Tracking Status

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Introduction

- **Goal: Summer Conferences**
- **Data sets are still small**
- **Quick processing turn around**
- **Tracking code converging**
- **More modern releases have more functionality**

Outline

COT Tracking

- Efficient tracking
- Understanding of errors

$\Rightarrow$ Good enough for physics and silicon tracking

OI Silicon Tracking

- Efficient tracking
- Timing performance
- Understanding of errors
- Alignment

$\Rightarrow$ Good enough for physics

COT Tracking Status

Efficiency

- **Efficiency from data: W no track study**
  see talk on Friday: Doug Glenzinski
  - Search for electrons and missing energy consistent with W transverse mass
  - Efficiency $99.7 + 0.3 - 0.8$
  - Uses Silicon Standalone tracking to reject background(out of the box - no ISL/L00)

COT track parameters and errors

- **Ongoing study**
  see talks: Robyn Madrak next and Andreas Korn Friday
- **Understand the effects of energy loss and multiple scattering on the COT tracks**
- **Errors good to well within a factor of two**

COT beam constraint

- **Useful for tracking studies and analysis**
- **Resulting track momentum resolution comparable to OI tracks**

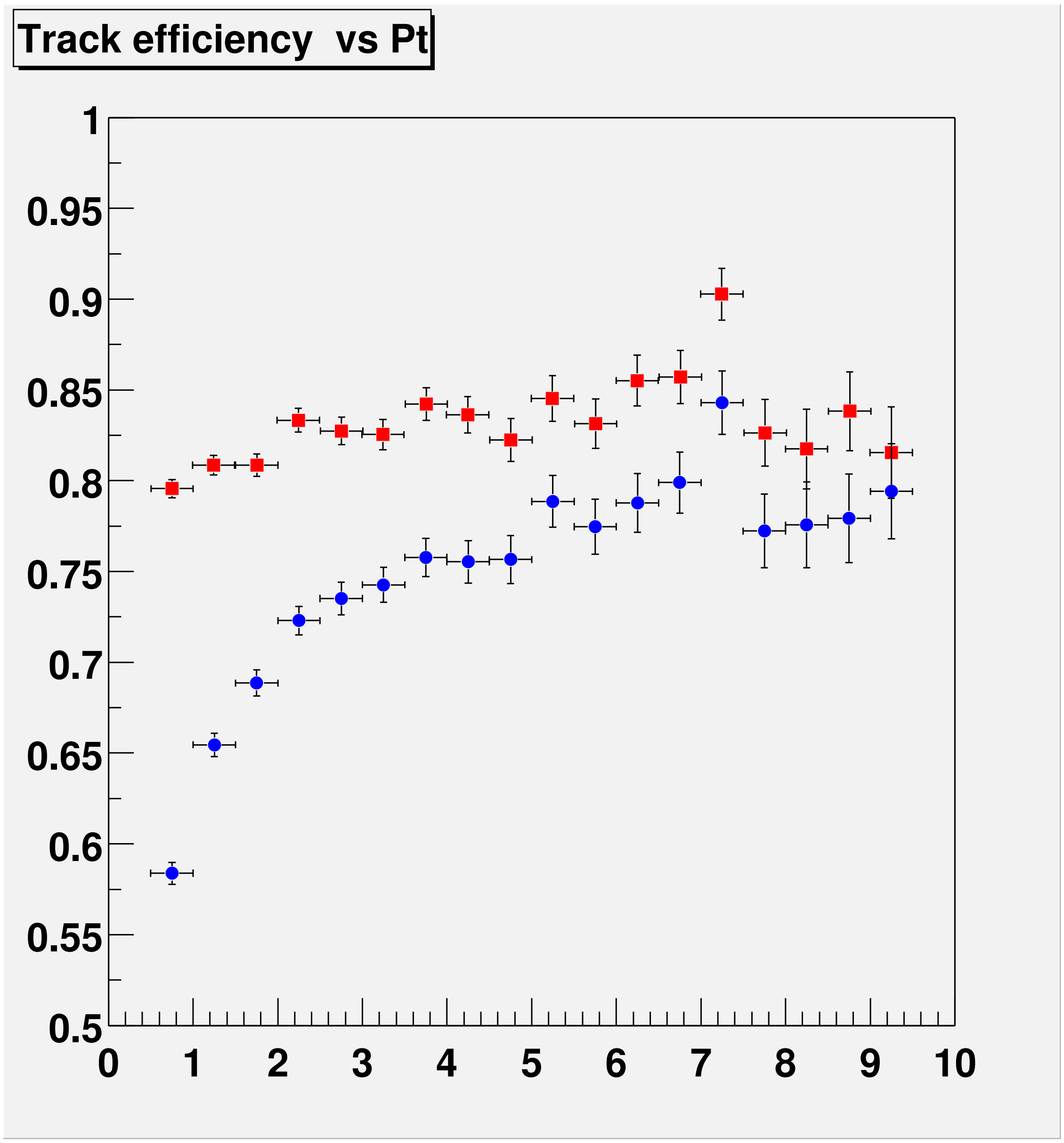
Good for physics and silicon tracking

OI Silicon Tracking Status: Efficiency

