Test of alignment pass0 2016 data: kinks
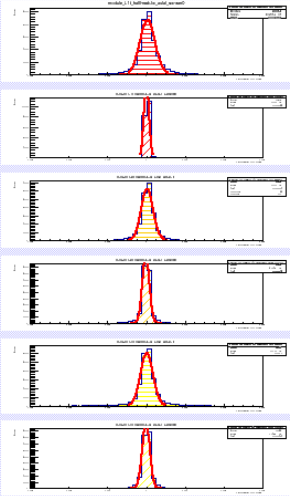
- Deviation angle (φ and λ) after the crossing of sensors
- Evaluation after GBL
- Geometry: v4-4-fieldmap
- Check on 17 file stubs (~50000 events each)
- φ kinks pattern
  - Peculiar pattern: axial distributions wider, stereo narrower (reversed for bottom: the first layer encountered layer has always wider distributions)
  - Ever understood? (can't recall)
- Study of λ kinks
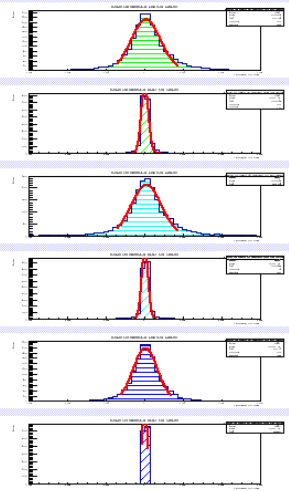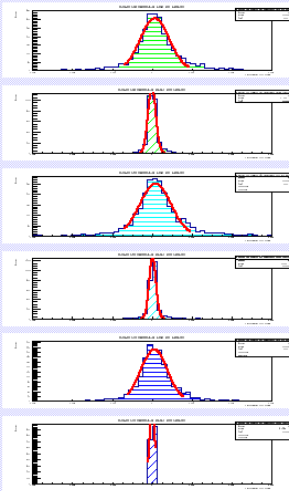 - More regular
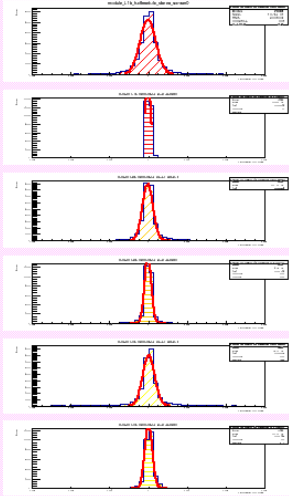
φ kinks

