DSG – HDice Meeting

Date: August 25, 2020
Time: 3:30PM – 4:30PM

Attendees: Peter Bonneau, Aaron Brown, Pablo Campero, Brian Eng, Tyler Lemon, Tom O'Connell, Xiangdong Wei

1. Discussed background subtraction and scaling added to fsNMR program
    - 1.1. Goal is to extract the true NMR signal from acquired signals that also include background noise and noise caused by Q-curve
        - 1.1.1. Q-curve is combined effects on the lock-in amplifier signal caused by inductance of NMR coil, inductance and capacitance of RF cables, and capacitance of equipment used to acquire NMR signal
        - 1.1.2. When you acquire background data, you are recording Q-curve of system
    - 1.2. Subtracting background data from new data removes background noise, but to see the true NMR signal, the data must also be scaled by a gain correction factor
        - 1.2.1. For the HDice NMR racks, the gain correction factor at a frequency f is assumed to be $\frac{R_{0bkgd}}{R_{bkgd}(f)}$
            - 1.2.1.1. R_{0bkgd} = maximum of Gaussian fit on background's amplitude signal
            - 1.2.1.2. $R_{bkgd}(f)$ = background amplitude at frequency f
    - 1.3. Scaling equations to use for X and Y:
        - 1.3.1. $S_X(f) = \left(X(f) - X_{bkgd}(f)\right) \times \frac{R_{0bkgd}}{R_{bkgd}(f)}$
        - 1.3.2. $S_Y(f) = \left(Y(f) - Y_{bkgd}(f)\right) \times \frac{R_{0bkgd}}{R_{bkgd}(f)}$

2. Tyler Lemon will correct scaling equations for X and Y in fsNMR program so they match equations above for $S_X(f)$ and $S_Y(f)$

3. Discussed UITF timeline
    - 3.1. Run 0 to test whether UITF is a viable accelerator ended 8/21/2020
        - 3.1.1. Got ~8 MeV beam in UITF
        - 3.1.2. May run additional tests in near future to see whether 9 MeV beam energy is possible
        - 3.1.3. After Run 0, documentation on UITF operation and approval from Department of Energy needed to continue
    - 3.2. Set up for Run 1 to begin testing HDice equipment scheduled to begin end of week of 8/25/2020
        - 3.2.1. Set up involves cooling IBC and tuning UITF accelerator
    - 3.3. Run 1 scheduled to start end of week of August 31, 2020

4. During Run 1, it would be ideal to have fsNMR program, however, if there are still bugs to be worked out in program, analysis can be performed offline with raw data
    - 4.1. Raw data logging proven and known to work

5. Request made to add ability for program to take automatic screenshot of program's front panel when fsNMR run is complete
    - 5.1. Tyler Lemon will investigate and add ability to fsNMR program if it is feasible