Data Analysis Update

Alina Moore - UTK – 11/24/2025

Good news

- I’ve been doing it wrong the whole time and not actually giving the real data to the model – explains error size and all other issues. Resolved Friday 11/21

Background info

- Corrected ROI / Corrected Intensity is used for everything here.
  - Scatterplots of this data are at the very end in case they’re needed for reference
  - ROI dimensions: $ROI_x = \pm 15\ cm$ $ROI_y = \pm 18\ cm$
- Intensity calculated as: 1631276234.5 (1.63E9)
- Fast neutron punchthrough area remains excluded

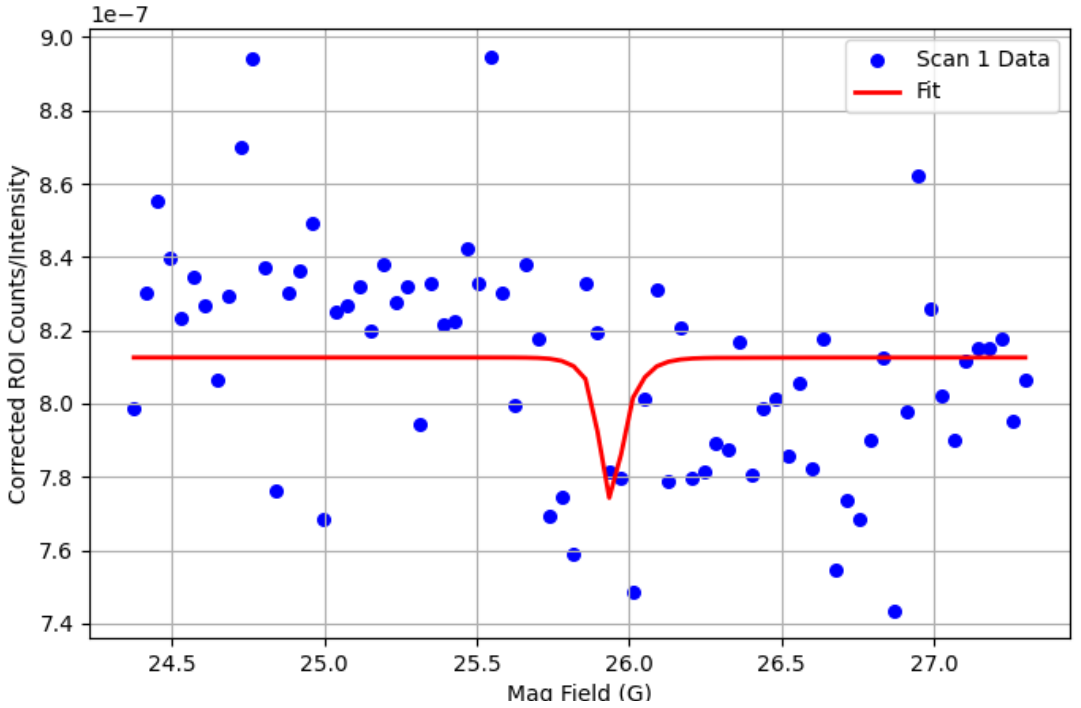
$$M = \left(a * p(n)\right) + B$$

- M: ROI/Intensity
- a: Amplitude of peak used to find k
- $p(n)$: Given function of regeneration probability over magnetic field
- B: Background

