Linewidth Narrowing for $^{31}$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.\(^1\) 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.\(^2\) Here we narrow the spectrum of the $^{31}$P in natural bone mineral (by a factor of up to 1600x). This technique offers a new route to do high spatial resolution, 3D $^{31}$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 µm)$^3$ 3D $^{31}$P MRI of *ex vivo* dry bovine cortical bones, wet procine rib bones, and wet rabbit femoral bones at 4T. We have also explored the use of compressive sampling$^3$ to push imaging time down to less than two hours without distracting artifacts.


\(^3\)M. Lustig et al., Mag Res Med 58, 1182 (2007)