Study of translations along z (w) straight/curved tracks (runs 5784+5772) part II

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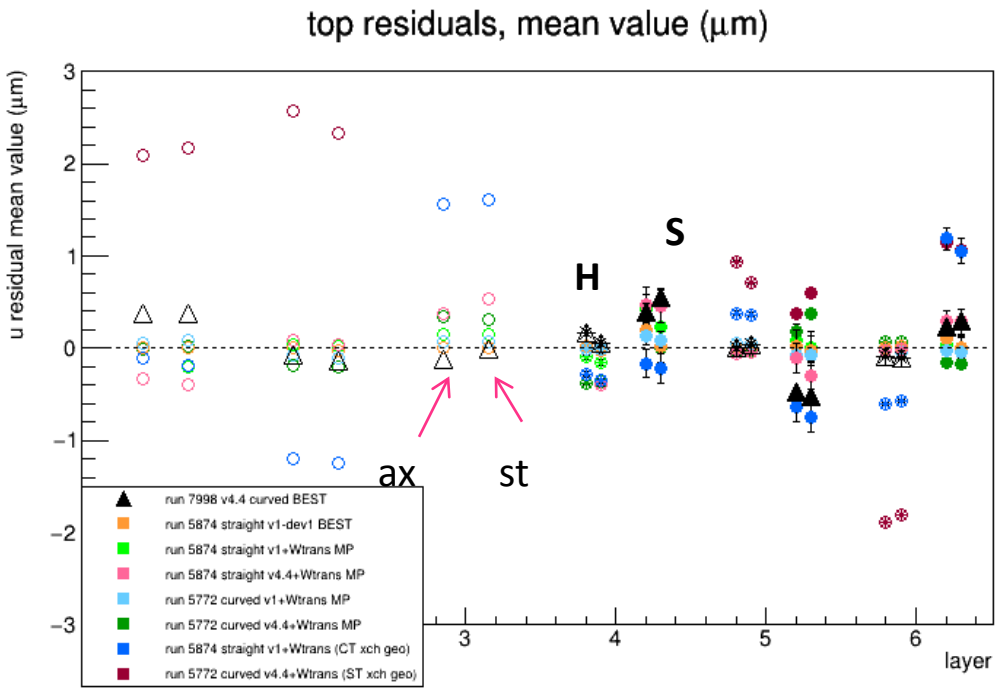
Study of z translations

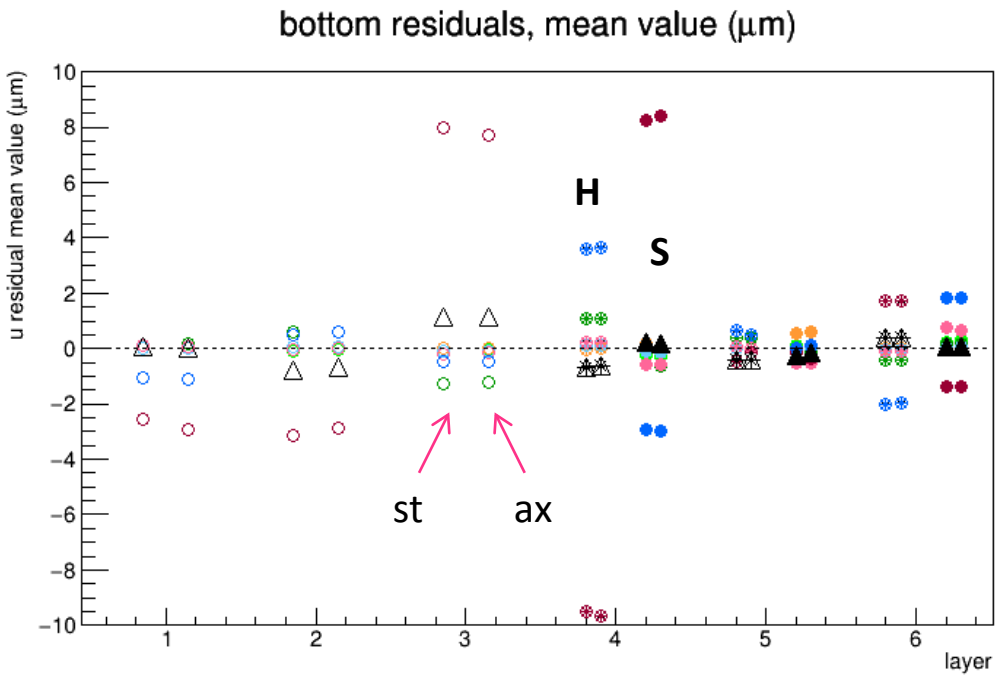
- Leave all w traslations (axial+stereo sensors) floating for sensors 3-4-5: study of z-scale effects
- Sensors 1-6 fixed

