Lab Notebook Guidelines Phys 3330

Spring 2014

Scientists use lab notebooks as the primary record of what we accomplish from day to day. We do this to prove what we discovered if it ever comes into question, but moreover to keep track of the progress of our own work. This record is useful for us to look back on days, weeks, months, and years into the future, and it is useful for others who follow-up on our work later. Your lab notebook will be the primary means of tracking your progress in this class; you will turn in a scanned copy of your notebook (on D2L) for each experiment you carry out.

Your lab notebook should tell a story of what you did and what you were thinking as you did it. It is kind of like a scientific diary, complete with sentences, diagrams, graphs, calculations, and raw data. You should write in it while you work in the lab, and then add more later as you carry out your analysis. The most important test of a good lab notebook is, “Years from now, could someone else replicate what I did using only my current equipment and my notebook and as a guide?” You should write in your notebook with this test in mind.

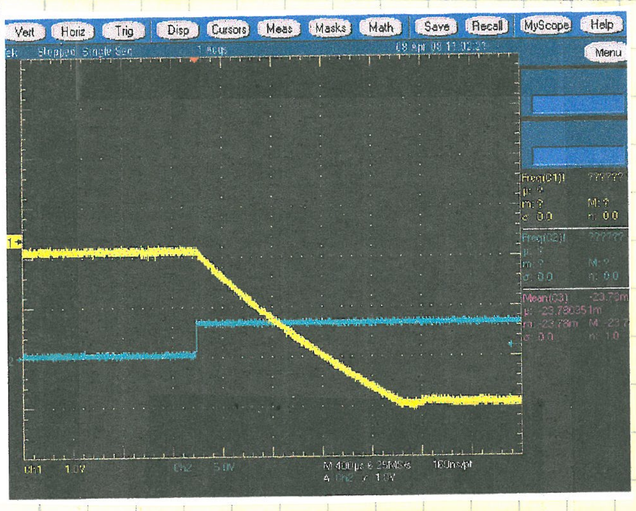
Beyond that, a good lab notebook should have:

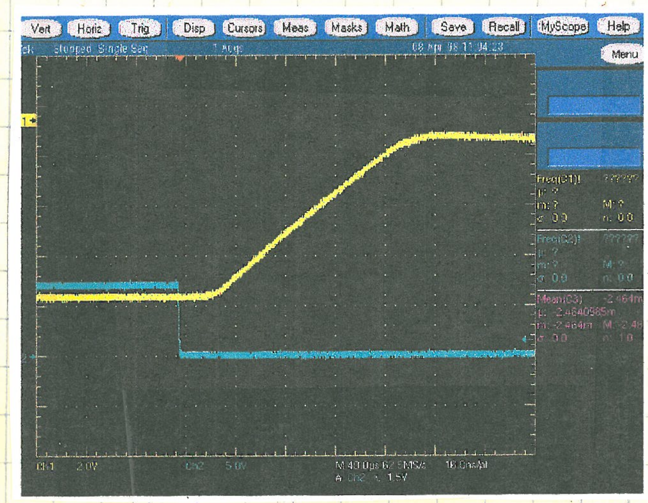
- The date of every session, written at the top of the first page
- Who you worked with
- Short sentences of text
  - Plan what you're about to do
  - Evaluate how it's working
  - Record your thoughts as you go
  - Reflect on how it went, and how it could have gone better
  - Brainstorm what you'll do in the future
  - Summarize the conclusions you draw from your data and analysis
- (Mathematica) Plots, printed out and taped in
  - Staples are less ideal than tape: they keep pages from closing flat
  - You will usually have plots from the prep work before lab *and* from the analysis of your data during/after your time in lab
- (Circuit) Diagrams
  - With labels that are referred to elsewhere (for example, label a resistor “R1”)
- Calculations and equations
- Neat tables of data
- Mistakes crossed out with a single line so they are still legible

You should include these things in your notebook as you go, using each one as it applies. Your score on each lab will depend, in part, on how closely your notebook matches these guidelines and how easy is is to follow the “story” of your lab work.

