Alignment study with cosmic-ray data

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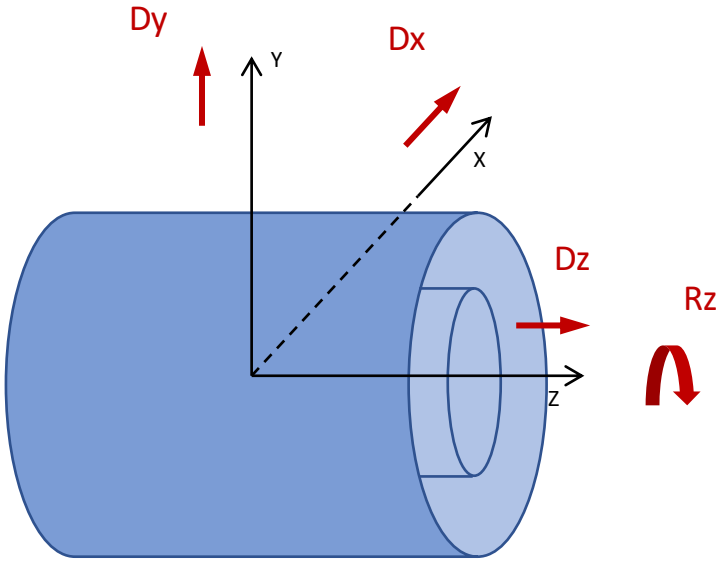
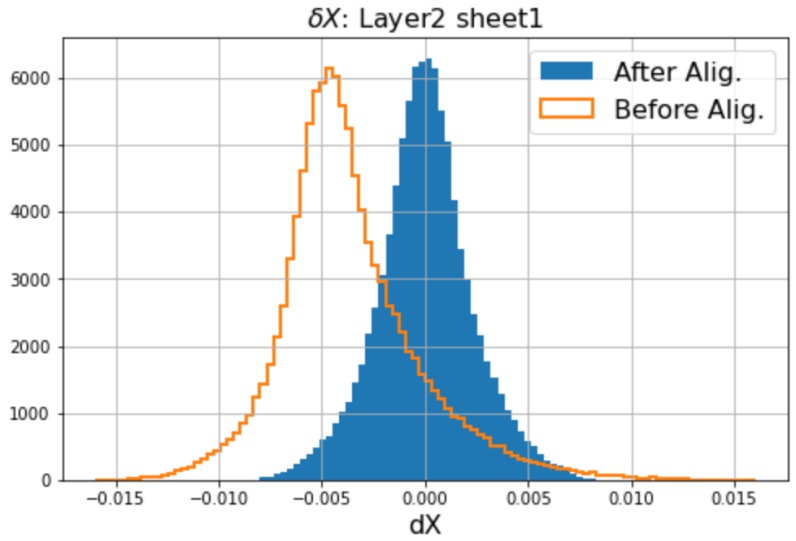
Cgem software meeting

Alignment for Cgem

- Configuration of alignment algorithm for cosmic-ray data
  - 2 layers of Cgem, position of outer layer is fixed as reference
  - For each layer, 4 alignment parameters: Dx, Dy, Dz, Rz
  - Dy is also fixed because it is insensitive to cosmic-ray data
- Preliminary result shows significant improvement on residual and chisq distribution





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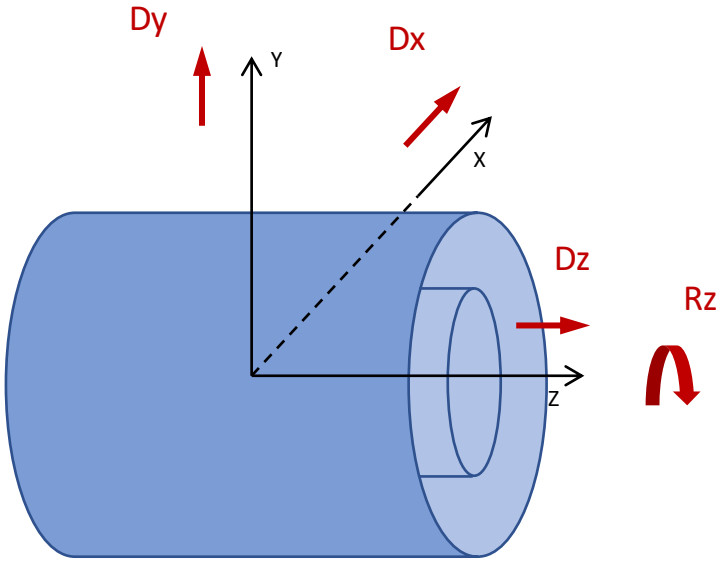

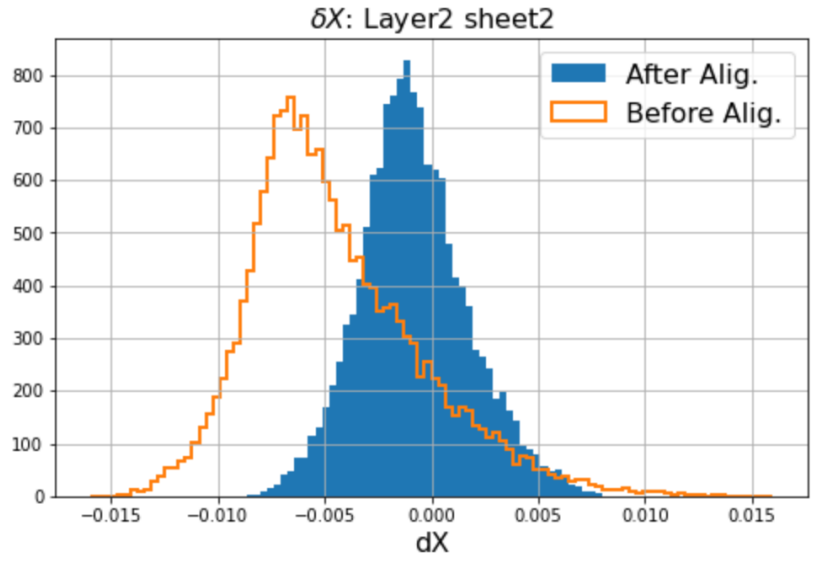

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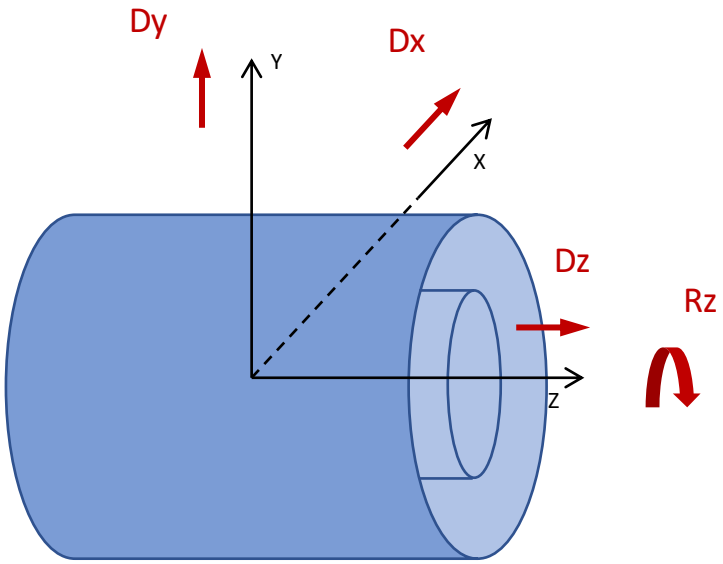

