# 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

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# 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

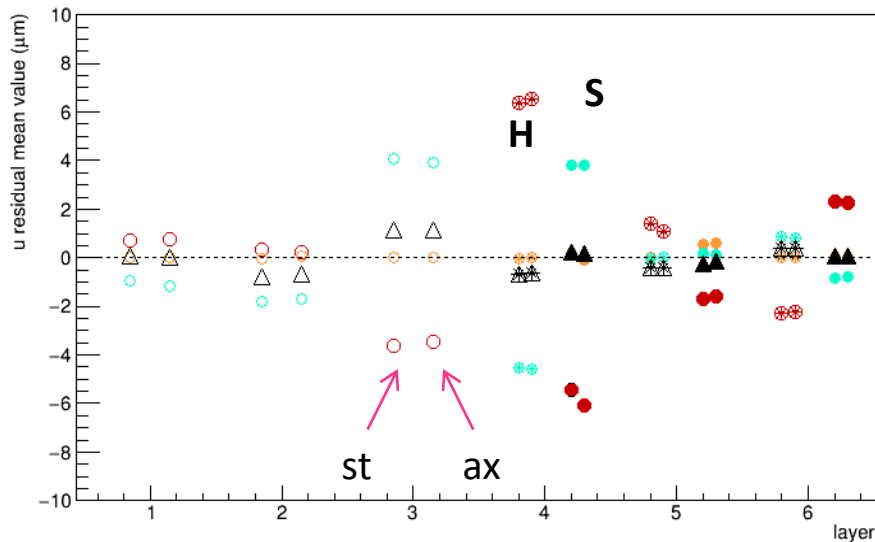Mean values drift away from zero in a systematic way
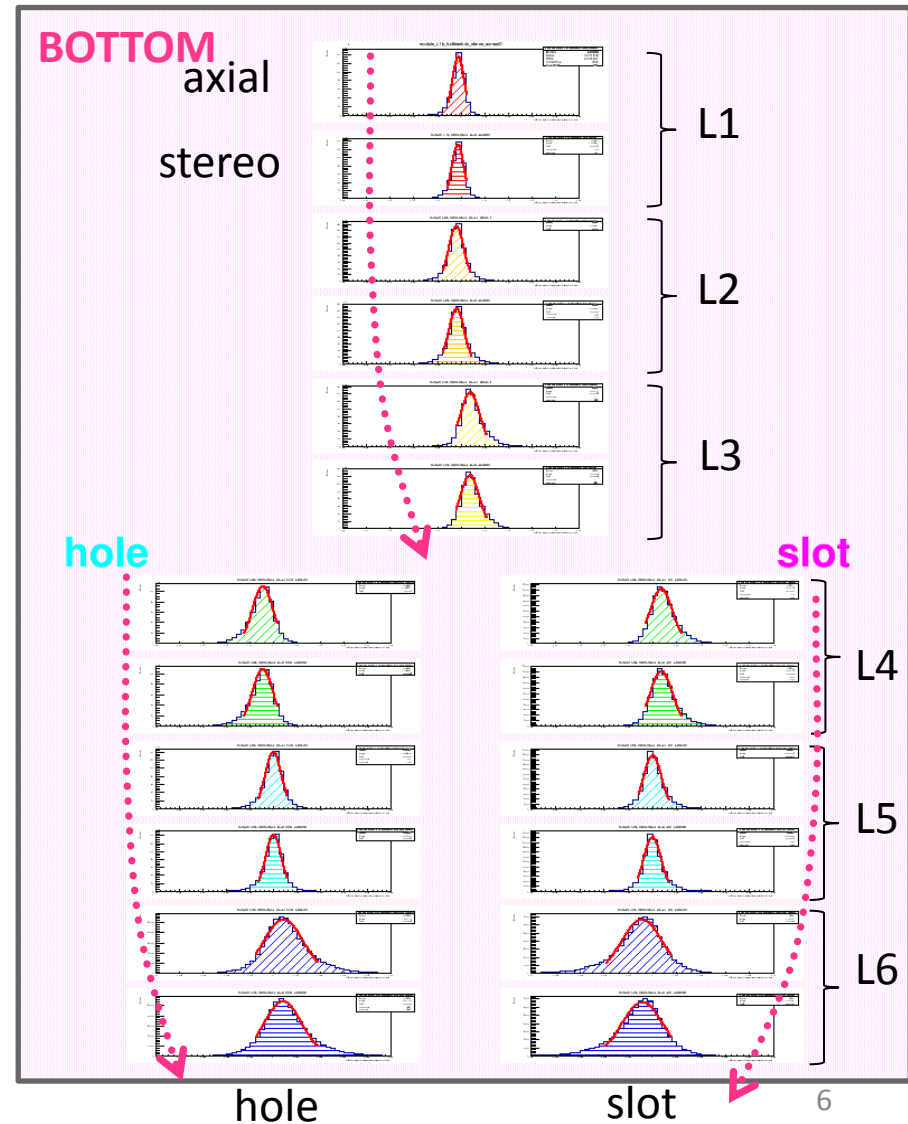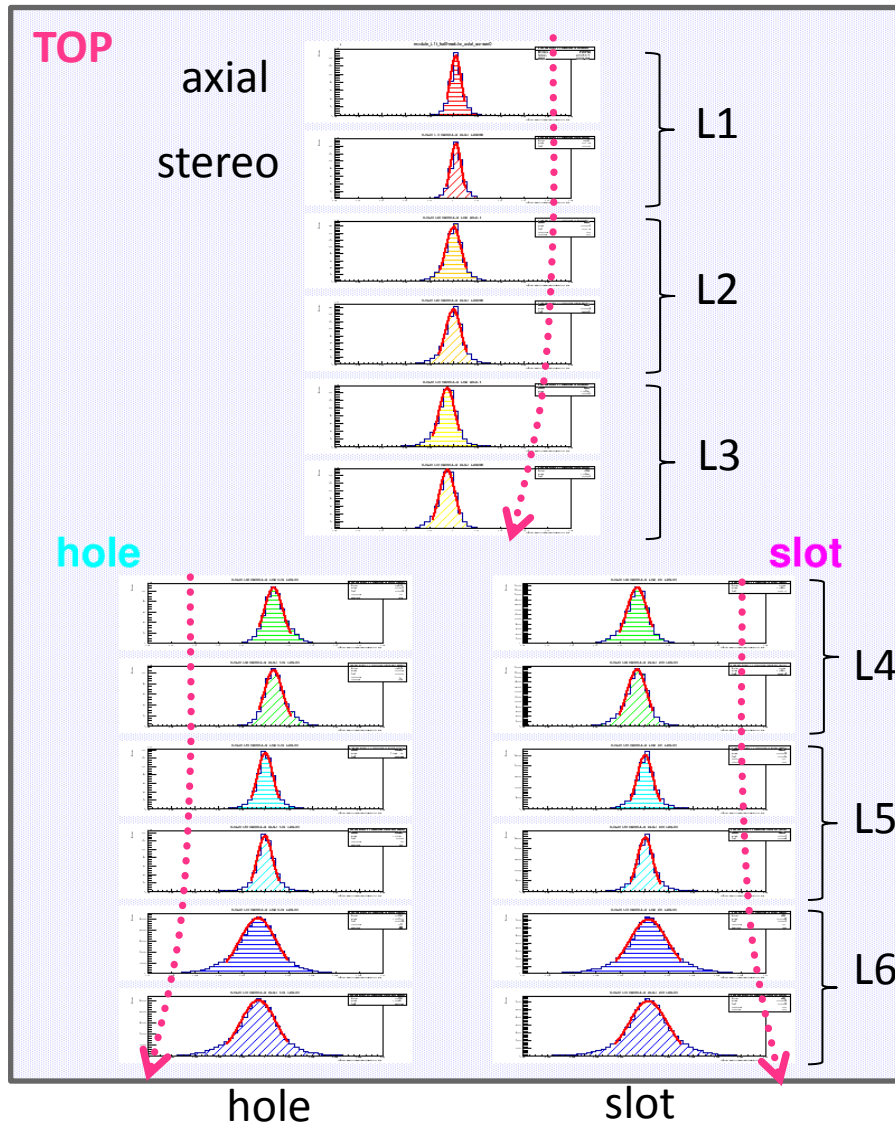
# u residuals after GBL, mean