- Starting geometry:
  - Curved tracks: best geometry (4.4), u traslations already floated + tweaks
  - Straight tracks: best geometry v1 with u translations (v1-dev1)

- Several trials
  1. Float w translations starting from the best geometries: slight improvements
  2. Swap geometries (use for curved tracks the best version for straight, and vice versa) + float w translations
     - Test the new geometry on the other data sample
       - Difficult to find a geometry which satisfactory for both the straight/curved samples
  3. Start from one geometry (v4.4), float w translations on a combined data sample
     - "Common" geometry: not satisfactory
  4. Constrain w floats: some improvements, in progress

u GBL residuals, mean

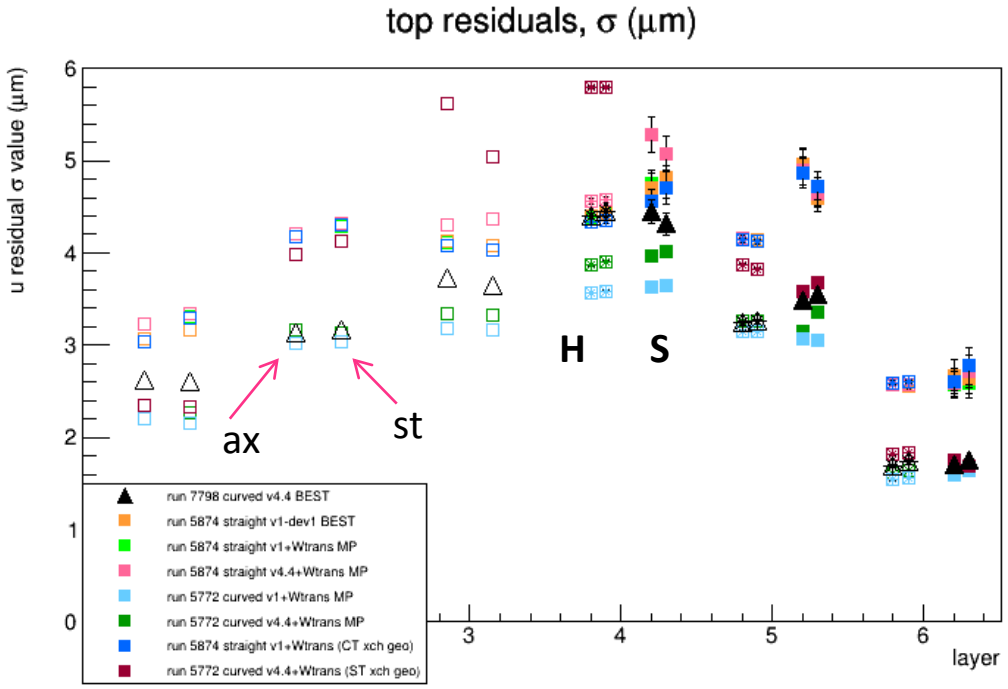


