Saturation of LEM and GPM in CG-2

James Rogers
jroger87@vols.utk.edu

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THE UNIVERSITY OF TENNESSEE KNOXVILLE
DEPARTMENT OF PHYSICS & ASTRONOMY

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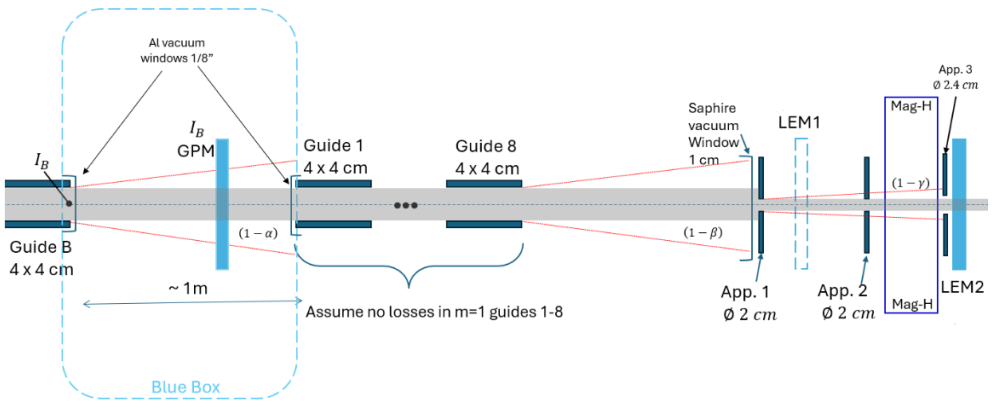
- Transmission efficiency in 2021 vs 2024
- Δt histogram for LEM, GPM: 2021, 2024
- Comparison to gold foil activation

Transmission Efficiency Comparison

Run #	GPM [cps]	LEM 1 [cps]	LEM 2 [cps]	LEM 1 Ratio	LEM 2 Ratio
89824	1.13e5 ± 22.7	1.93e4 ± 9.4	-	17.08% ± 0.01%	-
89949	1.10e5 ± 36.0	-	1.97e4 ± 15.2	-	17.91% ± 0.02%
89950	1.09e5 ± 18.6	-	1.98e4 ± 7.9	-	18.17% ± 0.01%
24876	1.32e5 ± 32.8	2.29e4 ± 61.2		17.3% ± 0.05%	
24877	1.35e5 ± 47.0	2.25e4 ± 42.8		16.7% ± 0.06%	
McStas Simulation: Intensity [n/s]	2.29e10 ± 2.9e8	3.92e9 ± 1.1e8	3.77e9 ± 1.0e8	19.7% ± 1.1%	16.5% ± 0.5%

