Flow-Through NMR

**LabVIEW Code:**

The LabVIEW code features 1 main .VI file that utilizes 3 sub .VI files. The main VI file inputs the starting Larmor Frequency and the pulse file and immediately starts the Larmor Optimization sub-VI file. This sub VI takes measurements at, above, and below the starting Larmor Frequency and outputs the one with the best signal, each time calling a spin echo amplitude extraction VI file that takes the initial amplitude of the spin echo. The main VI then calls a T2 curve VI which is almost exactly the same as the VI we use for normal NMR that returns a T2 curve. The main VI allows you to change the number of data points averaged for each T2 curve for this VI as well as the number of T2 curves that are saved for each iteration of the main VI. Each iteration of the main VI consists of a Larmor Optimization phase followed by a T2 curve saving phase. So if you have a number of samples of 4 and a number of loops per iteration of 4, the code will be collecting 16 samples and saving 4 curves for each time it optimizes Larmor Frequency.

**Running NMR:**

To actually run the NMR, the first thing you need to do is set up the system. This will be the same as normal NMR, except the main difference is that rather than having a static sample tube, pumps are used with a tube to consistently change the sample. All of it is in the fridge except for the magnet. The coil and the coil holder CAD piece are in the NMR toolbox. The coil PCB needs an SMA connector to be soldered on and it will need to be calibrated like in the HardwareX paper. The pumps are hooked up to an Arduino that has them set to run for a set amount of time and then off for a set amount of time. We were working with controlling it via LabVIEW, but it was inconsistent and weird and the Arduino connection just wasn’t reliable so we stopped and just made it fixed time intervals.

To conduct NMR the first step is to plug in the power supply that connects both to the pumps and the PCB. This will turn the pumps on. Do not plug in that power supply unless you are ready for pumps to bring in water. At this time you can start the NMR code and begin collecting data. Be sure to check in on the process every now and then to be sure the spin echoes are still visible. If not, unplug the power supply, force the code to stop, find the Larmor frequency, and run the code with a new folder to save data in. The power supply we use for this is an NI power supply – I believe it is in the wind tunnel lab, it is a thick black cord you can plug into a power strip.