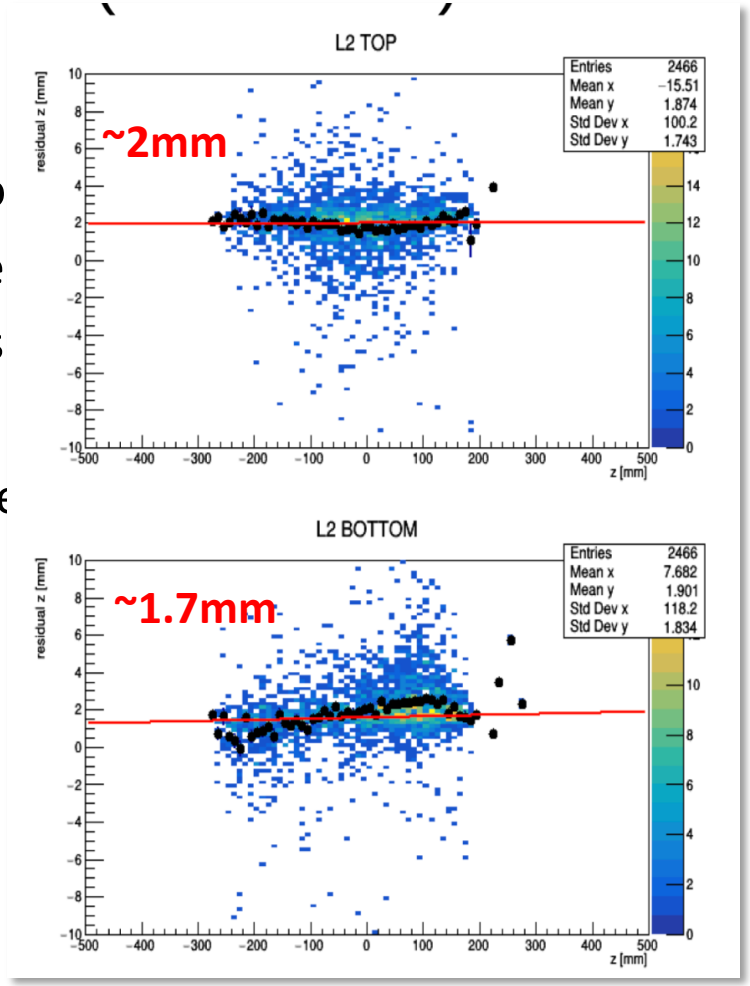

Lia also find the shifts in Z are different for different sheet on the same layer

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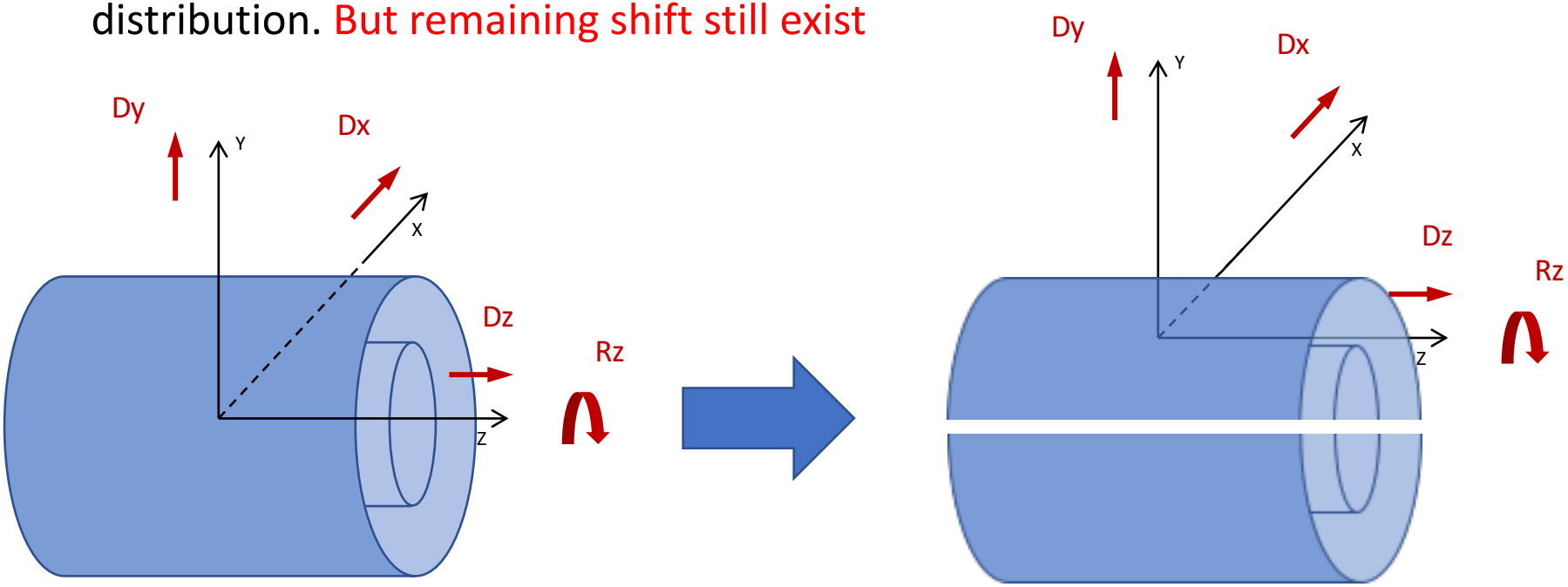
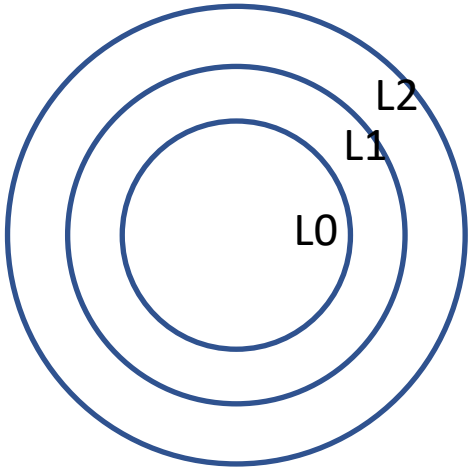
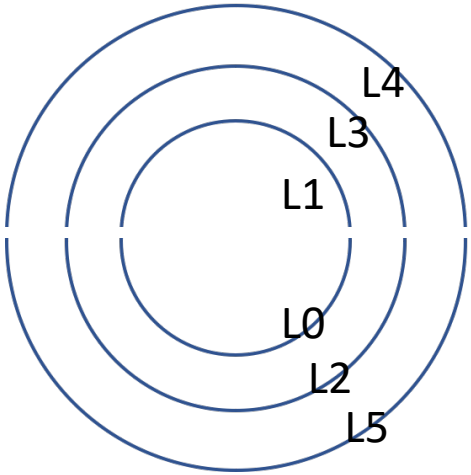


