Playing with CRAFT MC

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Settings

Tracks and Cuts

- TkAlCosmicsCosmicTF
- Cuts before (single) refit…
- $p > 5$ GeV
- $N(hit) \geq 15$
- $N(hit_{2D}) \geq 3$
- $N(hit_{MP}) \geq 10$
- $\chi^2/ndof > 30.$

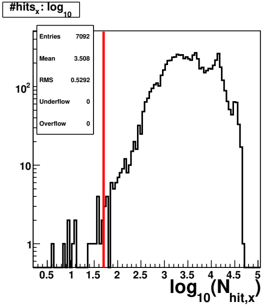
$\Rightarrow$ $2.9 \cdot 10^6$ tracks in pede.

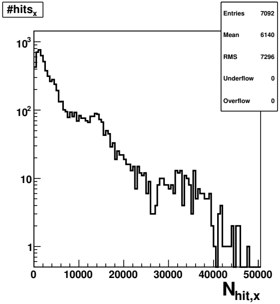
Millepede

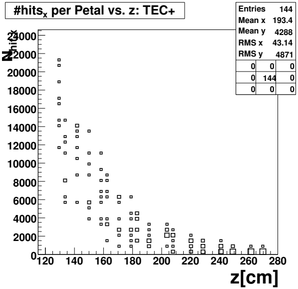
```
alignParams = cms.vstring(
   'TOBDetsLayers12,rrr00r',
   'TOBDetsLayers36,r0r00r',
   'TIBDetsLayers12,111111',
   'TIBDetsLayers34,101111',
   'TrackerTPEBlade,111000',
   'TrackerTPBLadder,111001',
   'TrackerTECPetal,111000',
   'TIDDets,101001,endCapSS',
   'TIDDets,111001,endCapDS'
      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

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

Statistics per Alignable

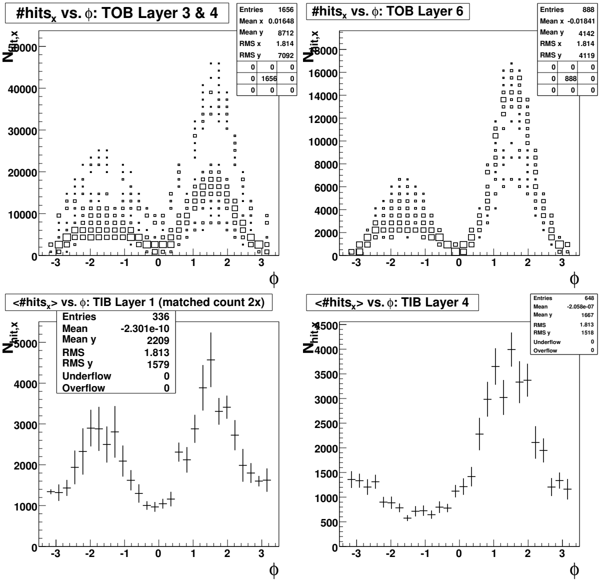




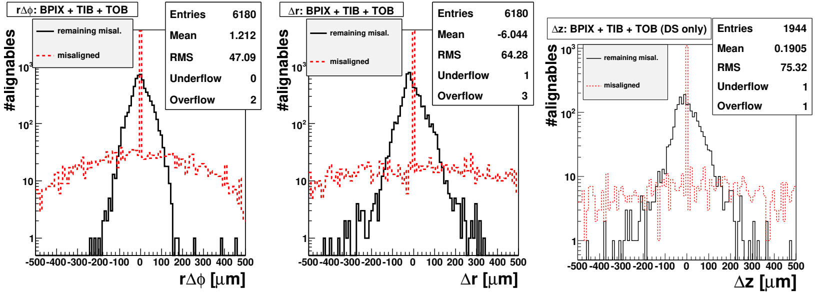


- 4 TIB Dets $<$ 50 hits.
- 14 TEC Petals $<$ 50 hits.
- TEC with large $|z|$ generally low stats, otherwise move to Dets? Allow shorter tracks in TEC?
