

Target Analysis

Water NMR Fit

Matthew Posik

¹Temple University
Philadelphia, PA 19122

05/03/2012

1 Water NMR Fit

Water NMR Fit

- Fit function is solved in Mathematica as a function of time
- NMR data is taken as a function of magnetic field
- Previously I converted magnetic field into time by applying $(H - 20.5)/\alpha$ and then fit the data
- Now I write the time t in the fit function as $t = (H - H_0)/\alpha$ where H_0 is a fit parameter

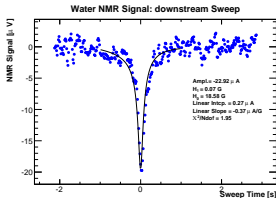


Figure: Old fit with out varying H_0 .

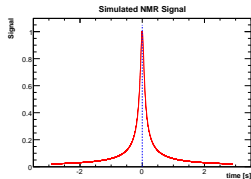


Figure: Fit function solved in Mathematica.

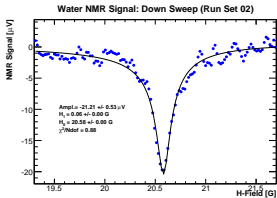
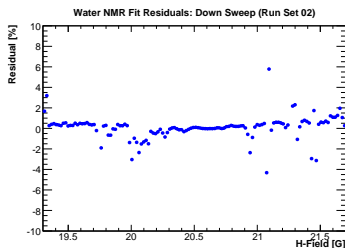
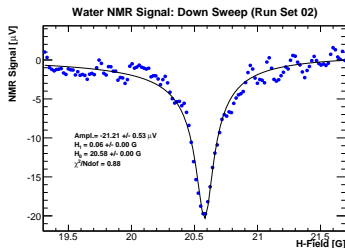


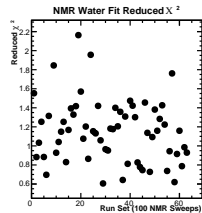
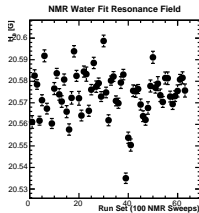
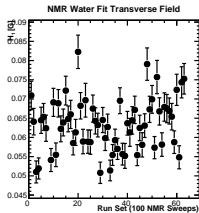
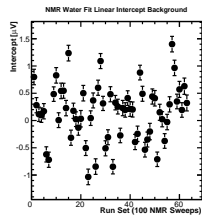
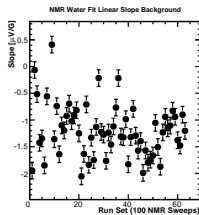
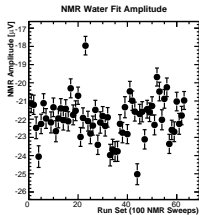
Figure: New fit varying H_0 .

100 Sweep Runs Sets: Down Stream Coil, Down Sweep

- Down stream Down sweep
- Made run sets consisting of 100 sweeps

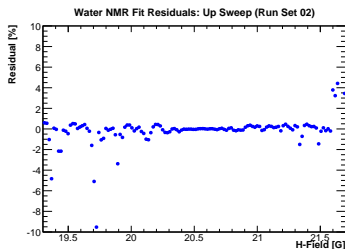
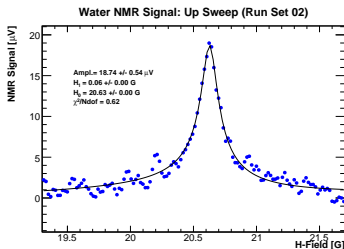


Run Set Systematics (Down Stream Coil Down Sweep)

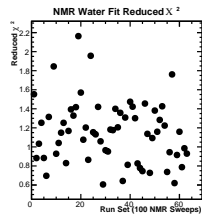
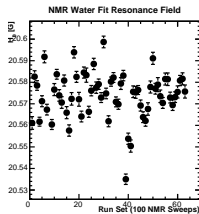
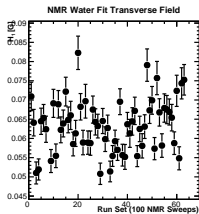
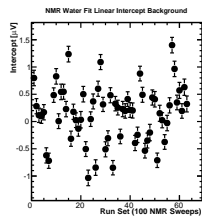
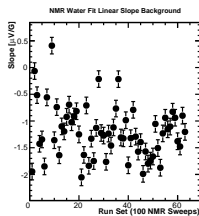
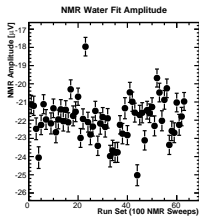


100 Sweep Runs Sets: Up Stream Coil, Up Sweep

- Up stream Up sweep
- Made run sets consisting of 100 sweeps

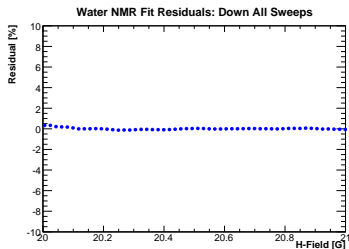
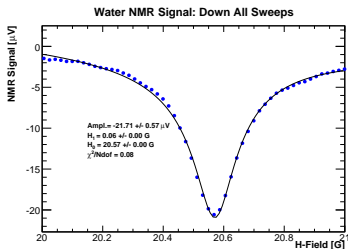
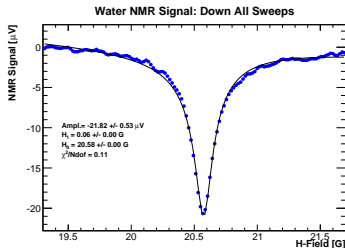


Run Set Systematics (Down Stream Coil Down Sweep)



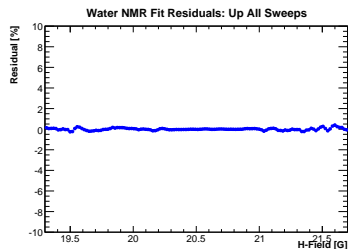
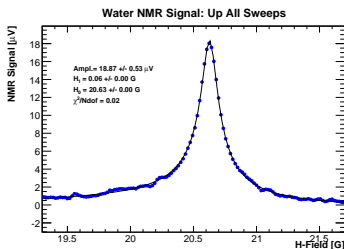
Down Stream Coil: All Down Sweeps

- Better fit achieved if fit range is reduced to $20 < H < 21$
- Total sweeps: 6,198
- Statistical error: $\frac{1}{\sqrt{\text{sweeps}}} = 0.0127$
- Amplitude statistical error:
 $\text{Amplitude} \times \frac{1}{\sqrt{\text{sweeps}}} = 21.7 \times 0.0127 = 0.27517 \mu\text{V}$
- Amplitude fit error: $0.57 \mu\text{V}$
- Total Error: 2.92%



Down Stream Coil: All Up Sweeps

- Total sweeps: 6,198
- Statistical error: $\frac{1}{\sqrt{\text{sweeps}}} = 0.0127$
- Amplitude statistical error: $\text{Amplitude} \times \frac{1}{\sqrt{\text{sweeps}}} = 18.87 \times 0.0127 = 0.2397\mu V$
- Amplitude fit error: $0.53\mu V$
- Total Error: 3.08%



Summary and To Do

- Look at and fit **upstream** coil
- Fit ^3He NMR data