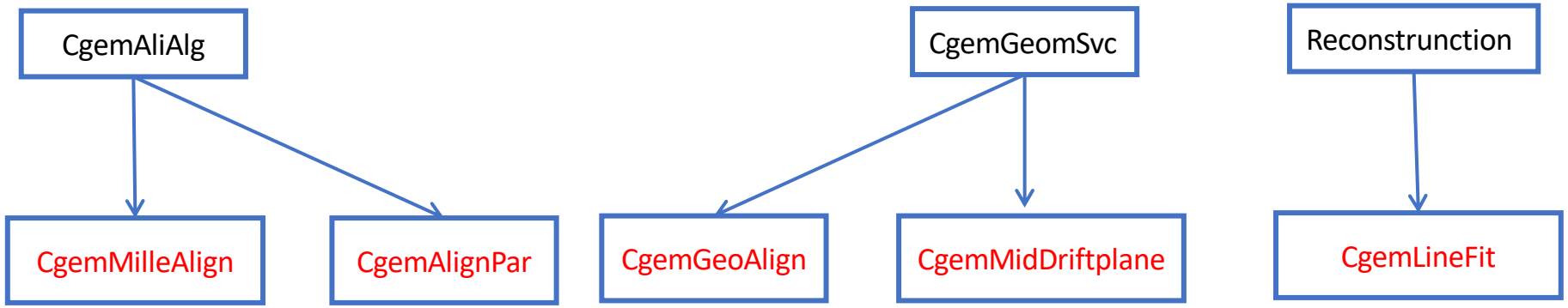
Algorithm modification

- We need re-define the layer index
  - From geometry layer → virtual layer



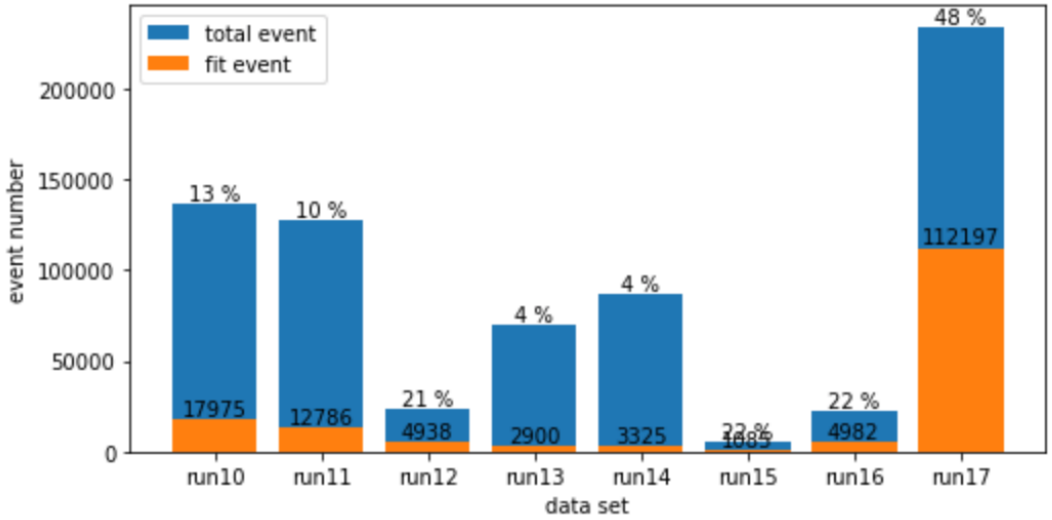


  - Only change the packages related to the alignment algorithm

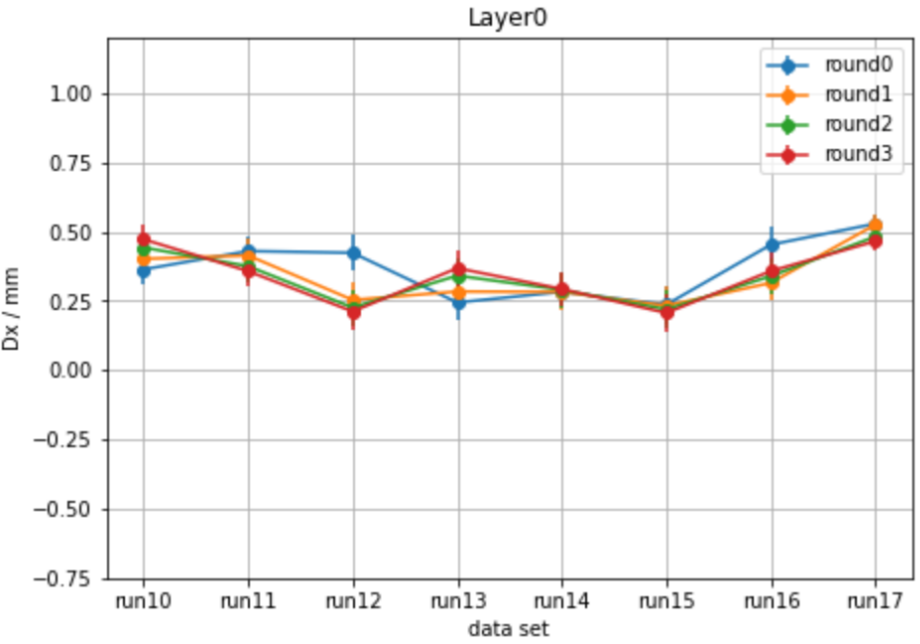


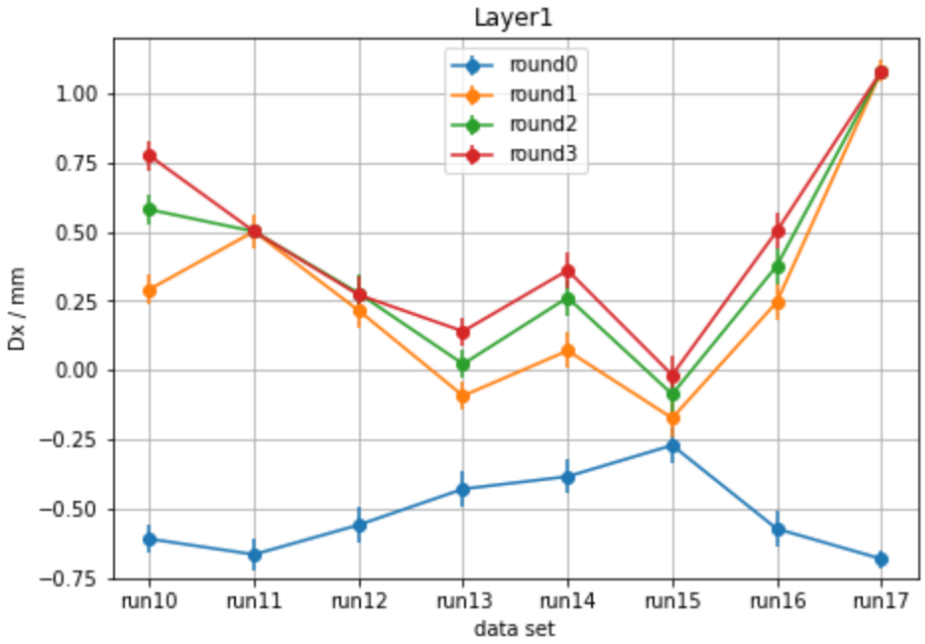
Data set and configuration

- Run over run10 – run17
  - CgemLineFit: Loop_maxQ, 3 clusters on each sheet
  - Chisq cut: <300 (wo alignment) <100 (w alignment)
  - Check the alignment parameter vs data sets
- Alignment procedure
  - Alignment parameters are obtained by iteration. The fit results from 1st round is used as the input for 2nd round fit
  - Initial parameters: Dx = 0, Dz = 0, θz = 0
  - Iterate the procedure until parameters are converged



