NMR - Nuclear Magnetic Resonance

Signature Sheet

Student's Name _____ Partner's Name _____

Pre-Lab Discussion Questions

It is your responsibility to discuss this lab with an instructor before your first day of your scheduled lab period. This signed sheet must be included as the first page of your report. Without it you will lose grade points. You should be prepared to discuss at least the following before you come to lab:

1. What is nuclear magnetic resonance? What is resonating? What magnetic fields do we apply to our sample? What do these fields do? What is Larmor precession?
2. Referring to NMR Head of this lab manual, in what directions are the DC field, the modulating (60 Hz) field, and the RF field? What do these fields do? How do these fields relate to question 1? When you arrive in lab, examine how these fields are actually oriented in space.
3. What are T1 and T2?
4. How does pulsed NMR differ from the continuous wave NMR experiment?
5. What is "free nuclear induction"?
6. What is a "spin echo"?

Staff Signature _____ Date _____

Completed before the first day of lab? (Circle one) Yes / No

Mid-Lab Discussion Questions

1. On day 3 of this lab, you should have successfully produced an H2O absorption resonance picture, with a calibrated frequency axis. What is the Larmor Frequency in MHz? Show them to a GSI and get a signature.

Staff Signature _____ Date _____

Completed by day 3 of lab? (Circle one) Yes / No

1. On day 7 of this lab, you should have successfully observed the spin echo on the scope. Show it to an instructor and ask for a signature.

Staff Signature _____ Date _____

Completed by day 7 of lab? (Circle one) Yes / No

Other Questions to answer about this experiment as you go along

1. **Quantum Mechanics and E and M:** Classical absorption and dispersion curves for light going through matter (covered in any 110 text). In the NMR lab you will encounter similar absorption and dispersion curves. Why should optical absorption and dispersion be so similar to NMR absorption and dispersion? [Hint: think of the relevant Hamiltonians!]
2. **E and M:** The experiment relies on the induced voltage generated in a "pickup" coil surrounding your sample (in more than one way). Study the sample NMR head apparatus and understand how a magnetization induced in your sample can be "picked up" by the coil (which is basically just an RLC circuit). Does the frequency of the RF field affect the pickup coil's response?

Checkpoint Signatures

1. Resonance Condition and Symmetry

   Staff Signature _____

2. Setup Pictures

   Staff Signature _____

3. CW Setup

   Staff Signature _____

4. Scanning Frequency

   Staff Signature _____

5. Mn Sample Traces

   Staff Signature _____