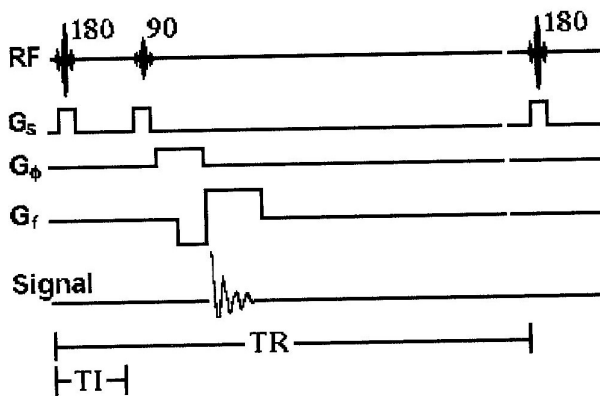


S-66.3322 Basics of MRI Exam 1.6.2015

Suorita 5 tehtävää tehtävistä 1-6! Answer 5 questions from questions 1-6!

1. A timing diagram for an inversion recovery imaging sequence is shown in the figure below. Explain this timing diagram! Sketch the time evolution of the magnetization M_z ! (Subscripts in the figure: S slice, ϕ phase and f frequency) (5p)



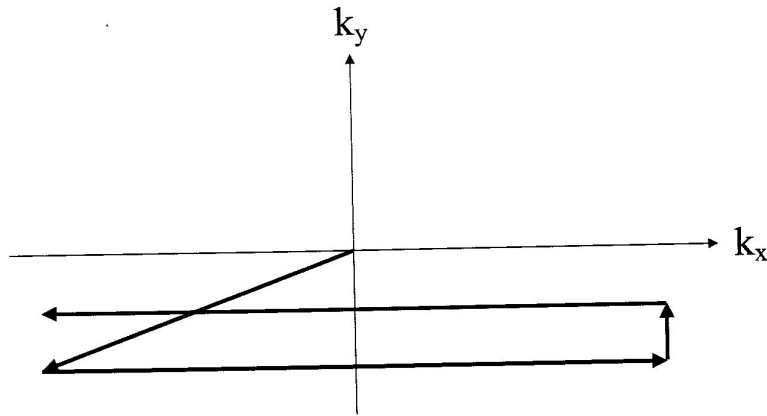
2. A chemical shift artifact is caused by the difference in chemical shift of fat and water. Larmor frequency of fat protons is shifted to a lower frequency with respect to that of water protons by about 3,5 ppm. For a gradient of 10 mT/m and $B_0 = 1,5$ T, calculate the amount of spatial shift! The width of a pixel is 0,3 mm. Explain, how the effect of the chemical shift shows on reconstructed image and explain why! (Magnetogyric ratio is $267.522 \times 10^6 \text{ rad s}^{-1} \text{ T}^{-1}$) (5p)

3. What is FSE (fast spin-echo) imaging? What are the limitations of FSE imaging? Draw a FSE imaging sequence! (5p)

It power multiple echoes

4. You want to excite spins in an xy-plane located at $z = -5.0$ cm. The resonance frequency at the isocenter is 63.85 MHz and your slice selection gradient is 0.1 mT/cm. Describe in detail the RF pulse which should be used. Magnetogyric ratio is $267.522 \times 10^6 \text{ rad s}^{-1} \text{ T}^{-1}$ (5p)

5. Draw a magnetic resonance imaging sequence which produces a trajectory in k -space according to the figure below! (5p)



6. In order for any tissue to be visible in a magnetic resonance image there must be contrast or a difference in signal intensity between it and the adjacent tissue. Explain how to generate tissue contrast in spin echo imaging! (5p)

Max 25 p