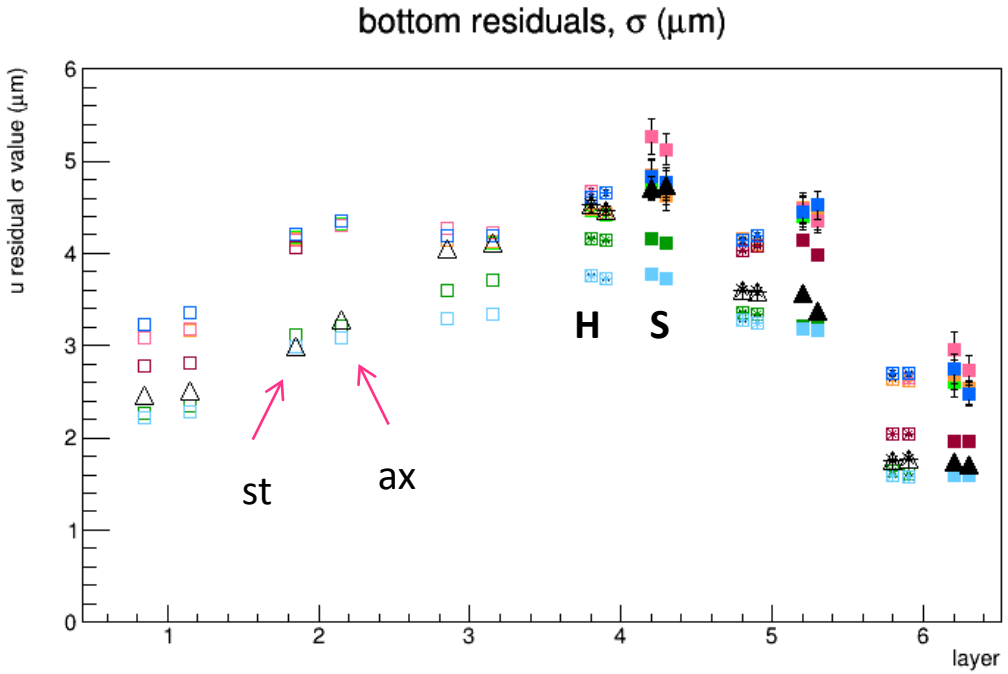


- Wide fluctuations in the first three layers (dangerous)
- Improvement for straight tracks when w translations are left free (green pts)
- No remarkable improvement for curved tracks (pink pts)
- Better fit: v1-dev1 geometry + w trans adapted to curved tracks (light blue), better than v4.4 geo to straight tracks (dark green)
- Swap geometries: better for straight tracks (blue) than for curved tracks (brown)

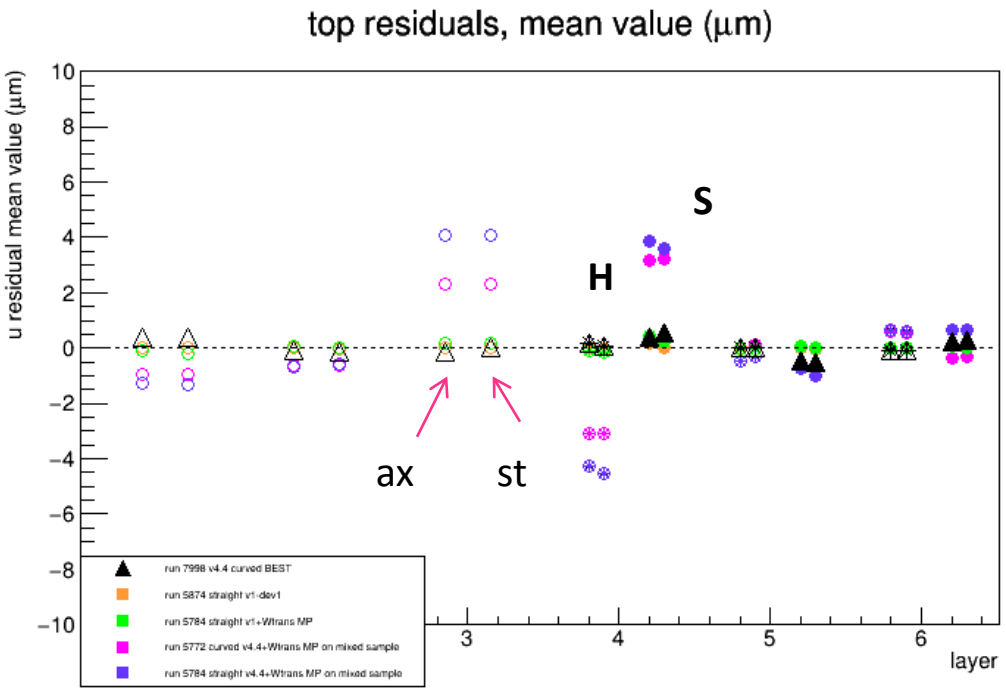
- Alignment of straight tracks samples seems to be more reliable (provided no errors are made in the reconstruction!)
  - Recommended by general experience (H1, LHCb, …)
  - Drawbacks with curved tracks:
    - Non-uniformities of magnetic field map

