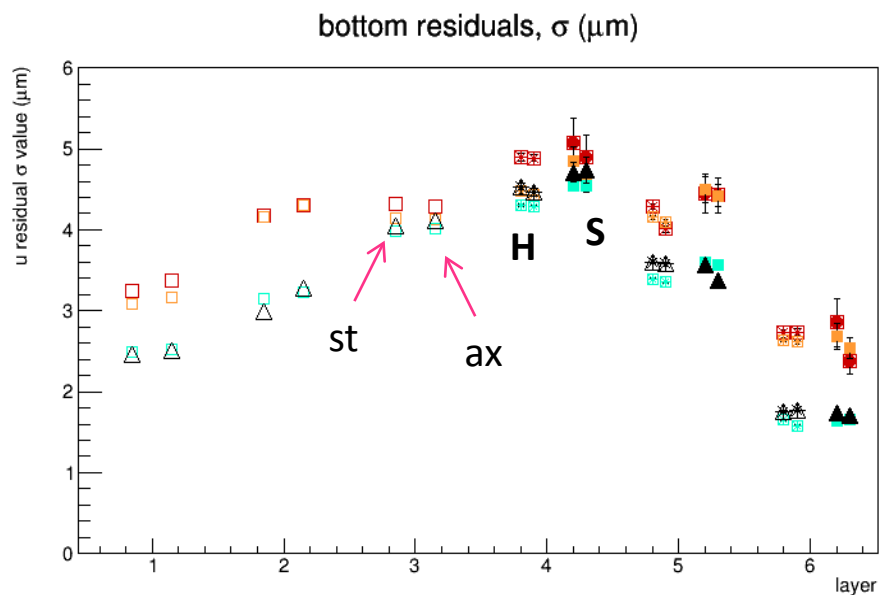bottom residuals, mean value (μm)

- The mean values for **curved tracks-v1ST** have always opposite sign as compared to **straight tracks-v4.4CT** (both are bad, anyway)
- Worse: layers 1-3-4-6 (central+external)
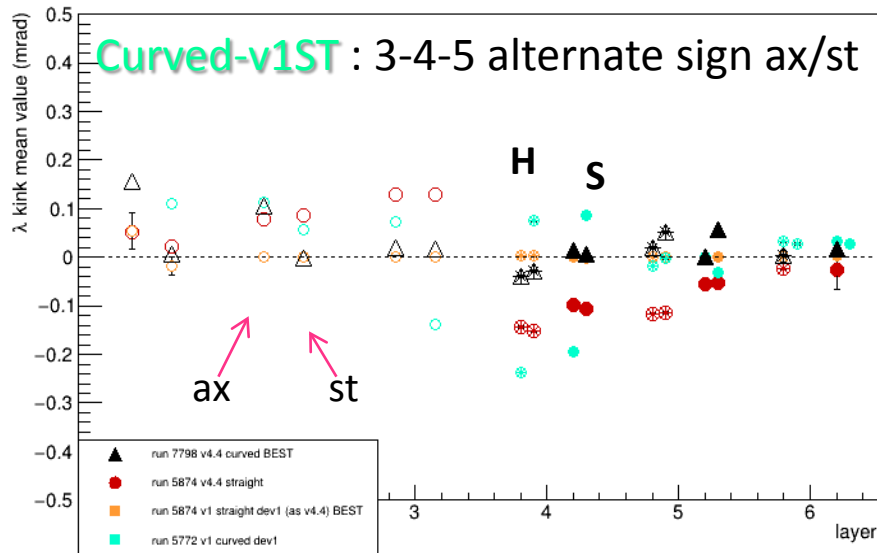- Better: layers 2-5

u residuals after GBL, sigma

top residuals, σ (μm)

bottom residuals, σ (μm)

- Smaller sigmas for curved tracks-v1ST

λ kinks, mean & sigma

top λ kinks, mean value (mrad)

Curved-v1ST : 3-4-5 alternate sign ax/st

H   S

ax   st

- run 7798 v4.4 curved BEST
- run 5874 v4.4 straight
- run 5874 v1 straight dev1 (as v4.4) BEST
- run 5772 v1 curved dev1

top λ kinks, σ (mrad)