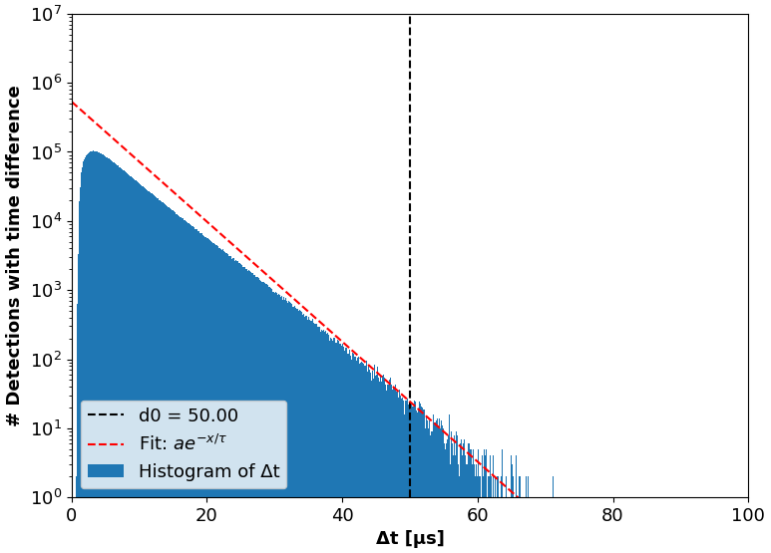


Unsure of LEM position

Countrate ratio = LEM ÷ GPM

2021: GPM and LEM

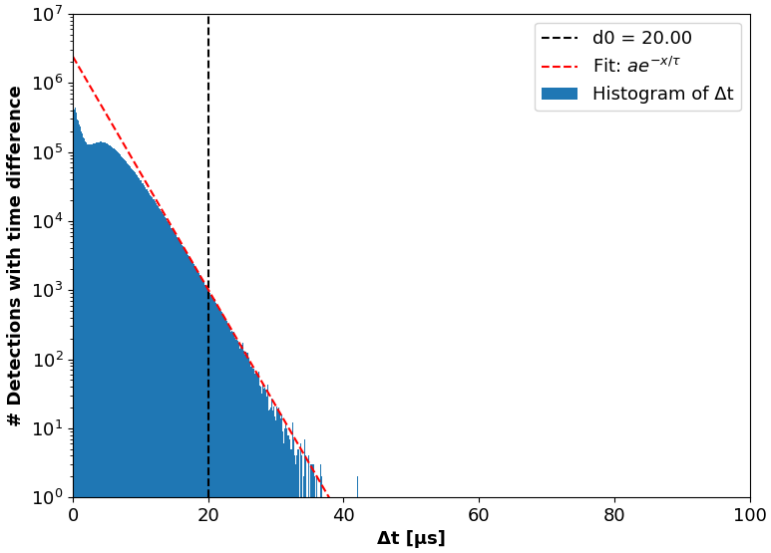
Run 24876: GPM



a=5.32e5, tau=-5.00 μs

Countrate: 1.32e5 ± 32.8

Run 24876: LEM

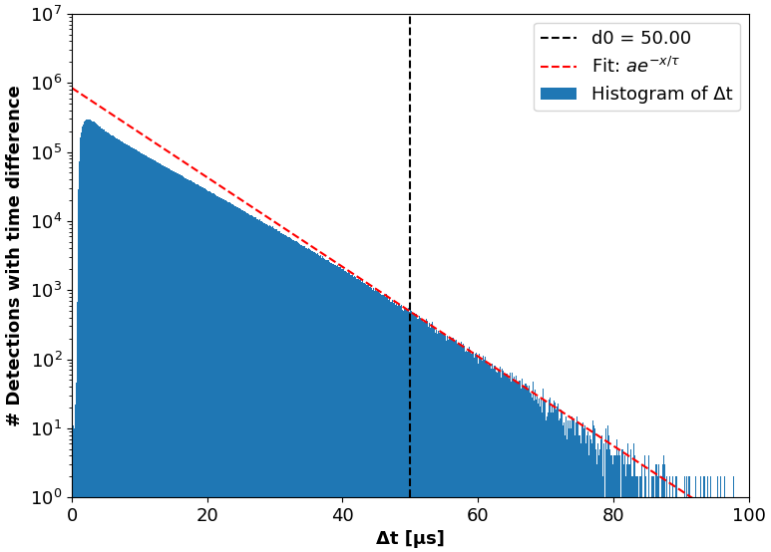


a=2.39e6, tau=-2.58 μs

Countrate: 2.29e4 ± 61.2

2024: GPM and LEM

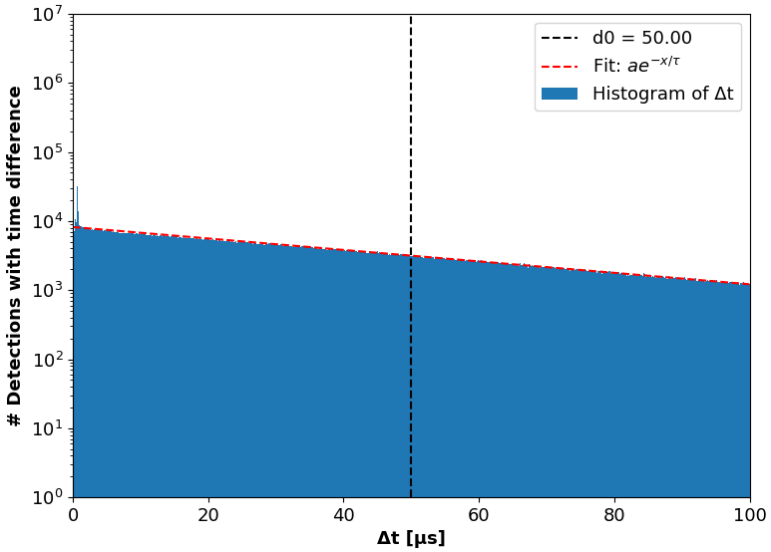
Run 89824: GPM



a=8.42e5, tau=-6.71 μs

Countrate: 1.13e5 ± 22.7

Run 89824: LEM



a=8.18e3, tau=-52.43 μs

Countrate: 1.93e4 ± 9.4

Detector Saturation Hypothesis:

(Summary)

- Δt histogram shows deviation from pure exponential expected of Poisson process
- Deviation manifests as different slope for small vs large Δt:
  - If detector saturation is the issue, small Δt suffer from decreased countrate, and large Δt slope should be extrapolated for true countrate (++)
  - If detector readout electronics are the issue, large Δt suffer from missing counts, and small Δt slope should be trusted (+)

<u>From 2021 experiment:</u>

- Gold foil activation measurement:

  7.4e8 n/s
- Lowell beam monitor (LEM):

  9.93e8 n/s

(Conclusions)

- Discussion with Vlad suggests that detector readout should not be a limiting factor

  (in favor of trusting large Δt slope)
- Gold foil activation measurement suggests LEM correction should be (-25%)

  (in favor of small Δt slope because correction will be smaller increase, possible fix for double counting behavior)

Questions?

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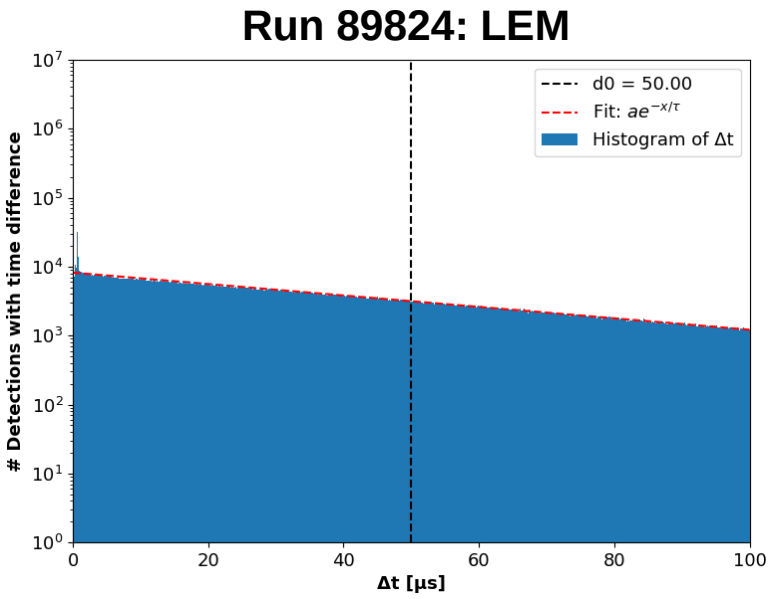
Supplementary

