

Effect of Regeneration with B0 as a Linear Function

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n-n' group meeting

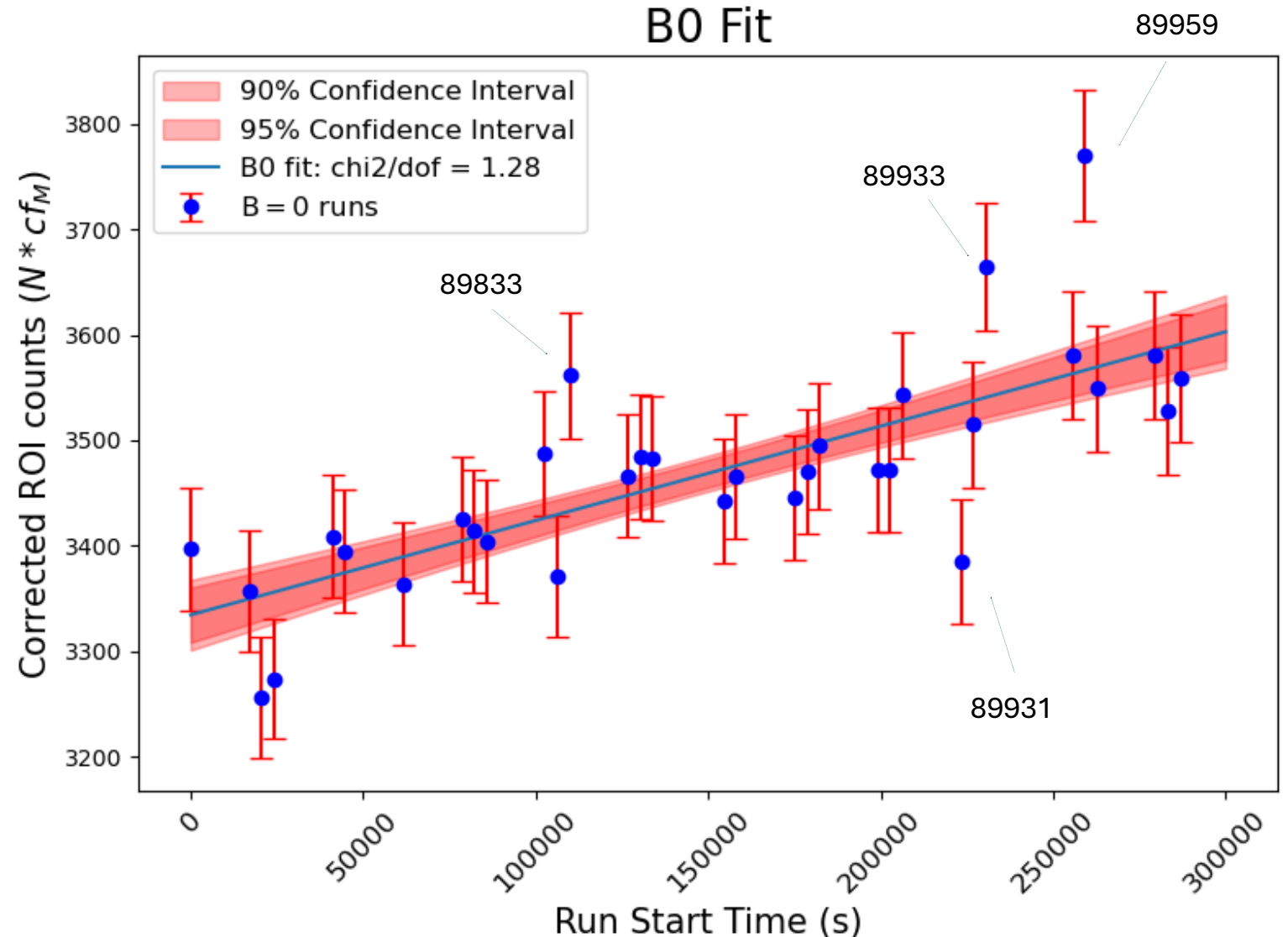
3/3/2025

B0 Linear Fit

Counts in ROI for each run is normalized based on the relative GPM counts compared to run 89839