top residuals, mean value (μm)
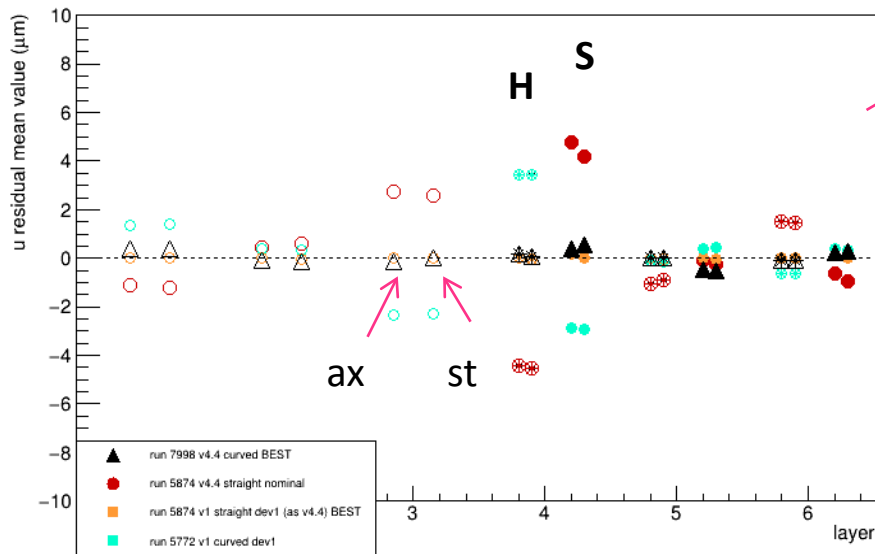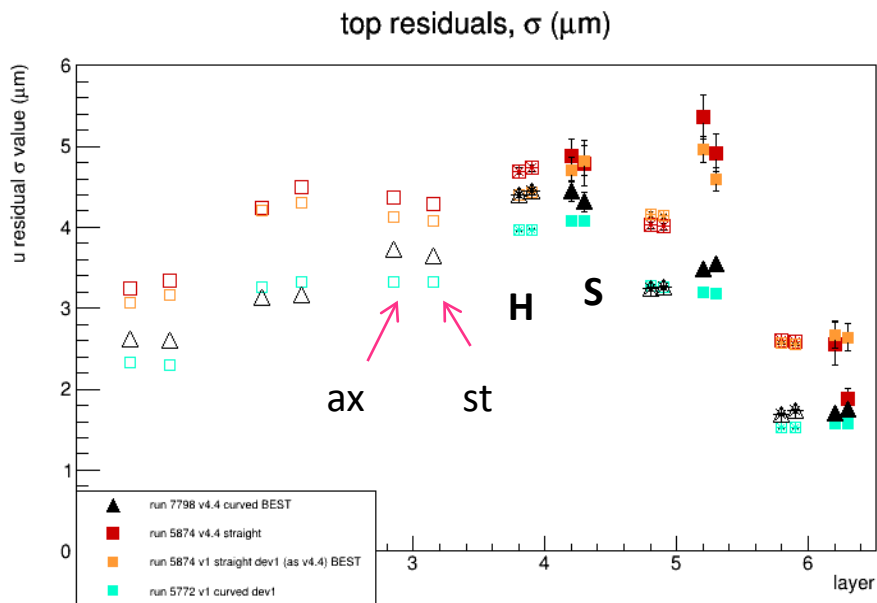