8 April 2008

We are trying to resolve why our cloud is so "cold" (80 μK). It happens that the magnetic trap is not turning off as fast as we think (pg 10). This is ~~becca~~ because there are 10 kΩ resistors on the gate of the mosfets that are slowing down the signal. We replaced the 10 kΩ resistors with 100 Ω resistors.





on time ~~≈400 μs~~ 1.6 ms

off time ~~≈40 μs~~ ~160 μs

Temperature of Trap:

$$k_B T = \frac{4}{5} \mu_0 g h B'_x X_{HWHM}$$

$\mu_0 = 1.4 \frac{MHz}{gauss}$

$g = 1/2$

$B'_x = 105.5$ gauss/cm

$X_{HWHM} = ?$

$= 1.65$ mm

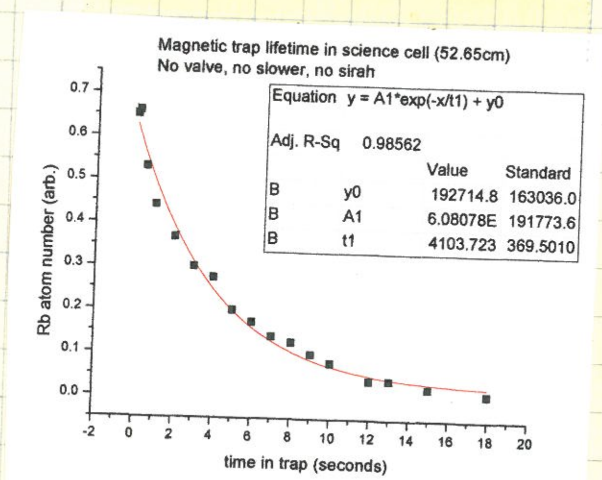
$X_{width} =$ ~~31.5~~ 34 pixels

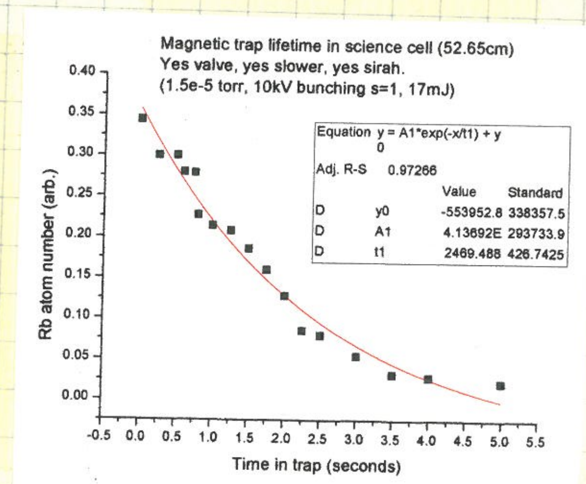
$X_{FWHM} = 2 \cdot 2.35 \cdot 34 \cdot 21 = 3.3$ mm

T = 466 μK

24 May 2008

Chamber baked overnight at 105°, only MCP and (isolation valve closed) TOFMS sections. Pressure in the back is now ~ 1×10^{-9} torr. Magnetic trap lifetime w/ no valve etc is now about 4 seconds, up from ~ 1.5 seconds with pressure in the mid -9's from last week. Lifetime measurements follow, unsure as to the cause of lifetime depletion with full aparatus running, we'll invertigate that after DAMOP. It could be the valve, sirah, or slower.

