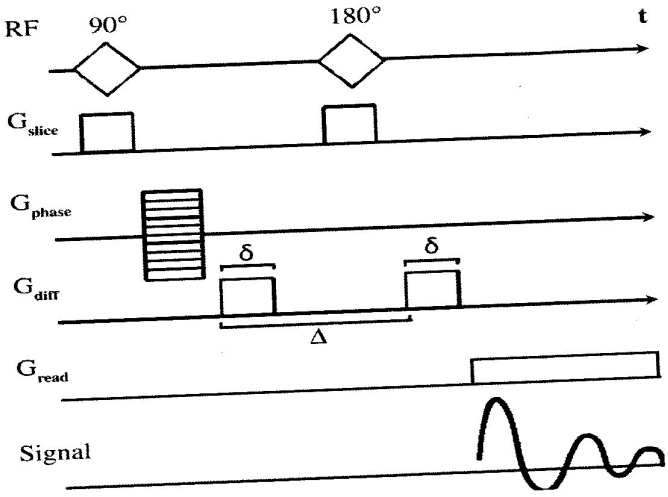
ELEC-E8738 Applications of MRI Exam 8.2.2016

Suorita 5 tehtävää tehtävistä 1-6! Answer 5 questions from the questions 1-6! A calculator is allowed.

1. Motion of the heart, pulsatile blood flow and respiratory motion can cause artefacts in cardiac MRI. Describe techniques to reduce those artefacts! (5p)

2 Spin-lattice relaxation in biologic tissues results from dipolar interactions of macromolecules and water molecules, which arise from their translational and rotational motion. The temperature dependence of this motion is reflected in changes to the spin-lattice relaxation time T_1. Describe how temperature measurements based on T_1 effects can be done and what difficulties there might be! 5(p)

3. Diagram below shows a pulsed gradient SE sequence used for diffusion MR imaging. Explain how diffusion can be observed with this sequence! (5p)



4. With FLASH (Fast Low Angle Shot) sequence residual transverse magnetization is destroyed by a spoiler gradient pulse in the slice selection direction. Compare the elimination of T_1-weighting with FLASH to this elimination with conventional spin-echo imaging! (5p)

5. In fast spin echo (FSE) imaging, *M* echo signals are generated for each 90° excitation pulse. These signals are encoded to obtain *M* k-space lines. Explain why and how does the encoding ordering (or the distribution of the echo trains in k-space) affect the resulting image! (5p)

6. Chemical shift imaging (CSI) is an extension of MR spectroscopy, allowing metabolite information to be measured in an extended region and to add the chemical analysis of body tissues to the potential clinical utility of Magnetic Resonance. Describe this imaging technique! (5p)

Magnetogyric ratio of ^1H is 267.522×10^6 rad s^{-1} T^{-1}