TOP

axial

stereo

L1

L2

L3

L4

L5

L6

hole   slot

BOTTOM

axial

stereo

L1

L2

L3

L4

L5

L6

hole   slot
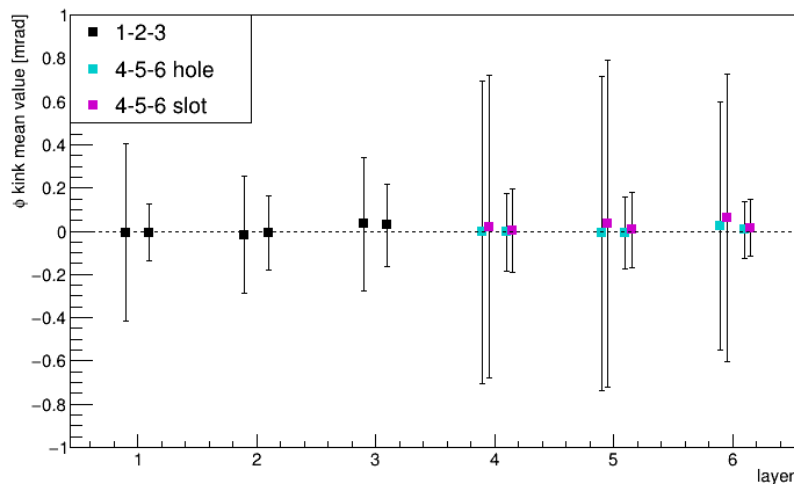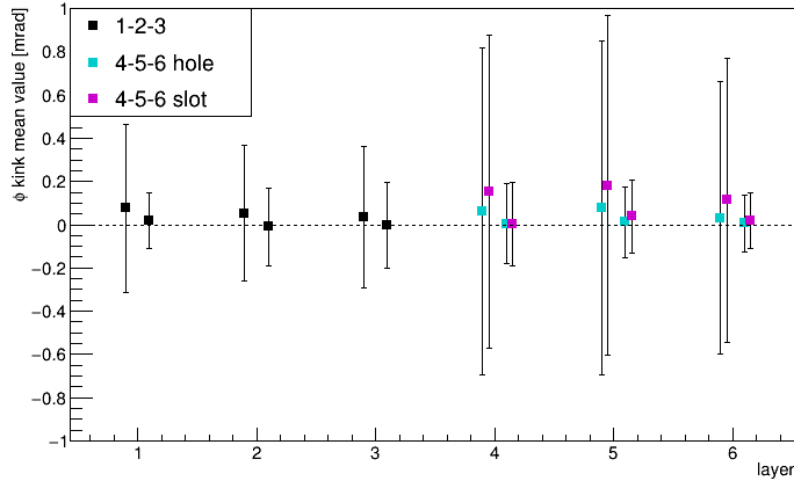