- Using the data Comparator - OI yield for good COT tracks
- Minimal ISL and no L00 are used for track finding
  - Only 5 layer SVXII
  - Must traverse from COT to outermost SVXII layer(ISL, port cards ...)
- Determine OI "efficiency" from different samples: MultiJet/JPsi
- Tracks with large negative impact parameters are considered "fakes"
  - "Efficiency" in good area of the detector: 82%
  - The "fake" rate is estimated to be 5%

OI efficiency is high for good areas of the detector

Silicon Tracking:OI



Silicon tracking status: Timing

- **OI tracking is reasonably fast**
- **700MHz Pentium III - similar to farm nodes**
  - OI tracking: 0.11 seconds in A-Stream (0.24 MJ)
  - Si clustering: 0.37 seconds in A-Stream
  - COT tracking: 0.94 seconds in A-Stream
- **Clustering/calibration performance needs improvement**
  - Working with detector group to optimize performance:
  - Optimize the use of memory in calibrations
  - Studying what calibrations are needed for L3: Most important calibration is the noise

OI tracking performance is good enough for L3: $\Rightarrow$ Global OI Tracking!

Silicon Geometry and Alignment

Geometry

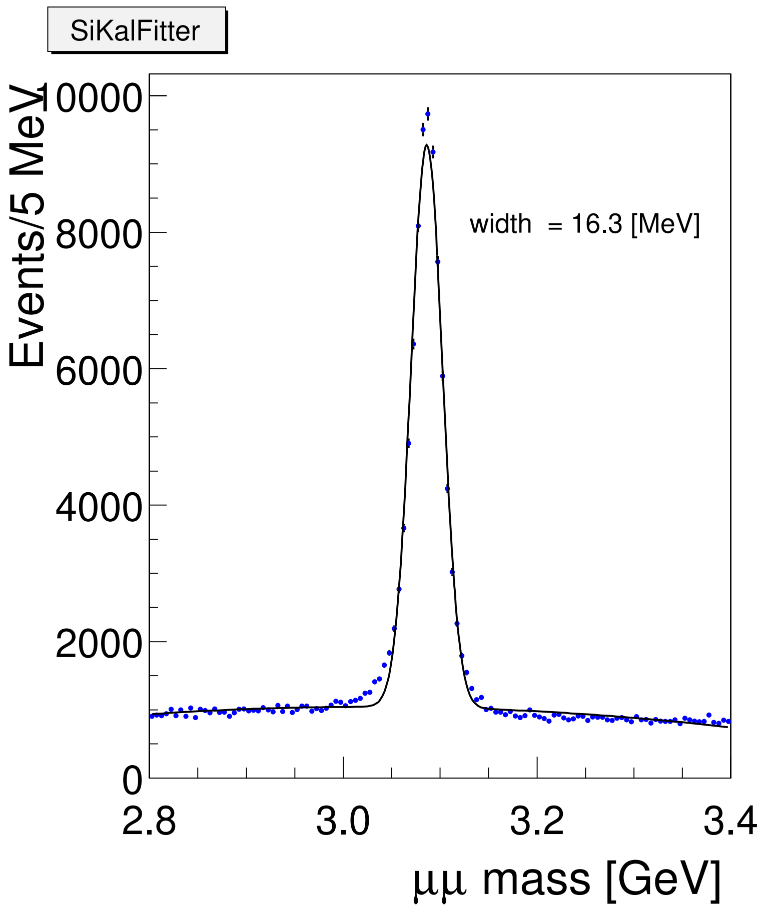
- R-phi silicon geometry understood
- Stereo geometry in progress
  - Corrected stereo geometry bugs: O(50)um remaining
  - Problems consistent with observations in alignment validation plots