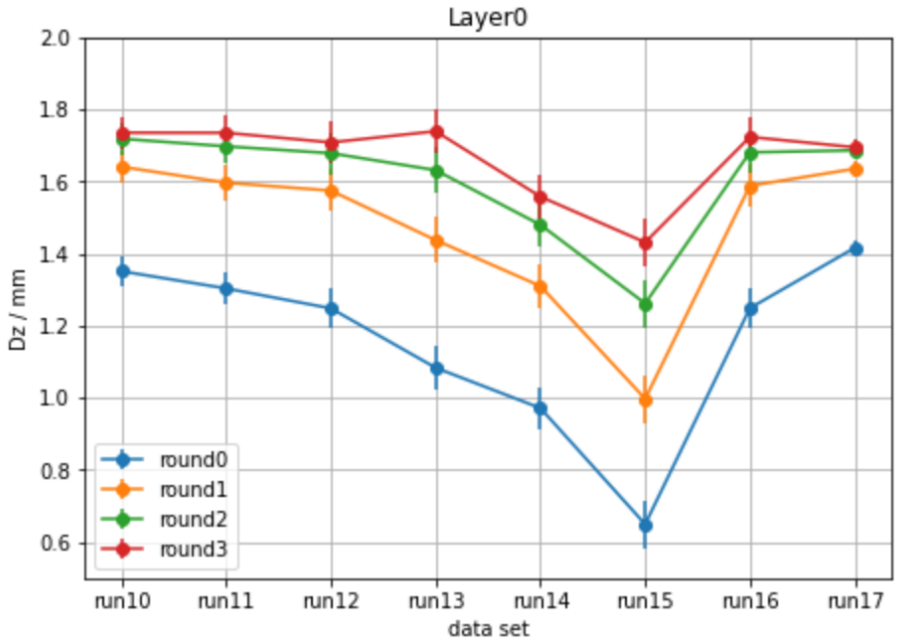
Alignment parameters vs run: Dx

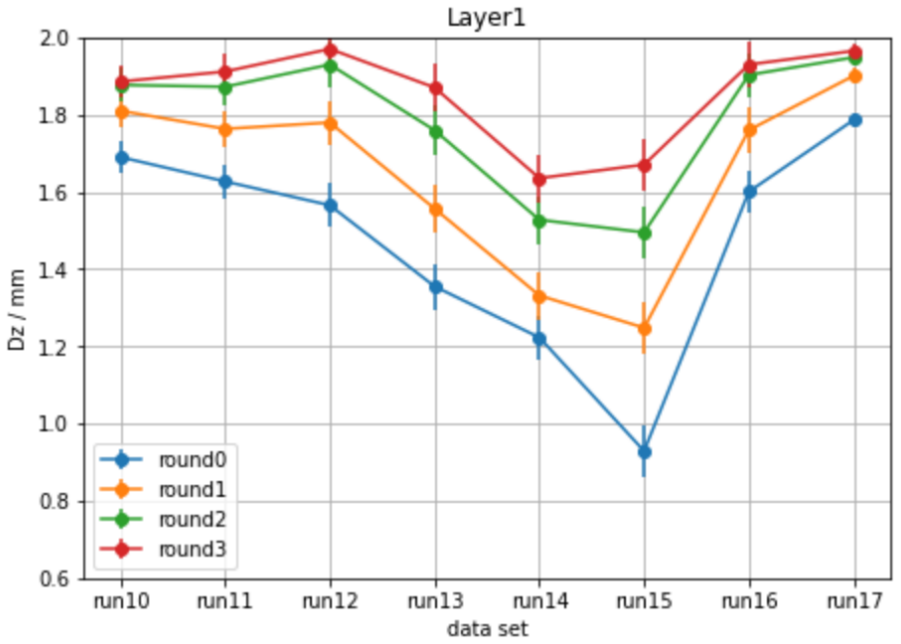




- Discrepancy of Dx between 2 layers obtained from Run 17 is significant
- Discrepancy of Dx between Run 17 and other data set is also large
- The Dxs from the data-sets except run 17 are roughly consistent