Errors are $\sqrt{N_{\text{ROI}}}$

Outliers are marked, but still included

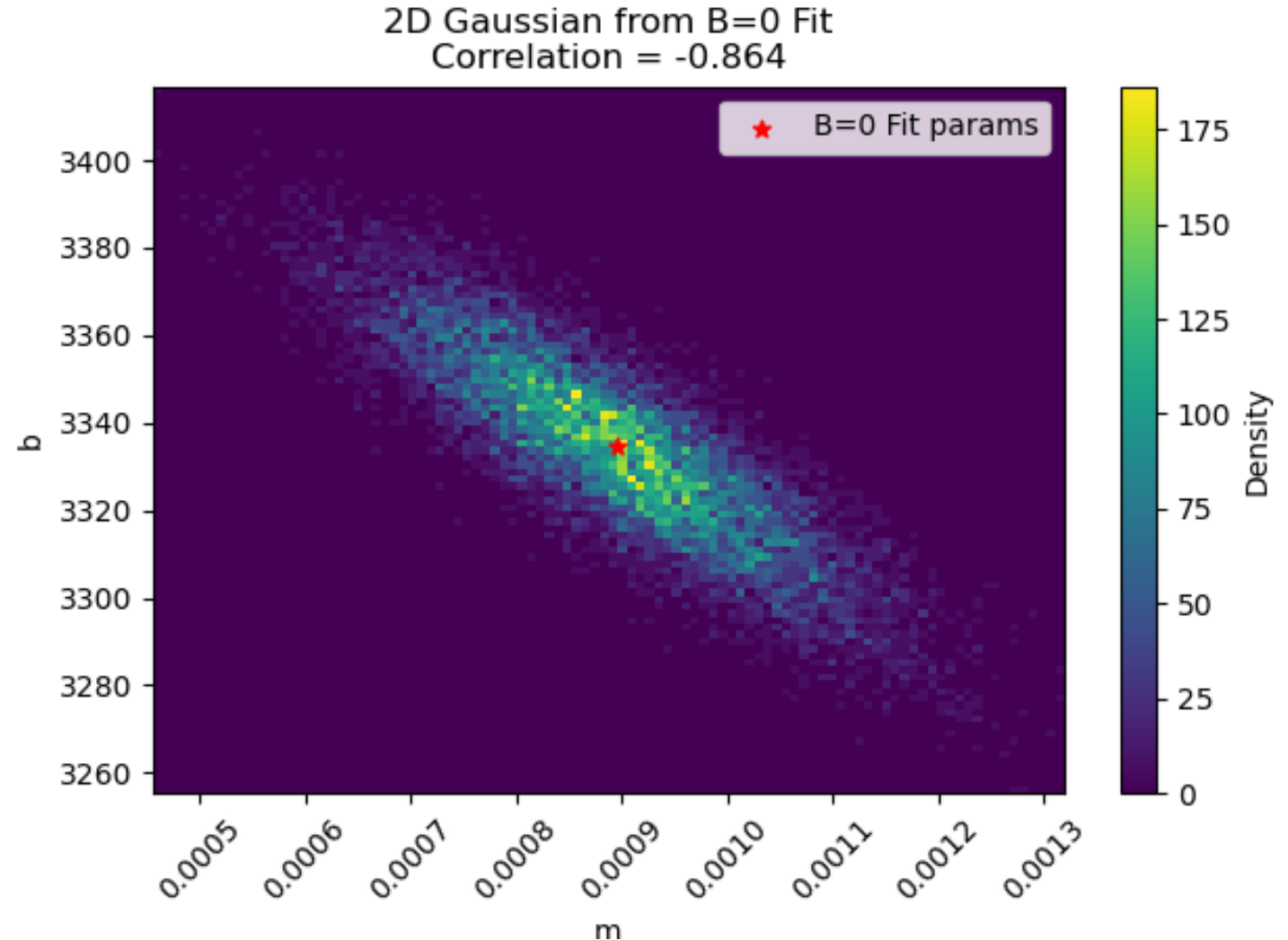


B0 Fit Parameters

Fit parameters = [8.95e-04 3.33e+03]

Covariance = $\begin{bmatrix} 1.45e+08 & -2.12e-03 \\ -2.12e-03 & 4.17e+02 \end{bmatrix}$

