

Playing with CRAFT MC

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Tracks and Cuts

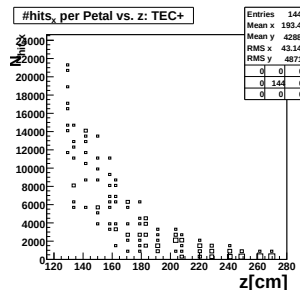
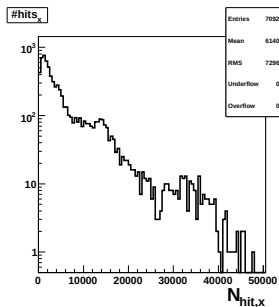
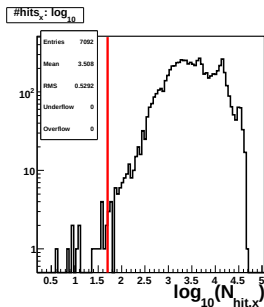
- TkAlCosmicsCosmicTF
 - Cuts before (single) refit...
 - $p > 5 \text{ GeV}$
 - $N(\text{hit}) \geq 15$
 - $N(\text{hit}_{2D}) \geq 3$
 - $N(\text{hit}_{MP}) \geq 10$
 - $\chi^2/\text{ndof} > 30$.
- ⇒ $2.9 \cdot 10^6$ tracks in pede.

Millepede

```
alignParams = cms.vstring(  
    'TOBDetsLayers12,rrr00r',  
    'TOBDetsLayers36,r0r00r',  
    'TIBDetsLayers12,111111',  
    'TIBDetsLayers34,101111',  
    'TrackerTPEBlade,111000',  
    'TrackerTPBLadder,111001',  
    'TrackerTECPetal,111000',  
    'TIDDets,101001,endCapSS',  
    'TIDDets,111001,endCapDS'  
)
```

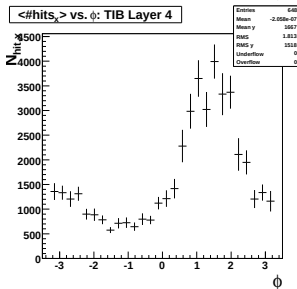
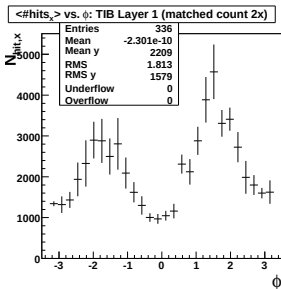
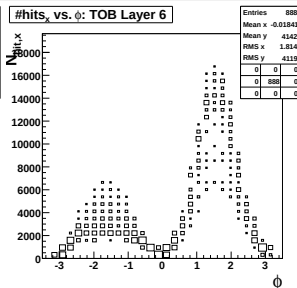
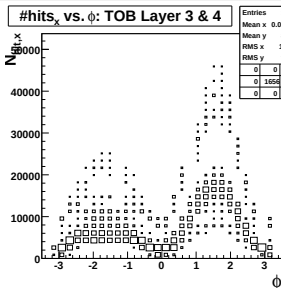
- Custom misalignment of these dof (not TOB).
- Need pede_4GB_64 executable.

Statistics per Alignable

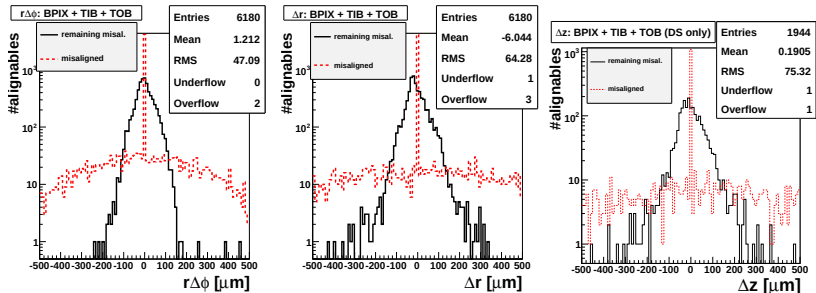


- 4 TIB Dets < 50 hits.
- 14 TEC Petals < 50 hits.
- TEC with large |z| generally low stats, otherwise move to Dets?
Allow shorter tracks in TEC?
- BPIX ladders have generally > 500 hits, except at $\phi = \pm\pi/2$,
 $\Rightarrow$ going to Dets probably possible?
- FPIX Blades with 250 – 800 hits, move to panels?

