Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Diffusion dependence of proton NMR relaxation rates in the presence of ferritin MICHAEL BOSS, P. CHRIS HAMMEL, The Ohio State University, Department of Physics — Ferritin is the predominant iron-storage protein in living organisms. It may serve as an indicator of neurodegenerative diseases such as Alzheimer's. Measuring brain ferritin concentration non-invasively via MRI could enable better diagnoses and treatments of such diseases. Quantitative MRI determination of the ferritin concentration requires an understanding of the NMR relaxation mechanisms of hydrogen protons in the presence of ferritin. In aqueous solutions, ferritin enhances the transverse relaxation rate (R_2) of the protons. This is thought to occur due to a diffusive mechanism, where protons diffusing near ferritin pass through a region of elevated magnetic field, and a chemical exchange mechanism, where protons bind to the protein for a period of time, experiencing an even higher magnetic field. These two mechanisms exhibit different dependencies on the self-diffusion coefficient of the protons. By adding glycerol to aqueous solutions, we control the self-diffusion of protons. We measure the R_2 of protons in ferritin-containing binary mixtures of water and glycerol using CPMG sequences, and compare the experimental results to theoretical predictions of diffusion dependence in order to distinguish the relative importance of the mechanisms.

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Date submitted: 21 Nov 2008 Electronic form version 1.4