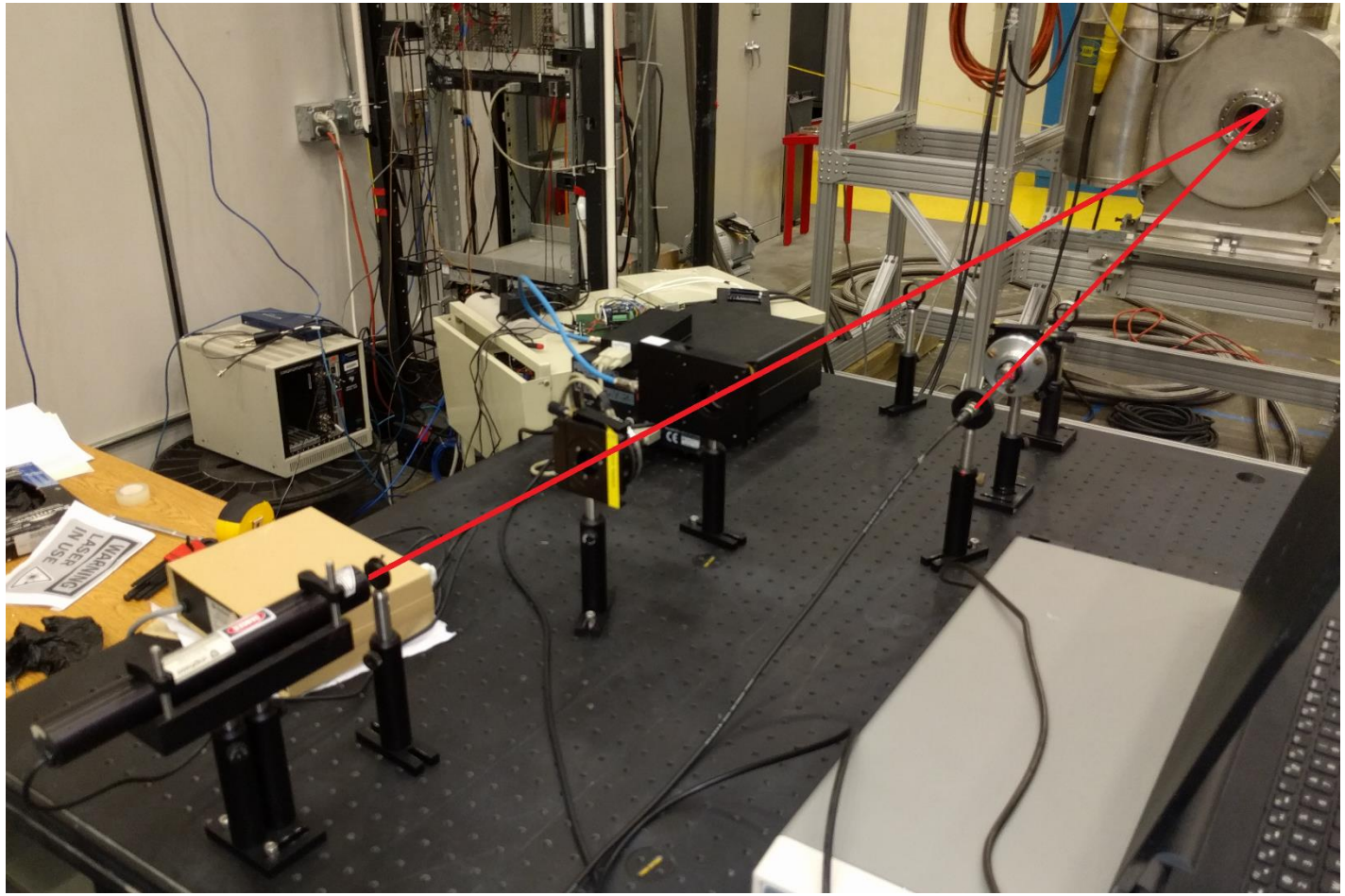
Jlab Kerr Studies

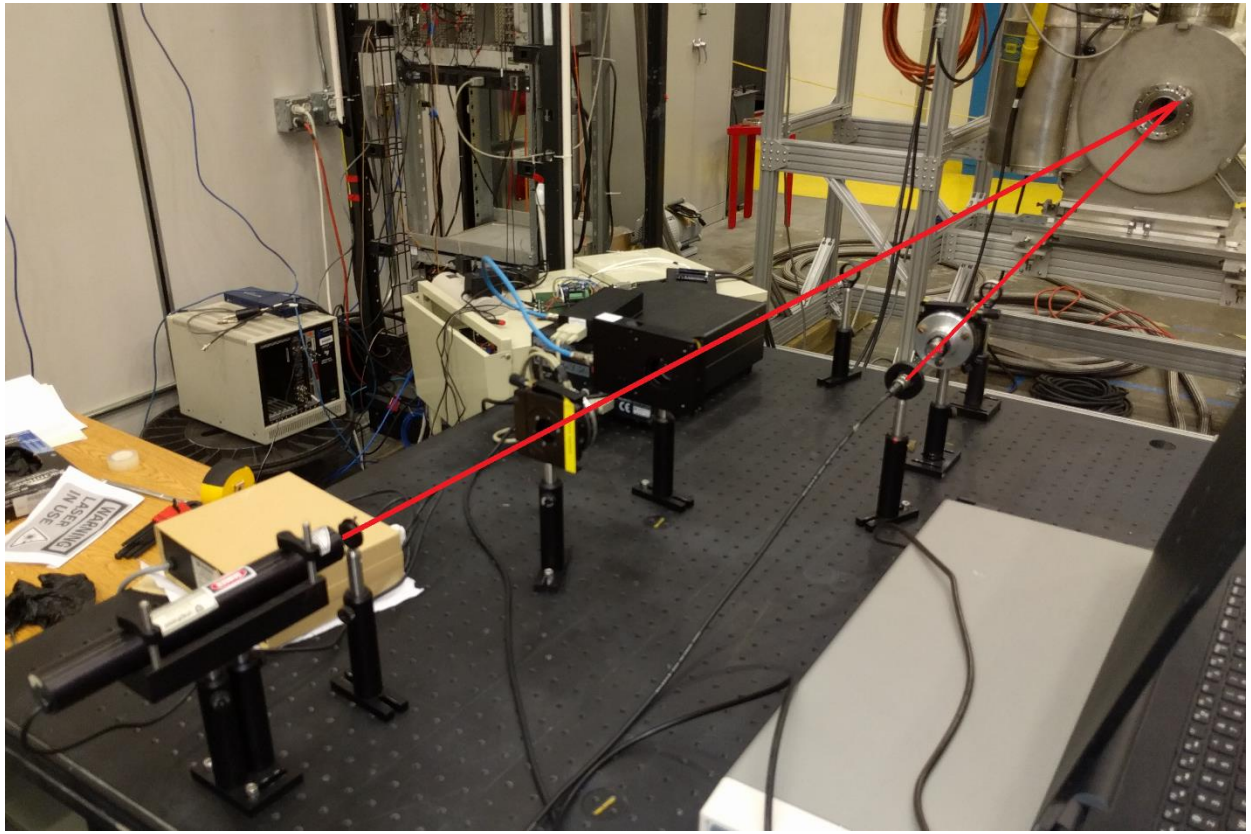
Test Lab Setup

- Optics setup in test lab
  - Laser
  - Iris
  - Polarizer #1
  - PEM
  - Lens #1
  - Target
  - Lens #2
  - Polarizer #2
  - Detector



