

Hall B 12 GeV Upgrade Workshop

May 14-15, 2007, JLab

Software Report

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- Outline:
1. Agenda.
 2. Summary of presentations.
 3. List of priorities for CD2 and beyond.

Software Agenda

May 14, 2007, 13:30-15:30

15+15	Overview of Reconstruction	Jerry Gilfoyle
20+10	Central Tracking	Sebastien Procureur
20+10	Recsis/SDA/GSIM	Franz Klein
20+10	Geant4 Simulation/Occupancies	Mark Ito

May 15, 2007, 8:30-12:30

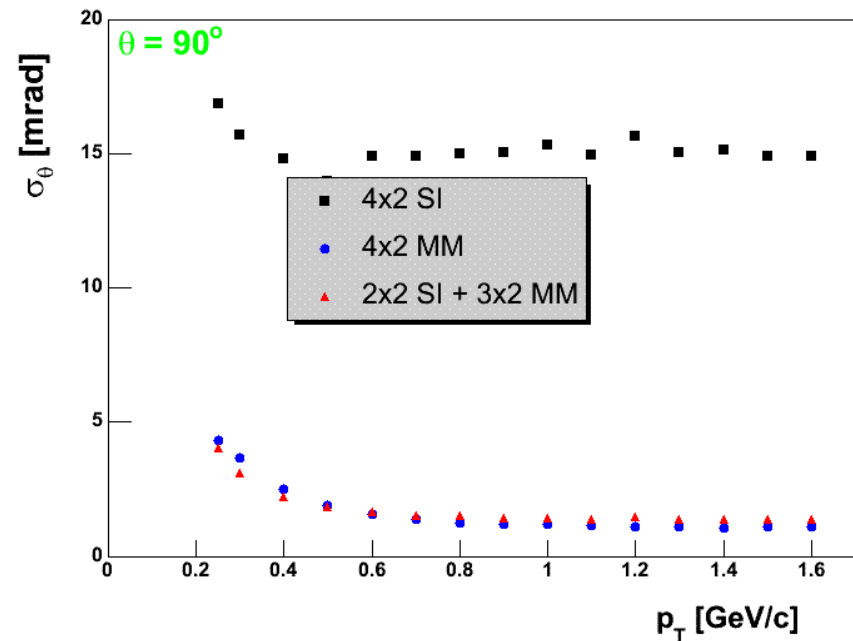
CD2 preparation	Latifa Elouadrhiri
Status of GISM12/RECSIS12	Cole Smith/ Franz Klein
Reconstruction in Central and Forward detector	Franz Klein
Framework progress	Mark Ito
Improvements to HDDS	Maurzio
Geometry status	Joe Santoro

Overview of Reconstruction, Jerry Gilfoyle

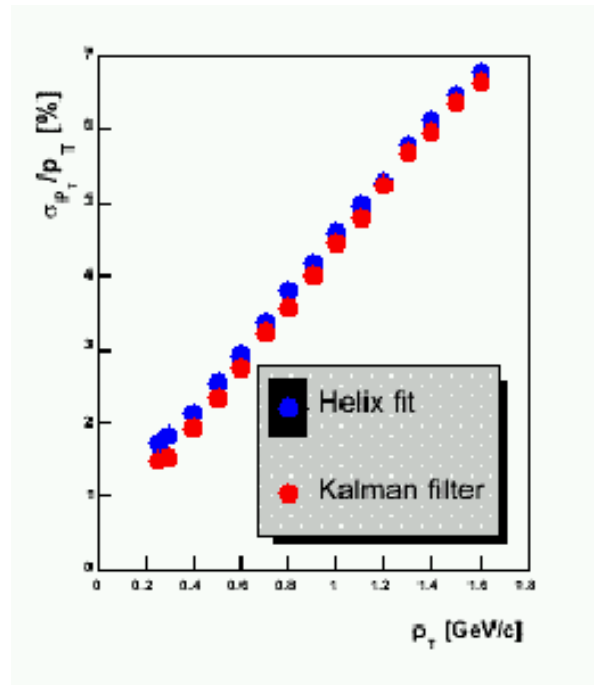
- Internal tracking review in February found that considerable progress has been made and raised significant questions in preparation for an external DC review in March.
- External DC review validated many of the DC design features. See final slide for impact on planning and priorities.
- CLAS12 Reconstruction Group, Membership and Projects
 - Jerry Gilfoyle:
 - * 12-GeV event generators and implement plugins in GEANT4 simulation.
 - Henry Juengst:
 - * revision of original SDA code for CLAS12.
 - * include energy loss, multiple scattering.
 - Franz Klein: GSIM12/RECSIS12, more below.
 - Dave Lawrence:
 - * track reconstruction framework JANA.
 - * liaison with GlueX software effort.
 - Sebastien Procureur: central detector reconstruction, more below.