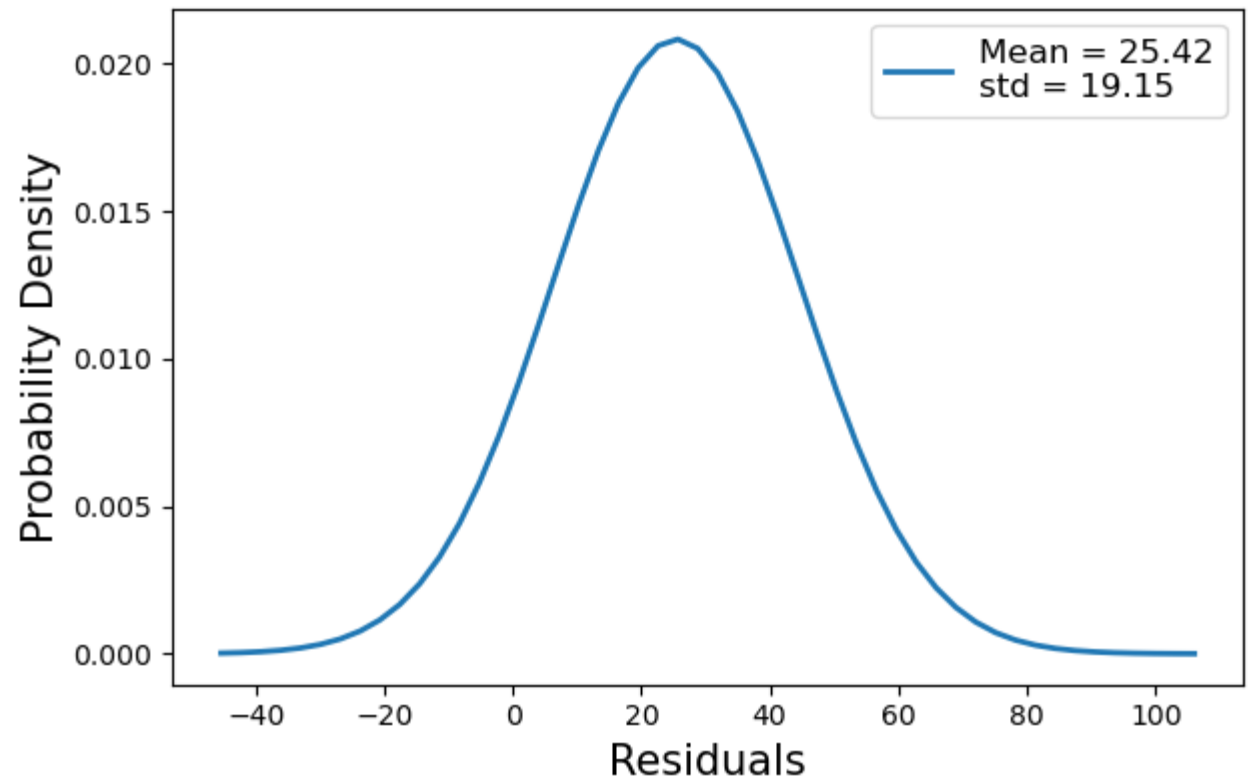
- $Y = mt + b$
- m and b parameters generated from the covariance matrix using `np.random.multivariate_normal()`
- Strongly Anticorrelated
- To include this correlation, subtract B0 at each point based on this distribution
- $B0_i = f(m_i, b_i)$



Subtracting Randomized B0 Fit in 1 run

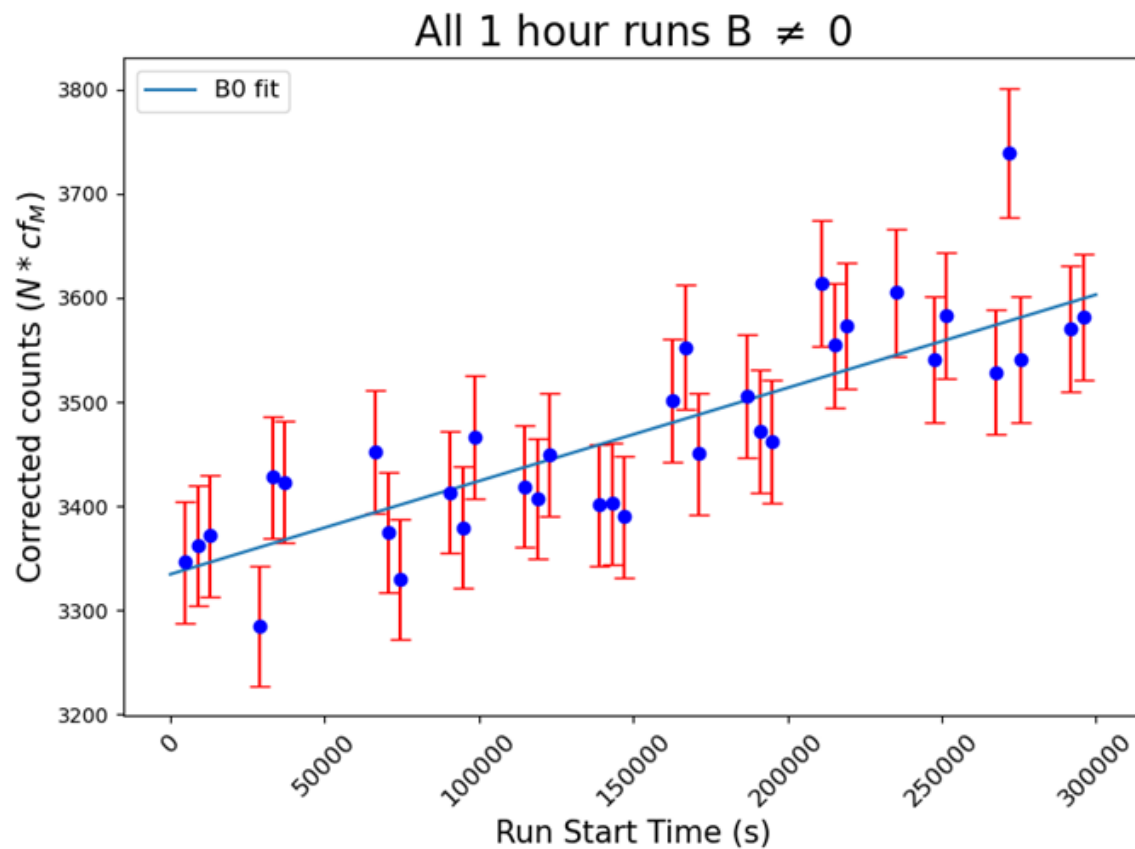
- N = corrected counts in ROI run #
- $B0_i = f(m_i, b_i)$ simulated fit from cov matrix
- Effect = $N - B0_i$
- After each randomized fit value is subtracted, the Standard deviation will be the error from fit