Example - Peak fixed at 25.935G

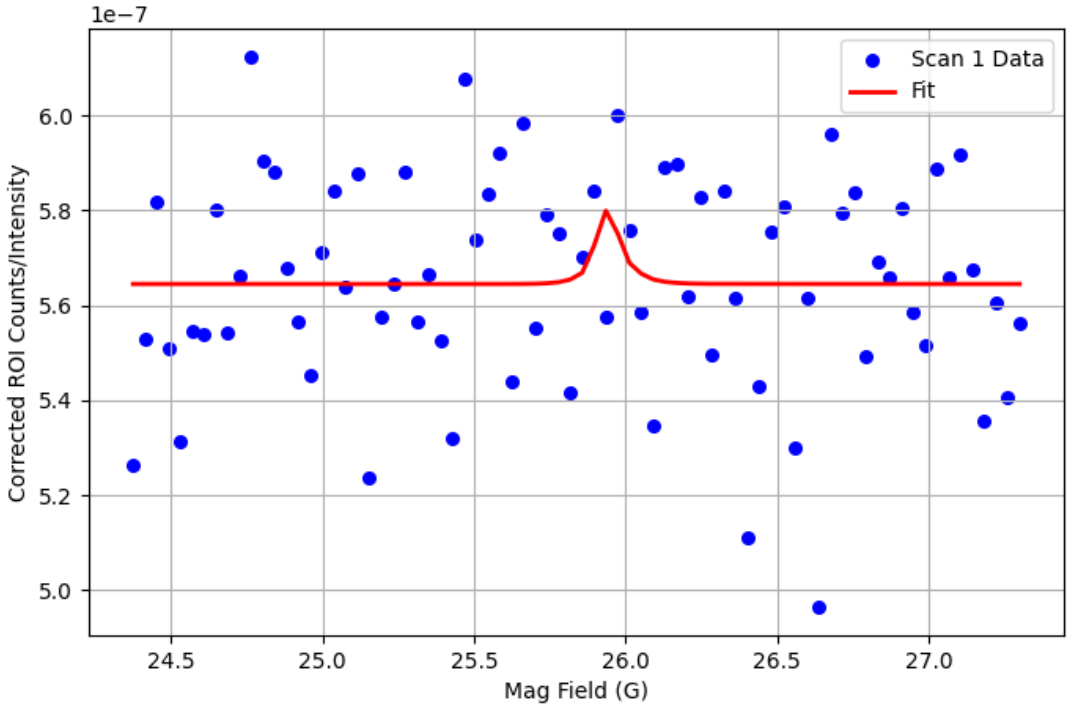
Scan 1

Parameter	Estimate	Error
a	-275.28	162.27
b	8.13E-07	3.54E-09



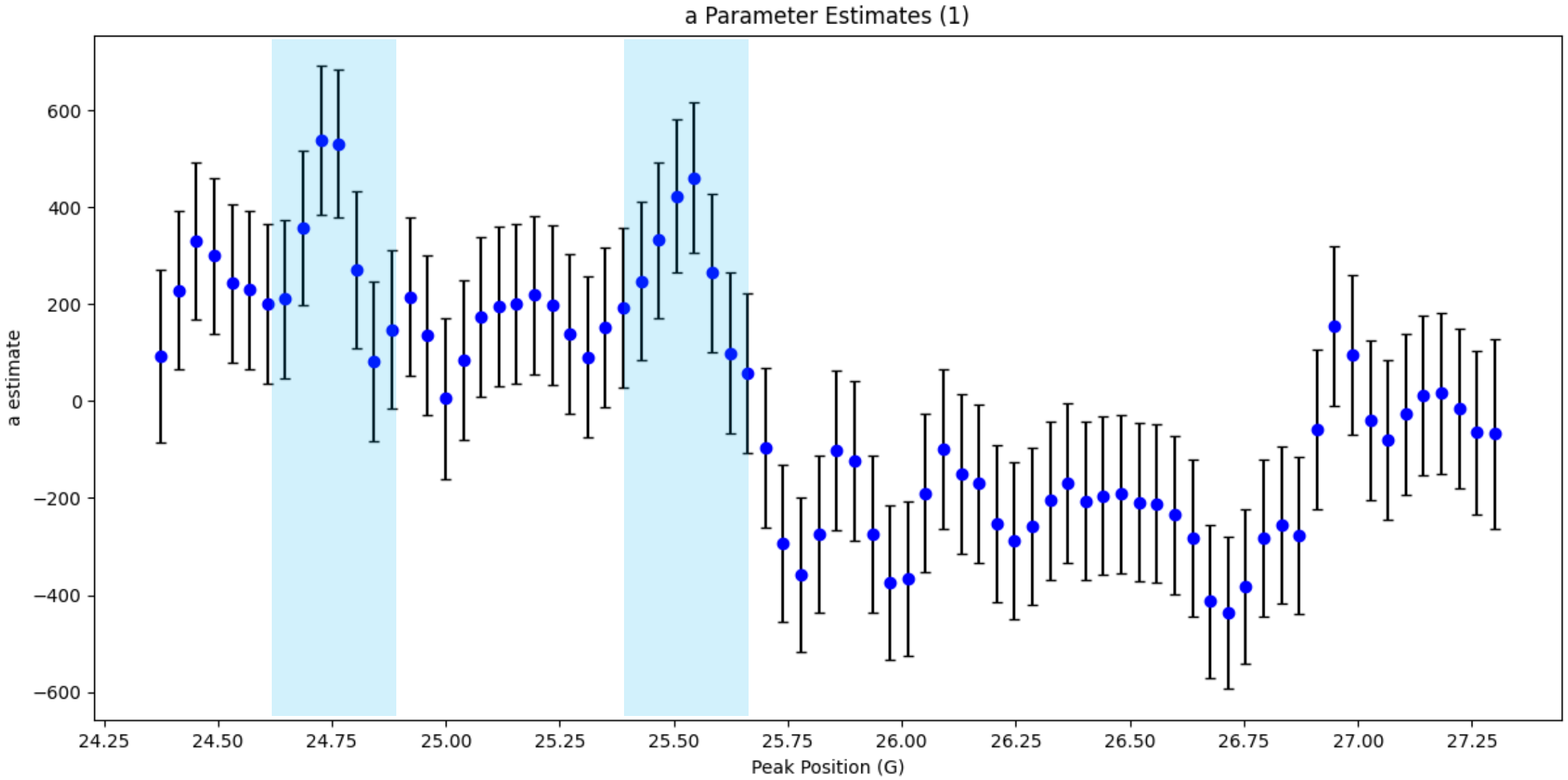
