Pulsed NMR Work at NHMFL PFF

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We have built up a pulsed NMR system and successfully tested it in the 20T superconducting magnet. The signal to noise ratio that we observed for protons and fluorine was more than adequate to allow us to see a well defined single free induction decay waveform. We decided at this point to put the NMR probe into our mid pulse magnet and began to optimize the system for pulsed magnetic field applications. We did one series of experiments in February using the same Teflon sample that was used for the 20T superconductor experiments. However, after several magnet pulses we were unable to see the signal. The rf pulse rate was set at 10kHz and we should have seen 2 or 3 pulses at the peak magnetic field of 9 tesla: the same field that the FID was observed in the 20T magnet. Because the Beta of the mid-pulse magnet is lower that the superconducting magnet it was considered likely that the magnetic field uniformity was at issue.

Calculations show that by placing a small bucking coil in the mid-pulse magnet bore and applying a small field in the opposite direction and same pulse shape as the magnet field, the z-axis uniformity can be significantly improved. This coil has been placed around the cryostat tail and located at magnetic field center. A voltage powered power supply will be connected to the coil that will permit a current waveform to be applied to the small coil with the required shape and amplitude. This work has not yet taken place.

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