Distribution of Residuals from B0 fit
Run 89845.0



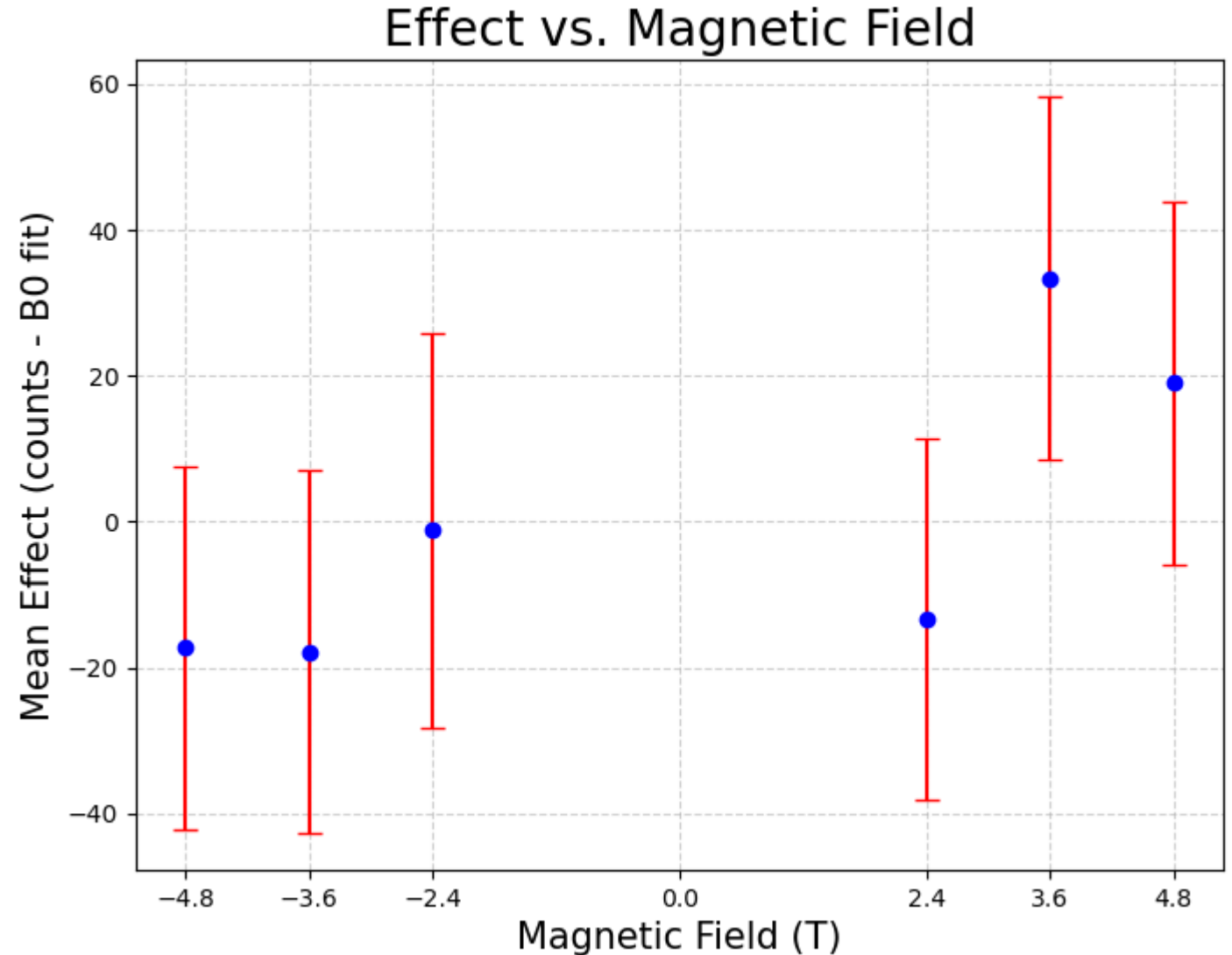
B0 fit subtraction for each run

- B0 subtraction error is calculated at every point for $B \neq 0$ runs
- Blue line is the B0 fit (background)
- Error bars are all $B \neq 0$ runs (data)