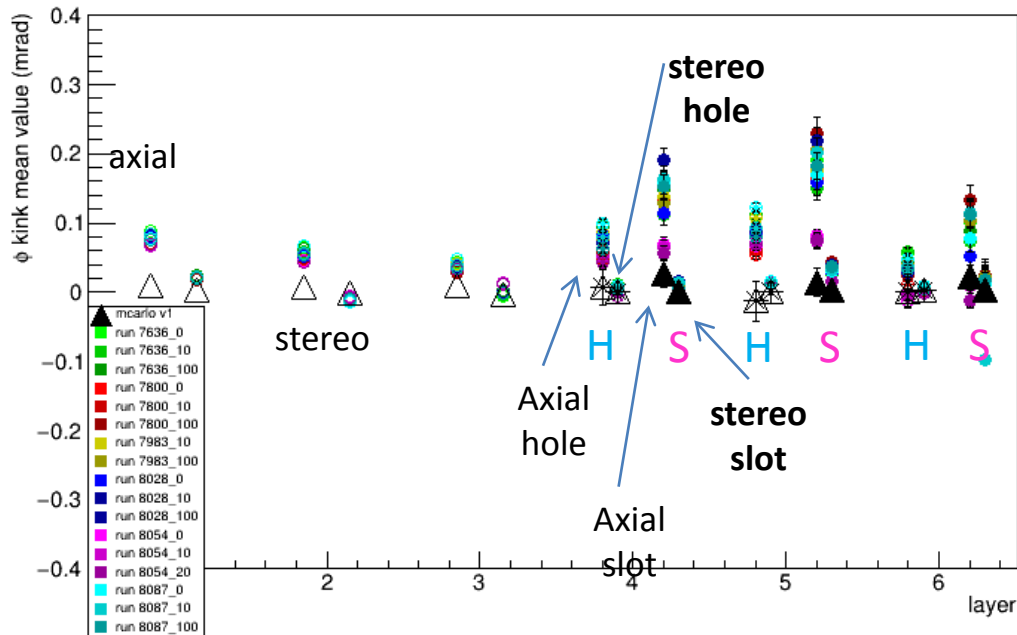
2
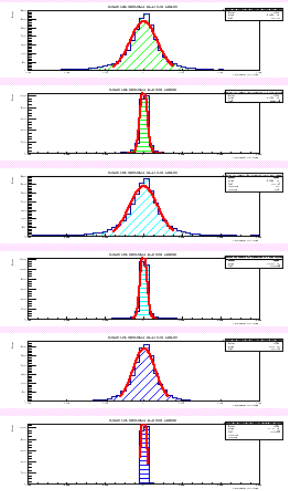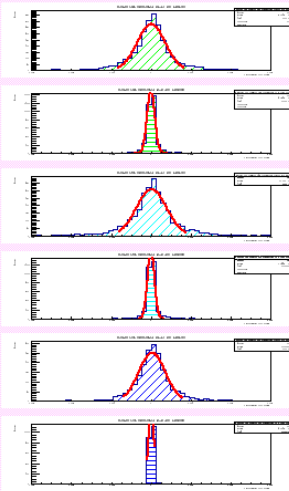
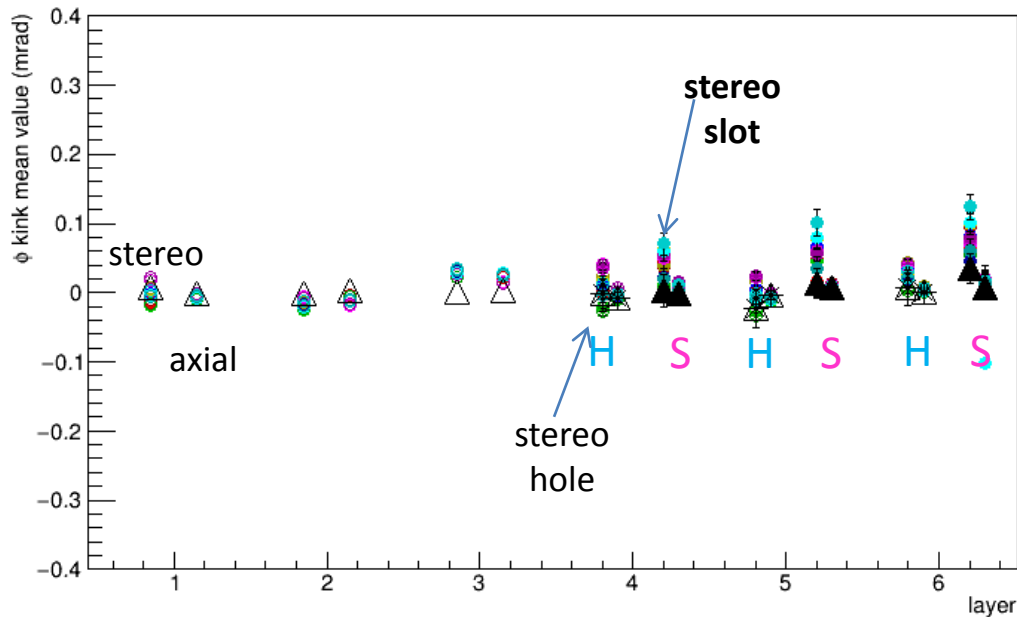# φ kinks, mean values trend (run 8870.100)

