Lääketieteellinen kuvantaminen Tfy-99.280

Tentti 29.08.2003

Kirjoita tenttipaperiin nimi, opintokirjan numero + tunnus, osasto ja vuosikurssi

Lisäksi: Jos olet jättänyt harjoitustyön (tutkielman), kirjoita sen otsake.

1. Determine the gradient parameters needed to obtain an image with 256x256 pixels and a 10 cm FOV in both frequency- and phase-encode directions. The sampling rate is 25 μs (i.e. time between successive sampling moments, when the signal is collected), and the maximum value of the phase- and frequency-encoding gradients should be the same.

(Hint: The parameters are: maximum gradient value, length of the gradient pulse for frequency-encode direction, the size of a gradient step in the phase-encoding direction)

2.
a) What is flip angle?
b) What is quadrature detector?
c) What is beam-hardening artifact?
d) What is ROI?
e) What is a Hounsfield number?

3. Explain the principle of SPECT imaging.

4. For a piezoelectric material with an ultrasound velocity of 6000 m/s, what thickness should a disk-shaped crystal have to provide an ultrasound beam with a frequency of 2,5 MHz?

5 A 5 MHz ultrasound Doppler flowmeter is used to measure blood flow velocity in a human artery. The mean blood flow velocity in this artery is 30 cm/s and the Doppler angle is 45°. Estimate the mean Doppler shift frequency.