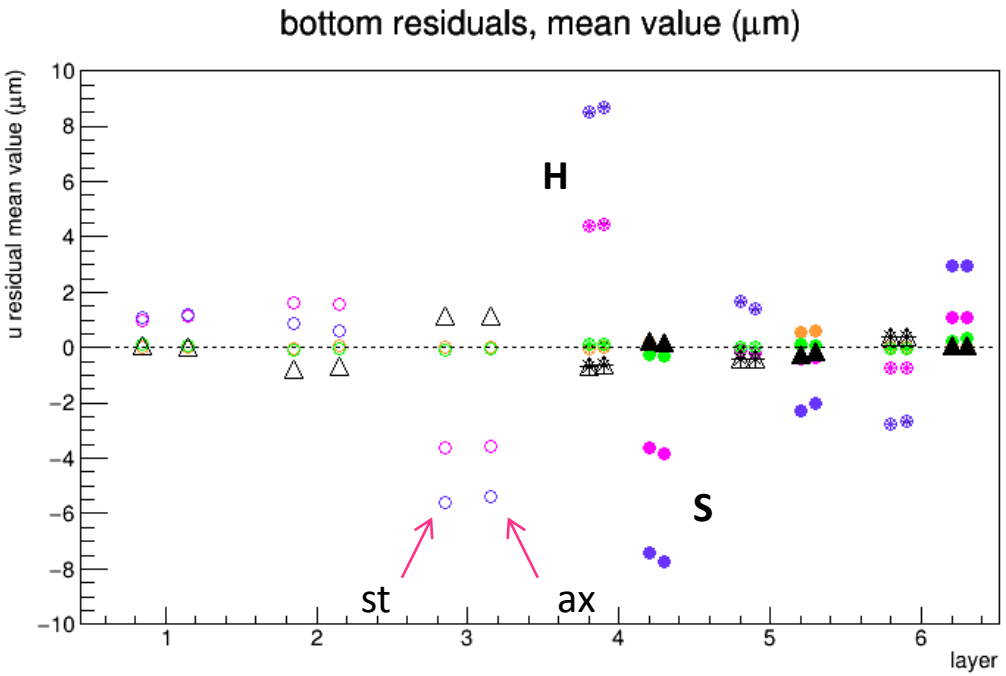
u GBL residuals, sigmas





- Wider fluctuations in the first three layers
- Better fit: v1-dev1 geometry adapted to curved tracks (light blue)
- These values are more meaningful when selected tracks samples are used (automatic rejection of outliers etc)