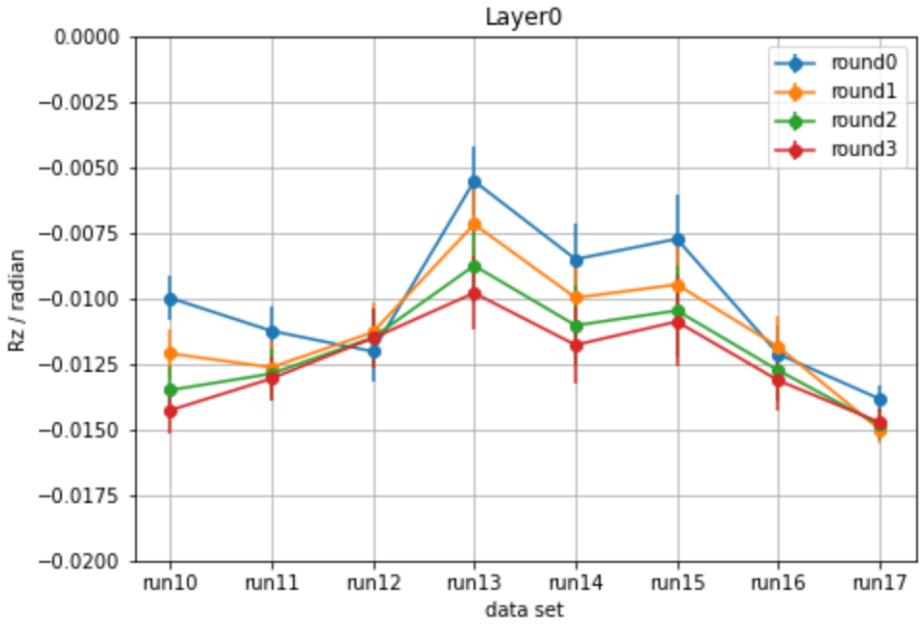
Alignment parameters vs run: Dz

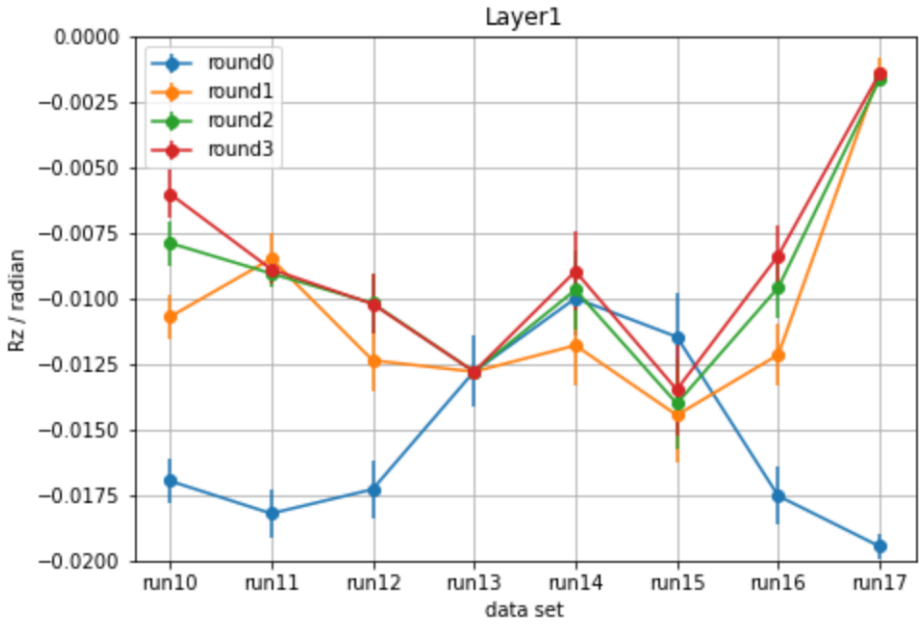




- Discrepancy of Dz between 2 layer from all data sets are clear
- Consistent with Lia's study
- The Dzs from the data-sets are roughly consistent

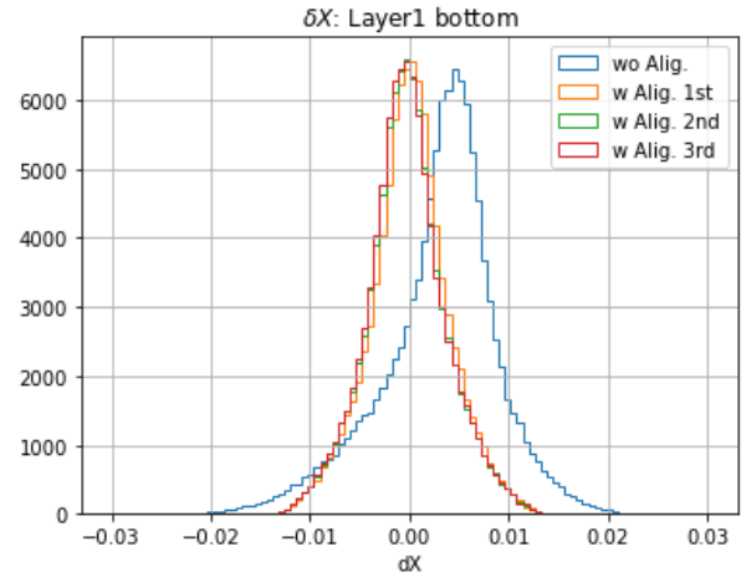
Alignment parameters vs run: Rz

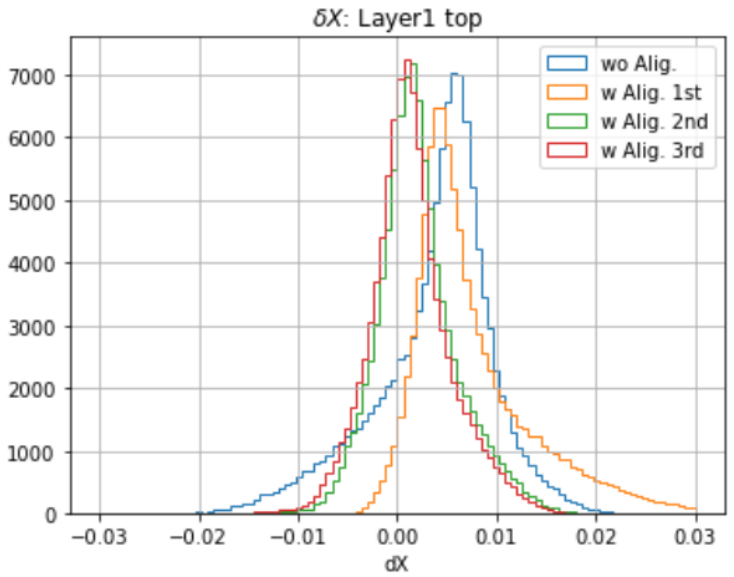


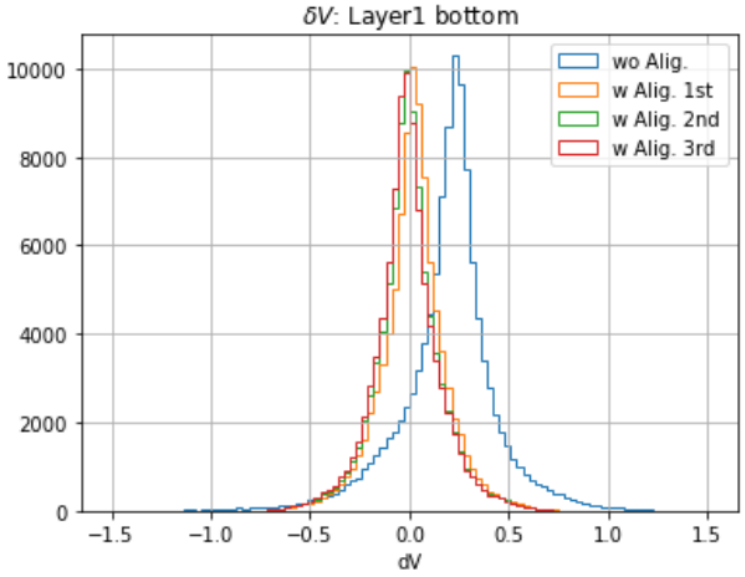


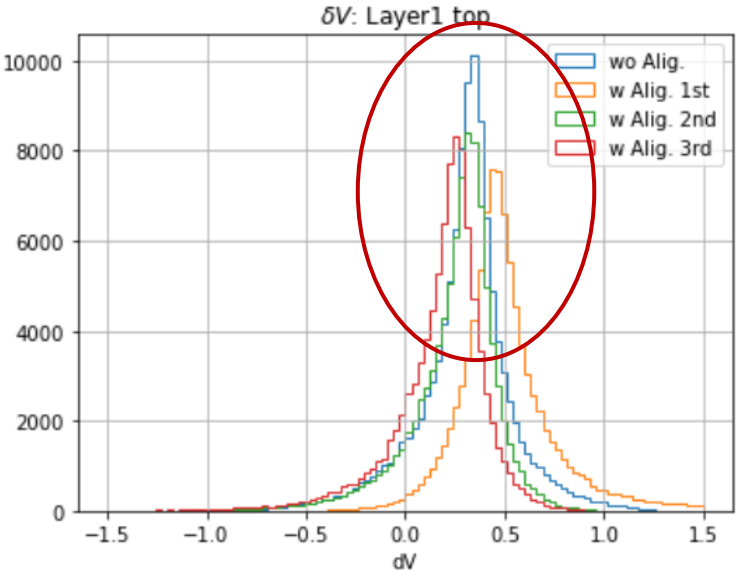
- Discrepancy of Rz between 2 layer from Run 17 is significant
- Discrepancy of Rz between Run 17 and other data set is also large
- The Rzs from the data-sets except run 17 are roughly consistent