- BPIX ladders have generally > 500 hits, except at $\phi = \pm\pi/2$, $\Rightarrow$ going to Dets probably possible?
- FPIX Blades with $250 - 800$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

More Hit Statistics

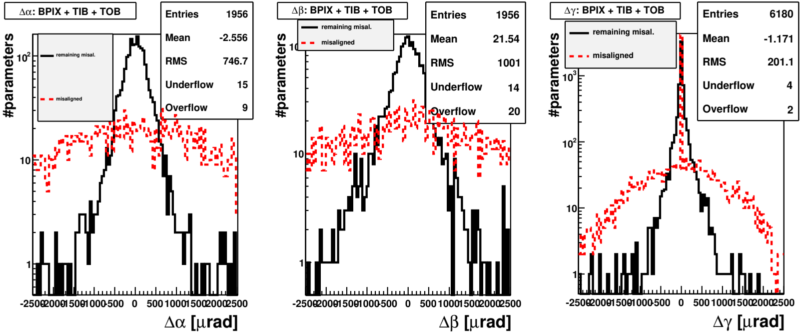


Alignment Results in Barrel: Movements



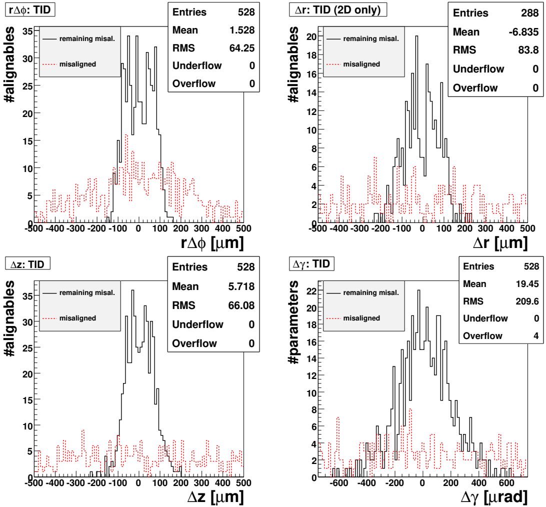
- few outliers
- RMS 50 μm

Alignment Results in Barrel: Rotations



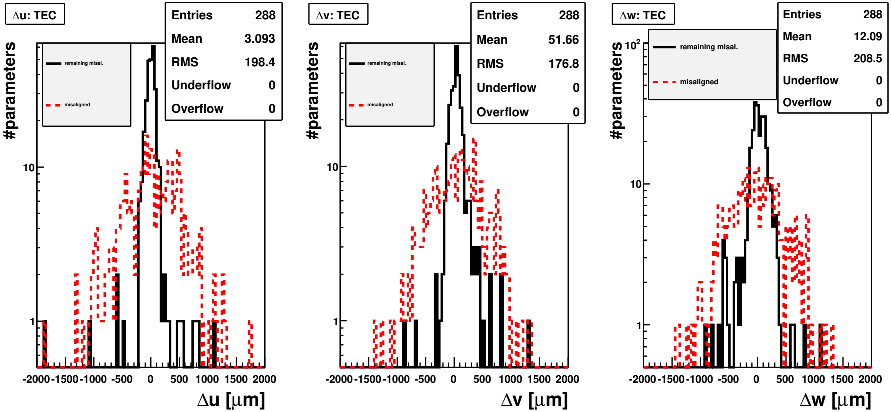
- γ outliers up to 5 mrad (TIB 3+4)
- α, β
  - only in TIB
  - core RMS up to 1 mrad
  - outliers up to 20 mrad (above 5 only TIB 3+4)