Scan 2

Parameter	Estimate	Error
a	111.02	121.2
b	5.64E-07	2.65E-09

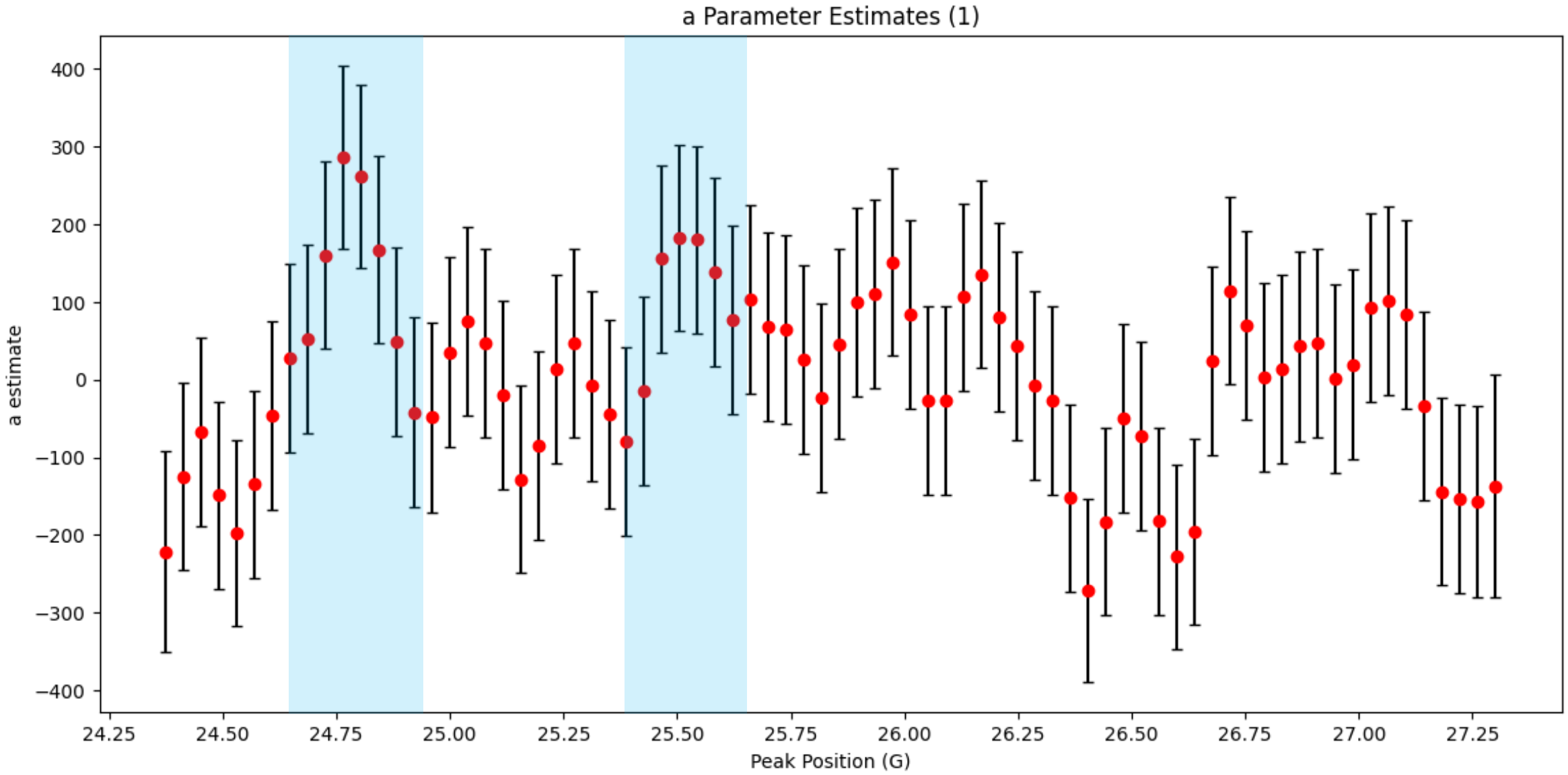


No longer in the millions!! :D

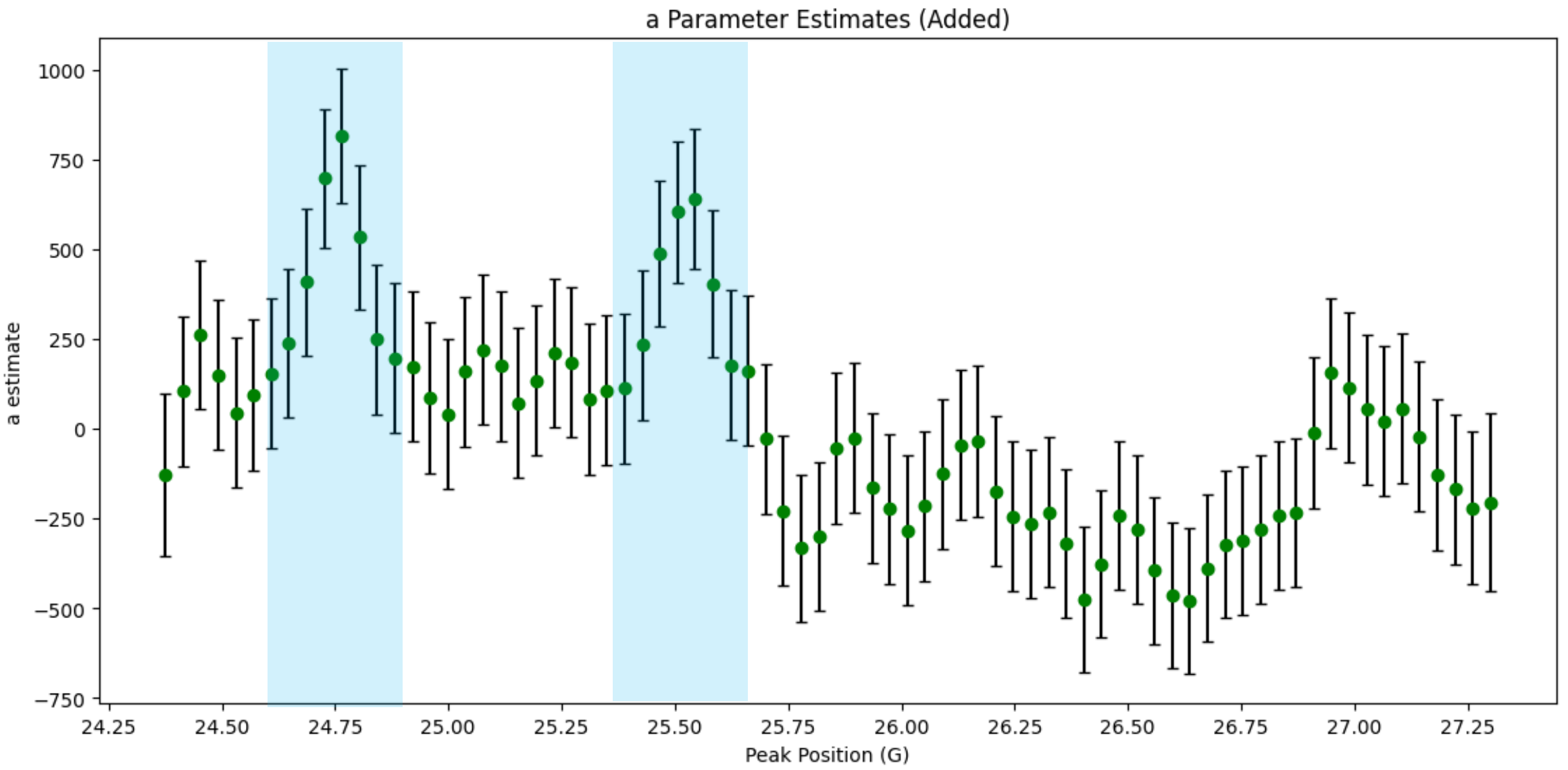