top residuals, mean value (μm)
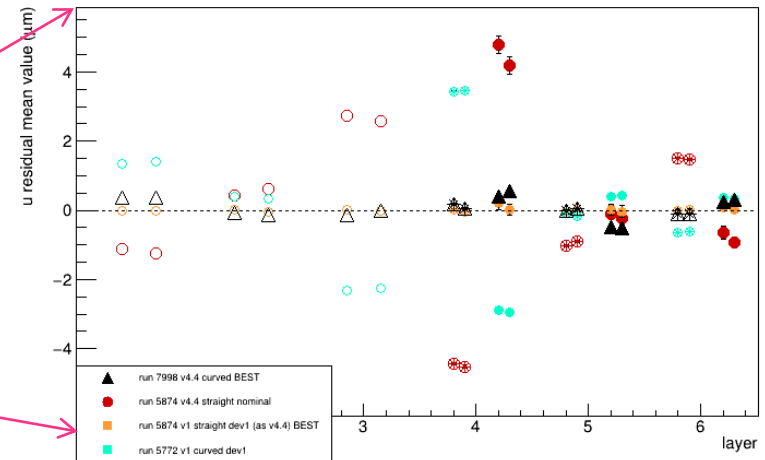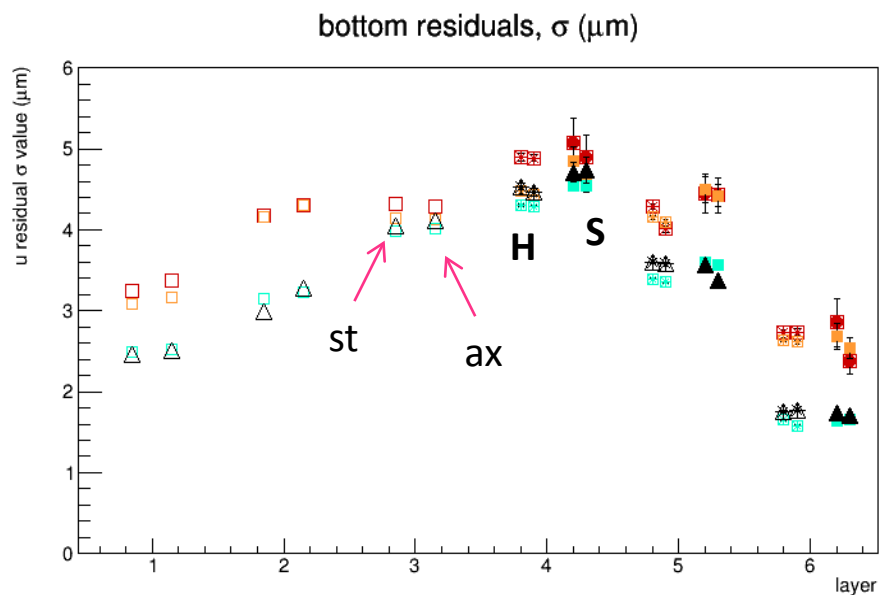


bottom residuals, mean value (μm)

- 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)
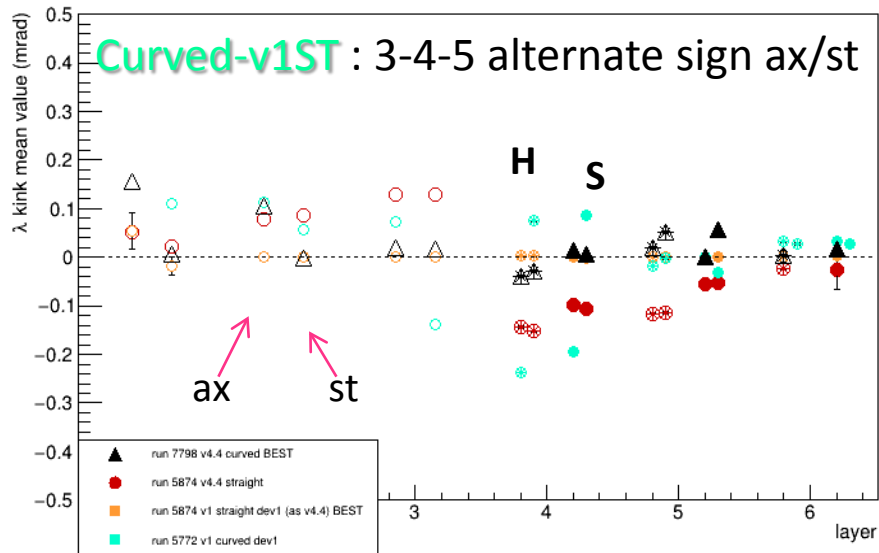- Better: layers 2-5 (external)

