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Development of Instrumentation and Metrology for Low Magnetic Field Bio-Imaging SUSANA BELTRAN, Southwestern University, JOSHUA BILLER, KARL STUPIC, JOHN MORELAND, National Institute of Standards and Technology — Because of the weak interaction of the proton magnetic moment with applied field, large applied static fields are necessary for adequate signal to noise ratios (SNR). An alternative route to increasing the SNR in a NMR or MRI experiment is to hyperpolarize the spins by placing them close to stable paramagnetic centers. For the same field strength, the paramagnetic centers are polarized 658x more than the protons, and some of this polarization can be transferred to the protons in a process called dynamic nuclear polarization (DNP). Solution state DNP can be applied to enhance NMR and MRI signals at low fields (<0.3T); however, the process is still not understood well enough to make quantitative measurements. Recently a digital NMR was constructed at NIST2 and has been extended to include DNP operation programmed with LabVIEW. Along with the DNP experiment, the instrument can measure T1H with a simple single pulse saturation recovery experiment (SPSR). However, the SPSR suffers from a larger measurement error (10%) than the more commonly used inversion recovery sequence. To reduce error in the T1H measurement, work was undertaken to program in an inversion recovery sequence with composite pulses and an eight-step phase cycle.

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