H

S

ax   st

- run 7798 v4.4 curved BEST
- run 5874 v4.4 straight
- run 5874 v1 straight dev1 (as v4.4) BEST
- run 5772 v1 curved dev1

Curved-v1ST : larger σ's

bottom λ kinks, mean value (mrad)

H   S

st   ax

bottom λ kinks, σ (mrad)

H   S

st   ax
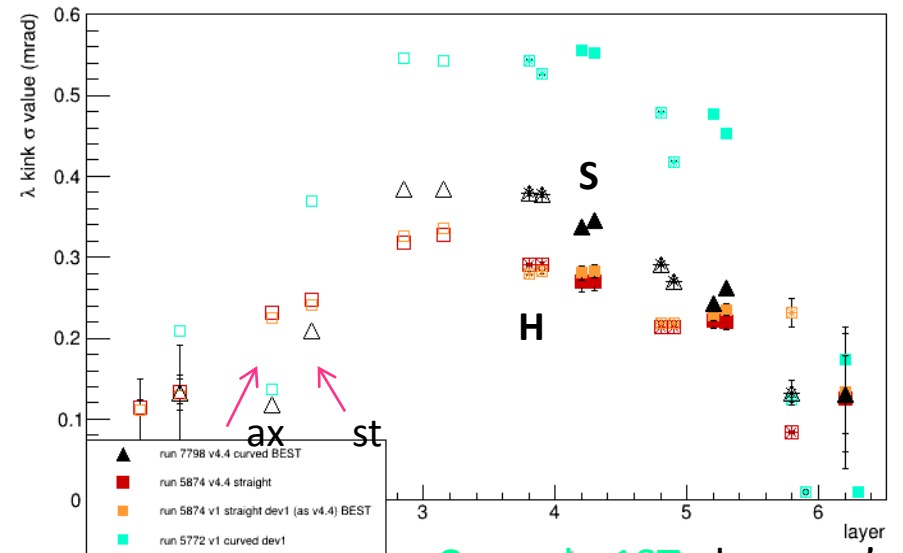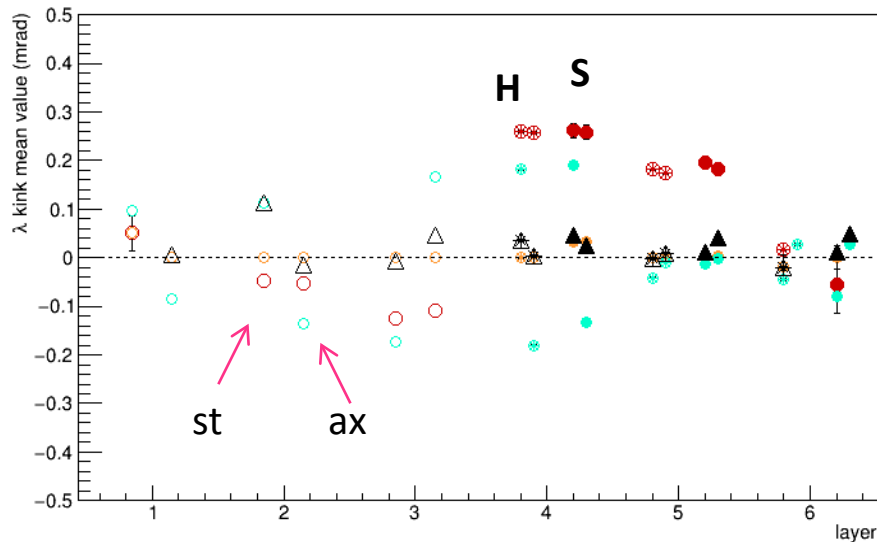
φ kinks, mean
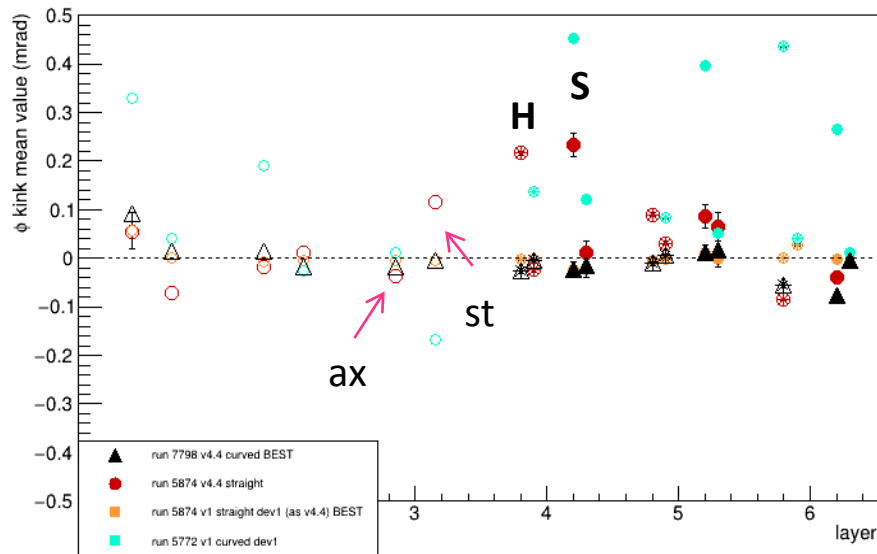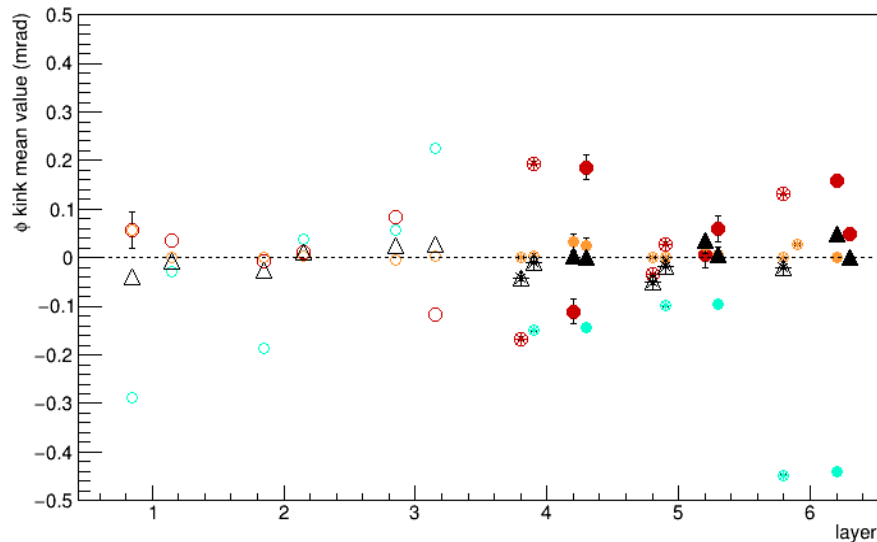

