

Bioengineering 208: Magnetic Resonance Imaging Laboratory
 Winter 2008
 Lab 10- Week of 3/10

For this lab you will use the diffusion features in spec. For all experiments, use the T/R birdcage head coil. Spin echo. Single axial slice with slice thickness 5mm. Relevant CV's are:

dif	1	Switch for diffusion weighting
pw_gd		δ is pw_gd + 400us
a_gxd	0 or 4	Amplitude of X diffusion grad in G/cm
a_gyd	0 or 4	Amplitude of Y diffusion grad in G/cm
a_gzd	0 or 4	Amplitude of Z diffusion grad in G/cm
		Assume $\Delta = \delta + 5.5\text{ms}$
vdif	2	Stepped diffusion per rep with linear gradient amp a_g[xyz]d will be stepped linearly across reps
vdif ramp	10	Number of b values
reps	10	Number of image (1 per value of diffusion weighting)
dda	2	Dummy scans

1. **Measure diffusion anisotropy in a phantom.** Pineapple phantom. FOV 16cm. Variable diffusion in X, Y, Z. Calculate values of pw_gd to give a bmax of approximately 1000s/mm².
 - a. **Single shot.** Collect one diffusion weighted run with diffusion weighting in each [XYZ] direction, opxres=64 and nl=1.
 - b. **Two shot.** Collect one diffusion weighted run with diffusion weighting in each [XYZ] direction, opxres=96 and nl=2.
 - c. Calculate maps of: Dxx, Dyy, Dzz, Trace, and Anisotropy (Var(Dnn)) (6 points)
 - d. Would you expect anisotropy to be higher or lower with higher resolution? Why? (2 points)
2. **Measure diffusion and motion in brain.** Human subject. FOV 22cm. Variable diffusion in X, Y, Z. Calculate values of pw_gd to give a bmax of approximately 1000s/mm².
 - a. **Single shot.** Collect one diffusion weighted run with diffusion weighting in each [XYZ] direction, opxres=64 and nl=1.
 - b. **Two shot.** Collect one diffusion weighted run with diffusion weighting in each [XYZ] direction, opxres=96 and nl=2.
 - c. **Calculate a temperature map of the brain.** Repeat for both nl=1 and nl=2. (5 points).
 - d. **Calculate maps of RMS brain velocity in X, Y, Z directions.** Which data is most appropriate for making this measurement? (5 points).
 - e. **As diffusion weighting increases what do you notice about the image quality for nl=1 vs nl=2?** Why do you see what you see? (2 points).