# 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)

S

H

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

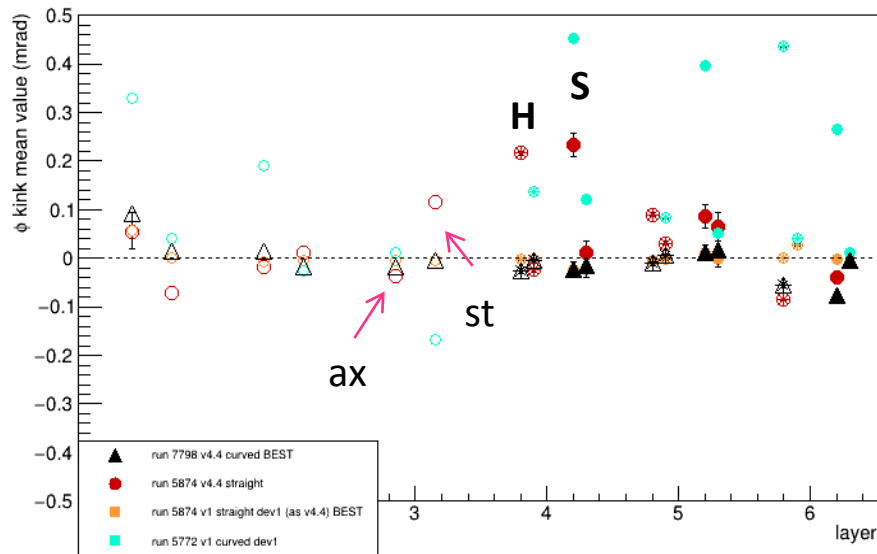bottom λ kinks, σ (mrad)

H   S

st   ax
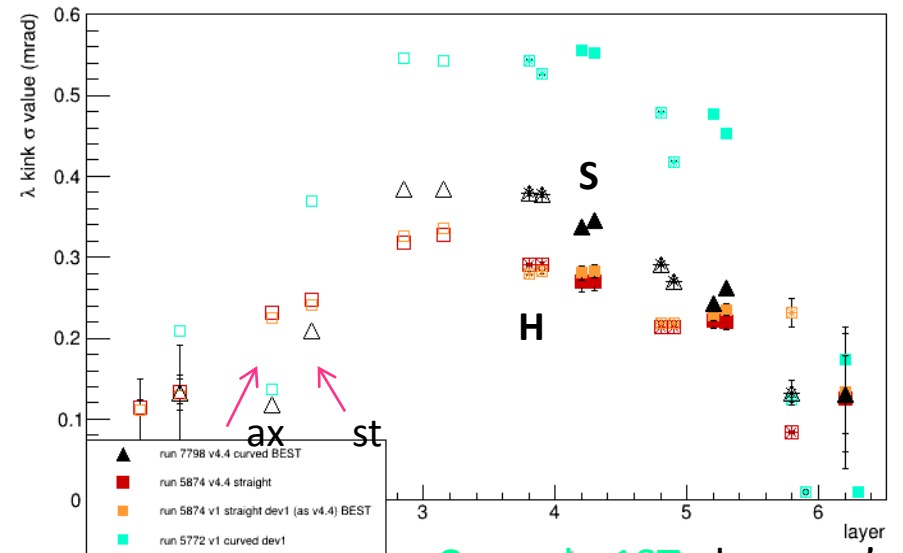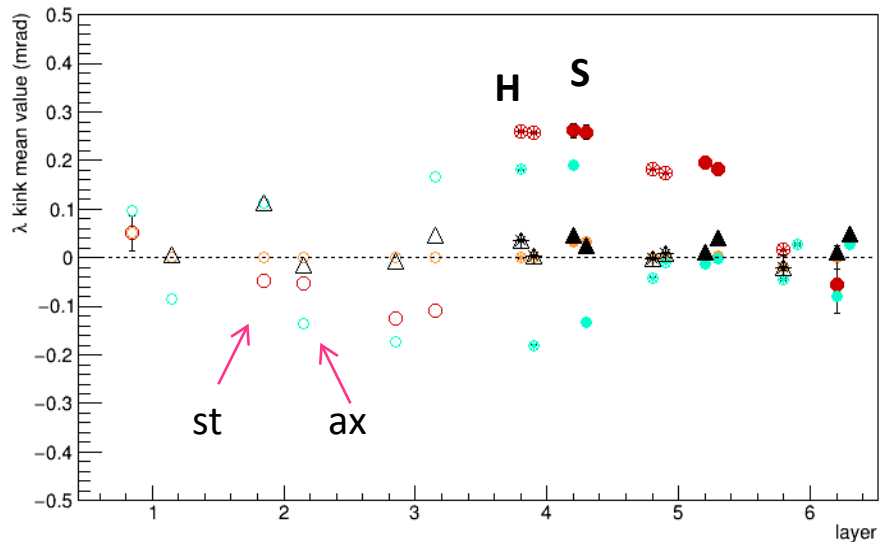
# φ kinks, mean