- Errors correspond to the sigma of the distributions
- φ kinks typically below 0.2 mrad
- Mostly critical top layers, second stack, slot side
- Well below the width of the distributions, < 0.8 mrad
- This trend is shared also di MC data with ideal geometry
  - A systematic introduced by GBL?

Top&Bottom φ kinks : mean values

top φ kinks, mean value (mrad)

stereo hole

axial

stereo

Axial hole

Axial slot

stereo slot

H S H S H S

bottom φ kinks, mean value (mrad)

stereo slot

stereo

axial

stereo hole

H S H S H S

- Distributions of mean values from gaussian fit of the φ kinks
- Errors from the fit
- TOP: mean values with some positive systematic offset (never negative!)
  - Larger offsets for layers 4-5-6, axial (the first of the two)
  - Maximum kink: ~ 0.3 mrad
- STEREO
  - More regular
  - The first of the two layers has always larger kinks
    - Largest kink: ~0.2 mrad
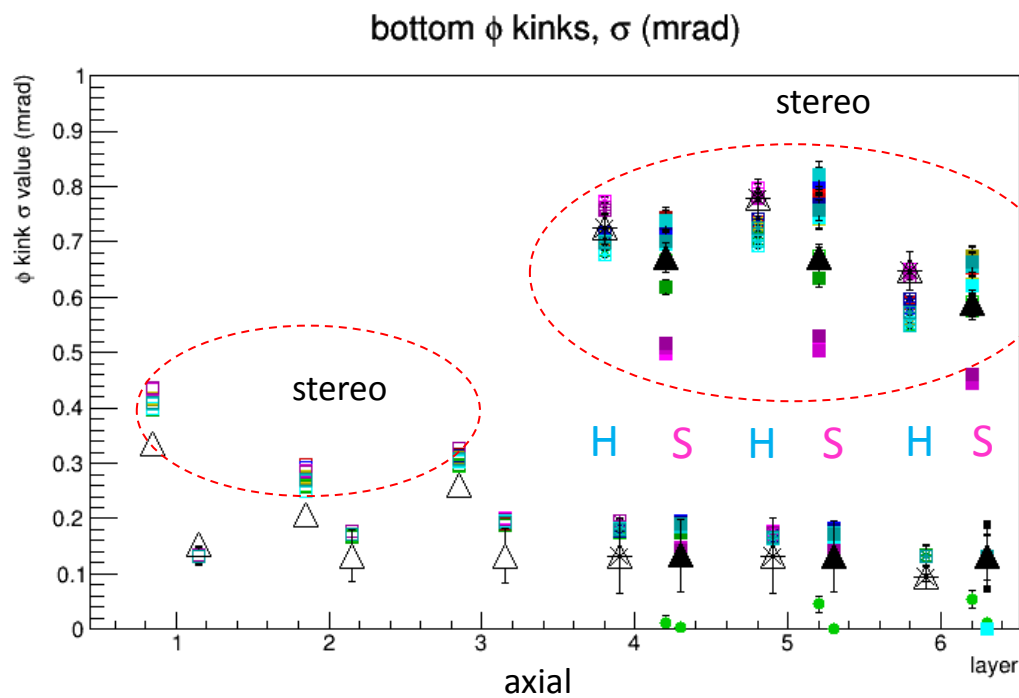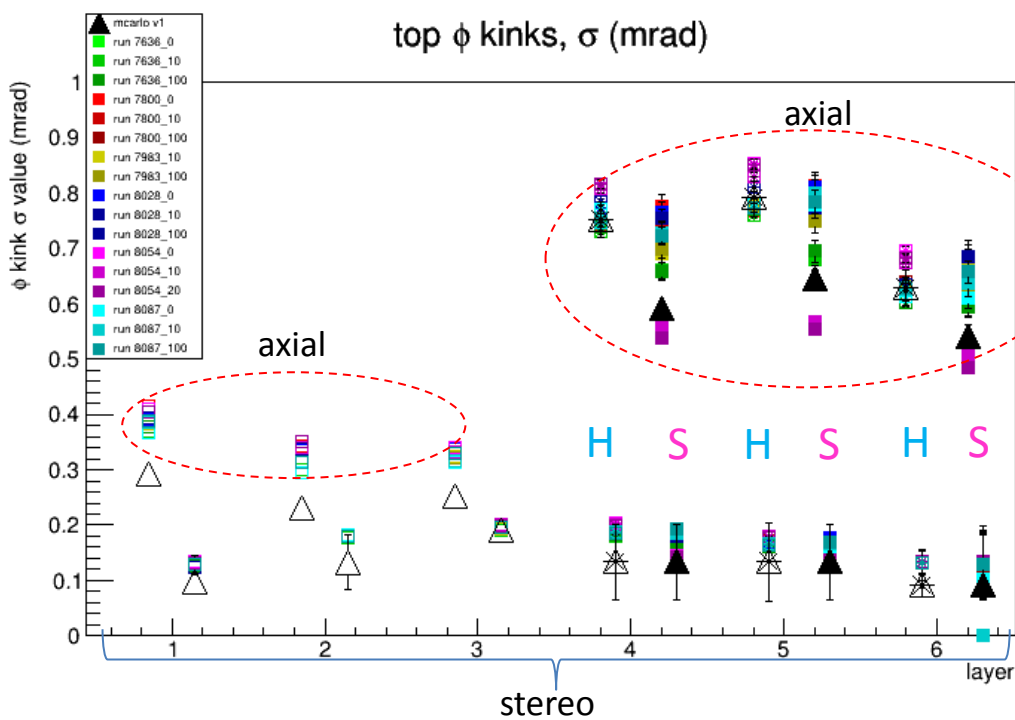
top φ kinks, σ (mrad)
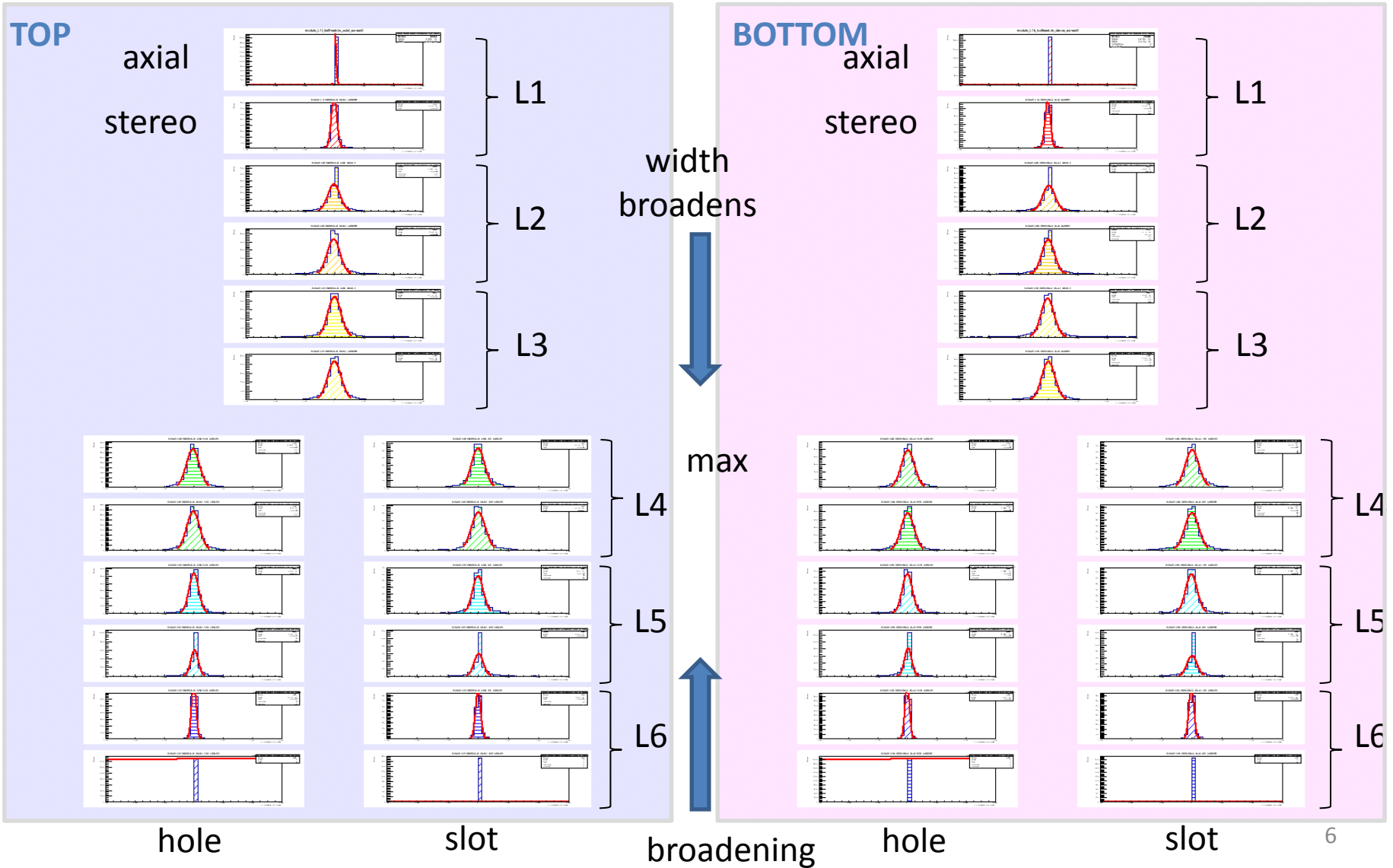
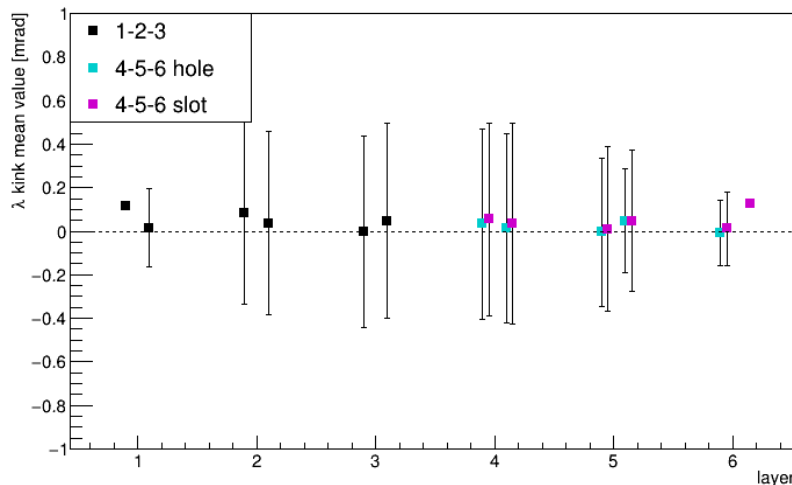bottom φ kinks, σ (mrad)