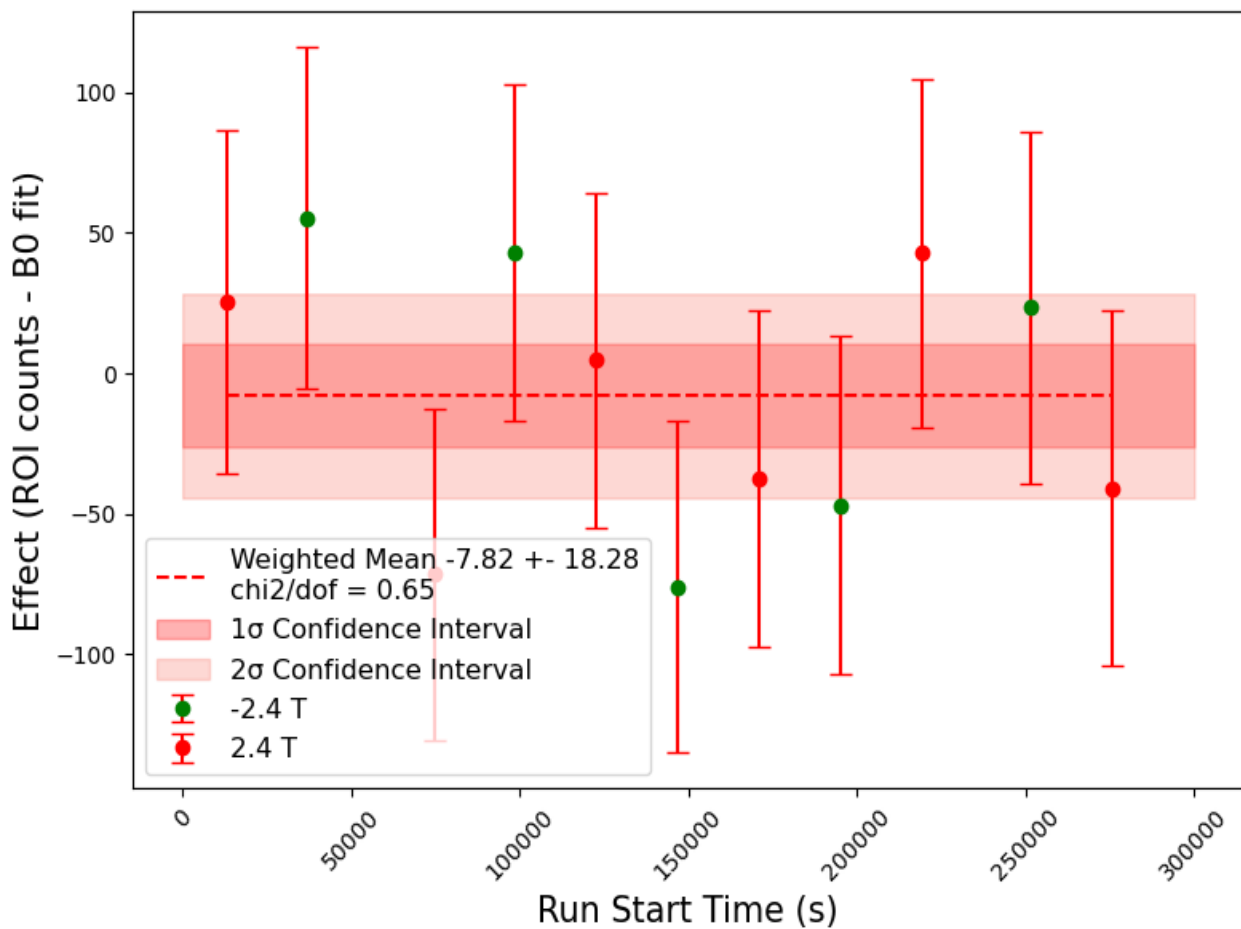
Effect of Regeneration at each Magnetic Field