top φ kinks, mean value (mrad)
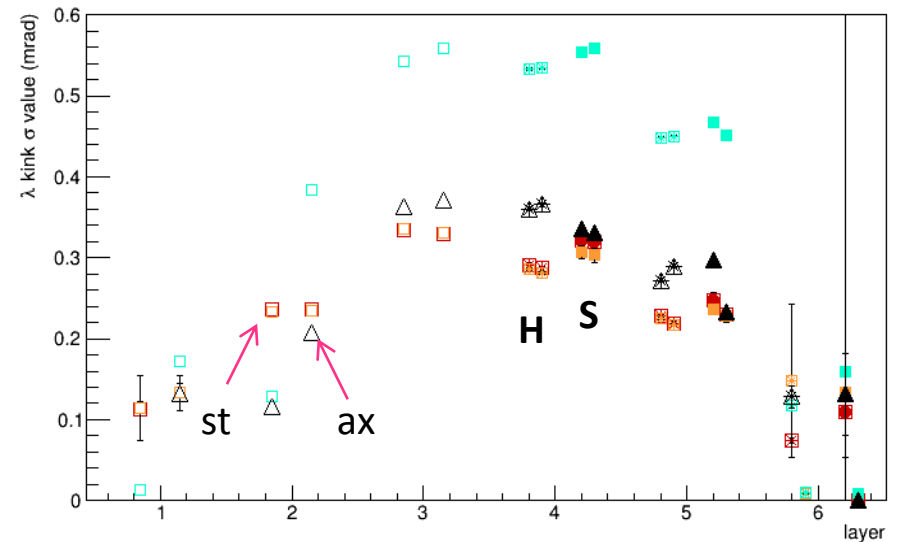


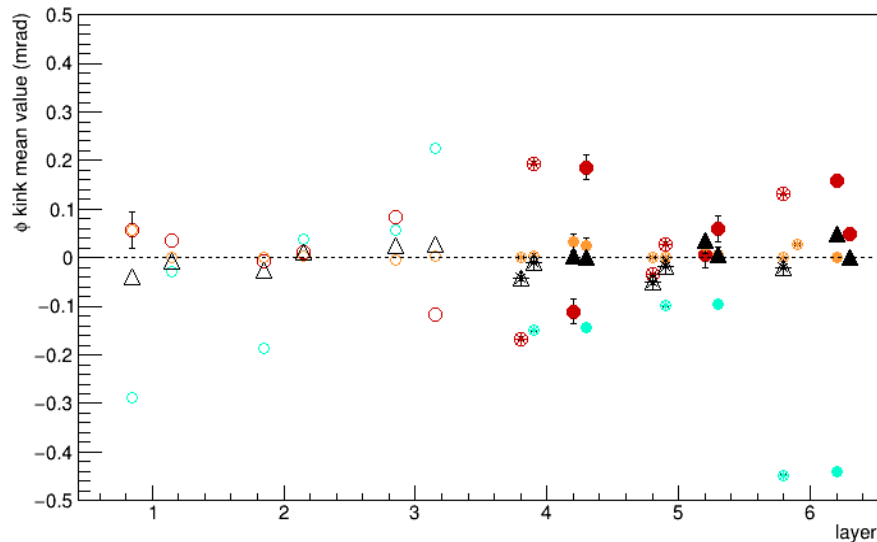bottom φ kinks, mean value (mrad)