From scan 1 (30 mins) data



From scan 2 (20 mins) data



From both scans (50 mins) data

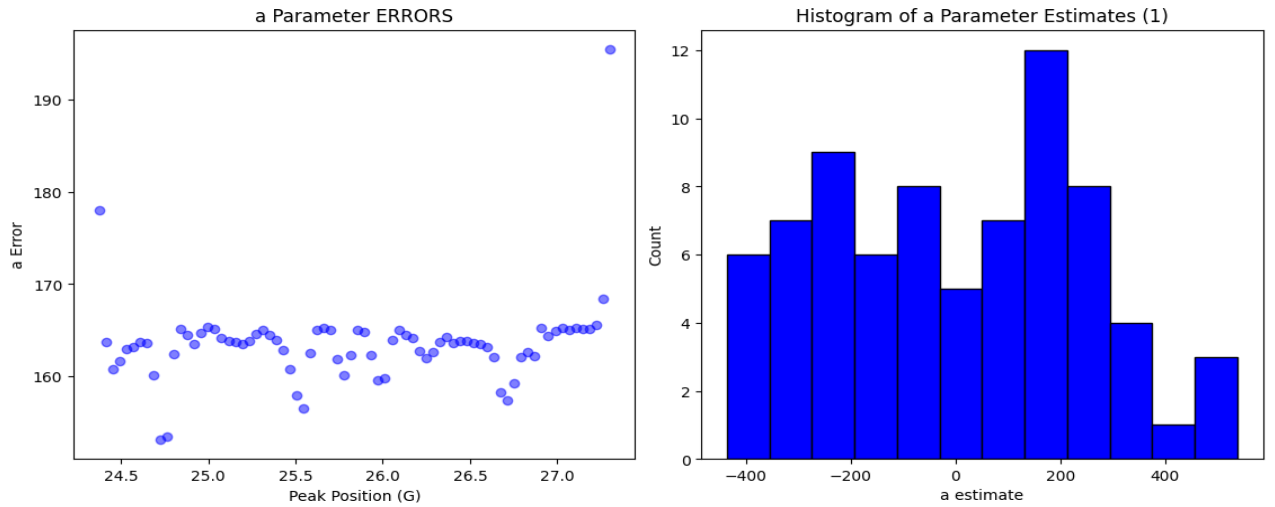


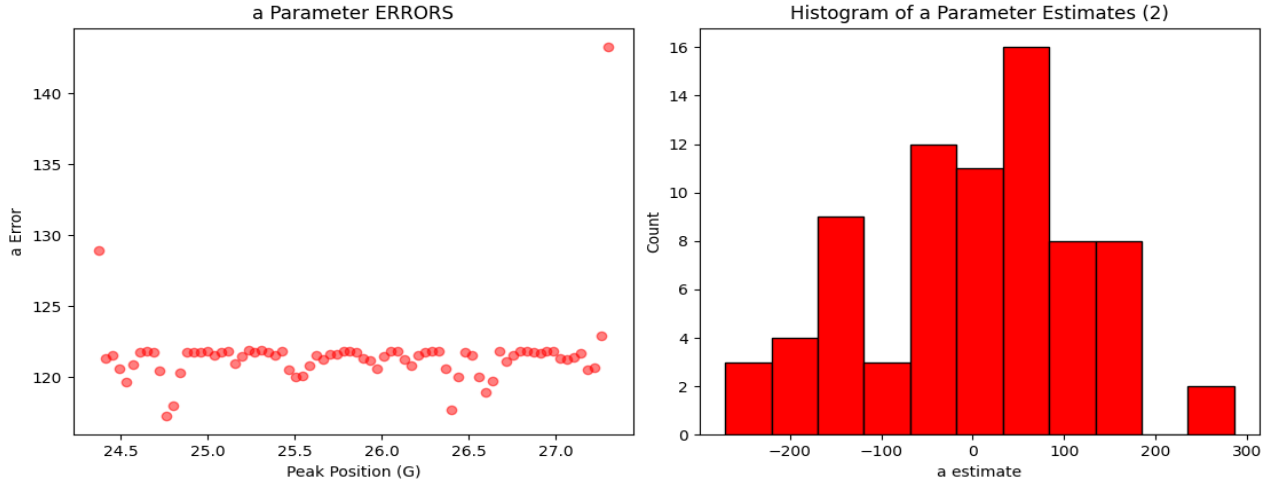
