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Unlocking the Full Potential of MR Imaging of Multi-Spin Solids

JARED ROVNY, SEAN BARRETT, MERIDETH FREY, Yale University — Advances in magnetic resonance pulse sequences have allowed dramatic increases in imaging resolution of single-spin solids by exploiting the internal dynamics of radio-frequency pulses. The "Quadratic Echo" pulse sequence [1] used to accomplish this provides results about 1000-fold worse when applied to multi-spin solids primarily due to heteronuclear dipolar interactions. Our preliminary goal is to discover an effective decoupling scheme for Phosphorus and Hydrogen in wet bone samples and integrate it with the complicated Quadratic Echo pulse sequence by advancing our understanding of the Hamiltonian dynamics of these systems. Initial trials will focus on simple systems and naive decoupling schemes, the results of which will serve to improve our understanding of the internal spin dynamics and guide further trials. Results will be presented from a benchmark study of Ammonium Dihydrogen Phosphate crystal as a simple multi-spin system under continuous-wave decoupling. Implications of these results and further possibilities for more complicated decoupling schemes will be discussed. [1] Proc. Natl. Acad. Sci. USA **109**, 5190 (2012)

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