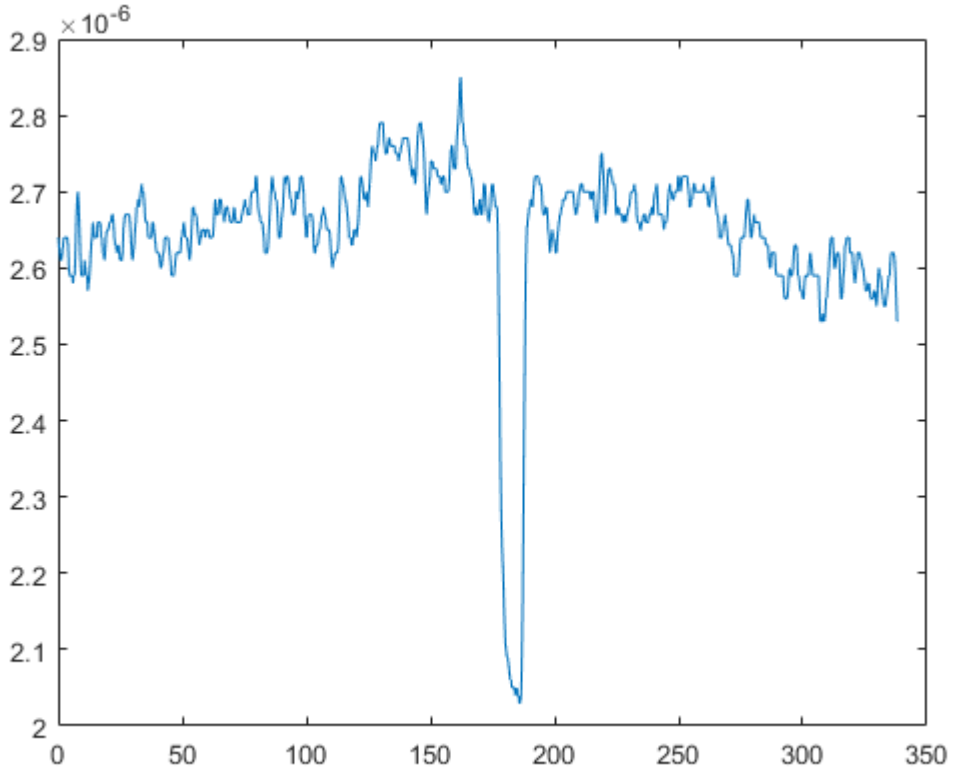
Problems & Solutions

- Optics table is next to large fan – air turbulence could* cause signal drift
  - Build simple frame and cover with material
  - Cover optics with cardboard boxes



Problems & Solutions

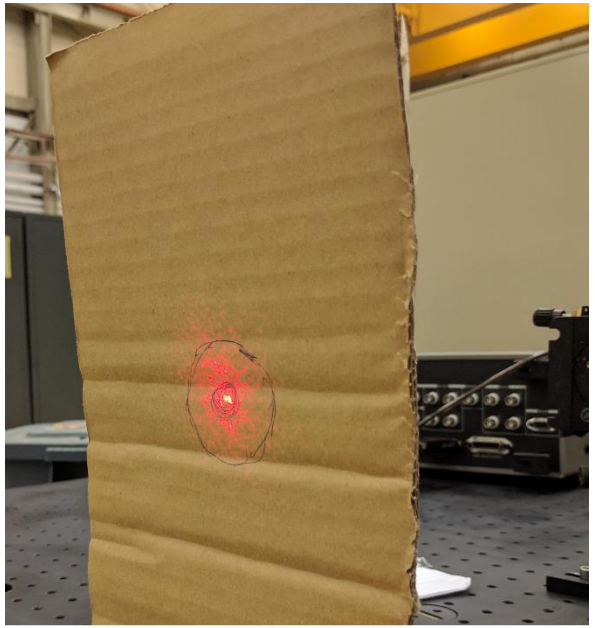
- Table not very stable – optics legs sit on wood blocks to reach target height
  - Don’t touch table while taking measurements
  - ???

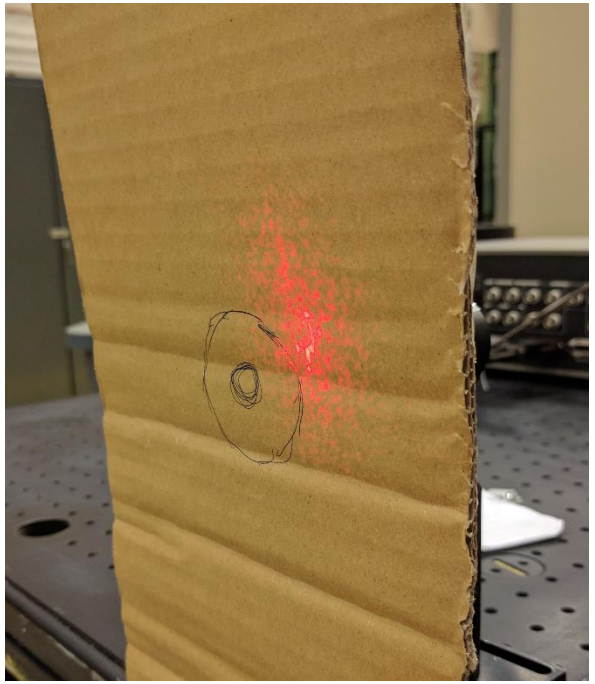


I=24A

Problems & Solutions

- Magnetic field causes foil to warp – deflects laser beam from detector
  - Compensate deflection with target holder control
  - Acquire more suitable lenses: focusing beam on target creates tighter reflection – deflection easier to compensate for
  - Polish foil more thoroughly – tighter foil reflection
  - Press/flatten foil? Holder has been tested again deflection – deflection must come from non-flat target surface
  - Sandwich foil between washers – center hole should be small enough to maximize stability but large enough to reflect laser spot

