**STT & SMT Assembly Precision**

- Method
- Results
  - no in situ alignment
  - w/in situ alignment
- Conclusions

Stress difference between assembly precision and knowledge of assembly
Simulation Method

- Tests
  - Generate tracks with "true" (non ideal) geometry
  - Reconstruct with different(ideal) geometry
- Simple simulation
  - Correct SMT geometry (RECO)
  - Intersect helices and ladders
- STT will use alignment
  - $\phi$, every cluster ($z_L=0$)
  - $r$, avgs. in matrices (look up)

Caveat: STT group not approved this yet...
Code Sanity Checks

Look at $b(\text{reco}) - b(\text{true})$ vs. ???

Move detector in X by 30 $\mu$m

Tilt detector about X by 100 $\mu$rad
Result 1: No in situ Alignment

This relies completely on assembly precision…*

- True, non-ideal for generation
- Assume ideal geometry for reco

*This also limits uncertainty on alignment knowledge for positions
Result II: Perfect $\phi$

This relies on assembly knowledge

- True (non-ideal) for generation
- For reconstruction
  - true $\phi$ from true geometry &
  - matrices(radii) from ideal

no problems if $\delta r < 200 \, \mu m$
and tilt < 250 $\mu$rad
**φ Precision (δφ)**

- Do we really know $\delta\phi$ well enough using alignment?  
  
  - Alignment goal: Doesn’t effect hit resolution by more than 10%...
  
  - Look at (limited) effects

\[
\delta\phi^2 = \frac{1}{(1+2\left(\frac{X}{r_c}\right)^2)(1+\left(\frac{X}{r_c}\right)^2)} \cdot \frac{1}{r_c^2} \cdot \left(\delta x^2 + \left(\frac{X}{r_c}\right)^2 \delta r_c^2\right) + \delta\phi_c^2
\]

\(X = SMT\) position (local)  
\(r_c = \) Radius at ladder center  
\(\phi_c = \phi\) at ladder center

\(\delta r_c = 100 \mu m\)  
\(\delta r_c = 50 \mu m\)

- One line/layer  
  
  smaller radii, larger effect
Conclusions

- Assembly requirements interplay with alignment status

- Constraints
  - Knowledge, offsets $\perp$ beam $25 \mu m$
  - Knowledge, radial offsets: $70 \mu m$
  - Assembly tol., angles $200 \mu \text{rad}$

- Not met, require in situ alignment.
  - Time dependence?
  - Systematics in alignment (CDF)?

- Absolute tolerances only on angles