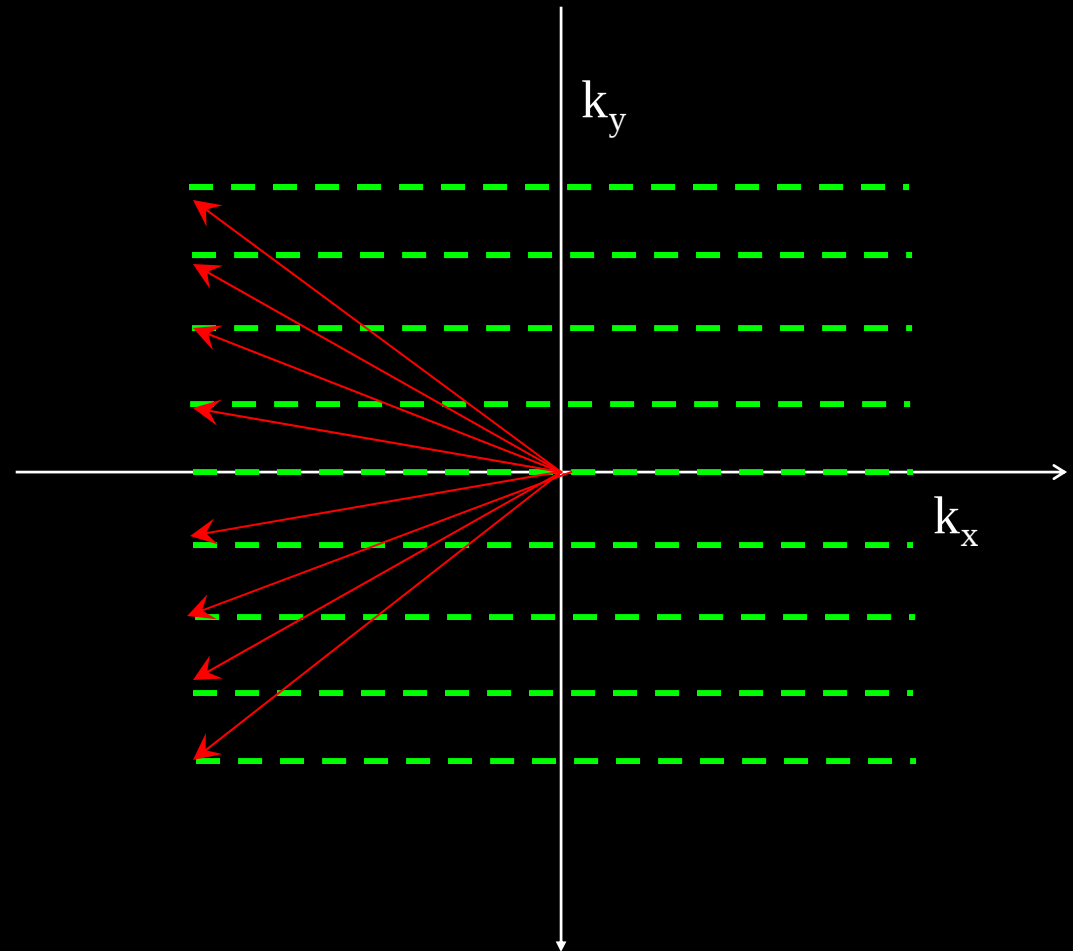
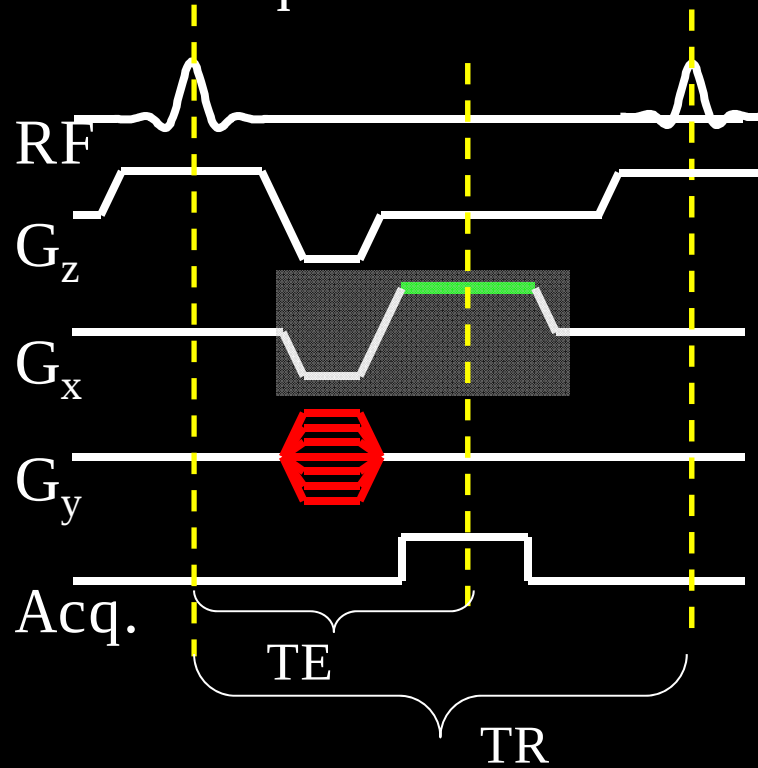