Residual distributions (run17)









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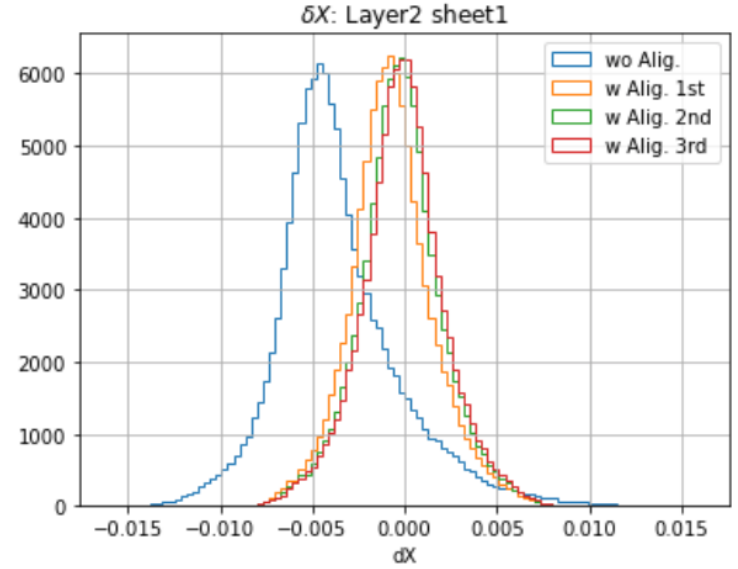
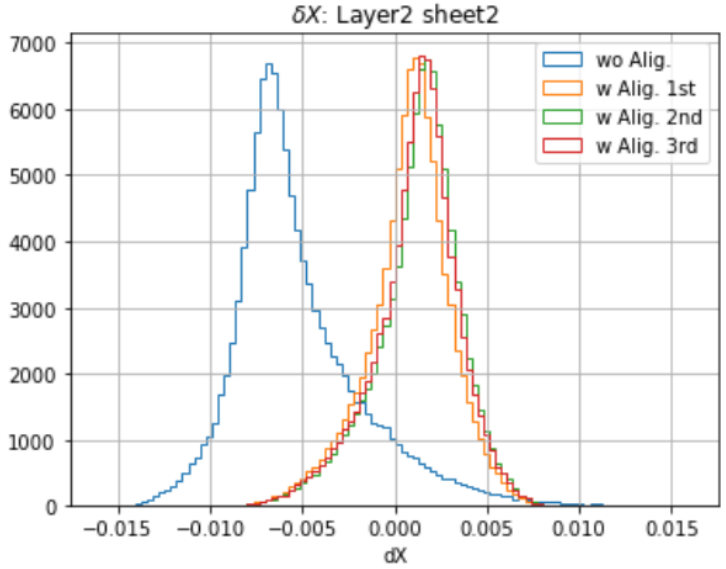
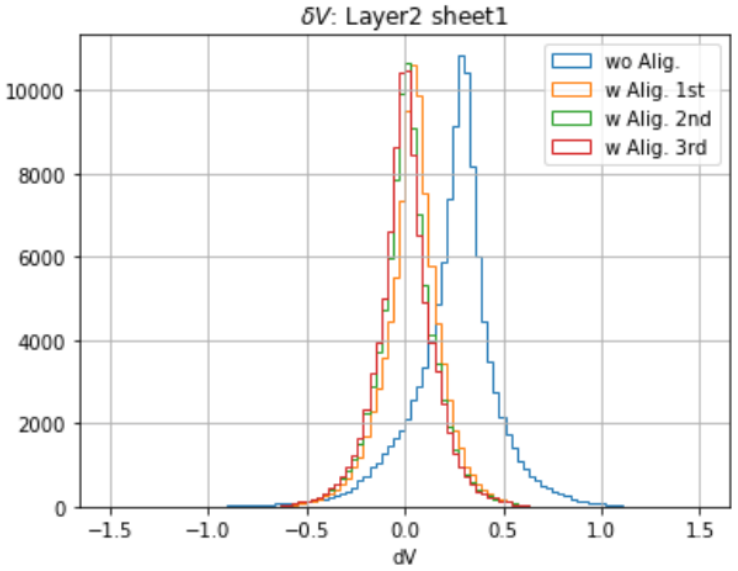
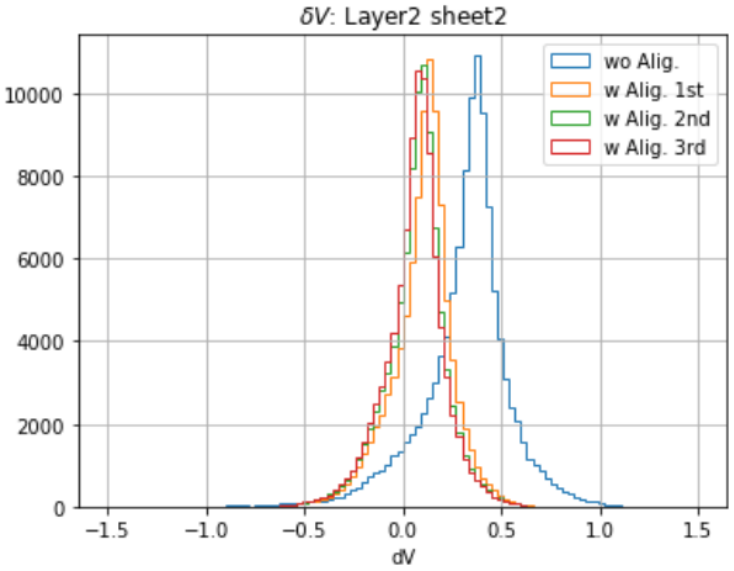
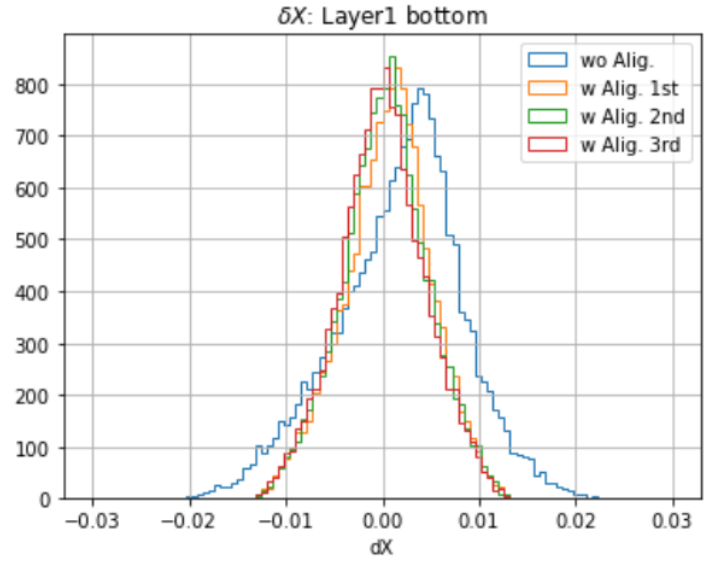


