# Stability of Magnet's Axial Field over 1 hour

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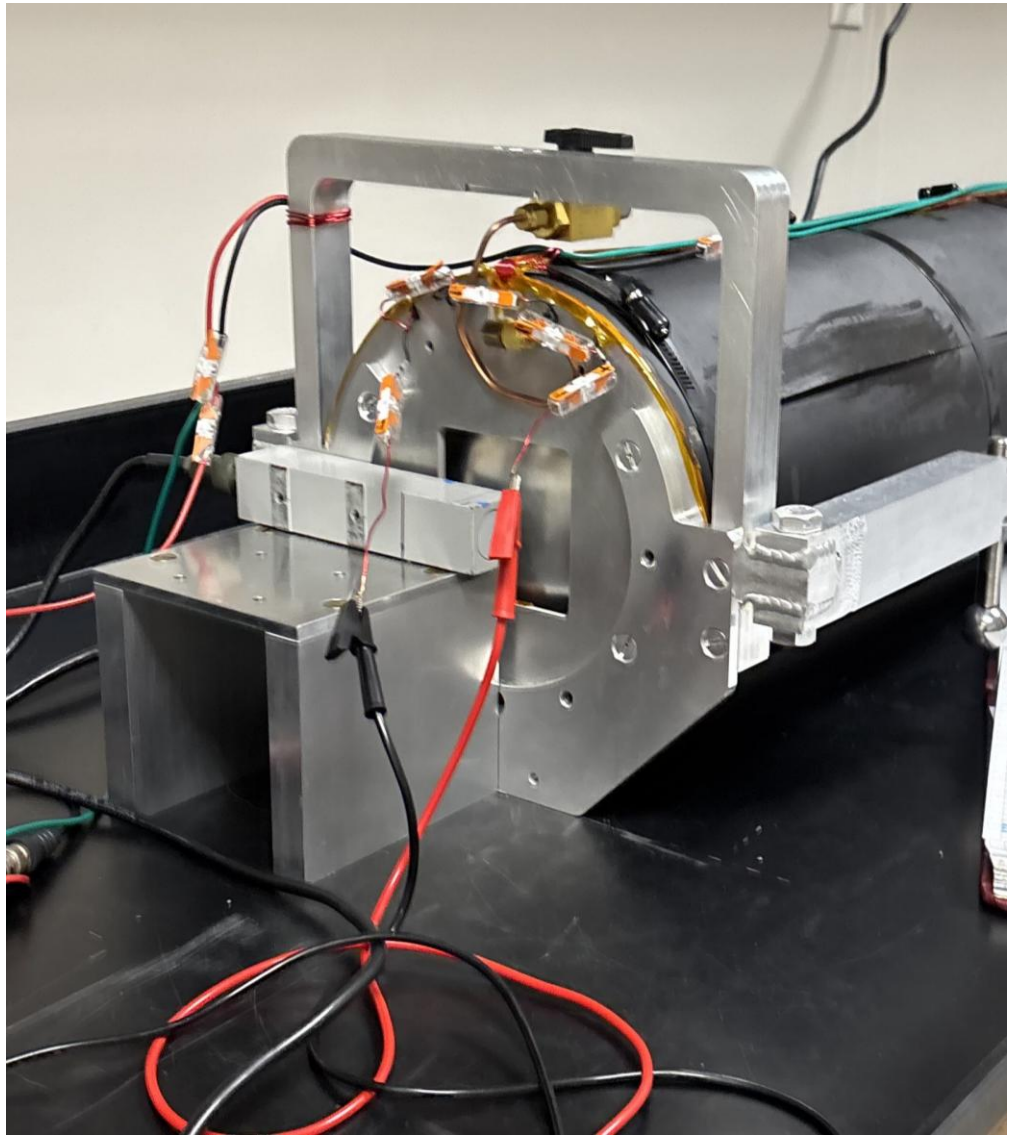
# Background

