

Abstract Submitted  
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**Linewidth Narrowing for  $^{31}\text{P}$  Phosphorus MRI of Bones** MERIDETH FREY, SEAN BARRETT, Yale University Physics Dept. — Bone is a particularly challenging tissue to study with conventional MRI given the relatively low water density and wider linewidths of its solid components.<sup>1</sup> Recent fundamental research in quantum computing gave rise to a new NMR pulse sequence that can be used to narrow the broad NMR spectrum of solids.<sup>2</sup> Here we narrow the spectrum of the  $^{31}\text{P}$  in natural bone mineral (by a factor of up to 1600x). This technique offers a new route to do high spatial resolution, 3D  $^{31}\text{P}$  MRI of bone which complements conventional MRI and x-ray based techniques to study bone physiology and structure. Thus far we have used our pulse sequence to do high spatial resolution (sub-250  $\mu\text{m}$ )<sup>3</sup> 3D  $^{31}\text{P}$  MRI of *ex vivo* dry bovine cortical bones, wet porcine rib bones, and wet rabbit femoral bones at 4T. We have also explored the use of compressive sampling<sup>3</sup> to push imaging time down to less than two hours without distracting artifacts.

<sup>1</sup>F. W. Wehrli, J. MRI **25**, 390 (2007); S. Anumula et al., Bone **42**, 405 (2008); D. Idiyatullin et al., J. Mag Res **193**, 267 (2008); E.E. Sigmund et al., NMR Biomed **22**, 436 (2009); Y. Wu et al., J. MRI **31**, 954 (2010)

<sup>2</sup>Y. Dong et al. Phys. Rev. Lett. **100**: 247601 (2008); D. Li et al. Phys. Rev. B **77**: 214306 (2008)

<sup>3</sup>M. Lustig et al., Mag Res Med **58**, 1182 (2007)

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