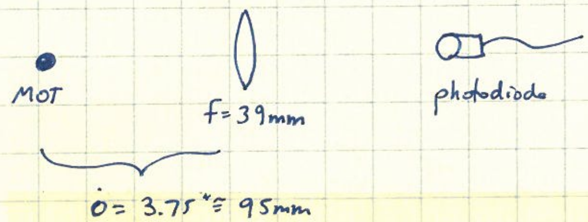




The "everything on" data fits a quadratic ~ t^2 much better than an exponential. Also of note: in the two plots above the MOT loading parameters were changed from a load point of 0.8 to 0.4 since the MOT would not load that high with the sirah on. so despite earlier conclusions,

the sirah does effect the MOT!

imaging of the mot with a photo diode



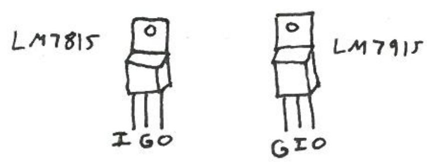
$$\frac{1}{f} = \frac{1}{i} + \frac{1}{o}$$

$\Rightarrow i \cong 66\,mm$

note: for MOT load program to work, it needs a ~~negative signal from diode~~ ~~⇒ positive signal so from amplifier~~, negative offset of ~ 2 volts. (amplifier output)

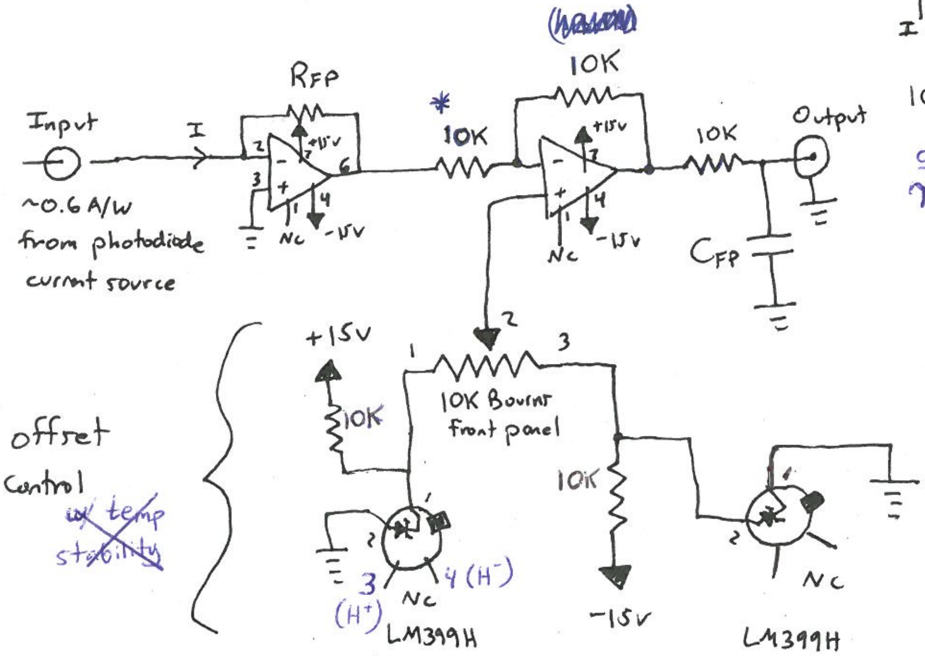
Photodiode Amplifier for MOT Imaging

power connections: ± 18 V supply



LF356 op-amps

10 μF bypass capacitors



output
$\tau = RC \in (0, 34\,ms)$

R_{FP} controls gain (2nd Amp is unity gain)
C_{FP} controls roll on/off speed. (low pass filter on output)

} both variable via multi-position switch, full CCW = position 1, full CW = position 10

roll on/off time: $\tau \approx RC$, $R = 10K$

switch position	R_{FP}	C_{FP}
1	1K	NC - 0
2	3.3K	1 nF
3	10K	4 nF
4	33K	10 nF
5	100 K	37 nF
6	330 K	100 nF
7	1 M	300 nF
8	3.3 M	1.6 μF

essentially, gain = R_{FP}

(I → V converter also sometimes called a transimpedance amp)

* actually a 1 KΩ ← see page 97