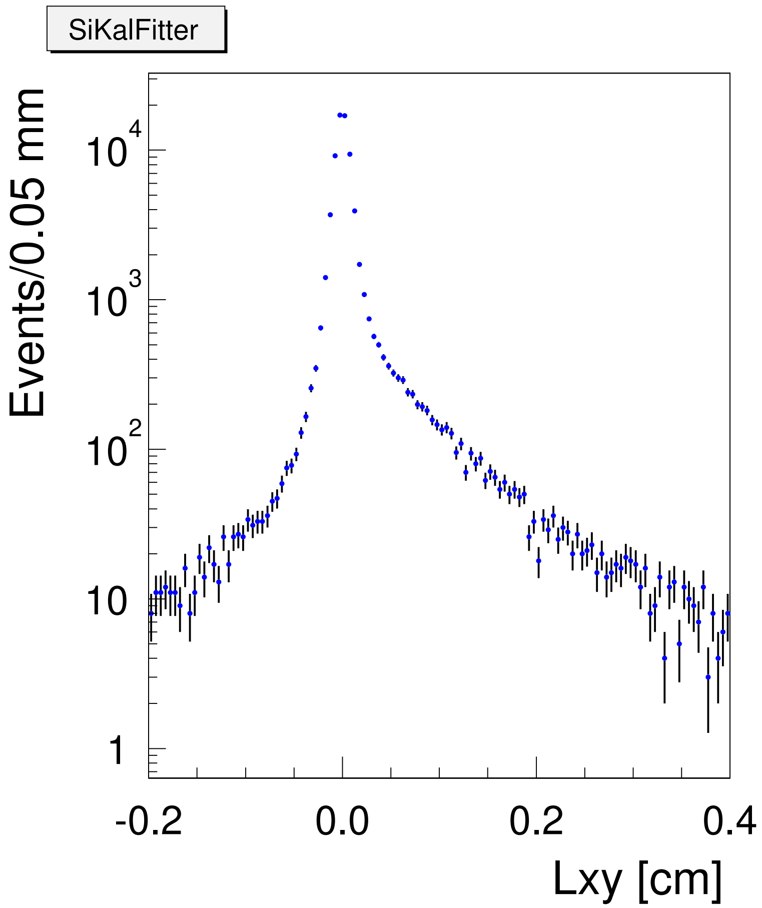
Alignment

- Alignment has become a precision tool for debugging geometry
- Looking for various problems in construction diagrams and survey data
- SVXII r-phi alignment is fairly good
  See physics talks tomorrow
  - One known problem with internal alignment
  - Systematic shift in unbiased residuals in some ladders: ± 50um problem(found using ISL study)
- Stereo alignment in progress
  - New geometry fixes may help
- First pass at ISL global alignment done

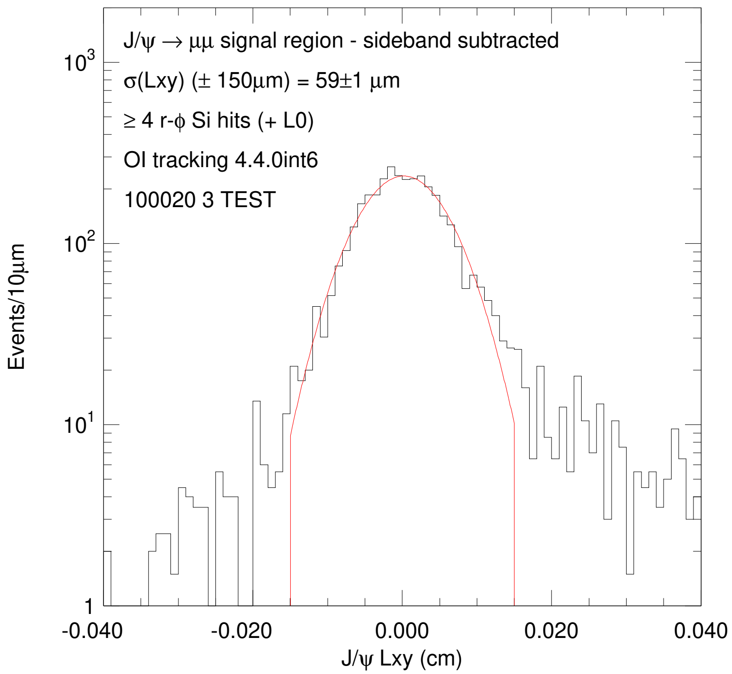
Vertexing possible in the r-phi plane

Silicon Geometry and Alignment Cont.