Fast Imaging – 18.1

2D imaging: K-space trajectory

Typical Gradient
Echo sequence



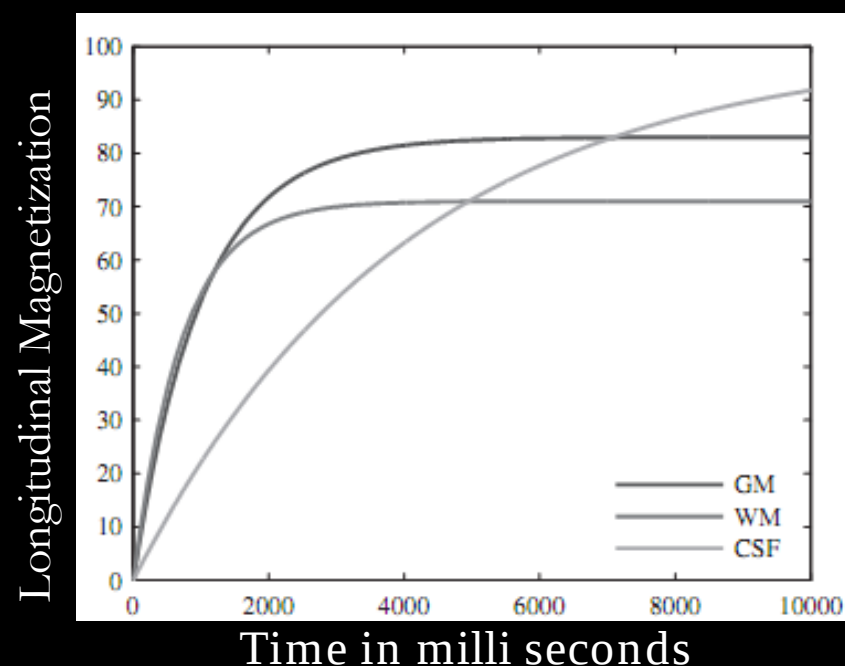
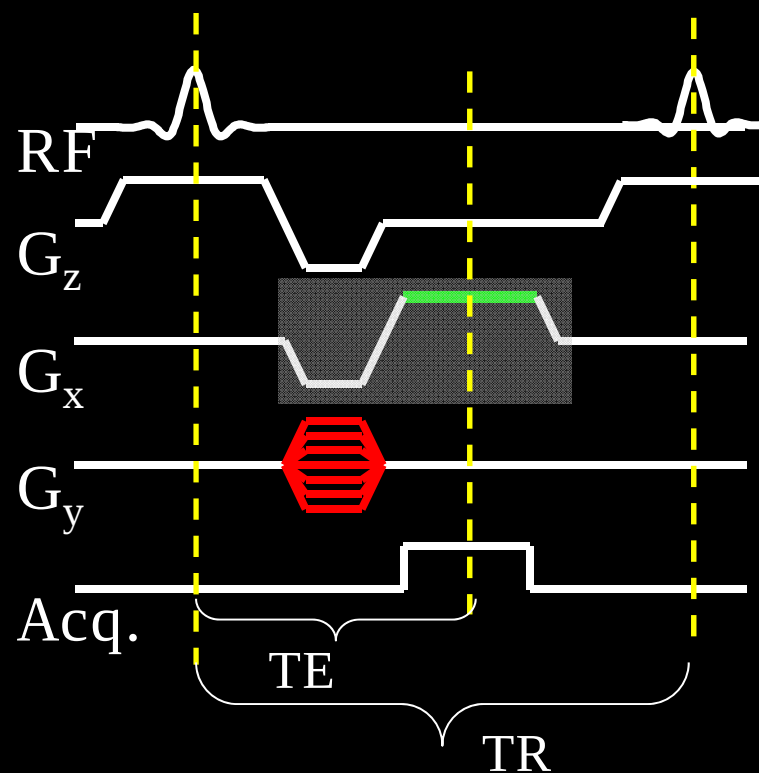
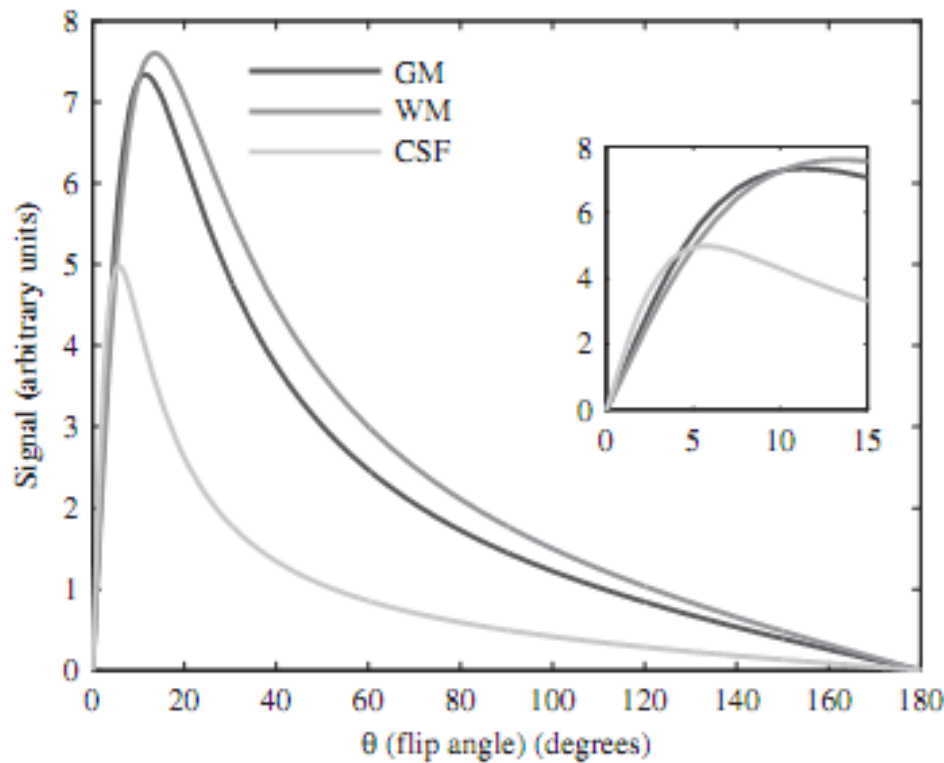


TABLE 2.1

	Relative spin densities ^a	1.5 T T1 (ms)	T2 (ms)	3.0 T T1 (ms)	T2 (ms)
Gray matter	83	1,000	100 (T2), 65 (T2*)	1,331	85 (T2), 42 (T2*)
White matter	71	710	80 (T2), 78 (T2*)	832	70 (T2), 49 (T2*)
Cerebrospinal fluid	100	4,000	2,200	4,000	2,200
Skeletal muscle	80	1,060	35	1,420	32
Venous blood	82	1,435	150	1,584	80
Arterial blood	82	1,435	235	1,664	165
Fat	90	300	165	380	133

^a100 denotes the 100% spin density.