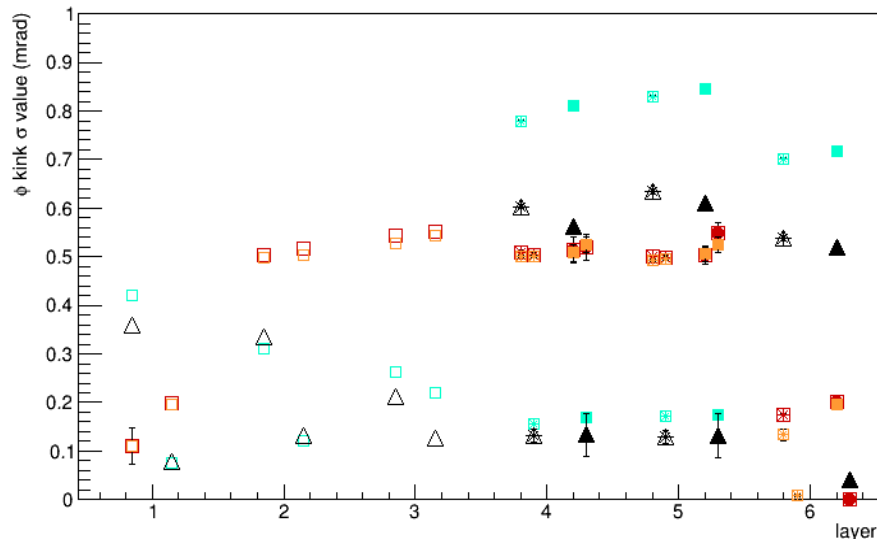- **Curved-v1ST** : same jumping behavior of mean values (but they have all the same sign)

# φ kinks, sigma



top φ kinks, σ (mrad)
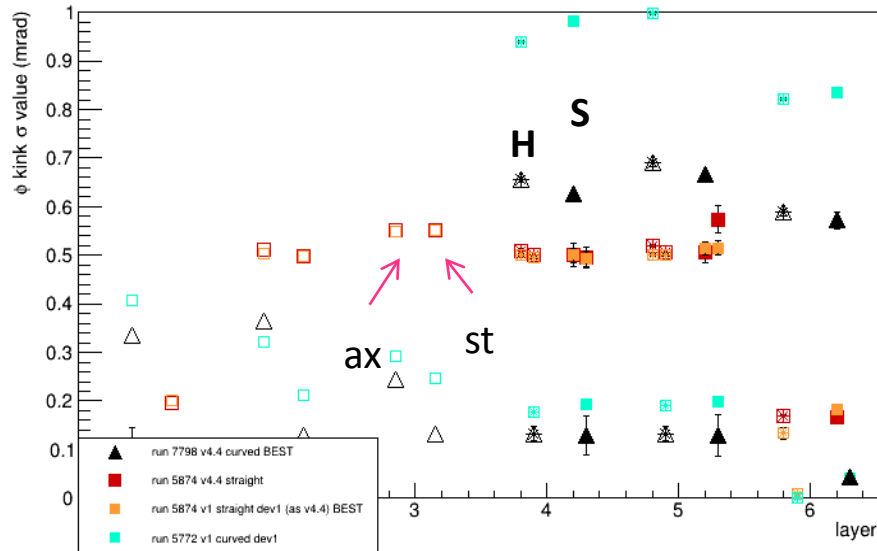


bottom φ kinks, σ (mrad)

- **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?

# 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 $\chi^2$, …), repeat minimization

- Test geometries with MC data