Silicon Geometry and Alignment Cont.



Current alignment achieves 60um resolution!

Silicon Track Parameters and Errors

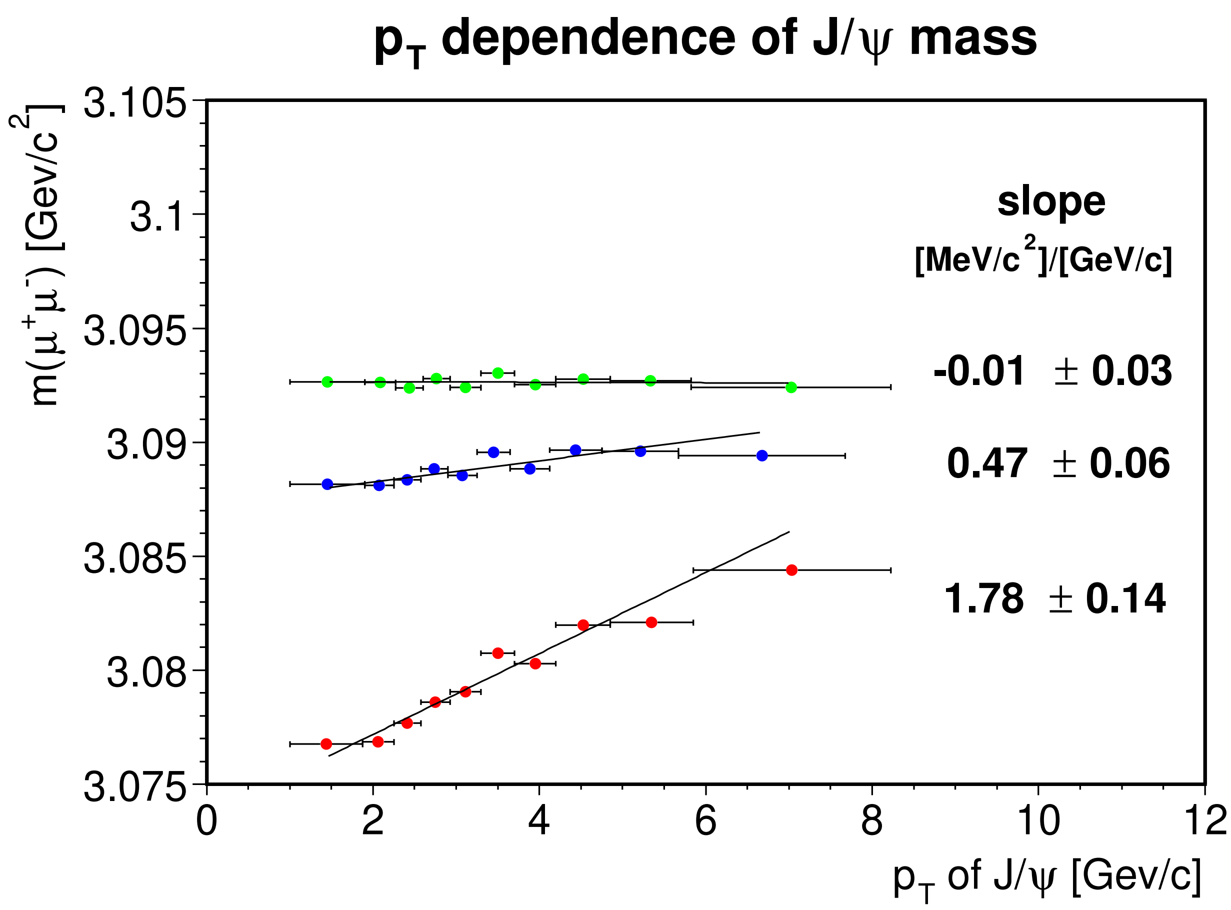
Status

- Silicon track fit works well (material, errors...)