Distributions

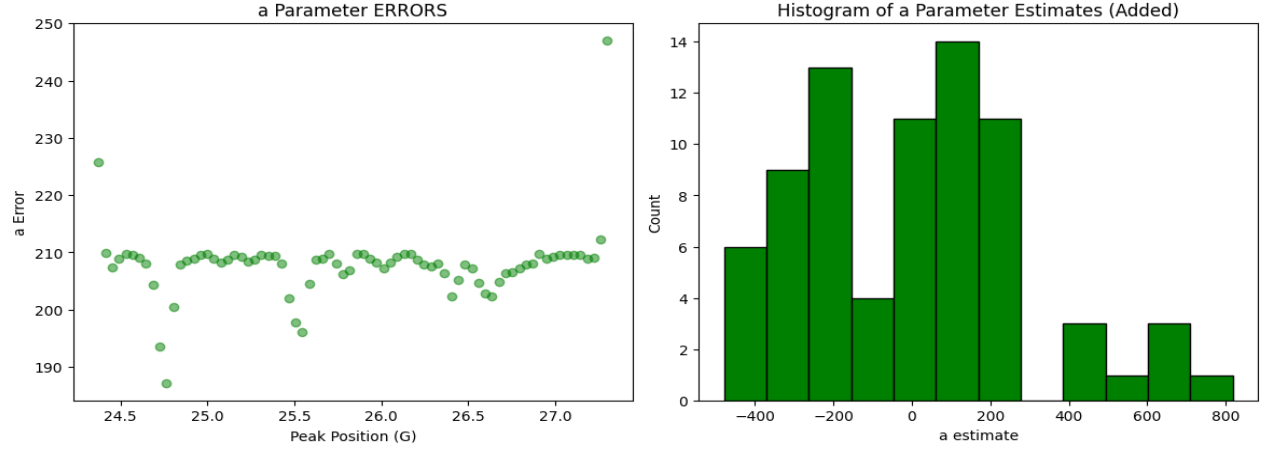
- Fitting added scan combines features from the 30 minute and 20 minute runs and their estimates

- The histograms show the distribution of the a estimates
  - Bimodal

- The scatterplots show the a errors over magnetic field.
  - minimized at “peaks” – look there (next slide)