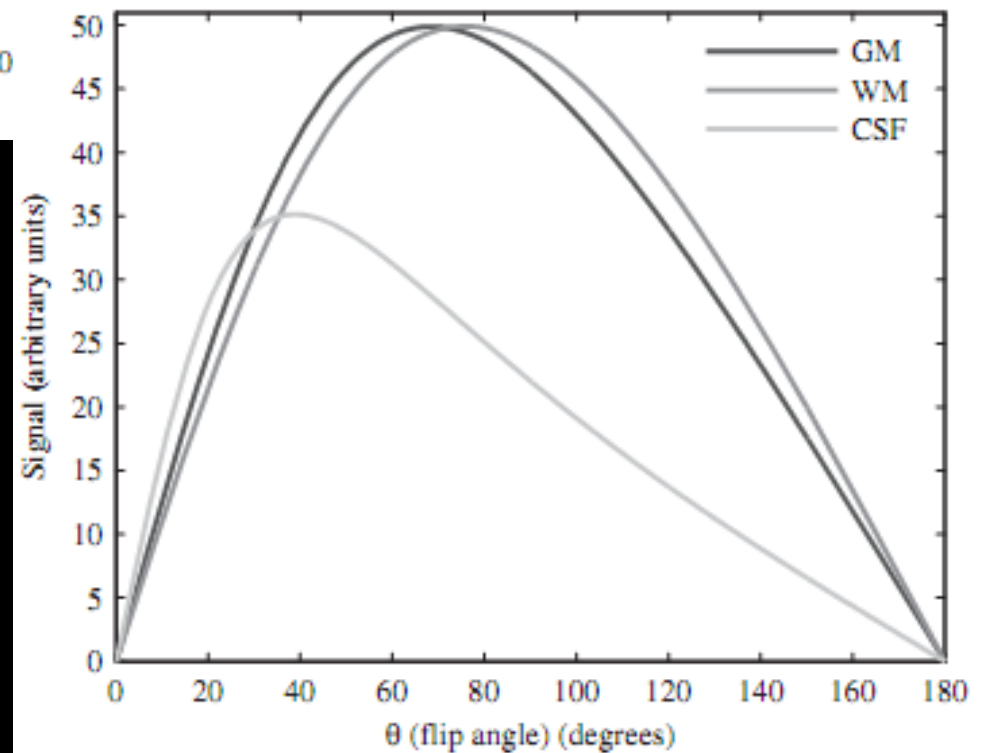


Signal behavior at 1.5T for a TR of 20msec

$$\hat{\rho}(\theta, T_E) = \rho_0 \sin \theta \frac{(1 - E_1)}{(1 - E_1 \cos \theta)} e^{-T_E/T_2^*}$$

$$E_1 \equiv e^{-T_R/T_1}$$

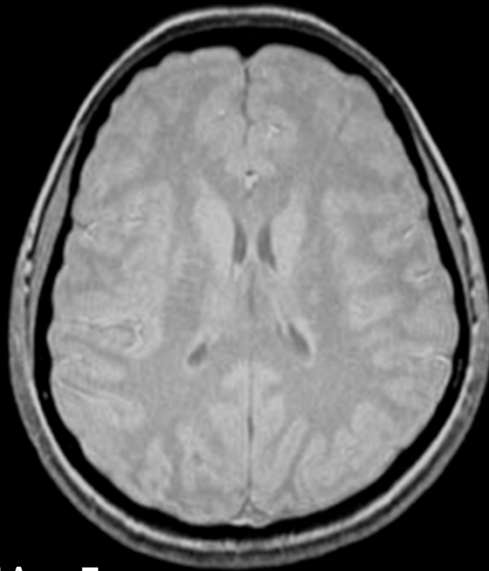
Signal behavior at 1.5T
for a TR of 1000msec