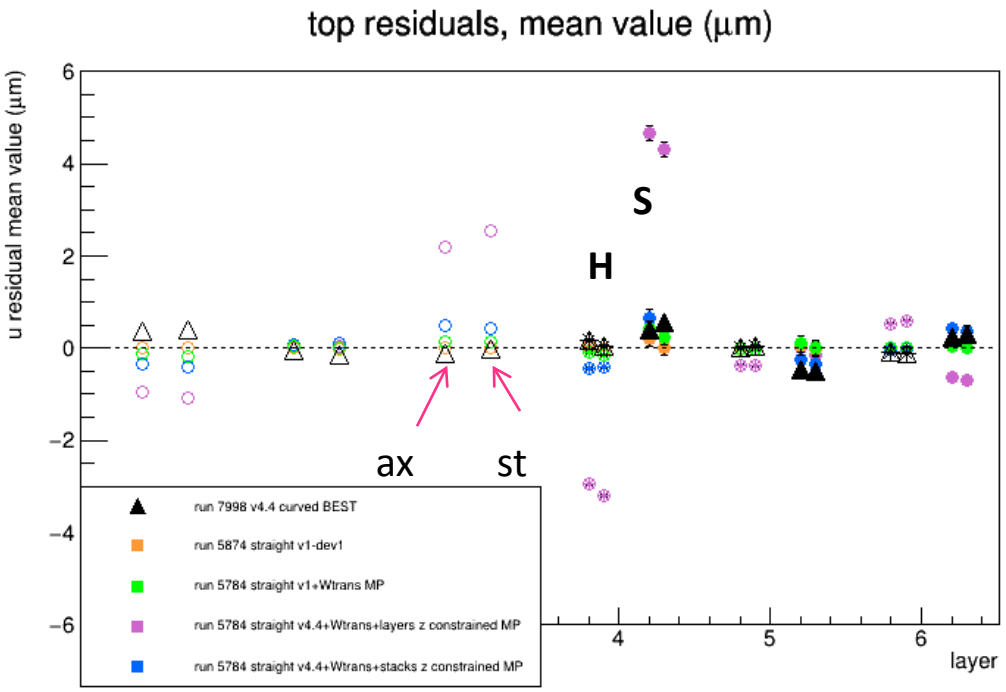


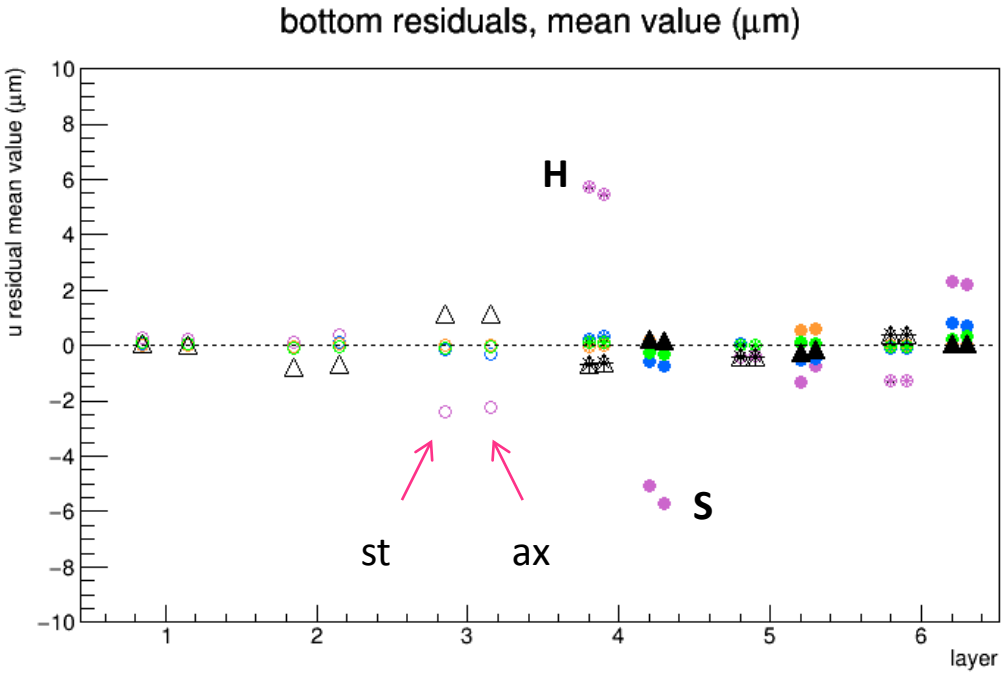


Geometry with combined sample, u residuals

- Start from best geometry (v4.4 w/ and w/o mag field)
- Float w translations and run millepede on a combined set of tracks (straight+curved)
  - MP solution: global parameters which should be the same for all tracks (local-trajectory parameters are disregarded)
- Test the new geometry on the single samples
- Results are in general worse (straight: compare green w/ violet)

Geometry with w translation constraints (z scale study)