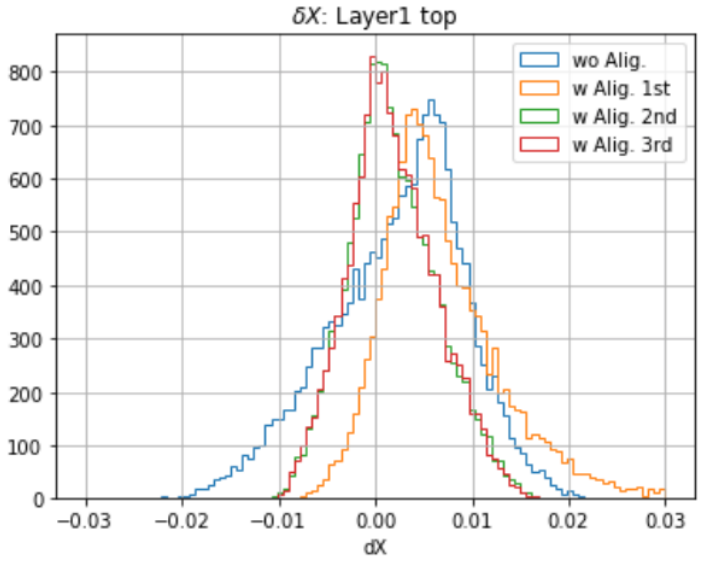


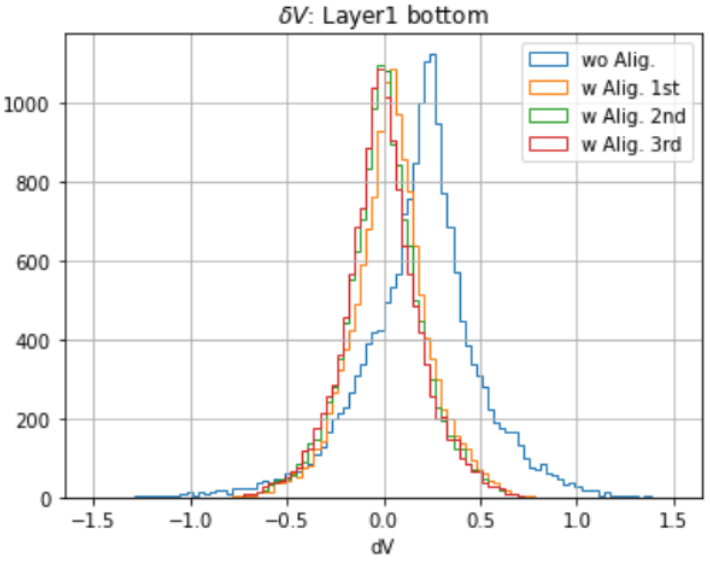


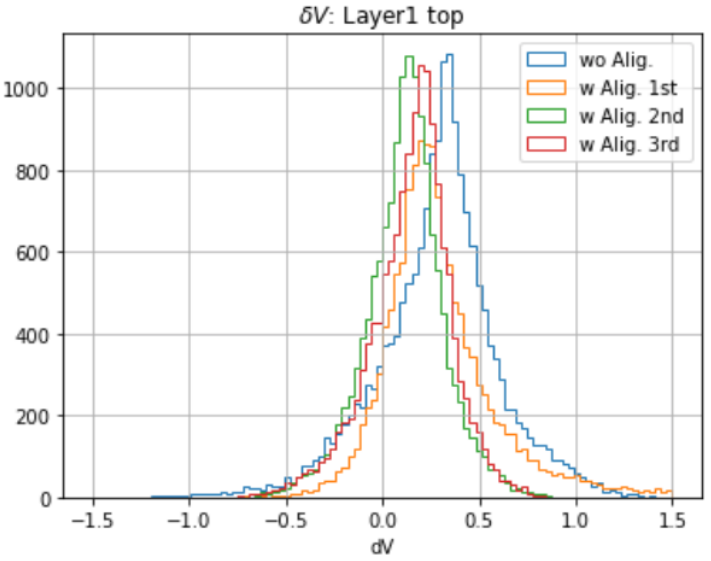


Residual distributions (run10)









