CLAS12 MC simulations and comparison with data

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CLAS NOTES: 2016-6, 2016-8, 2017-12, 2017-13, 2017-16, 2017-17, 2017-18

Beamline/Target Design and Validation FT-On, FT-Off configurations Solenoid Field Strength Target / Beam shifts Rates: comparison with data.





Beamline Design and Validation



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Beamline vacuum, shielding designed to minimize rates on detectors, focus on DC.

From target, to FT, to inside the torus and downstream of the torus, includes torus cold hub and warm hub components.

GEMC simulations included CAD imports from engineering models.



FT-On, FT-Off configurations



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Magnetic Fields Strength



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Determine the operating magnets current.

Optimize phase space for specific run groups: torus current and polarity.



Target / Beam shifts



DC Occupancies: FT On



layer

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DC Occupancies: FT Off



layer

CEBAF Large Acceptance Spectrometer

HTCC rates



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CEDAF Large Acceptance Spectrometer

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CTOF Rate Studies



Simulations of CTOF rates for L_{nom} :

- 5 MHz/counter with 0 threshold
- 150 kHz at 1 MeV threshold

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Good agreement with simulations CLAS12-Note 2017-016



FTOF Rate Studies



GEMC simulation at L_{nom} :

• 10.6 GeV, FT-On

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- 100% torus, 100% solenoid
- 1 MeV E_{dep} threshold



Rates from beam studies:

- Presented as average over panels
- Based on FADC scalers
- FADC threshold ~200 keV



ECAL rates



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GEMC 4a.2.2 rates:

- Edep>100 keV
- Full luminosity
- In-bending torus at full field

Measured rates:

- TET = 20 → (few hundreds keV)
- 80 nA
- 85 % inbending field





FT rates

GEMC 4a.2.2 rates:

- Edep>20 MeV
- Full luminosity
- Full solenoid field
- Max rate ~ 100 kHz

Measured rates:

- Edep>20 MeV
- Full luminosity
- Full solenoid field
- Max rate ~ 80 kHz



FTC FADC SCALERS



Outlook

Working on adjusting thresholds for a more precise comparison. Working on Solenoid scans from data.

Room for improvement with FT On: additional shielding around the torus mount.

Summarizing all these results in a CLAS NOTE, coming soon.