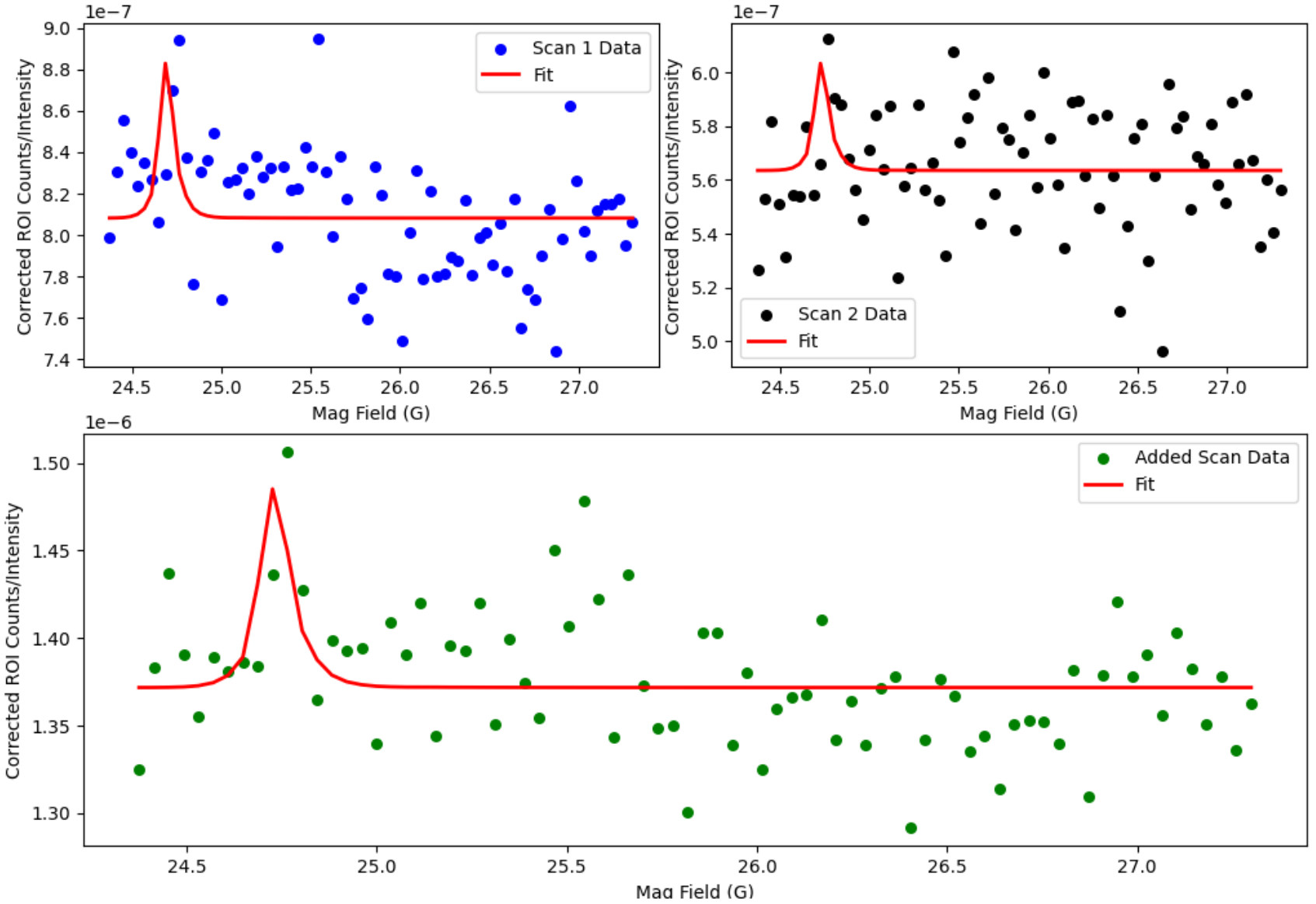


How does the fit look at these high points?

