Update on Pixel Module Alignment with Overlaps

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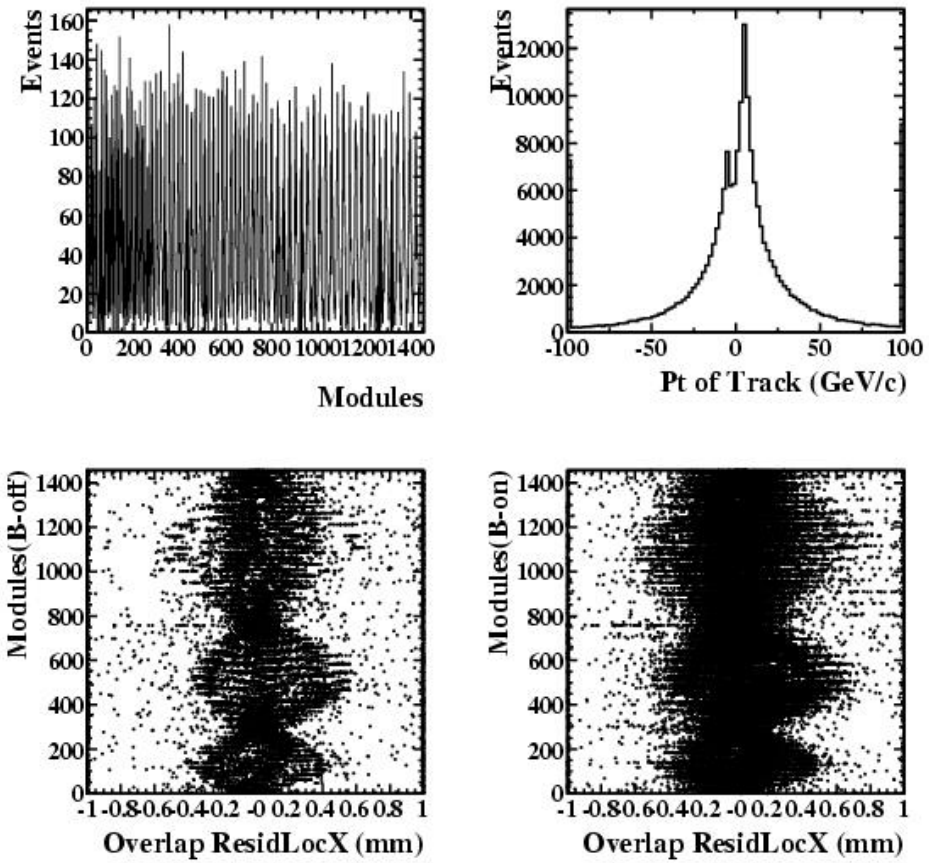
- Adding cosmic with bfield on
- Residual comparisons
- Next Steps

Prior presentation:at http://indico.cern.ch/materialDisplay.py?contribId=1&materialId=slides&confId=43984

