FYS-KJM 4740

MR-teori og medisinsk diagnostikk

Kap 3
Intro til puls-sekvenser

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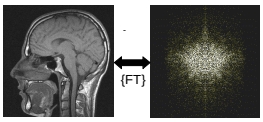
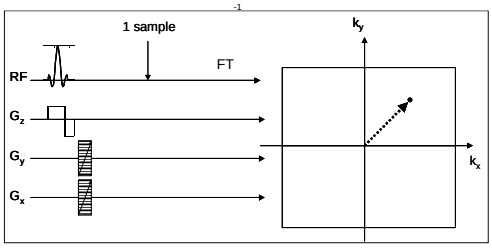
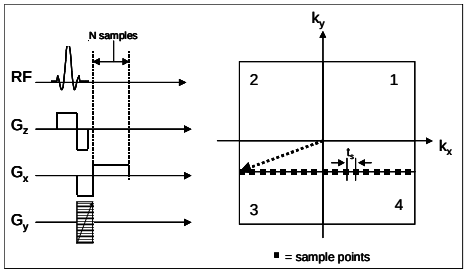
Mål: fylle K-space med (meningsfulle) data

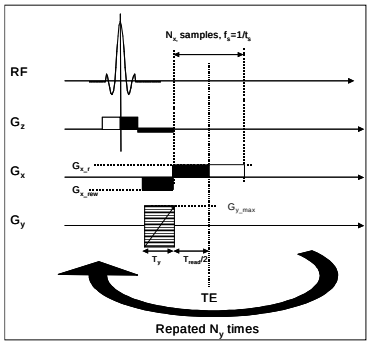


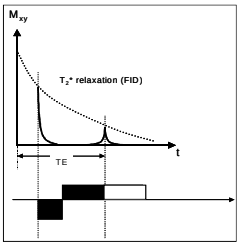


Gradient ekko (GRE) sekvens



Gradient ekko (GRE) sekvens (2D)

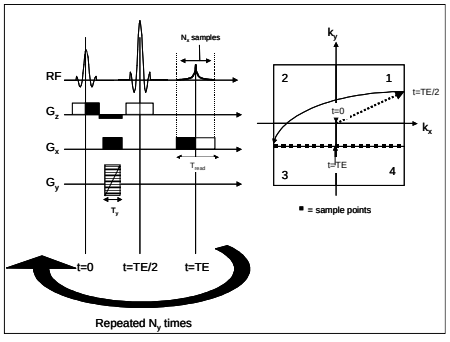




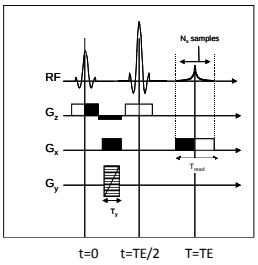
'Gradient ekko' skal inntreffe i senter av k-space (netto gradient areal =0):

$$k_x = \frac{\gamma}{2\pi}\left[\int_0^{T_y} G_{x\_rew}\,dt + \int_{T_y}^{T_y+T_{read}/2} G_{x\_rew}\,dt\right] = 0 \Rightarrow G_{x\_rew}T_y + G_{x\_r}\frac{T_{read}}{2} = 0$$

Spinn-ekko (SE) sekvens:



Spinn-ekko (SE) sekvens:



$$k_{y,n} = \gamma G_{y,n} \cdot T_y \qquad k_x = \gamma G_x \cdot t'$$

t'=(TE-t) slik at k_x=0 @ t=TE

Total fase-effekt:

$$\theta(TE) = -\gamma\left[\int_0^{\frac{TE}{2}} zG_z(t)\,dt + \int_0^{\frac{TE}{2}} yG_{y,n}(t)\,dt + \int_0^{\frac{TE}{2}} xG_x(t)\,dt\right] + \gamma\left[\int_{\frac{TE}{2}}^{TE} zG_z(t)\,dt + \int_{\frac{TE}{2}}^{TE} xG_x(t)\,dt\right]$$

Eliminere fase-effekt fra slice-select gradient:

$$\theta(TE) = -\gamma\left[\int_0^{\frac{TE}{2}} zG_z(t)\,dt + \int_0^{\frac{TE}{2}} yG_{y,n}(t)\,dt + \int_0^{\frac{TE}{2}} xG_x(t)\,dt\right] + \gamma\left[\int_{\frac{TE}{2}}^{TE} zG_z(t)\,dt + \int_{\frac{TE}{2}}^{TE} xG_x(t)\,dt\right]$$

I z-retningen:
180º puls inverterer fasen
90º puls nuller fasen