More Hit Statistics

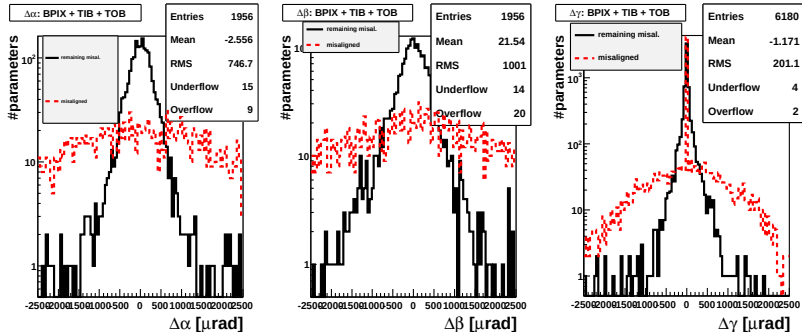


Alignment Results in Barrel: Movements



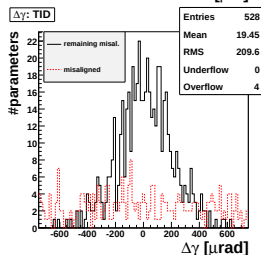
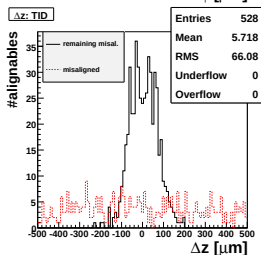
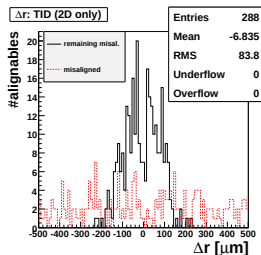
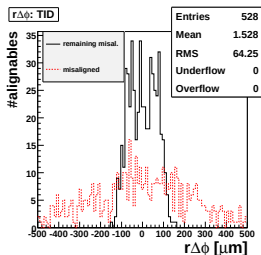
- few outliers
- RMS $50 \mu\text{m}$

Alignment Results in Barrel: Rotations



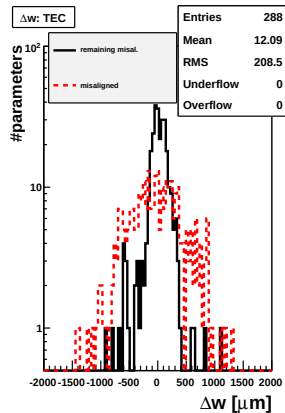
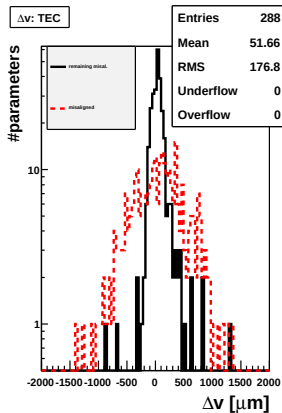
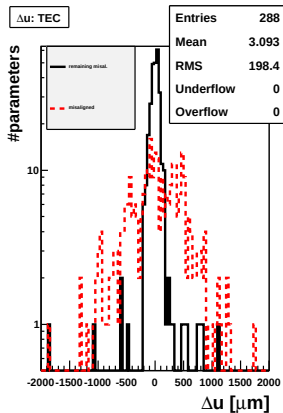
- γ outliers up to 5 mrad (TIB 3+4)
- α, β
 - only in TIB
 - core RMS up to 1 mrad
 - outliers up to 20 mrad (above 5 only TIB 3+4)