Central Tracking, Sebastien Procureur

- Investigating use of micromegas as a substitute for silicon in the vertex tracker.
 - cheaper, less material than silicon, smaller dead zone.
 - worse resolution by itself.
 - faster.
 - in February reported that a combination of micromegas gave the best performance.
- Added multiple scattering to the simulation. Degrades the resolution at lower momentum, but the silicon+micromegas combination is still the best solution.



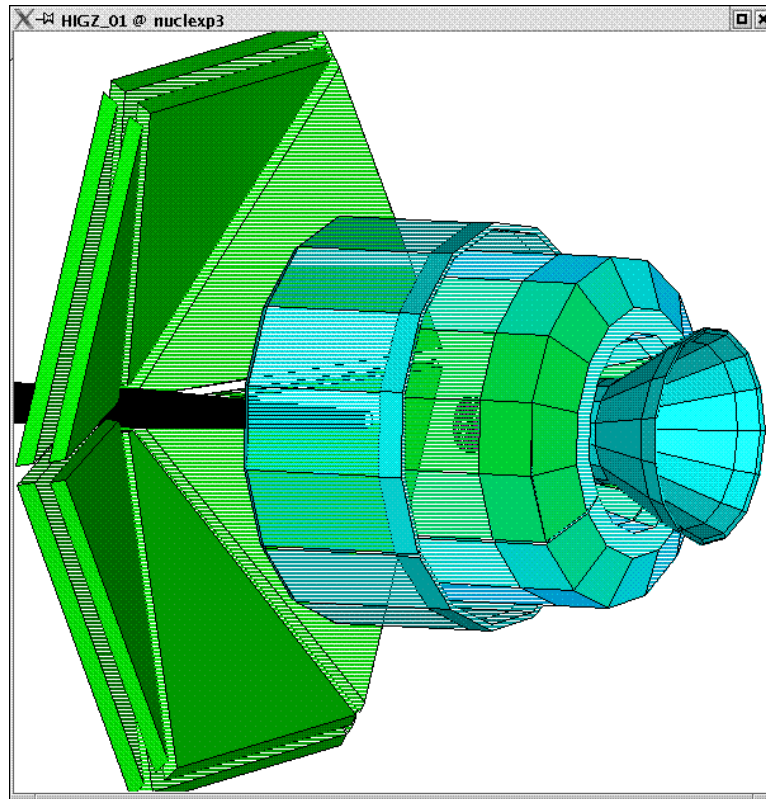
- Now reconstructing simulated tracks in the central detector with both fits to a helix and a Kalman filter using the silicon+micromegas combination. Simulation includes multiple scattering.