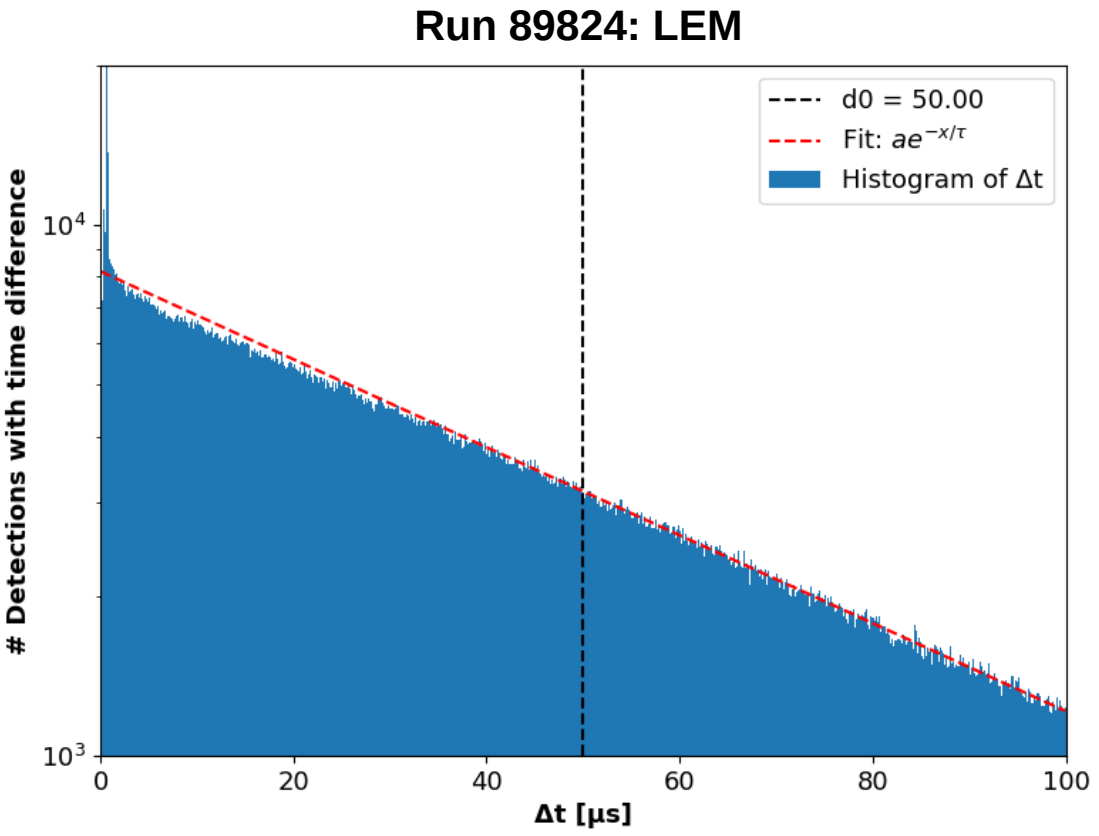
LEM in 2024 Experiment: Long tail



a=8.18e3, tau=-52.43 μs

Countrate: 1.93e4 ± 9.4

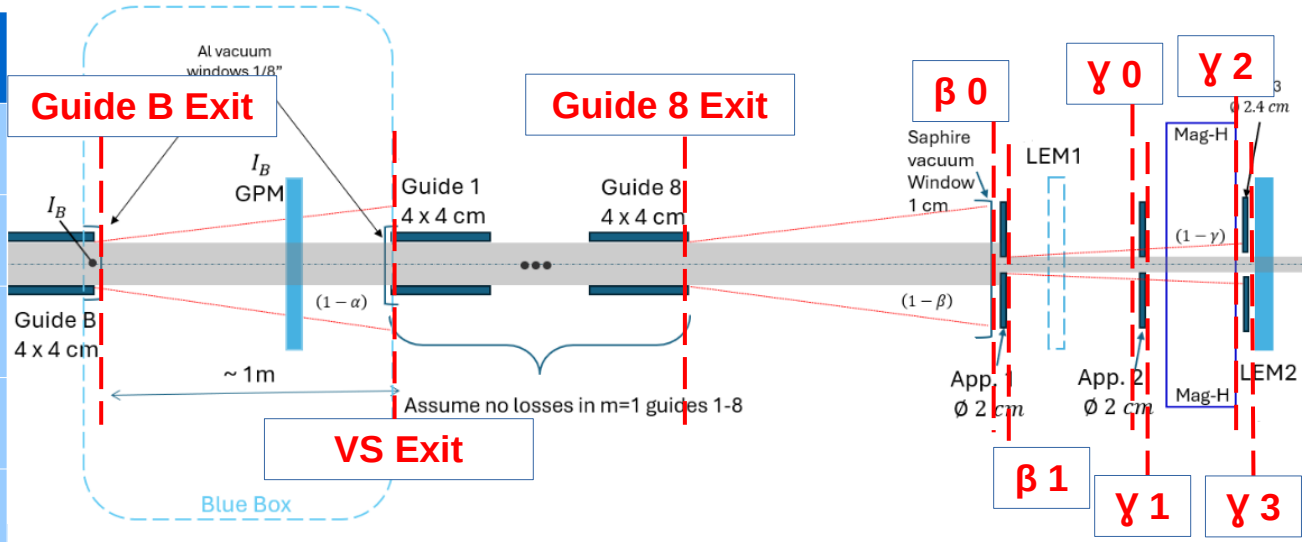
(zoomed)