Alignment Results in TID

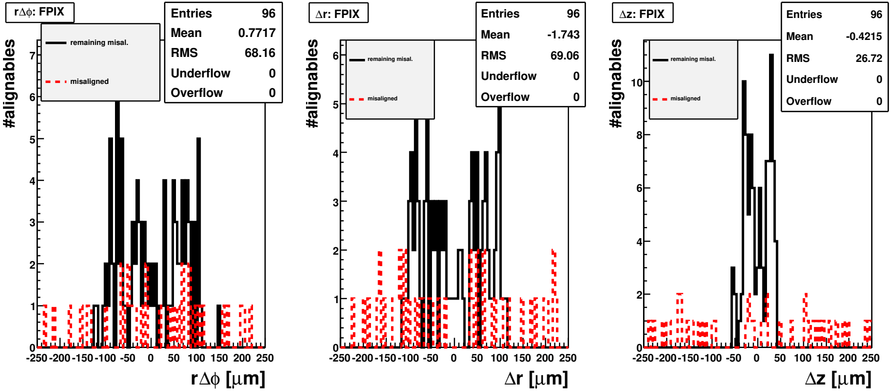


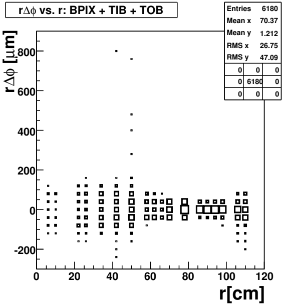
- γ outliers below 1 mrad

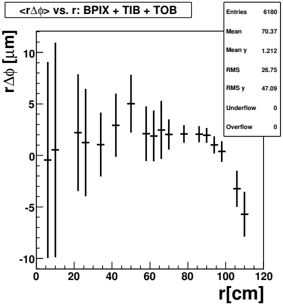
Alignment Results in TEC



Alignment Results in FPIX

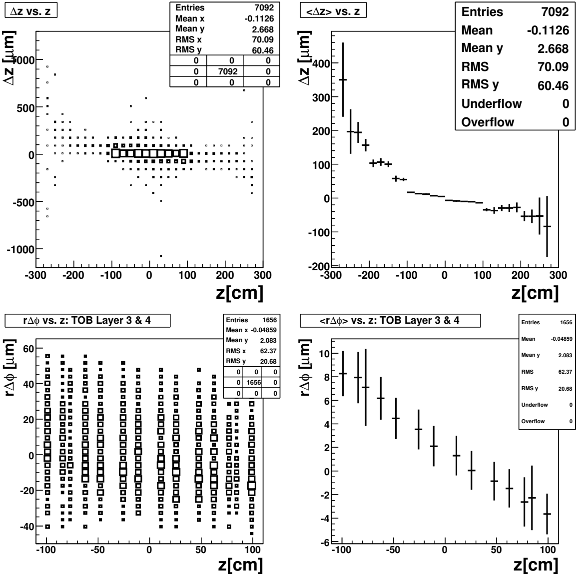






- Here show Barrel only
- outliers TIB layer 4
- TOB layer 6? ($y < 0$, $\phi \approx 0, \pi$)

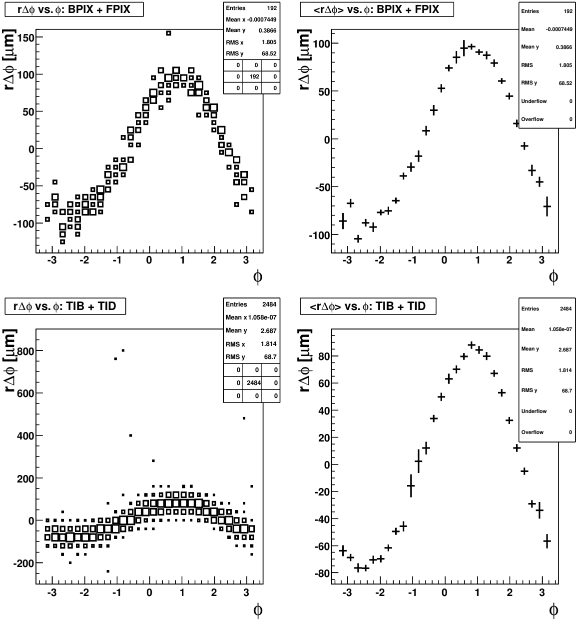
Vs Z



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

- TOB layers 3&4: see little twist

Vs ϕ



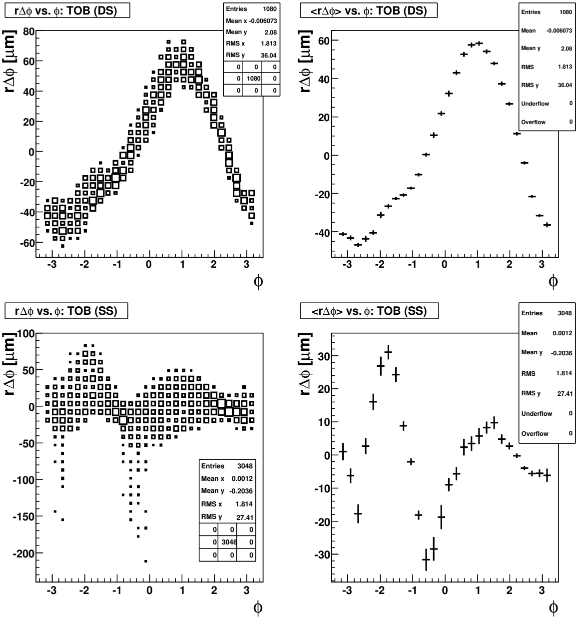