- All Runs at each magnetic field taken as a weighted mean

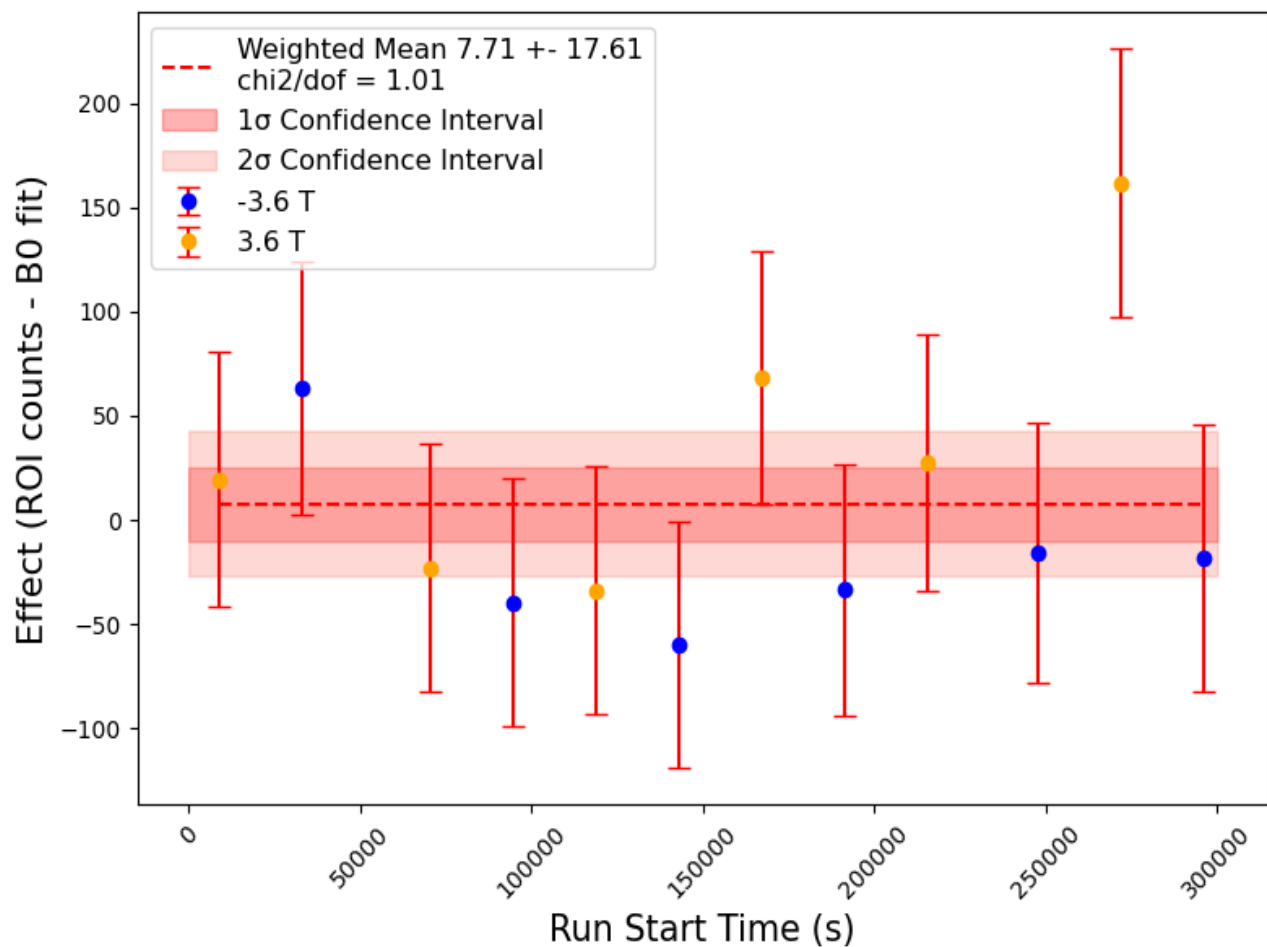


Consistency of ± 2.4 and ± 3.6 T

Effect for ± 2.4 T Runs

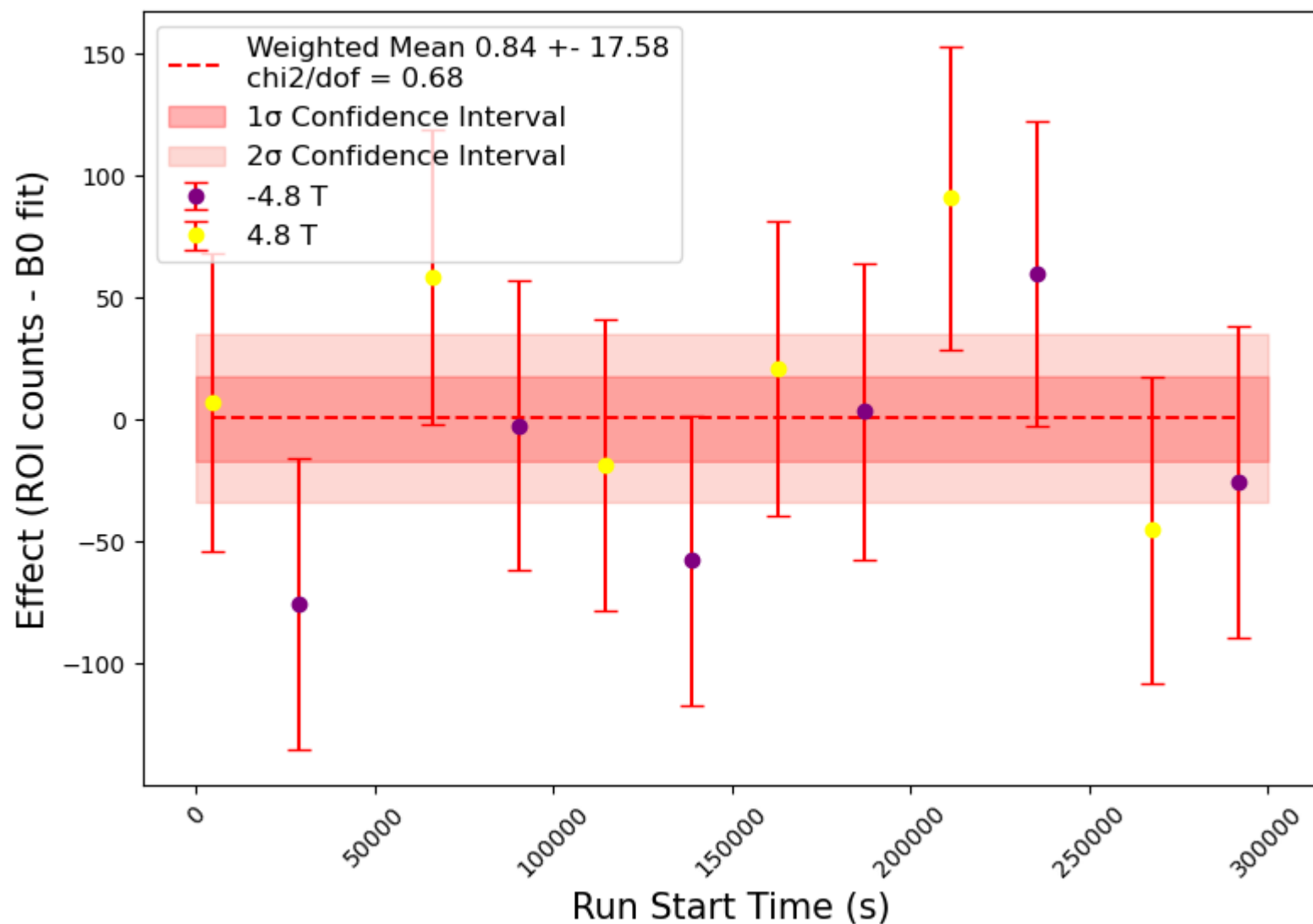


Effect for ± 3.6 T Runs

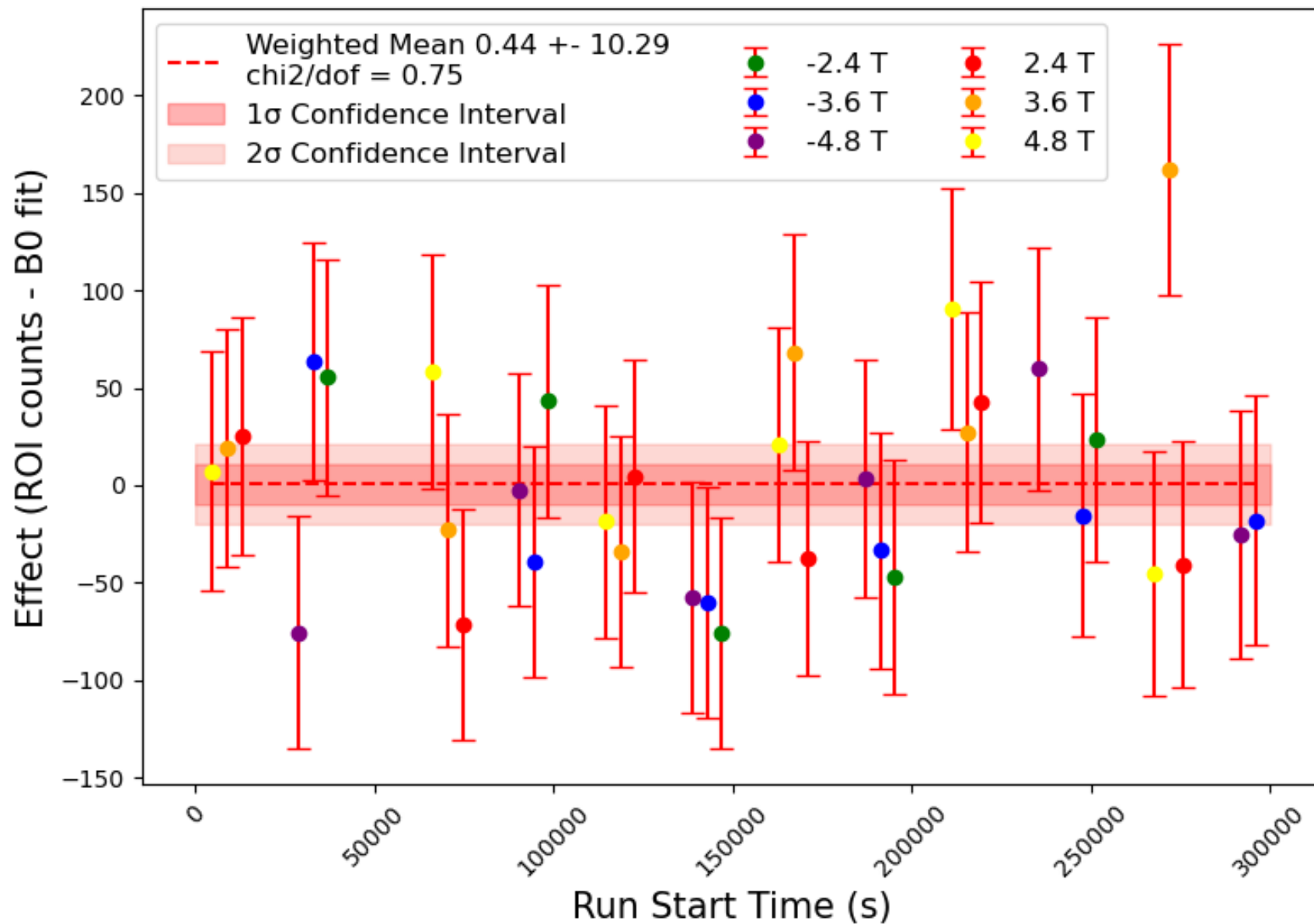


Consistency of ± 4.8 runs

Effect for ± 4.8 T Runs



Effect for $B \neq 0$ T Runs



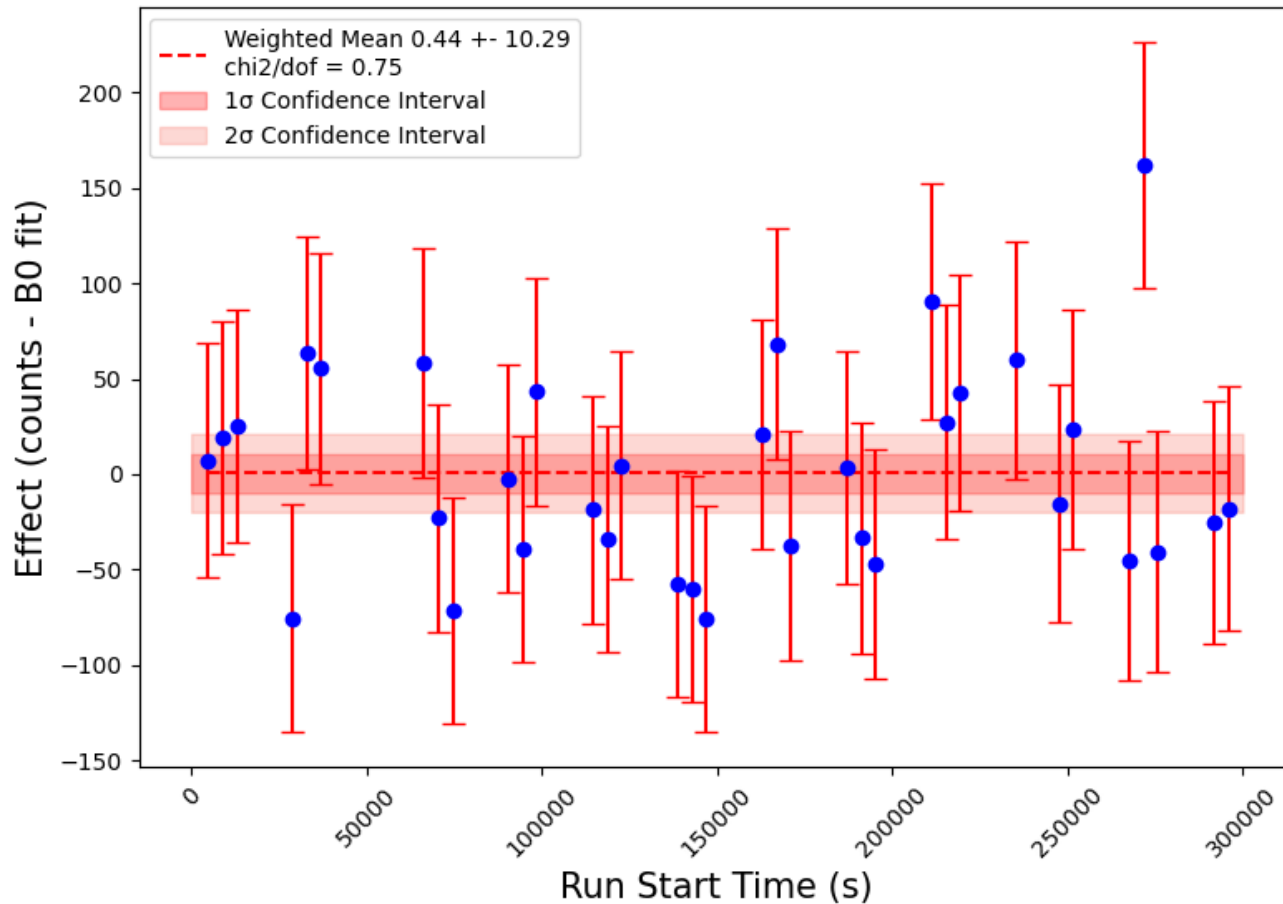
Data added to Excel

- Still need to correct by windows and deadtime

Magnetic Field	Mean	Error	Chi2/dof
2.4	-13.40473584	24.78965885	0.529253635
3.6	33.35462713	24.9332653	1.303596573
4.8	19.00536161	24.87750005	0.651596329
-2.4	-1.156170806	27.07320651	0.93392561
-3.6	-17.83542875	24.88729145	0.499336108
-4.8	-17.29700881	24.85330724	0.625540867
±2.4	-7.818720182	18.28302968	0.649330934
±3.6	7.712361625	17.61420426	1.011466128
±4.8	0.836516196	17.58248929	0.677401821
B ≠ 0	0.4416285	10.28719401	0.748408023

Preliminary Results

Effect for B ≠ 0 T Runs



$$\text{Mean} / \left(\frac{\text{GPM Reference}}{\text{GPME efficiency}} \right) = 1.10e-14$$

$$\text{Error} / \left(\frac{\text{GPM Reference}}{\text{GPME efficiency}} \right) = 2.58e-13$$

- TODO:
- Correct by LEM
- window efficiency
- Deadtime