top φ kinks, mean value (mrad)
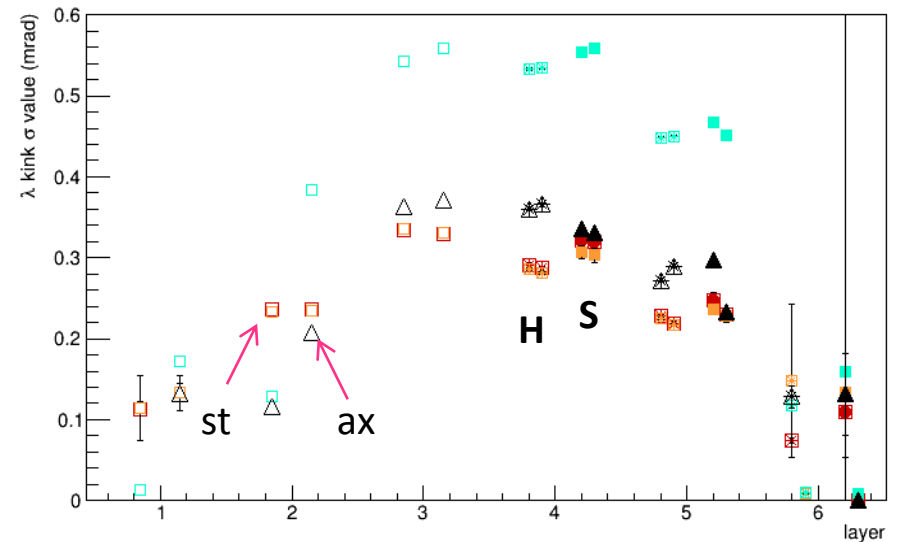
bottom φ kinks, mean value (mrad)
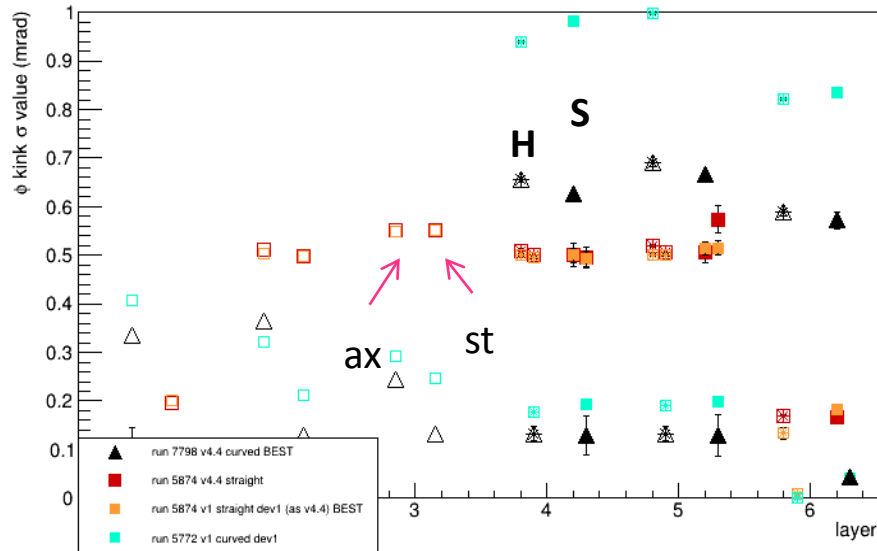
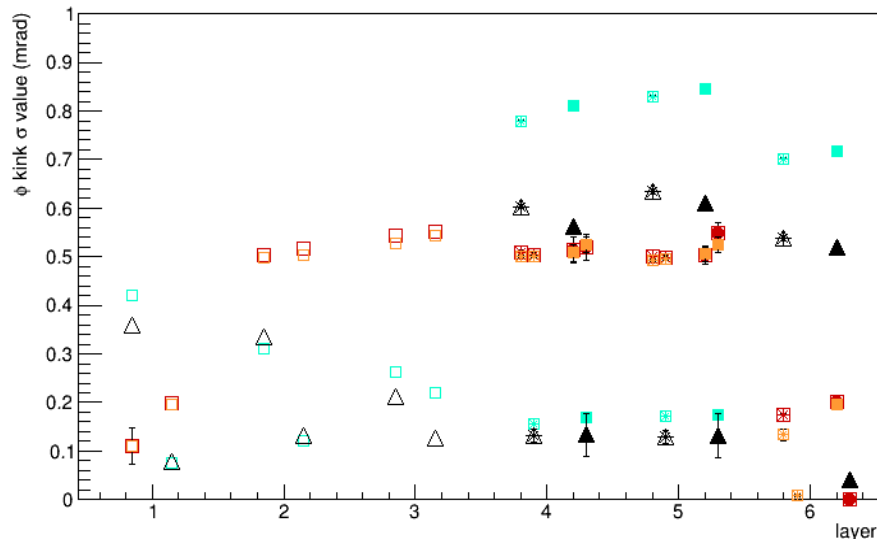- **Curved-v1ST** : same jumping behavior of mean values (but they have all the same sign)

φ kinks, sigma

top φ kinks, σ (mrad)

bottom φ kinks, σ (mrad)

- **Curved-v1ST** : again alternate pattern typical of curved tracks 1st layer-small- σ/2nd layer-large-σ sigma

- Larger sigmas ever for **curved-v1ST** geo

- Always observed with curved tracks

- Never observed for straight tracks, not even with v4.4

- Has this alternate behavior of kinks something to do with the alternate-sign offsets chosen by MP?

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Next steps

- Think...

- Change minimization strategy for both curved and straight tracks: start from rotations

- Use selected tracks from run5772: v4.4 alignment on them is not perfect (ie, worse than taking all tracks)

- Impose some tighter quality selection on straight tracks (n. of point per track, track χ^2, ...), repeat minimization

- Test geometries with MC data