Pixel

- shift by -70 μm in x
- shift by 65 μm in y

TIB + TID

- similar

Vs ϕ



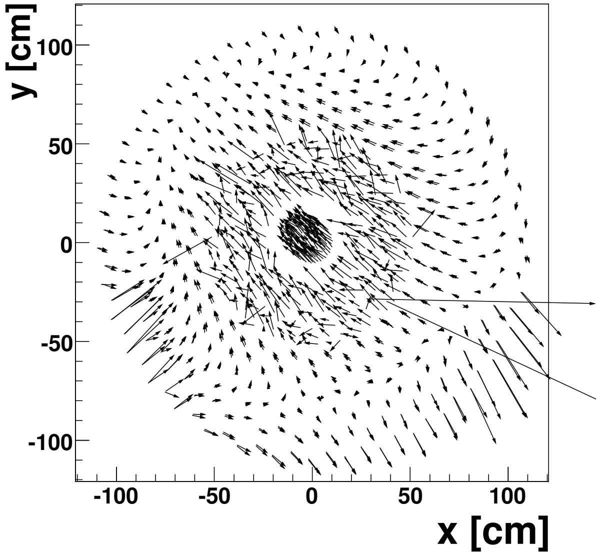
TOB DS

- overlay shift with sign ?

TOB SS

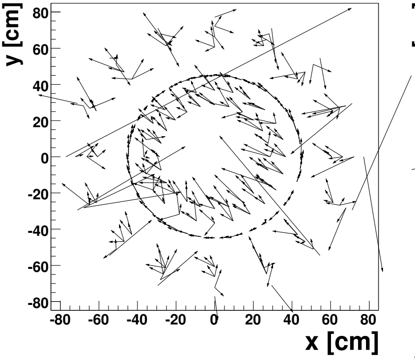
- getting strange…
- outliers below $-50\ \mu$m all layer 6 (but all > 350 hits!)

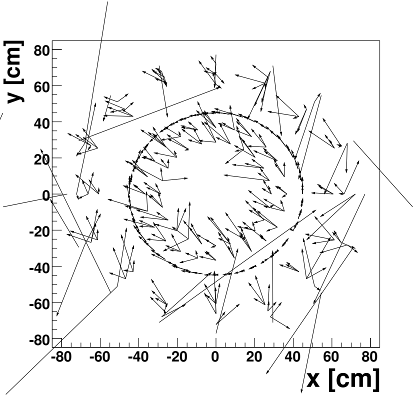
Arrow Plot Central Barrel



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

Arrow Plot TID/TEC





- TEC petals at laregr 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 tracjectory to increase power at lower half
- Merge with cruzet MC