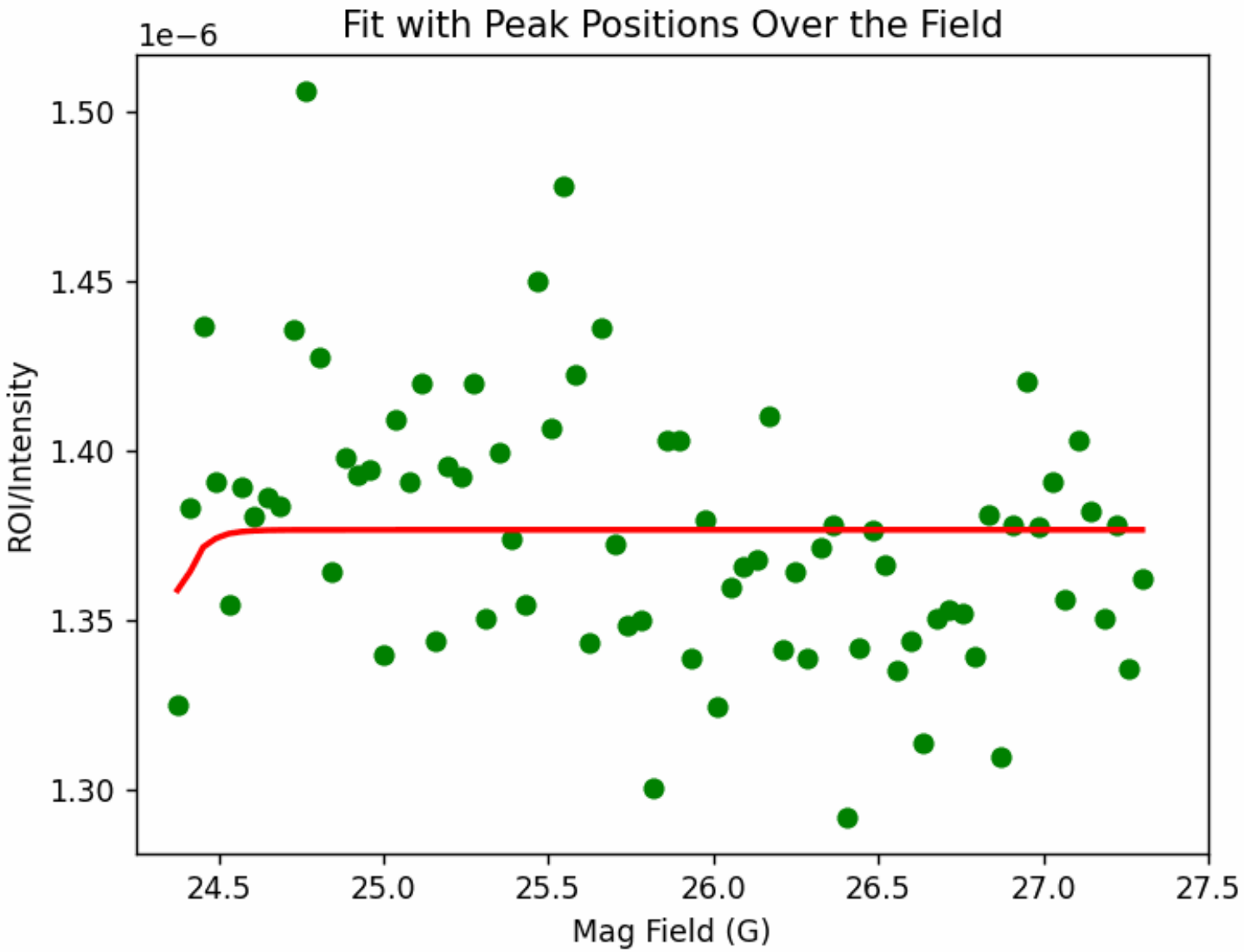
For each dataset, selected the position in magnetic field where the a errors are the lowest.

- This ignores the second high spot around 25.5G

Scan	Best Peak position
1 (30 mins)	24.726 G
2 (20 mins)	24.765 G
Added (50 mins)	24.765 G



Animation for summed data!



Thoughts and to do's

- Peak at 25.935 G doesn't seem to match the actual data,
  - Both have two distinct high points around the same magnetic field values
  - Seen visually and in the parameter estimate errors
- Double check intensity calculation
- Fix χ^2 and get statistical significance
  - Expected: The points given by the fit
  - Observed: The measured ROI/Intensity
- Try it with the worst case scenario fit function (calculated by Yuri, to be used assuming leak was present during measurement)
  - See how the results change using these regeneration probabilities
  - Compare them
- Eventually introduce peak position as a 3rd parameter (b_0). This will allow for checking the "in between" points that we can't access yet since we scanned over discrete values of magnetic field.

Downloadable

- CSVs of the a and B parameter estimates and their errors for each peak position in the magnetic field range
- Original regeneration probability function with peak shifted to each point in magnetic field range
- The scan 1, 2, and added data files I've been using, all sorted by magnetic field
  - This also includes a column for UNFILTERED ROI counts. These are still raw and have been unused

https://liveutk-my.sharepoint.com/:f:/g/personal/amoor168_vols_utk_edu/EnJD2cRjQolAkA4GX_9olzcB2YbGjqZCj1G5mtgydiVe0g?e=lRmnQI

ROI/Intensity scatterplots