Bioengineering 278: Magnetic Resonance Imaging Laboratory
Winter 2014
Lab 5

1. The Spatial-Spectral Pulse (Wednesday)
The spatial-spectral pulse is designed to excite a slice in space, but excite only water or fat, but not both. The goal of this lab is to plot the 2D response of the pulse in z-f (space-frequency) space, both experimentally and theoretically. The B1 and Gz for the pulse is shown below, and is given in the file lab5.mat on the class server. In lab5.mat, B1(rho) is in G, Gz is in G/cm and the timebase in s is in the vector t. For this lab use the pink spherical phantom in the birdcage coil for uniform B1+. Use our homemade pulse sequence 'slicpro', and set rhexecctrl to 11. Acquire an axial image of the slice profile, with frequency encoding L/R. This pulse sequence rotates the slice select gradient so that it is along the frequency encode axis and the slice profile can be visualized directly. In Manual Prescan, offset the Y shim value by 200 units and rescan. This adds a static linear gradient in the Y direction, and makes the image a map of z-f space. Calculate the expected response of the pulse in z-f space. Display the measured and calculated responses to the pulse as an image in z-f space, and label the axes in cm and Hz (**12 points**). By comparing your image with your calculated response, calculate (verify) the gain of the Y shim system in G/cm per adjustment unit. (**2 points**)

2. Small tip pulse design (Friday)
Prior to lab, design and email to the instructor a small tip RF pulse which, when applied in the presence of a 0.1G/cm gradient, will produce an excitation profile of your choice across a 16cm centered FOV. The pulse should be 4.096ms in length, and described by 512 complex points sampled at 8μs per point, and supplied as a .mat file. A rewinder gradient will be applied so that you can assume the center of the pulse is the center of excitation K-space. Each student should provide a different pulse. Measure the response of your pulse using the slicpro sequence, and compare your theoretical and measured responses. (**6 points**)