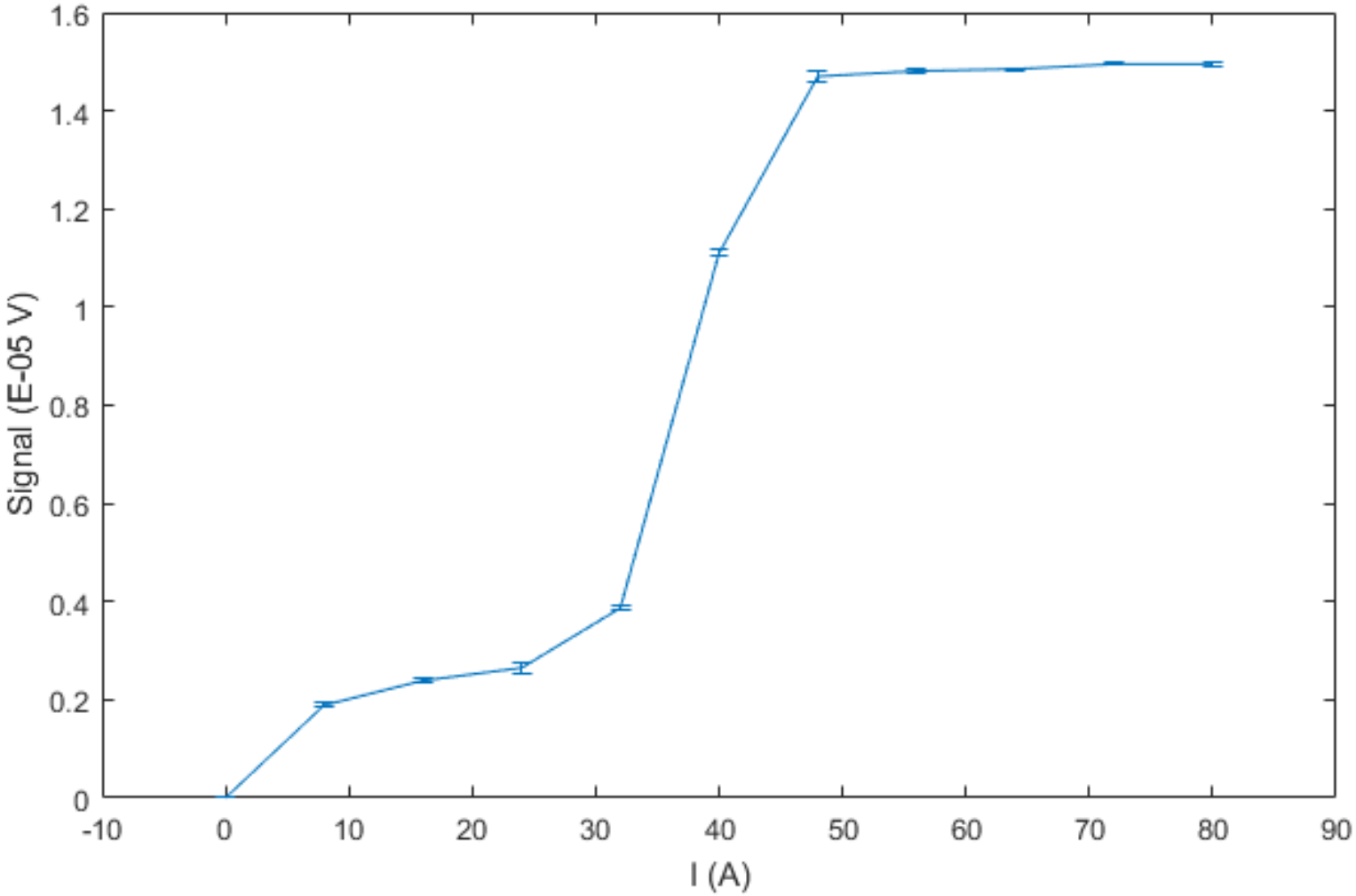




Measurements

- Took measurements at 8, 16, 24, 32, 40, 48, 56, 64, 72, 80 A
- After each field ramp, beam spot was checked for deflection and adjusted as necessary
- Due to target adjustments, measurements may not constitute a true BvH measurement
- Still useful as 10 independent measurements of signal stability