Supplementary

McStas Simulated Transmission Efficiencies

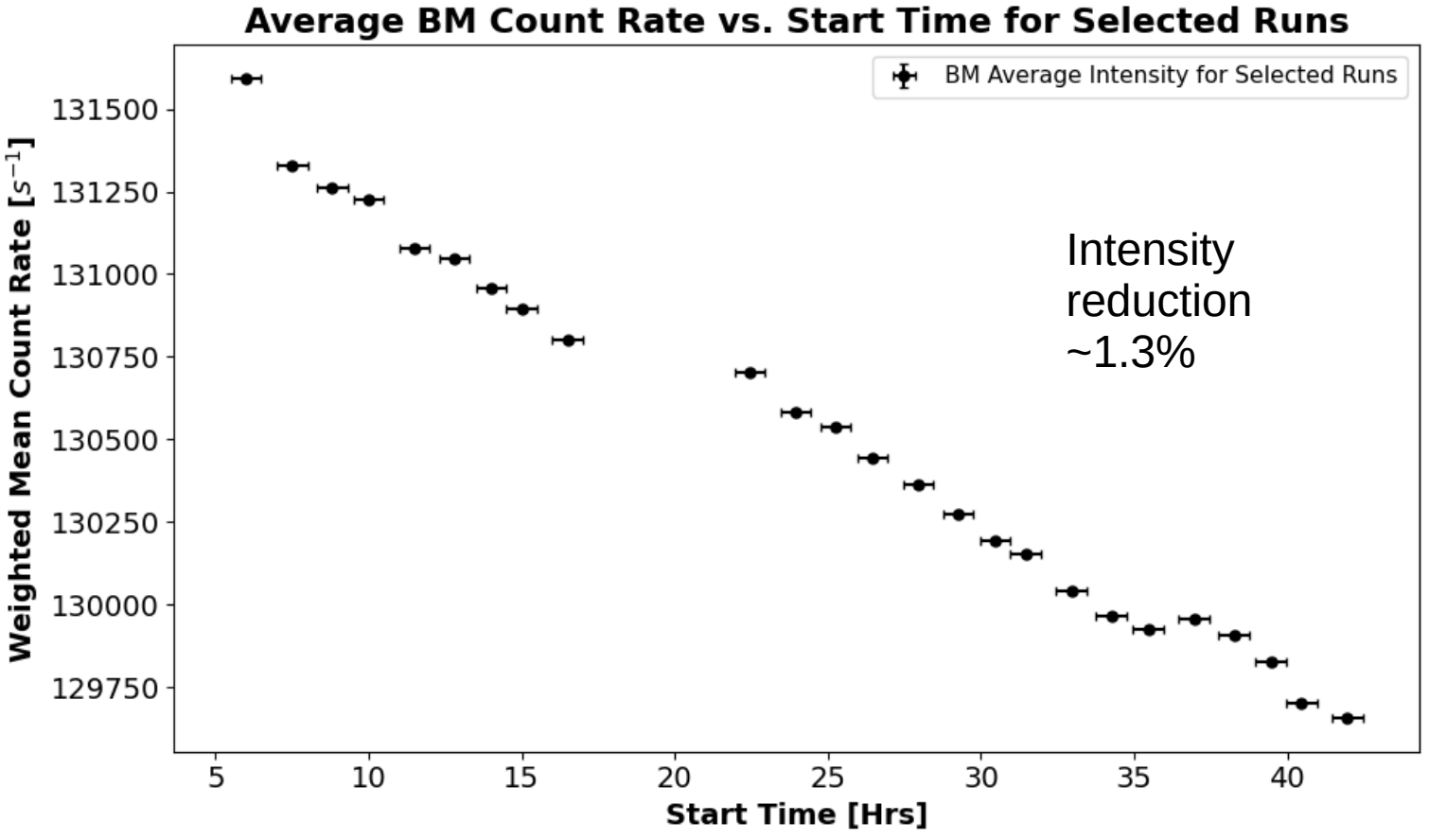
Position	Intensity	ROI
Guide B Exit	2.29e10 ± 2.9e8	4x4cm
VS Exit	2.10e10 ± 1.1e9	4x4cm
Guide 8 Exit	1.99e10 ± 1.0e9	4x4cm
β 0	1.72e10 ± 2.2e8	4x4cm
β 1	3.92e9 ± 1.1e8	r=1.2cm
ɣ 0	3.92e9 ± 1.1e8	r=1.2cm
ɣ 1	3.78e9 ± 1.1e8	r=1.2cm
ɣ 2	3.77e9 ± 1.0e8	r=1.2cm
ɣ 3	3.77e9 ± 1.0e8	r=1.2cm



- VS Exit/ Guide B Exit = 91.7% ± 4.9%
  - → α = 8.3%
- β 1/ Guide 8 Exit = 19.7% ± 1.1%
  - → β = 80.3%
- ɣ 3/ β 1 = 96.2% ± 3.7%
  - → ɣ = 3.8%
- ɣ 3/ Guide B Exit = 16.5% ± 0.5%

Supplementary

GPM Countrates in 1 hour runs



Supplementary

GP-SANS Countrates in 1 hour runs