CogSci 260: Introduction to Diffusion Tensor Imaging
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Week 4 Problem Set

Problem 1

Problem 1a Increase.

Problem 1b $\Delta x = \frac{\pi}{k_{x,max}}$ $\Delta y = \frac{\pi}{k_{y,max}}$

Problem 1c $FOV_x = \frac{2\pi}{\Delta k_x}$ $FOV_y = \frac{2\pi}{\Delta k_y}$

Problem 2

Problem 2a $W_x = 1/\tau$

Problem 2b $W_y = 1/\Delta$

Problem 2c $\Delta x = \tau \delta B_0 F_x$, *Problem 2d* $\Delta y = \Delta \delta B_0 F_y$

Problem 2e Assuming the same fields of view in each $\Delta y > \Delta x$ because $\Delta \gg \tau$.

Problem 3

Problem 3a If there was one spoke, the critical distance would be $\omega t = \pi$ where $t = (1/24)sec$ so that implies $\omega = 24\pi s^{-1}$. With 8 spokes, there are 4 in the range $(0, \pi)$ so the wheel only needs to turn $\pi/4$ for this condition to be met. Thus $\omega = (24\pi/4) = 6\pi s^{-1}$.

Problem 3b Every odd line in k_y is modulated with the same intensity and every even line in k_y is modulated with the same intensity, but different from the odd lines. So the image can be thought of as the sum two images, each with 1/2 the FOV of the original images since each has $\Delta k'_y = 2\Delta k_y$ and $FOV = 2\pi/(\Delta k'_y)$. The image thus has bright spots at the location of the vessel and at $\pm FOV_y$.