Ceci n’est pas une BvH measurement (maybe)



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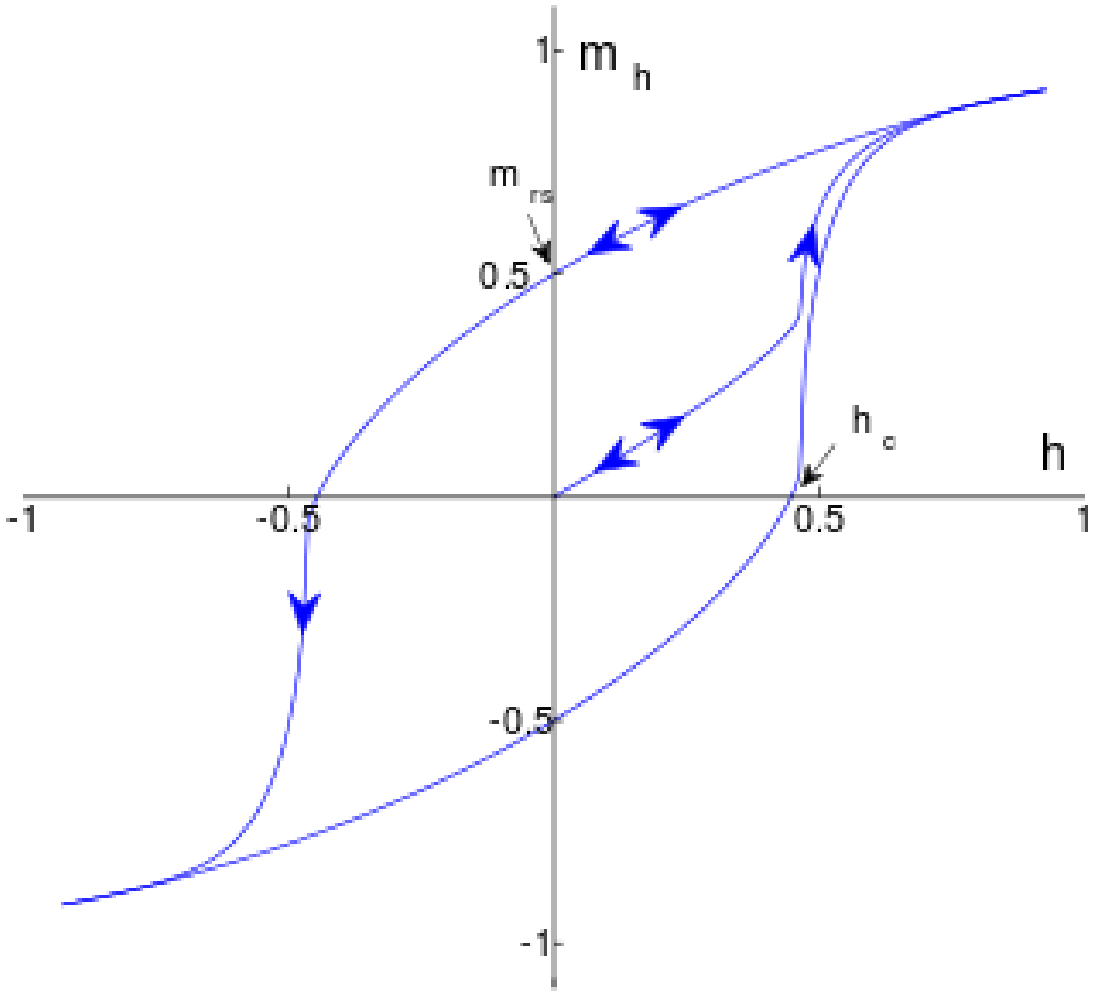
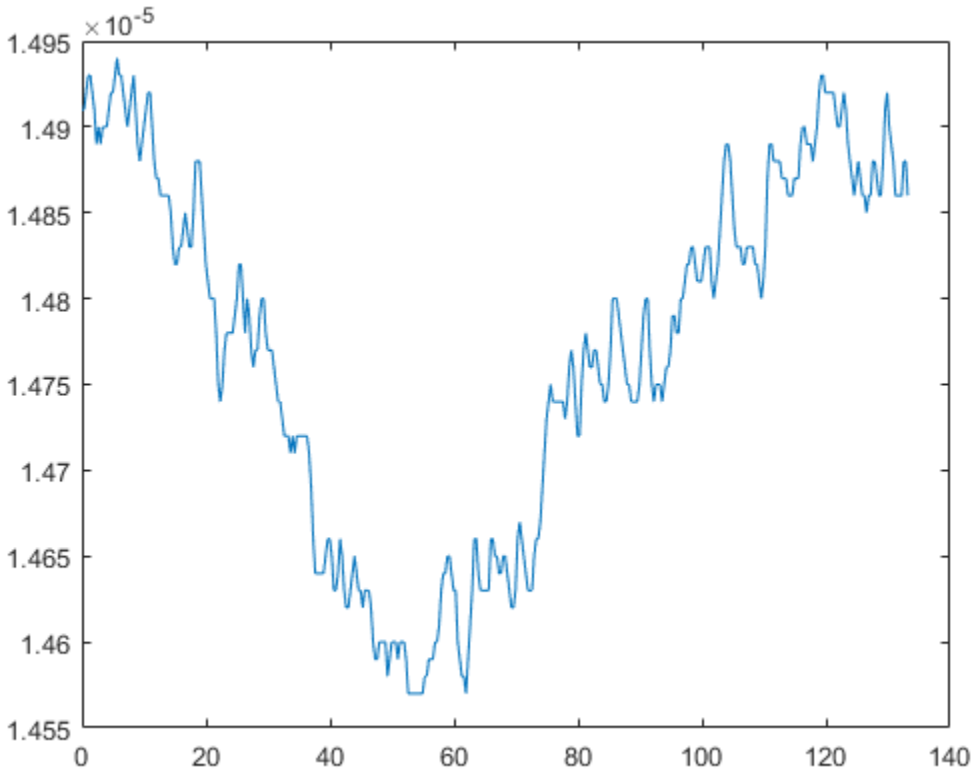