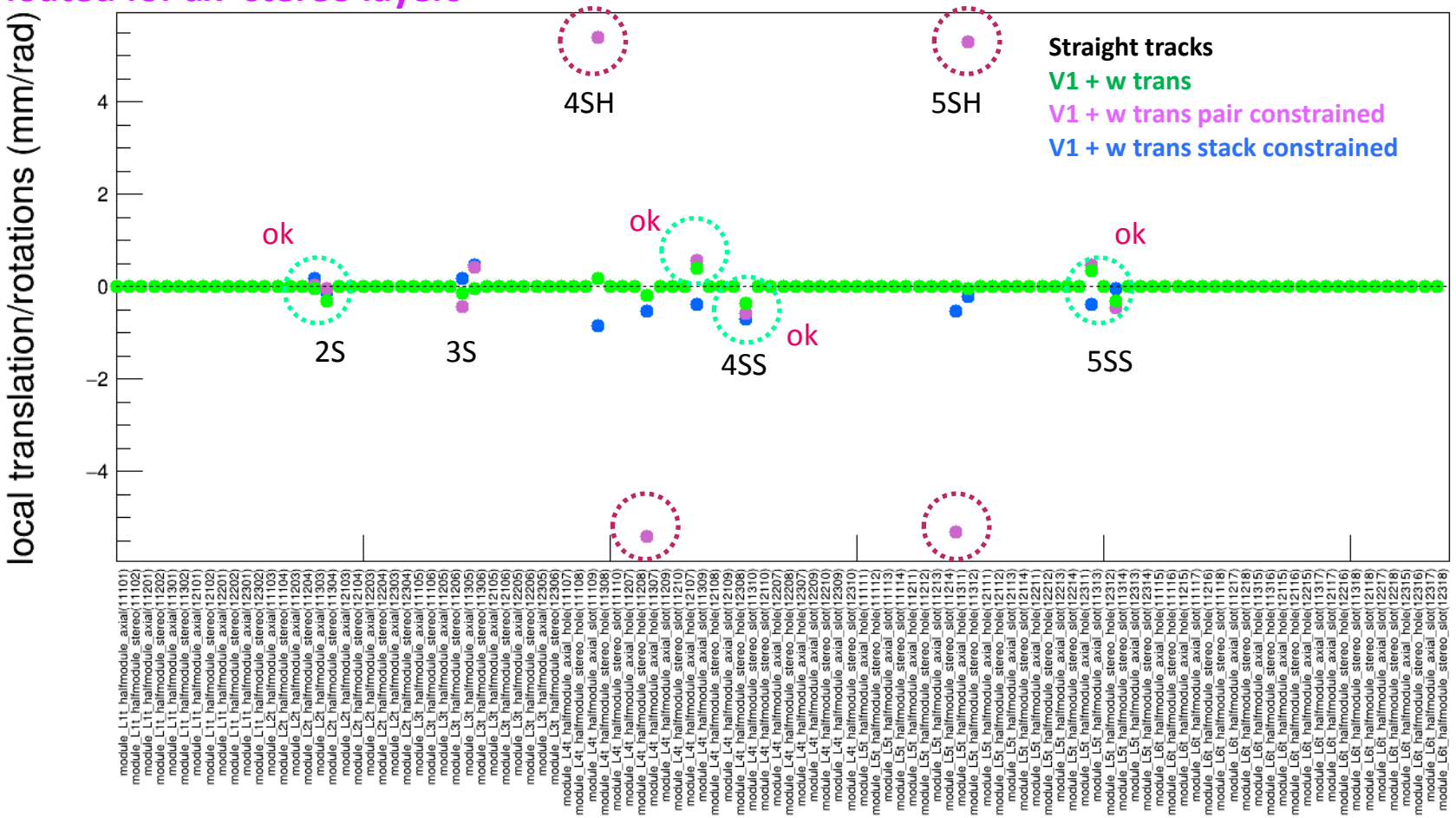
- Study on straight tracks
- 2 kinds of constraints:
  - Same offset for axial & stereo of the same layer
  - Same offset for axial & stereo of all sensors of the same stack (2+3, 4+5 hole/slot)

- Results are in general worse but constraining stacks seems to deliver better results in terms of residuals
  - Some studies still needed (sign flips to be checked)

