Lab Notebook for

PHY 445

Will Lancer

will.m.lancer@gmail.com

Lab notebook for PHY 445 Spring 2026

Contents

1 Feb 5, 2026

Link to the lab website: https://you.stonybrook.edu/phy445/experiment-overview/

Note: We are allowed to have 1–2 extra days for this experiment as there was no lab manual given.

1.1 Experiment: Nuclear Magnetic Resonance

Experiments that we will run:

- We will test T_1, T_2, T_2^*, and T_2' for three samples: distilled water, tap water, and water with metal in it (or honey if we do not have that);

Sub-experiment one: distilled water

We got the distilled water from the HEP-ex water room; poured it into the little pipe without a pipette because the only one we found was super dirty and probably full of AIDS.

Distilled water: T_1 Experimental set-up and tuning for measuring T_1 for distilled water:

- RF frequency matching: Tuned it until there was a minimal sine curve. Measured frequency is 21.01291 MHz.
- $\pi/2$ pulse: $1.12 \pm 0.005\,\mu$s
- π pulse: $7.32 \pm 0.005\,\mu$s

Now we tried to measure T_1 for distilled water, but this was very hard:

- We didn't know how to export the osc. data to fit it.
- We didn't know if the pulse was just one peak of the sine curve or if it was the entire curve.
- Corliss came over and helped us kind of. We didn't know how to do anything. He pointed out that we were syncing on A when we probably should have been syncing on B.
- TA came over and helped us more; got back to my original question which I'm just going to email Prof. Liu.
- After class, emailed Prof. Liu the following:

> Hi Professor Liu,
>
> My partner and I are trying to measure the T_1 timescale for the NMR experiment in PHY 445. We know that we have to fit a damped sine curve to the response of the nucleus to the A pulse to determine T_1. After asking both the TA and Professor Corliss for advice on how to do this, we are still not sure how to take the oscilloscope data and translate it into a form that we can fit a curve to. Do you have any advice on how to do this?

Also, you previously said that some sort of iron solution is commonly used in this experiment to test different responsivities to the external magnetic field and RF pulses. Will this be made available to us next Tuesday?

Thanks,
Will Lancer

Sub-experiment Two: Tap Water

Sub-experiment Three: Water with Metal in It