Alignment Results in TID

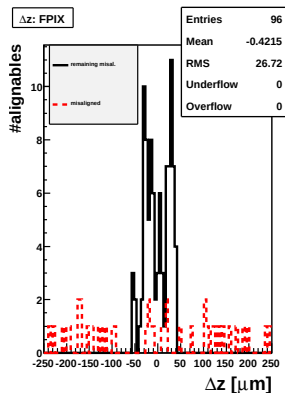
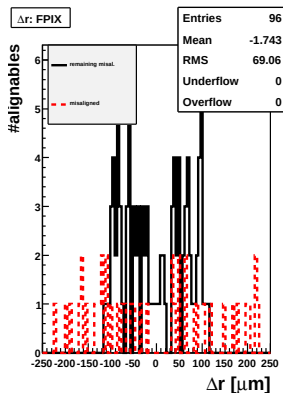
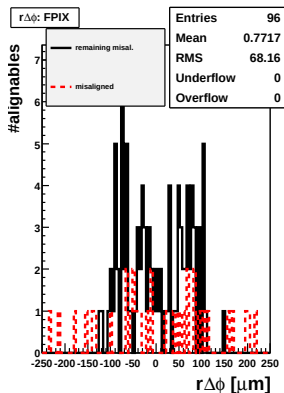


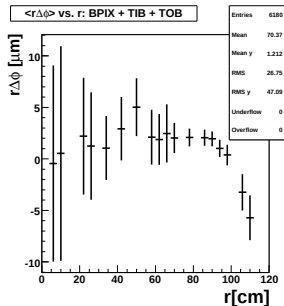
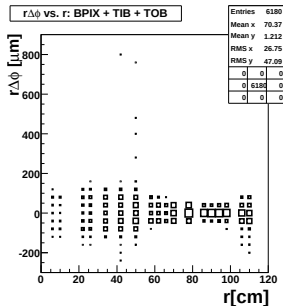
• γ outliers below 1 mrad

Alignment Results in TEC

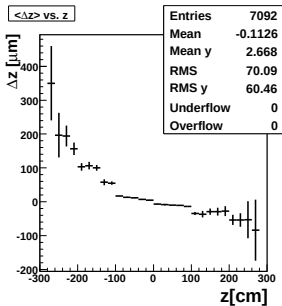
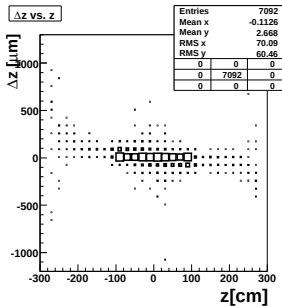


Alignment Results in FPIX

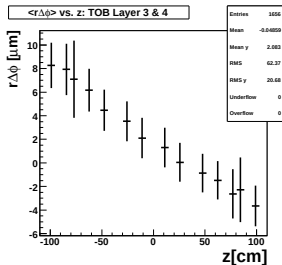
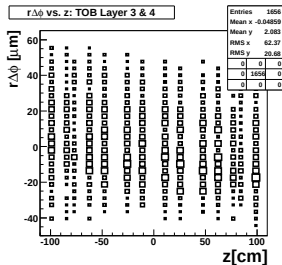




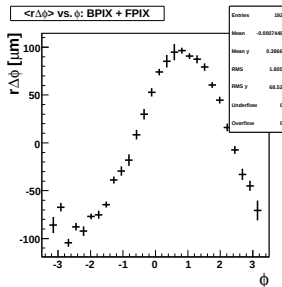
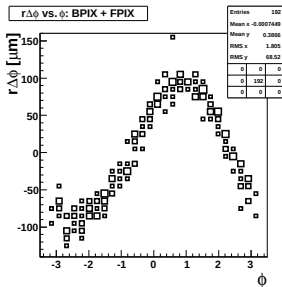
- Here show Barrel only
- outliers TIB layer 4
- TOB layer 6?
($y < 0$,
 $\phi \approx 0, \pi$)



- shown are all alignables, even those with no (mis-)alignment in z
- see a bit shrinkage

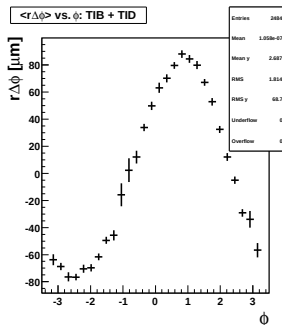
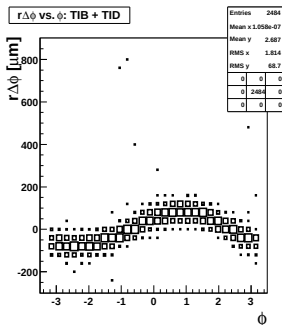