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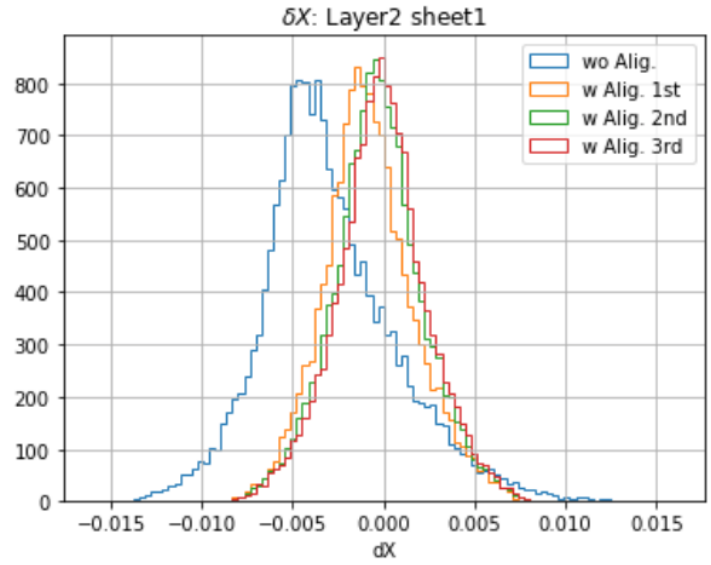
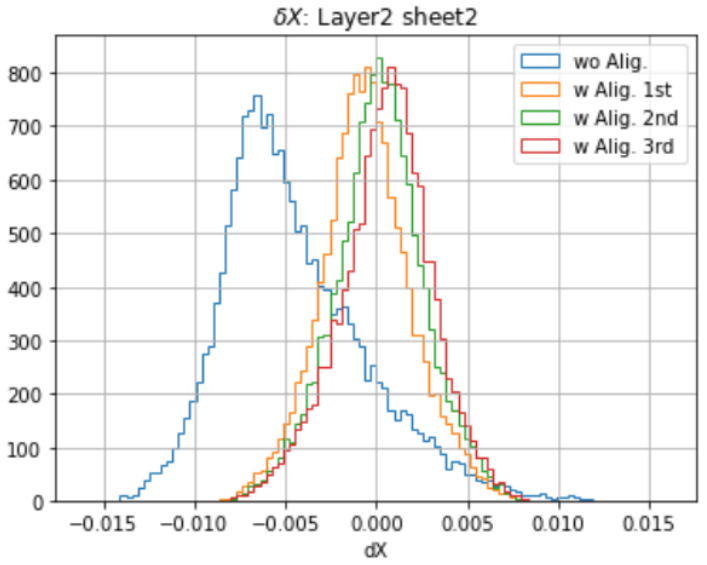
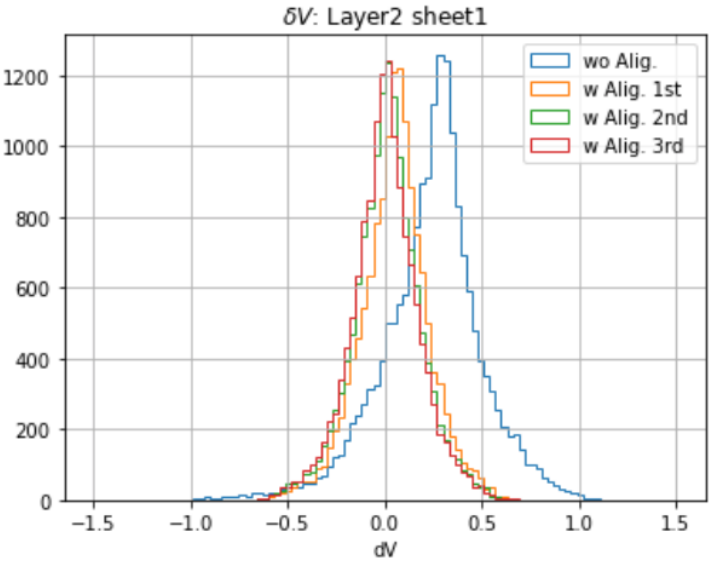
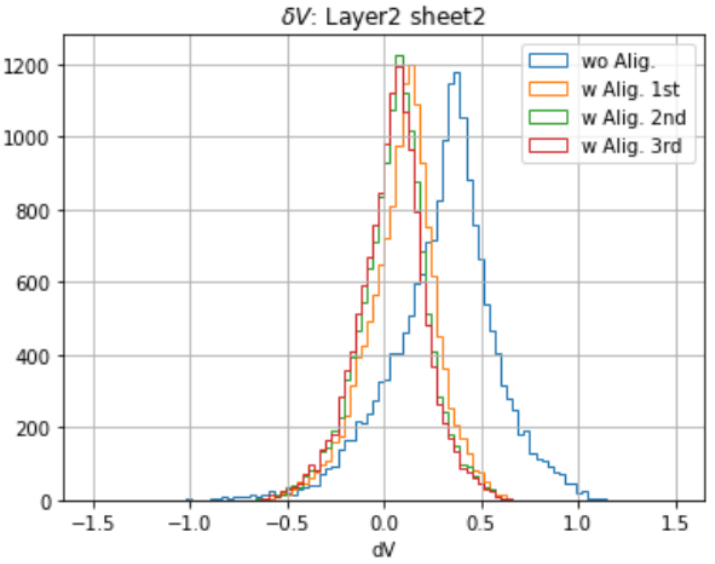


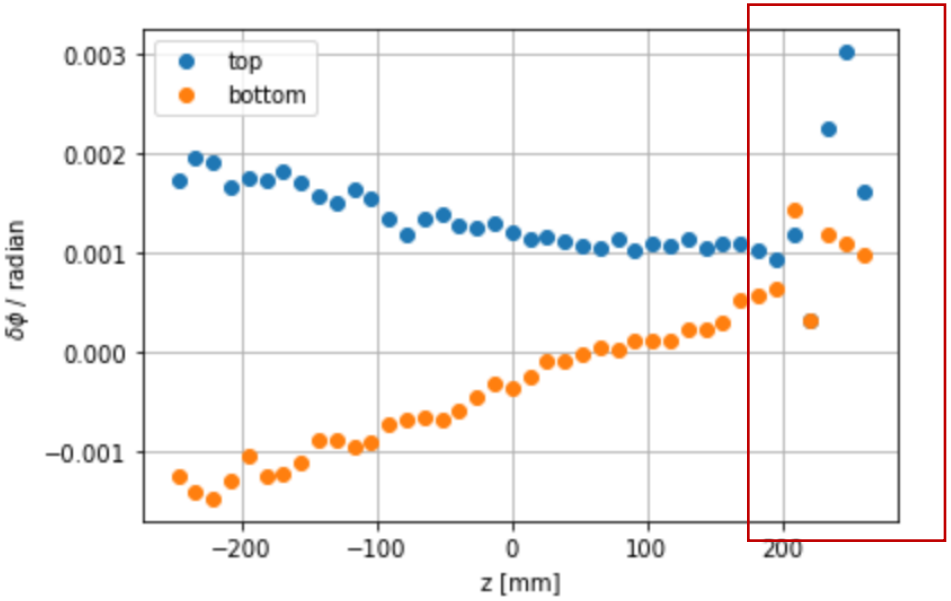


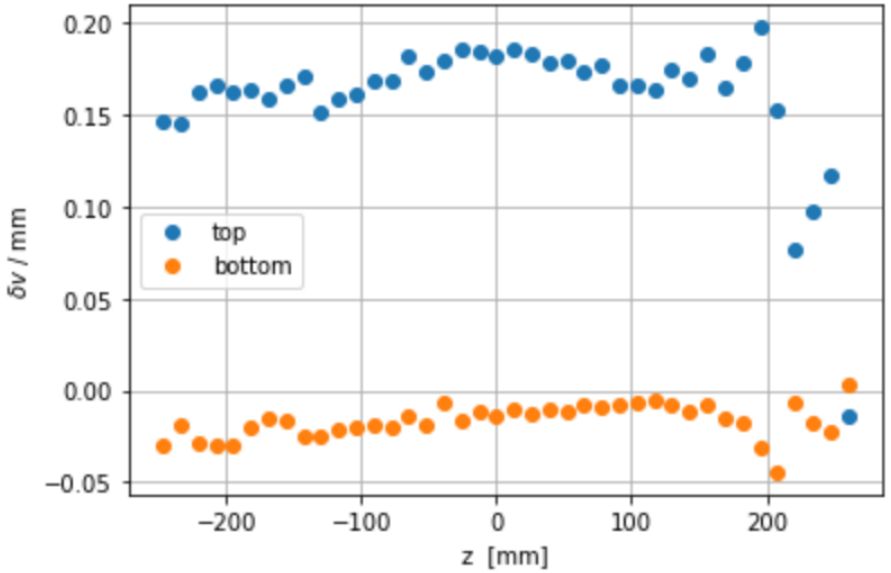




Residual vs Z （run17）

Due to low statistics





Summary

- More alignment parameters are introduced in the new Cgem alignment algorithm
- Clear different mis-alignment affect on 2 sheet is observed from data
- The residual distributions are investigated. In some case, a large shift to 0 is observed from run17
- Further study is necessary to understand the issue.

Thank you!