Adding Cosmics with Bfield-on

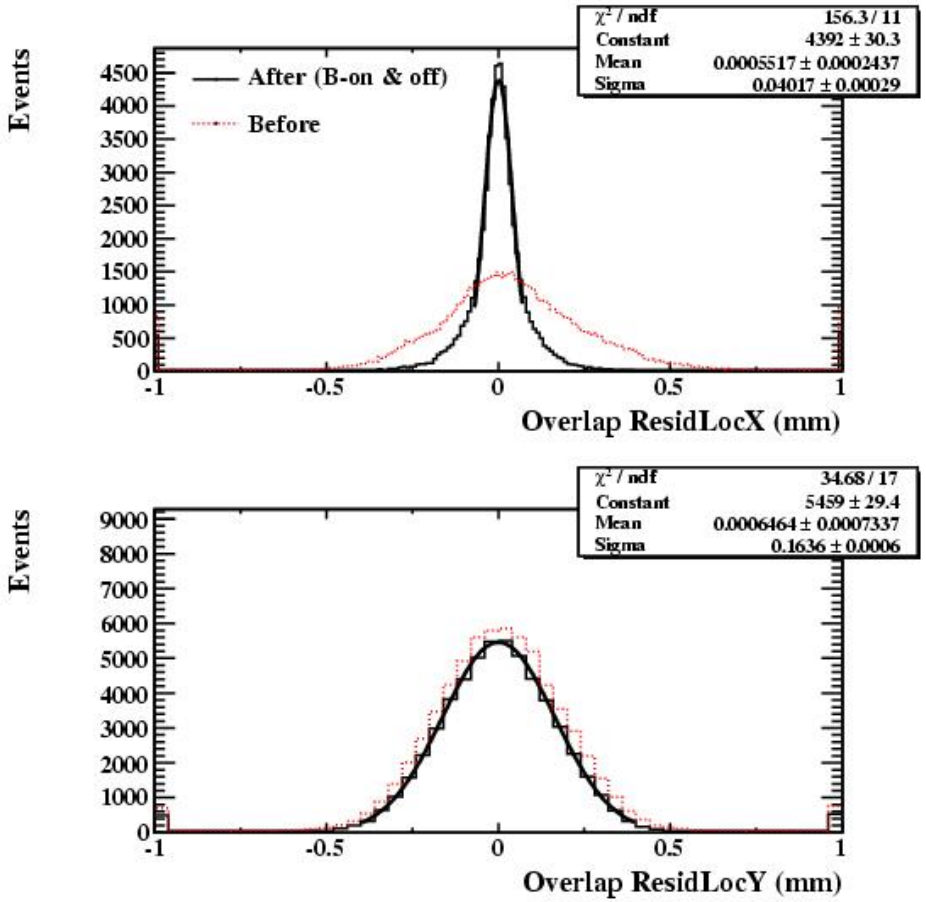
- To gain the statistics, we have included the overlaps using the cosmics with bfield on data
- Default cosmic tracking with Pixel geometry Survey + GX2L1L2.
- bfield on: 192K events in runs 90731-92082
- Selections:
  - $P_T > 2$ GeV/c
  - Remove duplicated events
  - Correcting Lorentz angle shift -30 μm at the ntuple level
  - Constrains with the curvature and direction of the reconstructed track.
- Tried to minimize the residuals with 3 or 6 degrees of freedom per module that give similar results. So, we ignore the rotations for now.

Overlap Residuals in Pixel Barrel



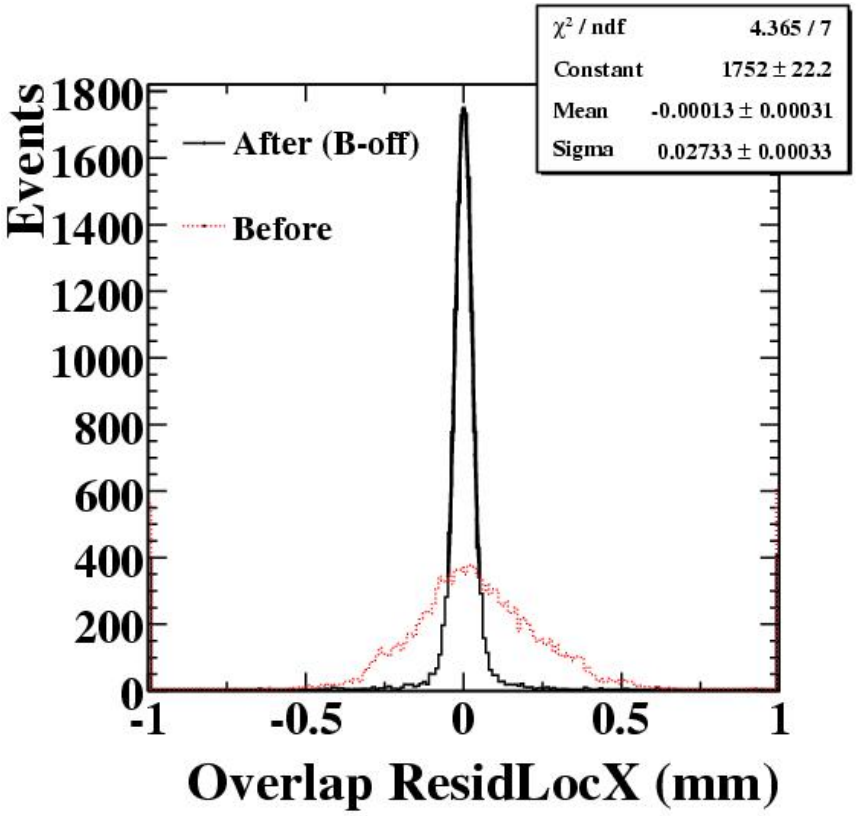
- The bowing of module is evident in both bfield on and off cosmics data.