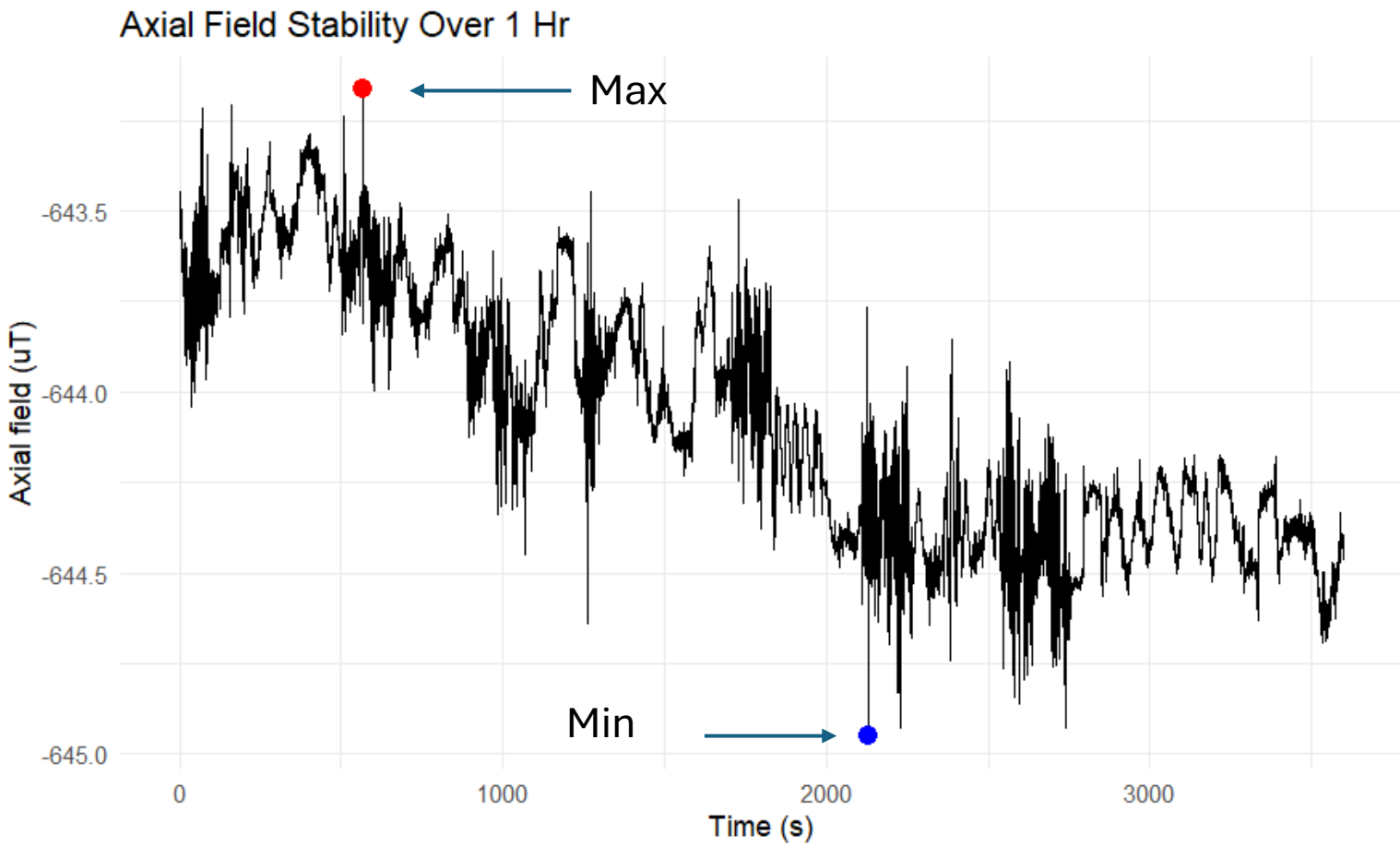
- Goal: Monitor stability and identify movement in the axial field over a long period of time

- Sampling at 10hz – 36,000 datapoints
- 0.35A to M1’s main coil
- Power supply: TDK-Lambda connected with DC filter
- Using y sensor now to measure the axial field component due to its 4% lower error