- TOB layers 3&4: see little twist



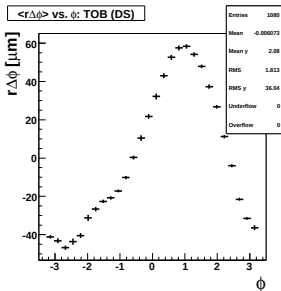
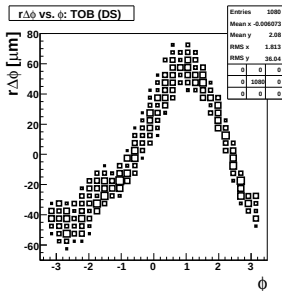
Pixel

- shift by $-70 \mu\text{m}$ in x
- shift by $65 \mu\text{m}$ in y



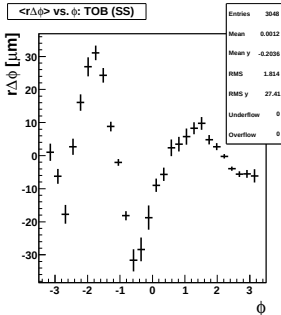
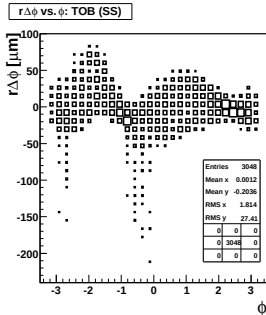
TIB + TID

- similar



TOB DS

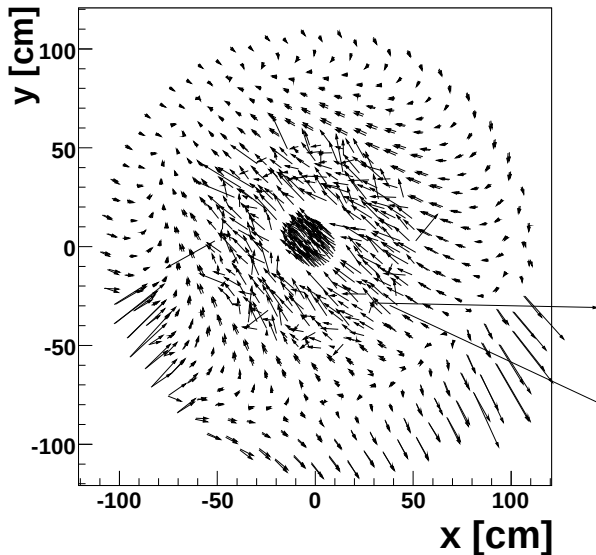
- overlay shift with sign ?



TOB SS

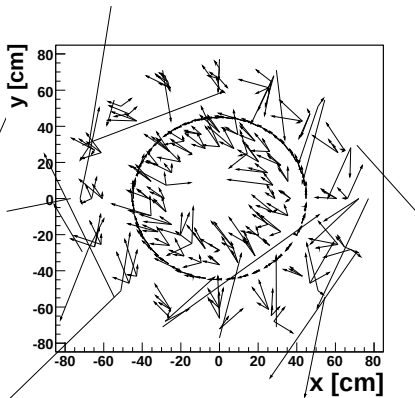
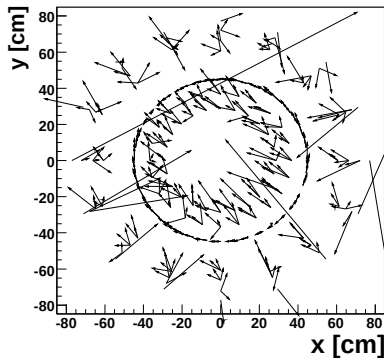
- getting strange...
- outliers below $-50 \mu\text{m}$ all layer 6 (but all > 350 hits!)

Arrow Plot Central Barrel



- $-10 < z < 10$ cm
- scale for mispositioning: 1000
- coherent, weak movement clearly visible

Arrow Plot TID/TEC



- TEC petals at large radii
- TID Dets elsewhere
- plus on left, minus on right
- scale for mispositioning: 1000

Seen

- Low statistics in (outer) TEC petals.
- Can align, but there are pathological outliers!
- Systematics:
 - z-shrinkage,
 - sign waves in $r\phi$ vs ϕ , relative xy-shifts
 - little twist

Ideas

- misalign TOB
- some areas with smaller structures (i.e. more dof)
- use tracks twice/three times to increase power at $y < 0$)
- combined trajectory to increase power at lower half
- Merge with cruzet MC