## 2D imaging (chap 5)

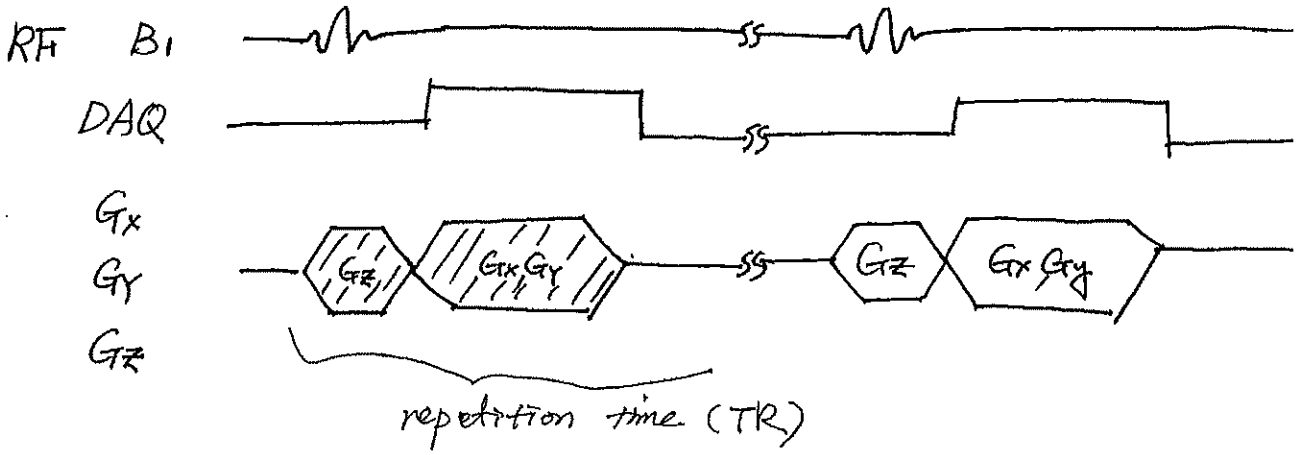
Basic process:

B1+, Gz — 1) selectively excite slice $\Delta z$ — 3-5 ms

DAQ, Gx Gy — 2) record FID, vary Gx Gy — 5-30 ms
during signal read out

3) wait for relaxation — 5 ms – 5 sec
(can change image contrast)

4) Repeat measurement



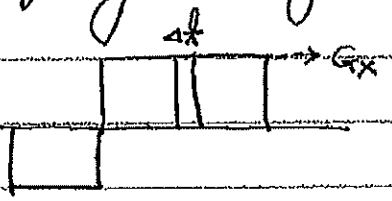

2 portions to understand

1) selective excitation

2) signal read out ← will cover this first chap 5

* FOV in "frequency encoding" & "phase encoding" direction

- Frequency encoding

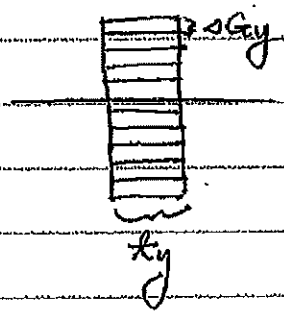



$$\Delta k_x = \frac{\gamma}{2\pi}\int_0^{\Delta t} G_x\, dt$$

$$= \frac{\gamma}{2\pi} G_x \Delta t$$

$$FOV_x = \frac{1}{\Delta k_x} = \frac{2\pi}{\gamma G_x \Delta t}$$

- Phase Encoding




$$\Delta k_y = \frac{\gamma}{2\pi}\int_0^{t_y} \Delta G_y\, dt$$

$$= \frac{\gamma}{2\pi} \Delta G_y\, t_y$$

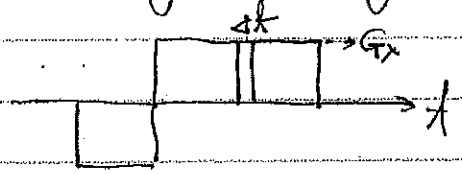
$$FOV_y = \frac{1}{\Delta k_x} = \frac{2\pi}{\gamma \Delta G_y \cdot t_y}$$

- $2\pi = \underbrace{FOV_y}_{cm} \cdot \underbrace{\gamma \Delta G_y \cdot t_y}_{rad\ cycles/cm} = FOV_x \cdot \gamma G_x \cdot \Delta t$

amount of phase over FOV

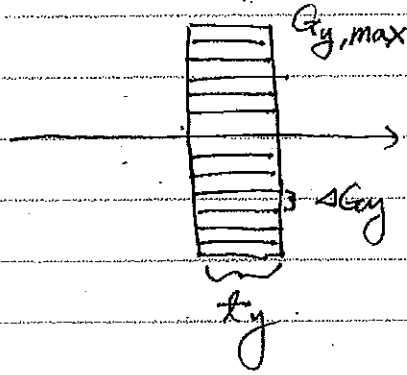
* Spatial resolution along "frequency encoding" & "phase encoding" direction

- frequency encoding




$$W_{kx} = N_{read} \times \Delta k_x$$
$$= N_{read} \cdot \frac{\gamma}{2\pi} G_x \Delta t$$
$$= \frac{\gamma}{2\pi} G_x T_{read}$$

- Phase encoding




$$W_{ky} = N_{PE} \times \Delta k_y$$
$$= N_{PE} \cdot \frac{\gamma}{2\pi} \Delta G_y \cdot t_y$$
$$= \frac{\gamma}{2\pi} 2 G_{y,max} \cdot t_y$$