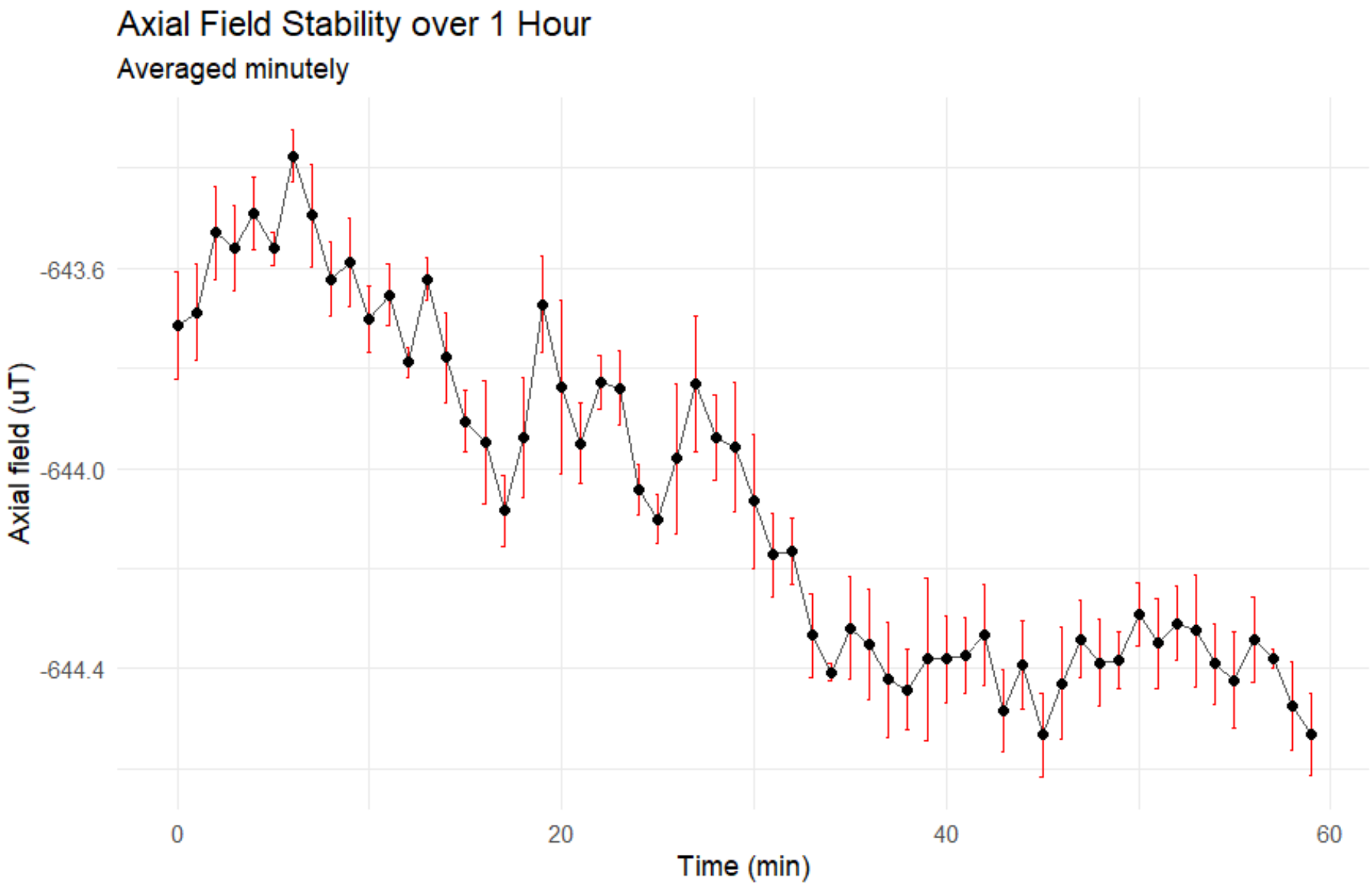
# Raw data and values

- 36000 points at 10 Hz
- σ: 0.35 relative to the mean value
- Mean: -644.1 $\mu T$
- Range ratio: 1.788
  - (max: -643.16
  - min: -644.95)
  - % change from max to min: $2.8 * 10^{-3}$(0.28%)



