

Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

A RF Preamplifier Design For Low Temperature NMR Experiments.¹ SUNG SU KIM, CHAO HUAN, LARRY PHELPS, JIAN-SHENG XIA, NEIL SULLIVAN, University of Florida, DONALD CANDELA, University of Massachusetts, Amherst — It was reported by several research groups that the recently discovered possible supersolid state of solid ^4He has strong correlations with the presence of ^3He impurities and other defects. These observations aroused new interest in the NMR study of solid ^4He doped with ^3He . However, the extremely low concentration of ^3He (less than 100 ppm) and the long nuclear spin lattice relaxation times in the interested regime lead to a challenging task to achieve detectable NMR signals. We present a new design for a low temperature preamplifier working with a crossed-coil NMR probe. This preamplifier reduces the noise temperature to 1 K at a sample temperature as low as 250 mK when it is thermally anchored to the mixing chamber of a dilution refrigerator. With an adapted design, we are able to cool down the sample to about 10 mK and keep the noise temperature well below 4 K.

¹This research was carried out at the NHMFL High B/T Facility which is supported by NSF Grant DMR 0654118 and by the State of Florida. This project was supported in part by an award from the Collaborative Users Grant Program of the NHMFL

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Date submitted: 20 Nov 2009

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