Top&Bottom
φ kinks: sigmas

- Distributions of sigmas from gaussian fit of the φ kinks
- Errors from the gaussian fit
- Evident pattern already outlined: the first encountered sensor in each layer has larger sigmas
- Larger sigmas for the second stack of layers
  - Maximum sigma: ~0.85 mrad

- Lower limit from MC nominal geometry, v1: 0.1 mrad
- Also MC data have this behavior

λ kinks

TOP

axial

stereo

L1
L2
L3
L4
L5
L6

hole   slot

width
broadens

max

broadening

BOTTOM

axial

stereo

L1
L2
L3
L4
L5
L6

hole   slot

λ kinks, mean values trend (run 8870.100)
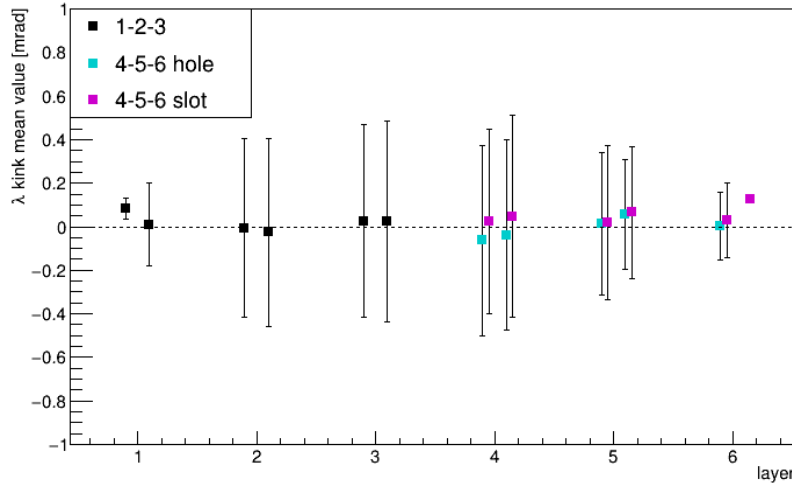
- Errors correspond to the sigma of the distributions
- More regular trends as compared to φ
- λ kinks typically below 0.15 mrad
- Mostly critical: first and last sensors
  - Larger offsets but smaller sigmas (when possible to evaluate them)
- The width broadens for the central layers (3-4)

- Well below the width of the distributions, < 0.5 mrad

top λ kinks, mean value (mrad)

bottom λ kinks, mean value (mrad)