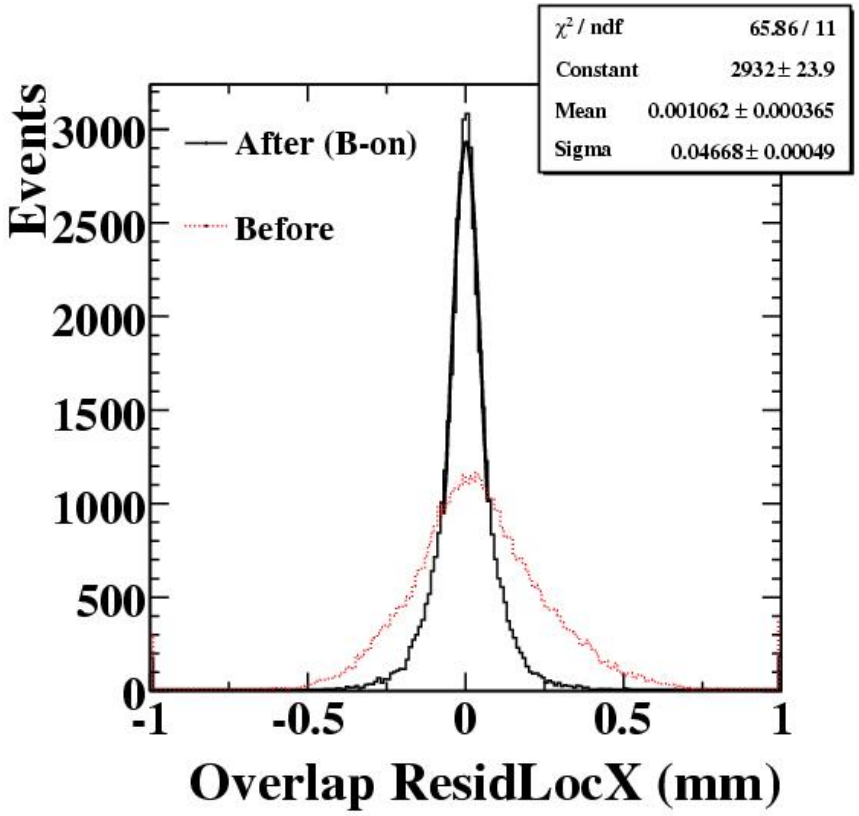
Overlap Residuals After Corrections



- After correction, the sigmas of residual in locx and locy are 40 μm and 164 μm, respectively.

Residuals in LocX with bfield or not





- The overlap residual is much better with no bfield cosmic with a resolution of 19 μm.
- The cosmic with bfield is less precise to point, but are still useful.

Next Steps

- The technique is promising to achieve the relative module alignment below 20 μm.
- It would be great to take more cosmic with no bfiled if possible.
- The next step is trying to constrain the neighboring modules with these relative alignment and stitch the rest of modules together.
- There may not enough cosmics to cover whole barrel, but obtaining alignment for most barrel modules would be possible for the first collision data.