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Development and Characterization of NMR Measurements for Polymer Gel Dosimetry ZACHARY KWONG, HEATHER WHITNEY[1], Wheaton College — Polymer gel dosimeters are systems of water, gelatin, and monomers which form polymers upon irradiation. The gelatin matrix retains dose distribution in 3D form, facilitating truly integrated measurements of complex dose plans for radiation therapy. Polymer gels have two proton pools coupled by exchange: free solvent protons and bound polymerized macromolecular protons. Measuring magnetization transfer (MT) and relaxation affords useful insights into particle rigidity and chemical exchange effects on relaxation in polymer gels. Polymer gel dose response has been previously quantified with several techniques, most often in terms of MRI parameters, usually at field strengths of 1.5 T and below. The research described here investigates the dose response of a revised MAGIC gel dosimeter via both high-field imaging and simpler nuclear magnetic resonance (NMR) spectroscopy. This includes both transverse and longitudinal relaxation rates (R2 and R1) and quantitative MT parameters. We investigated estimating polymer molecular weight for a given applied dose using the Rouse model and R2 data from the imaging study. Finally, we began development of NMR methods for studying dose response, requiring adaption of NMR experiments to accommodate for radiation damping.

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