C-Gem Software Resolution Studies



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14-15/05/14, Frascati

Overview

- Preliminary yest of the expected resolution (rz, r ϕ) of the new C-Gem detector
- Comparison between the new C-Gem detector and the actual MDC
- Using software version
 - CgemBoss-0.0.2
 - 6.6.2

Cgem Studies

 Actual software not include Reconstruction of the C-Gem tracks

- Created 2 MC samples of $e^+ e^- \rightarrow J/\Psi \rightarrow \Lambda \Lambda$
 - 1000 events with normal procedure
 - 1000 events with a "smeared" track's final position

The "smeared" MC

- Generated to reproduce the effect of the resolution of the Cgem detector
- Modified the code in

/Simulation/BOOST/BesSim/BesSim-00-04-03/src/BesMcTruthWriter.cc

- A gaussian distribution is used to reproduce the smearing
 - Parameters:
 - Mean: original value
 - Width: expected resolution
 - 200 um in rz
 - 90 um in r ϕ

Results:

Simulation of the hits on the Cgem layers Layer 1 Layer 2 Layer 3



Results:

- Immagine dei grafici sovrapposti X
- Immagine dei grafici sovrapposti Y



Cgem Resolution:

 This analysis has to be considered preliminary: tested only the first 100 event of run -28495 (J/psi phase scan run_id number, Turin data)

- Test only of the xy plane

- Get the secondary vertex position of Λ
- Resolution obtained as the difference between the smeared and the not smeared MC results

Cgem Resolution: the secondary vertex position determination

• First hypotesis: no bending of the tracks.

Tracks are considered as straight line

• Second hypotesis: vertex is the geometrical intersection of the two straight lines

Result: pull distributionx = 390 umY = 273 um



counts

MDC resolution study

Study of the pull distribution of the secondary vertex position

- Generated MC sample:
 - 10000 e+e- \rightarrow J/ $\Psi \rightarrow \Lambda\Lambda$ event

 Resolution obtained by the difference between the Λ MC truth position and reconstructed secondary vertex

Results: counts counts 450 700 400 E 600 350 500 300 E 250 E 400 E 200 E 300 E 150 E 200 E 100 E 100 E 50 E 0_2 0 -1.5 -0.5 -1.5 -0.5 0 0.5 1.5 0 1.5 -1 0.5 difference $\mathbf{Rxy} \Lambda$ [cm] difference z A [cm] counts counts 450 700 400 600 350 500 300 250 400 200 300 150 200 100 100 50 0 0 -0.5 0.5 -0.5 0 1.5 -1.5 1 0 0.5 1.5 -1 -1.5 difference $z \overline{\Lambda}$ [cm] difference $\mathbf{Rxy}\,\overline{\Lambda}\,$ [cm] Rxy = 0.2 cm Z = 0.3 cm

Summary

- For the Cgem
 - Tested the CgemBoss software
 - With very simple hypotesis, made a first study of the secondary vertex
 - Preliminary test of the resolution for x, y and R_xy
- For the MDC: comparison of how much the C-Gem can improve the reconstruction of Λ secondary vertex

Further studies

• Complete the C-Gem studies with all the samples available

• When the Reconstruction will be ready, do the same analysis to have a complete comparison between C-Gem and MDC

Thanks for your attention!

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