- Problem: sometimes too large w offsets chosen by MP

Comparison of MP offsets: TOP

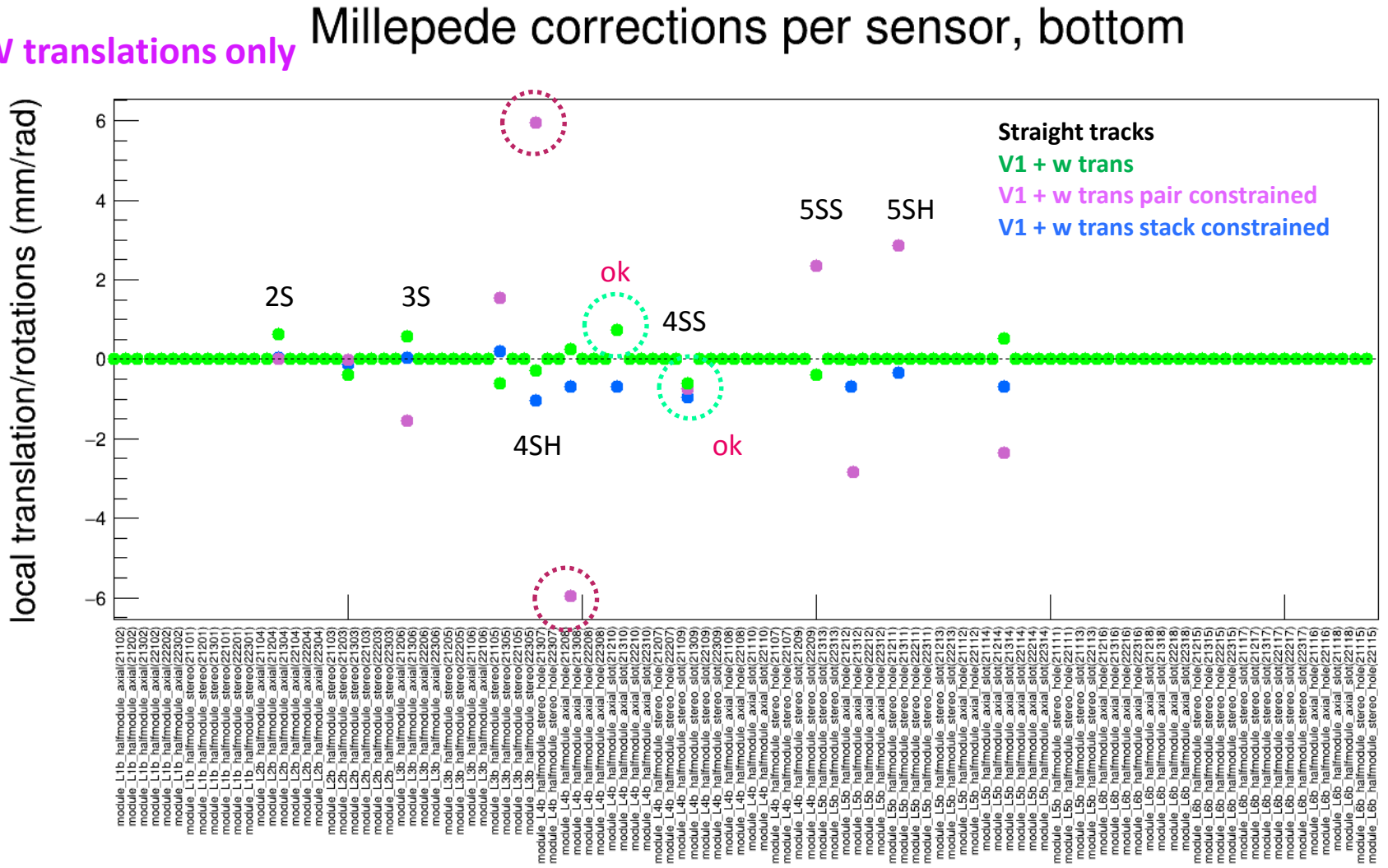
W translations only
Floated for ax+stereo layers



- Some of the w offsets chosen when they are constrained in pairs are larger than 4 mm: too much!
- reduced offsets for slot-side sensors
- MP constraints work (but the sign must be checked with care…)

Comparison of MP offsets: BOT

W translations only



- large offsets (~ 6mm) chosen for sensor 4 stereo hole (doubtful)

Work in progress

- Understand better the sign matching when constraining floating parameters
- Try to include the vertex as further track point (never tested)
- Start with rotations (α, β, γ angles) before translations – somehow recommended
- Focus on straight tracks
  - Use larger data sets
  - Select strictly track quality (use elastic kinematics?)
  - Float more sensors at a time and check convergence
- check the code (reconstruction and python procedure extracting the input to MP)
  - Lorentz corrections for stereo modules (sign?)
  - Consistency of geometry for curved and straight tracks
- Learn what other people did… the field/no field mismatch is not something new

- Systematic checks of misalignment effects with MC data
  - w misalignments have the same effect of module rotations around v and cause a systematic drift of u residuals mean values
  - Repeat systematic checks with known misalignments for u translations and α, β, γ angles