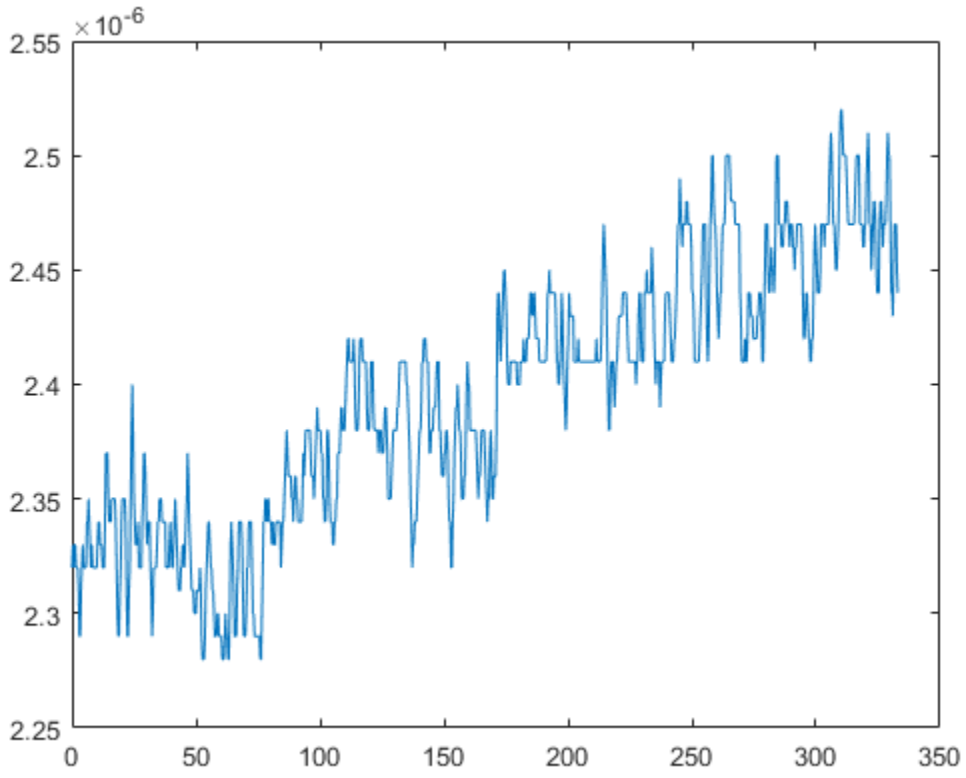
Signals Characteristics/Noise



I=48A

- Oscillating signal

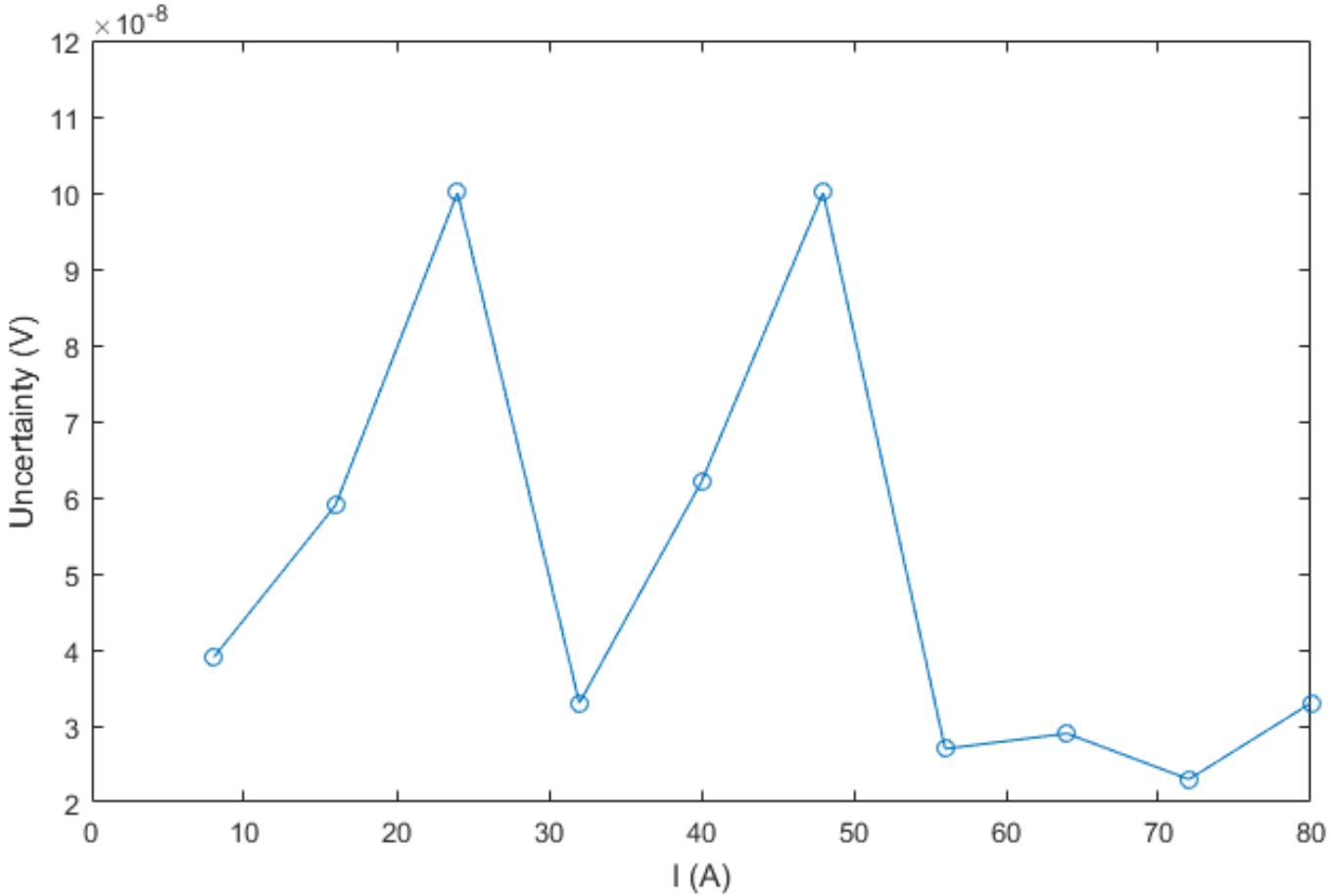
Signals Characteristics/Noise



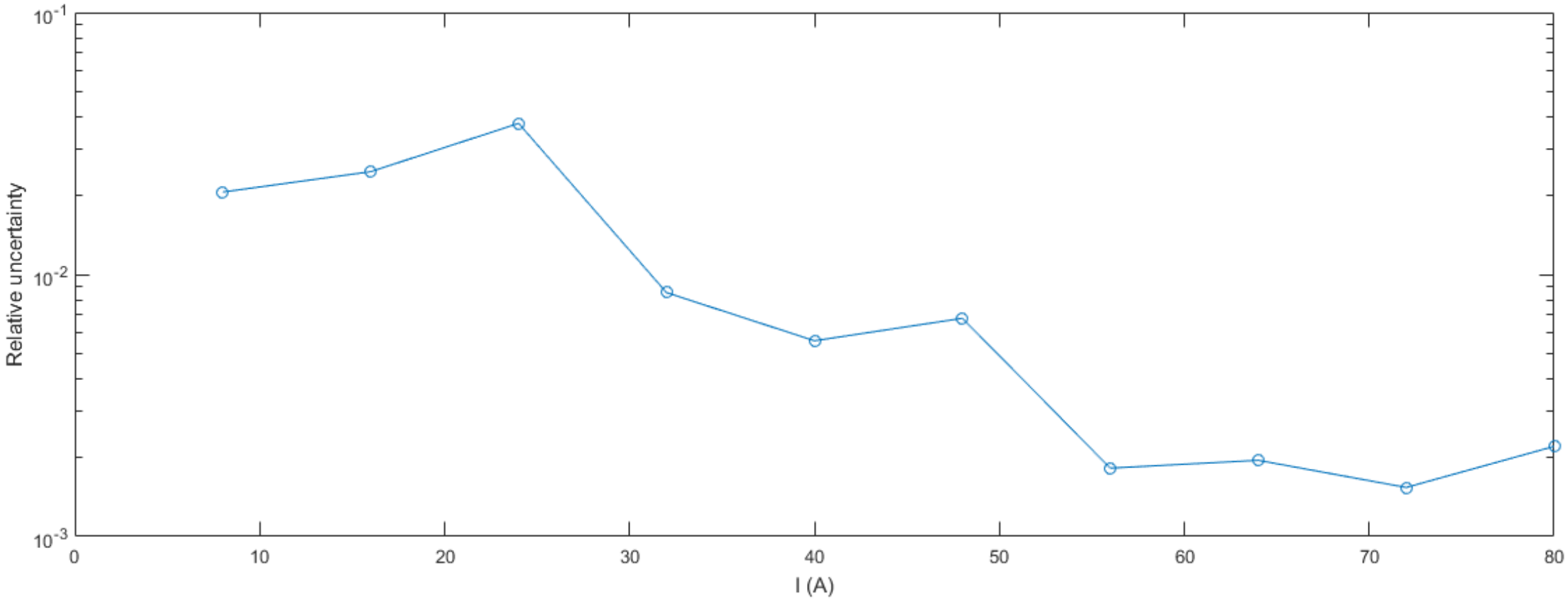
I=16A

- Drift

Uncertainties



Relative Uncertainties



Relative Uncertainties

- Total uncertainty ranges from 2-10E-08 V
- Unsurprisingly, near saturation total uncertainty is smaller than for measurements at SBU: 7E-08 versus 3E-08 V
- Relative uncertainty is reduced due to increased signal magnitude – about 2 microvolts with Supermendur versus 15 microvolts with iron foil (Supermendur relative uncertainty misquoted as .34% -- actually 3.4%)
- Relative uncertainty twice as good as prediction of .4%

Current (A)	Relative Uncertainty
8	2.06E-02
16	2.34E-02
24	4.07E-02
32	8.64E-03
40	5.59E-03
48	7.29E-03
56	1.84E-03
64	1.97E-03
72	1.59E-03
80	2.21E-03

5-7 Week Plan

- Address problems
- After setup is fine tuned, can address systematics
  - Different foil thicknesses
  - Different foil compositions
  - Angle scans
  - Audience suggestions