Central neutron reconstruction based on CND

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contents

- Neutron identification
- Neutron resolutions, efficiency, and energy loss
- Contamination of charged particles (beyond CVT_Tracks?)
- gemc simulation of the neutron-DVCS experiment



CND: Three- layer plastic scintillators

Softwares

- gemc4a.2.3, RUNNO = 10
- coatjava-5b.4.0 + EBCND (standalone neutron rec. based on CND)
- Event generator:

internal generator, n, p, e, pion, K, gamma, 0.1-1.5 GeV, 50 < θ <110 deg; n-DVCS event generator, e, n, and gamma.



CND hits clustering Clustering the CND hits in the space-time (x, y, z, t)

Let $x_i = x, y, z, t$ of the hit, Distance between hit A and hit B is calculated by,

$$S_{A,B} = \sqrt{\sum_{i} \frac{(x_i^A - x_i^B)^2}{\sigma_{x_i^A} \sigma_{x_i^B}}}$$
$$\sigma_x = \sigma_y = 1.5 \text{ cm}, \sigma_z = 2 \text{ cm},$$
$$\sigma_t = 0.14 \text{ ns}$$

Combing two hits each time; If S > 5, stop combining the hits.

(x, y, z, t) of the cluster is taken as the average of the hits.

Hit-multiplicity of CND_clusters



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Resolutions of neutron without Eloss correction





The CND-cluster information is consistent with the MCgenerated information.

Resolutions of neutron with Eloss correction



Resolutions of neutron without Eloss correction





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Resolutions of neutron with Eloss correction





Momentum loss correction: Pn = Pn + 0.17*Pn*Pn





θ (°)



120 θ (°)

Contamination of pion+



Contamination of e-



Contaminations of charged particles without CTOF veto



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Contaminations of charged particles with CTOF veto at CVT gaps



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Contamination of gamma





Contamination of gamma



ed → e' n γ (p)

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Resolutions of electron



■ $ed \rightarrow e'n\gamma(p)$

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Resolutions of neutron



ed → e' n γ (p)

<u>#22</u>

Resolutions of γ



• $ed \rightarrow e'n\gamma(p)$

<u>#23</u>

Missing mass distribution



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neutron-DVCS simulation

Squared four-momentum transfer from gamma to gamma, and from neutron to neutron



Summary and outlook

- SUMMARY: preliminary central neutron information is given
- OUTLOOK: Test the neutron reconstruction with e p → e n pi+ data of RG-A.
 (look at the efficiency)



Backup-1







