

Getting started on the PULSED-NMR Expt:

1. Turn on the **TeachSpin** (PS1-A) instrument via a switch in back near the plug.

2. On page 25 of the **TeachSpin** manual, you will first check out a single pulse from the pulse programmer. Be sure to put CH1 on the *A+B out* port and obtain a display similar to Fig. 4.2 on the digital scope.
 - a. Verify that the width of the A-pulse varies from 1 μ s to about 35 μ s.
 - b. Verify that the repetition time (between initial edges) varies from about 1 ms (10% on 10 ms setting) to about 10 ms (100% on 10 ms setting).
 - c. Switch to *Man. Mode* and observe the A-pulse when you press the *Man. Start* button.

3. On page 26 of the **TeachSpin** manual, you will next check out a two-pulse sequence from the pulse programmer. You should now obtain a display similar to Fig. 5.2 on CH1.
 - a. Verify that you can vary the width of the B-pulse to make it look like the A-pulse.
 - b. Change the B-pulse delay time, noting that the delay must be greater than the A-pulse width. Observe delay times from 1 ms to 9 ms.
 - c. Change the *Sync* to the B-pulse and observe the B-pulse to move to the original position of the A-pulse's leading edge. The A-pulse may not even show up, if the repetition time is long enough.
 - d. Turn the A-pulse off and back on; likewise, turn the B-pulse off and back on; vary the repetition time. Observe what happens. [Note: If you try to *shorten* the repetition time too much, a high-frequency tone will start, which indicates that you have reduced the time between pulse too much causing the rf-generator to shut down. If this happens, turn off the PS1-A unit and then restart it.]

4. Now, check out the multiple-pulse sequence.
 - a. Start with three pulses and observe them on the digital scope using $100 \mu\text{s}$ per cm. Note that the B-pulses have twice the width as the single A-pulse by choice.
 - b. Change the horizontal sweep on the digital scope to $250 \mu\text{s}/\text{cm}$. Now, vary the number of B-pulses up to 10. Note that the spacing between successive B-pulses is twice the spacing between the A-pulse and the first B-pulses by design (as constrained by the spin-echo and the rephrasing times).
 - c. Change the mode switch to *MAN* and the press *Man Start* button. Note that the appearance of the pulse sequence can be captured by using the single acquisition triggering mode of you digital scope.
 - d. Return to a 3-pulse sequence and the internal mode; then change the delay time to 2 ms. Also change the scope sweep time to $1 \text{ ms}/\text{cm}$. Observe that all pulses look like spikes and they do not change over the full range of the pulse width (though increasing the A-pulse width does make the scope display more stable).

5. Skip the receiver checking section of the **TeachSpin** manual on page 27 since we do not have a “dummy signal” probe.

6. Estimate the duration of the rf-pulse needed to rotate the longitudinal magnetization M_z by 90° to become the transverse magnetization M_{xy} .

7. You are now ready to observe the *Free Induction Decay* (FID) signal on the digital scope, by going to page 2 of the “Experimental Procedures” handout.