# Averaged by minute

- 60 points made of an average of 600 observations
- Standard deviations in red

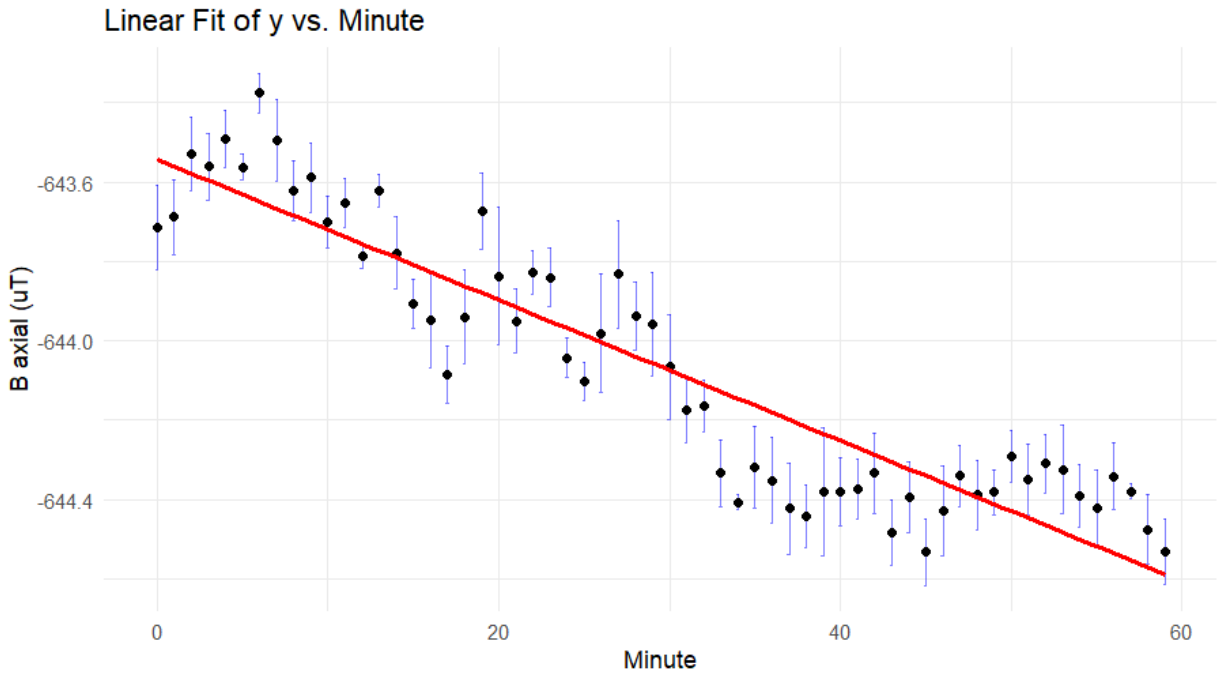


# Linear fit for minutely data

$$B_{ax} = -643.5 - 0.0177(mins)$$

Fit values:

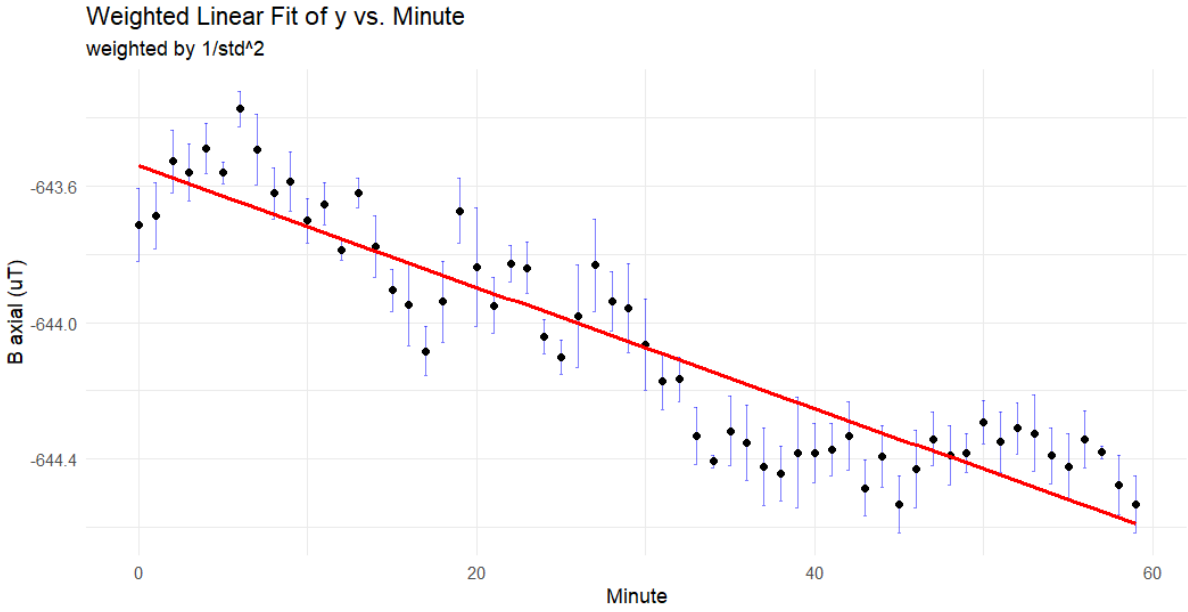
- At min = 0: -643.50
- At min = 60: -644.56




Weighted fit:

$$B_{ax} = -643.6 - 0.0164(mins)$$

- Still reasonable, little change. Using the standard deviation from the calculation of each minutely average



# Conclusions

**In the experiment:** changing the field in steps of 0.03 G from the central position at 26 G, required stability better than

$$\frac{0.03}{26} = 1.15 * 10^{-3}$$

- Using the weighted linear fit we have sofar: $1.53 * 10^{-3}$ (almost there)
- More measurements are planned (to exclude possible worming-up effects of power supply and magnet)
- Also, possible improvement if run 2 x ½ hours to reduce the effect
  In situ monitoring of magnetic field will be needed.