Refining the components: Intrinsic resolution, material and the fit

- Intrinsic resolution being studied
  - Requires separating track pointing resolution from intrinsic resolution
  - Methods: make hard cuts or unfold resolution
  - Both working: needs some additional work
- Passive material good to within 20%
- Track fitter
  see talks: Kurt Rinnert next and Andreas Korn Friday
  - Errors behave well in pull distributions
  - Standard fitter/integrator produces same result as G3X in much less time

Silicon Track Parameters and Errors



- Refit using G3X integrator
- Refit using extra layer of material between COT and silicon
  - Roughly accounts for missing 20% material

Primary Vertex Strategy

Global Z vertexing (VTVZ)

- Two pass Z vertexing strategy:
- Pre tracking Z vertex finder
  - Efficiency: 100% in ttbar and 99.7% in bbbar
  - Used as input to Si standalone and stereo COT pattern recognition
  - Improves tails in COT Z0 distributions
- Post tracking Z vertex finder
  - Use silicon tracks to clean/refine Z vertices

Analysis vertexing(VXPRIM)

- User supplies Z0 position (W lepton or mean Z of jet)
- Run vertex class with input Z to find high precision x,y,z vertex
- Beam line job can use all vertices in Z collection

Z vertex collection and user interface to vertexing class ready

Tracking Status Summary

Improvements available in 4.6.0

- Improved OI tracking efficiency
- Faster OI execution time
- Corrections to SVXII stereo geometry
- Better Z vertex collection and vertex fitting interface
- Smaller track collection
- Improved silicon track fit

Other improvements

- Global ISL alignment
- Working on better stereo alignment for 4.6.0

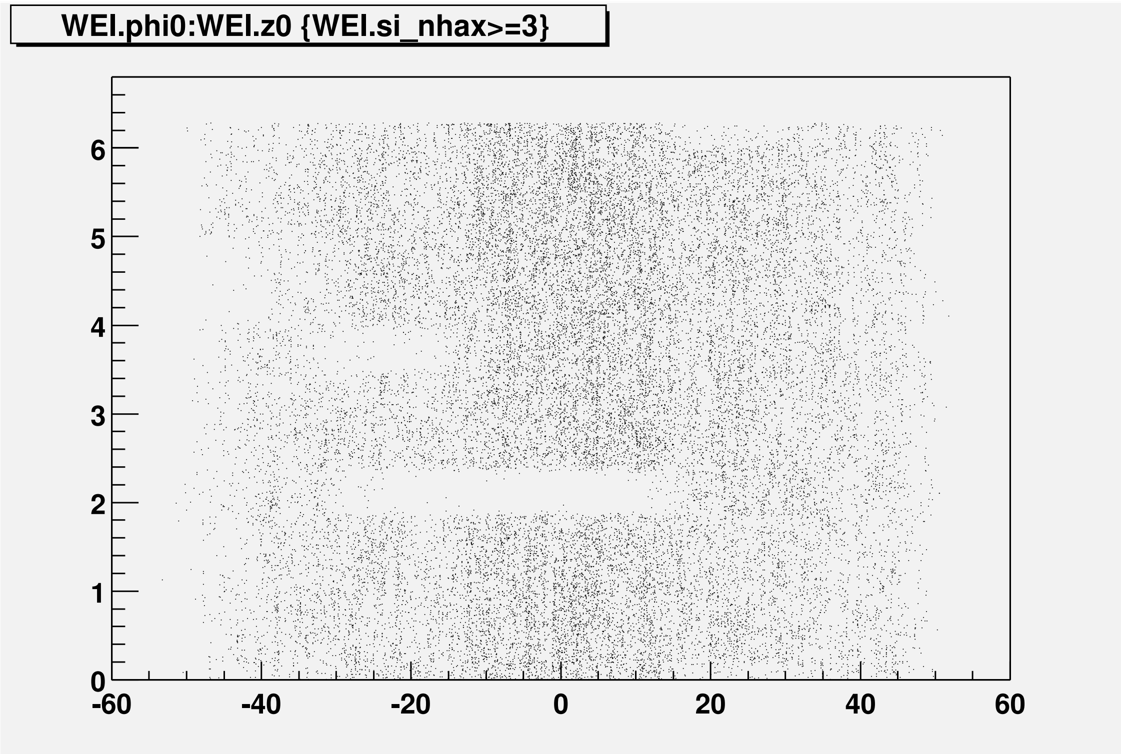
In progress in collaboration with the detector groups

- L00 cluster finding and L00/ISL alignment
- Finish study of COT errors
- Study of silicon errors

Conclusions

- Tracking code converging
- Ready for most physics applications
- See physics sessions tomorrow for User's perspectives

Silicon Tracking: Good Regions



Silicon Tracking: OI Algorithms