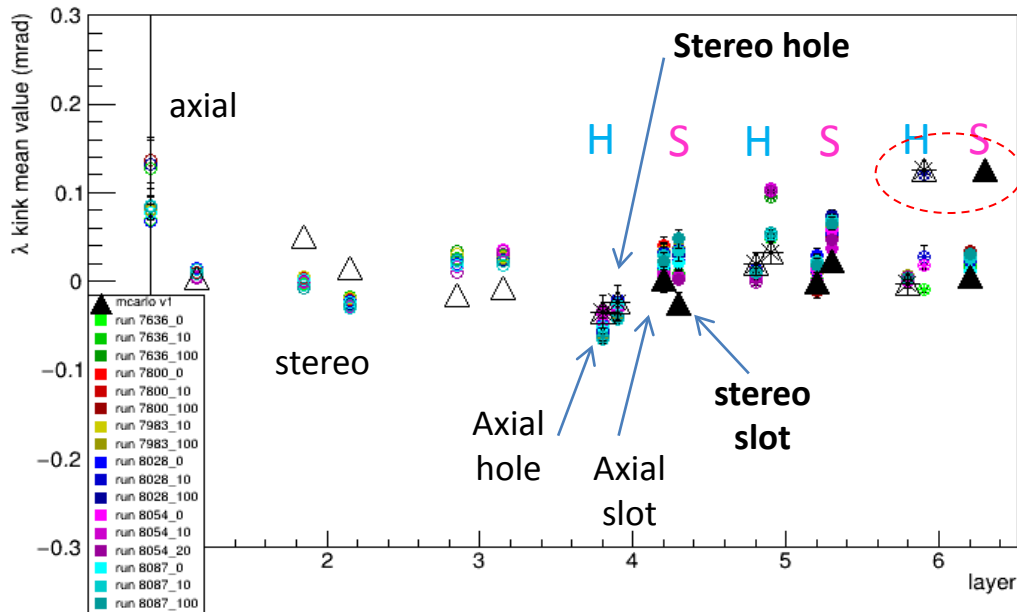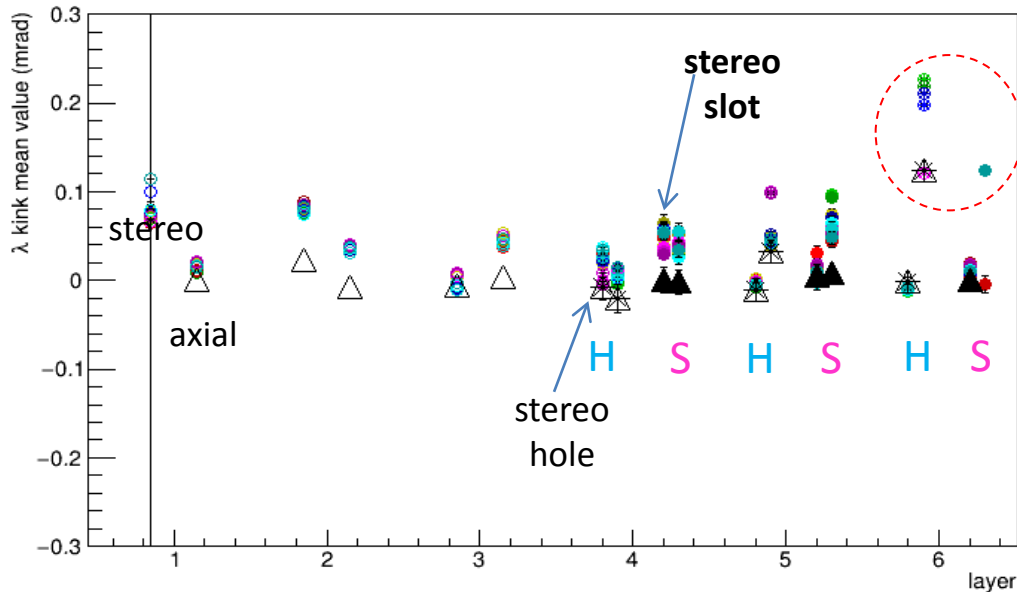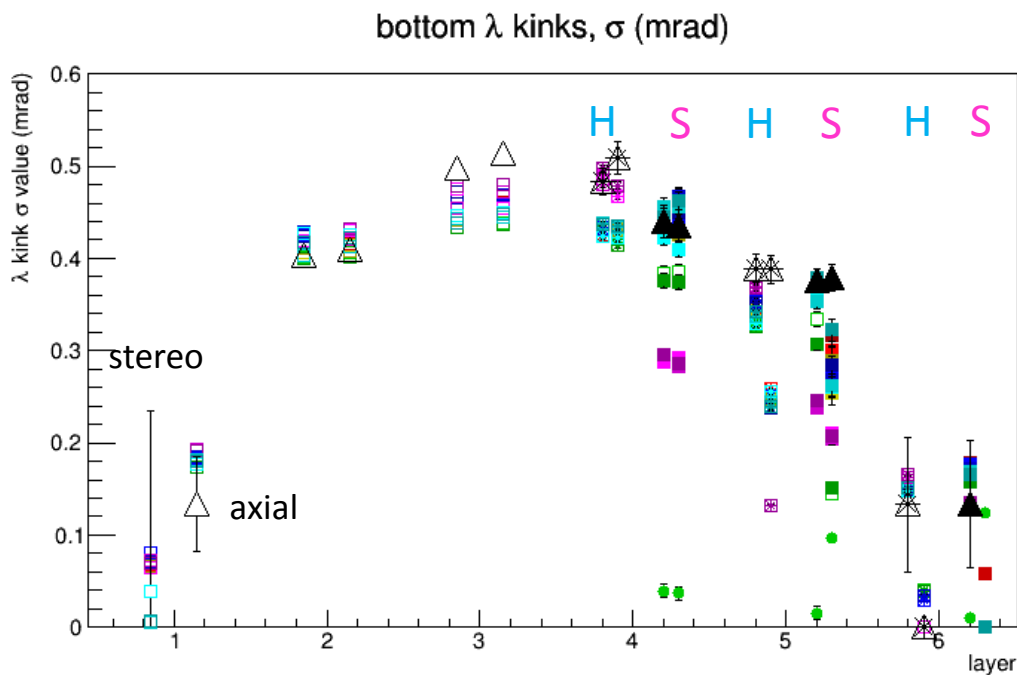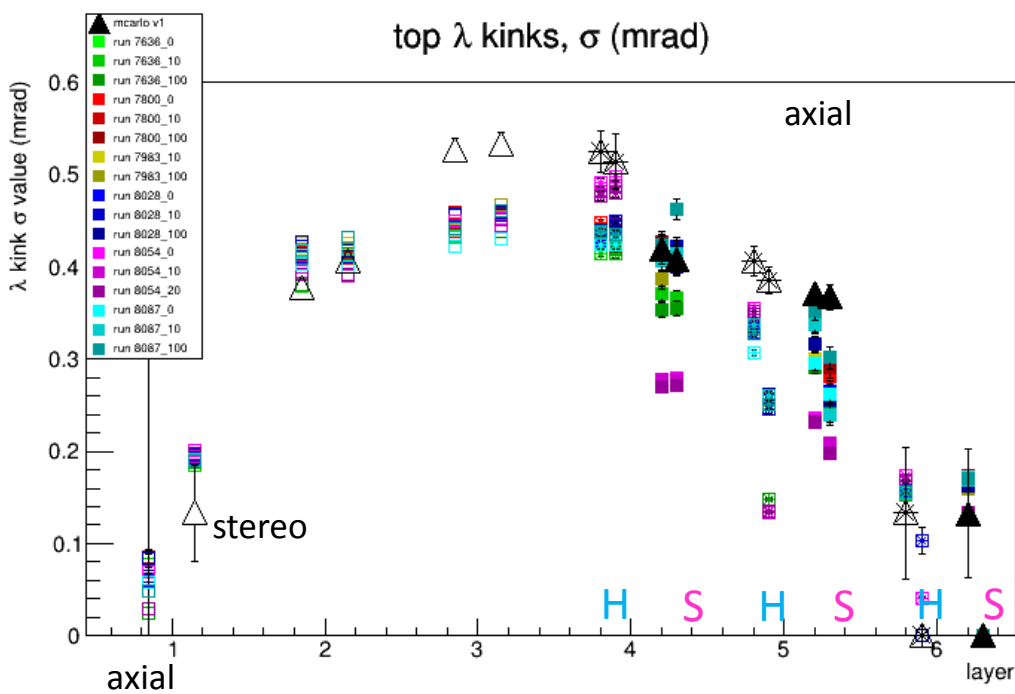# Top&Bottom λ kinks : mean values

- Distributions of mean values from gaussian fit of the λ kinks
- Errors from the fit
- TOP: mean values oscillate, below 0.15 mrad (mostly positive angles, again
  - Maximum kink: below 0.2 mrad
- STEREO
  - Some offsets, below 0.1 mrad
- Largest offsets for layer 1 and 6, both top and bottom

Top&Bottom λ kinks: sigmas

- Distributions of sigmas from gaussian fit of the λ kinks

- Errors from the gaussian fit

- Largest sigmas from MC! Vales to be taken as systematic errors

- Largest sigmas for central layers (3-4)

- All sigmas below 0.6 mrad

Conclusion from kink studies

- It would be nice to understand a little better the pattern shown by φ kinks
  - Is a systematic introduced by GBL?
  - Kinks out of the second crossed layer in a pair are more precise
  - It does not depend on the strip orientation in the sensor (axial vs stereo)
- Kinks more regular
  - Less precise correction for central modules
- All found offsets cluster decently well
  - Consistent behavior across several runs
- All found offsets are well below the sigma of the angular offset distributions

- Alignment of version 4.4-fieldmap can be considered satisfactory also for angular offsets