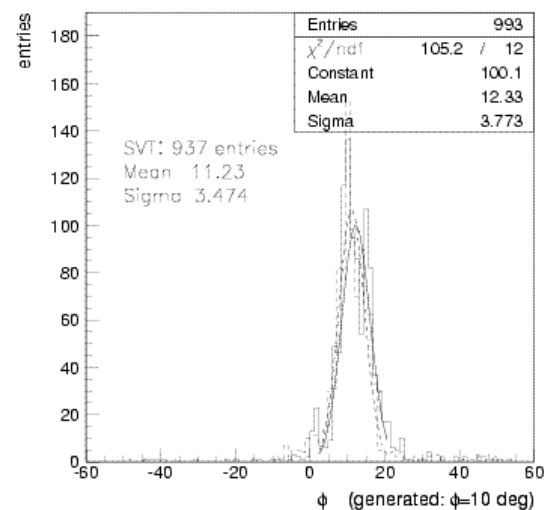
- Plans
 - add background hits to the simulation to test reconstruction algorithms.
 - do simulations at a wider variety of angles.

GSIM12/RECSIS12, Franz Klein

- Installed the CLAS12 geometry in GSIM including the vertex tracker.
- VT trackers are in the original, closely-spaced configuration.



- Progress on matching hits in the VT with DC tracks.
 - finds tracks in DC independently.
 - Unrealistic background.
 - for tracks in the solenoid starts at target using the VT hits as constraints and extrapolates out to the rest of the detector.
- Good News: modified RECSIS matches VT with DC.
- Bad News: ‘Features’.
 - efficiency down to $\approx 76\%$.
 - removing the middle layer from VT boosts the efficiency to $\approx 94\%$.
 - global tracking model used in SDA is not the best choice for a high-B environment.
- Reconstruction in the central tracker is done with a helix fit.



SIM12, Mark Ito

- Geometry
 - use HDDS: HALL D Geometric Detector Specification
 - geometry is defined in human-readable, XML files.
- I/O
 - use EVIO format from CODA group.
 - bank design is progress.
- Occupancy study
 - occupancy rate in drift chambers: 8%!.
 - analogous studies by F.Klein (GSIM12) and A.Vlassov each found about 2% occupancy.
 - put vacuum from the target to the Moeller shield and the occupancy drops to 0.2%.
- Plans/needs:
 - SIM12 reconstruction.
 - CED-like events display.
 - Get full CLAS12 geometry in GEANT4.

Second Software Session

- Status of GSIM12/RECSIS12, Cole Smith/Franz Klein
 - CTOF, PCAL geometries are in GSIM12.
 - reconstruction tests underway.
 - problems with magnetic field map
 - more discussion of matching DC with VT.
- Improvements to HDDS, Maurizio Ungaro
 - XML provides an easy-to-read, self-documenting text interface to GEANT4 for the geometry, the magnetic field, controlling how SIM12 treats 'hits'.
 - EVIO: object-oriented extension of the original EVIO C event I/O utility.
 - All of the items above are working well.
- SIM12 Geometry Status, Joe Santoro
 - Demonstrated many nice features for manipulating and visualizing the SIM12 geometry.
 - To be added: PCAL, EC, solenoid coils, HTCC, SVT, Cerenkov, second TOF.
- SIM12 Program and Documentation, Mark Ito

Updated Plans and Priorities

1. Study of correlated backgrounds in CLAS12 and compare 8-layer and 6-layer designs of the central detector.*
2. Clear physics justification for current ϕ resolution.*
3. Optimize forward VT spacing.*
4. Comparison of GEANT4 and latest GSIM12 with VT reconstruction.*
5. Study of effect of misalignments on resolution.*
6. Each group should have a geometry manager.
7. Collaborate with Hall D on reconstruction software.
8. Vertex tracker geometry in GEANT4 (almost done).
9. Full CLAS12 geometry in GEANT4.
10. Investigate alternate detector configurations like large stereo angle DC, micromegas.
11. Event display in GEANT4.
12. Level 2 trigger development.
13. Realistic physics studies to test GEANT4 simulation.
14. Event generator plugins for GEANT4.
15. Procedure for CLAS12 timing and calibration.

*** - Needed for CD2.**