Rate Performance of ME0 GEM Detectors in Test Beam
About Me

Nicholas Kurth

Education:
- Rowan University, Glassboro, NJ
- Physics, Bachelors of Science
- Research biophysics and reverse micelle

CERN Summer Student:
- June 10th to August 13th
- Work with CMS on the performance of GEM detectors
GEMs & CMS
GEM Basics

Readout
GEM Lab
Evaluate the rate performance of ME0 GEM detectors within the GIF++ test beam
Results — Rate per Chamber, Eta, & Strip

Everything follows our expectations
Results — Rate vs. Attenuation
Results — Rate vs. Attenuation

Rate and Absorption in Chamber 3 Eta Partition 1 (Compensation OFF)

- Eta Partition [Hz]
- Average Strip Rate [Hz/Strip]
Results — Rate vs. Distance

Run 285
Rate over Distance (Compensation OFF)

- Linear Fitting: $mx+b$
- Taylor Expanded: $C/x^2$
- Rate
Results — Rate vs. Distance

When Taylor Expanded around $b$ ($b >> 0$)

\[
\frac{C}{x^2} = \frac{C}{b^2} - \frac{2C(x - b)}{b^3} + \frac{3C(x - b)^2}{b^4} - \frac{4C(x - b)^3}{b^5} + \ldots
\]
Results — Rate vs. Pulse Stretch

At a pulse stretch of -1, we count every event → unfeasible due to electronics

C = 4.948e+07 (±1.461e+06)
B = 2.024 (±0.098)
Conclusion

The results of the test beam show that the ME0 GEM detectors are following the expected rate performance

Future Work

- Determine the spatial resolution using test beam data
- Determine the efficiency of the detectors
- Optimize and streamline all analysis code
Rate Performance of MEO GEM Detectors in Test Beam

Questions?

Contact: kurthn42@students.rowan.edu
Results — Rate vs. Distance

X-Position for Taylor Expansion (Compensation OFF)

- Average Chamber Distance: 143.25 cm
- Taylor Point

X-Position for Taylor Expansion (Compensation ON)

- Average Chamber Distance: 143.25 cm
- Taylor Point
rechitGlobalX vs. partialProphitGlobalX

residual

partialProphitGlobalX

rechitGlobalX

Backup
Results — Spatial Resolution & Efficiency

Spatial Resolution

Backup

Efficiency
Results — Spatial Resolution

Run 342
Observed and Expected Spatial Resolutions for Chamber: 0

Run 342
Observed and Expected Spatial Resolutions for Chamber: 1

Run 342
Observed and Expected Spatial Resolutions for Chamber: 2

Run 342
Observed and Expected Spatial Resolutions for Chamber: 3