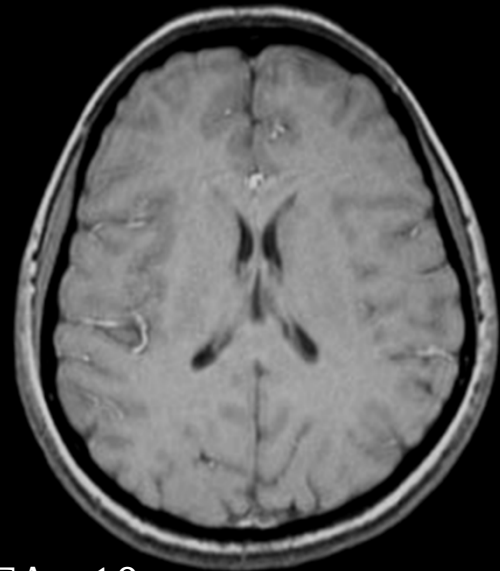
1.5T, TR= 21msec



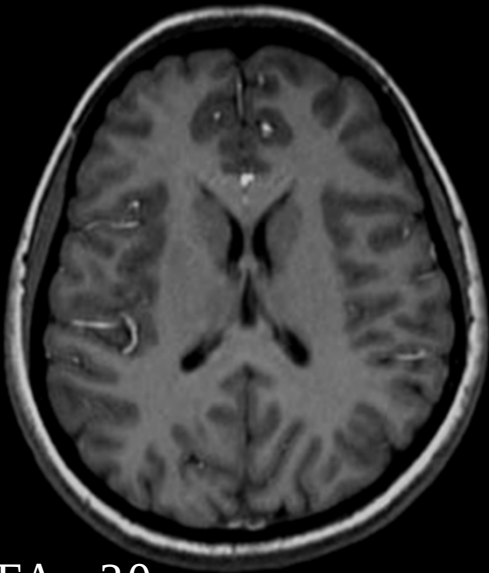
FA =2



FA =5



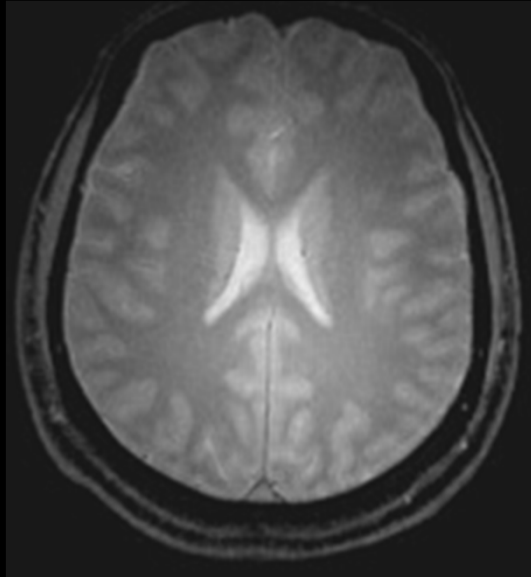
FA =10



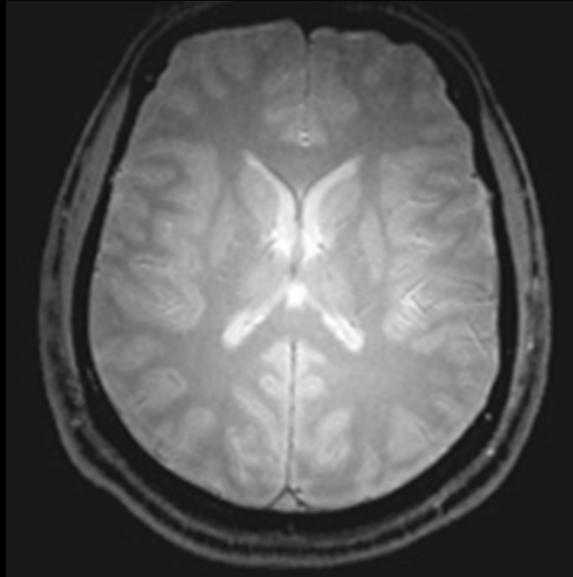
FA =20

TR=20msec @ 4T field strength

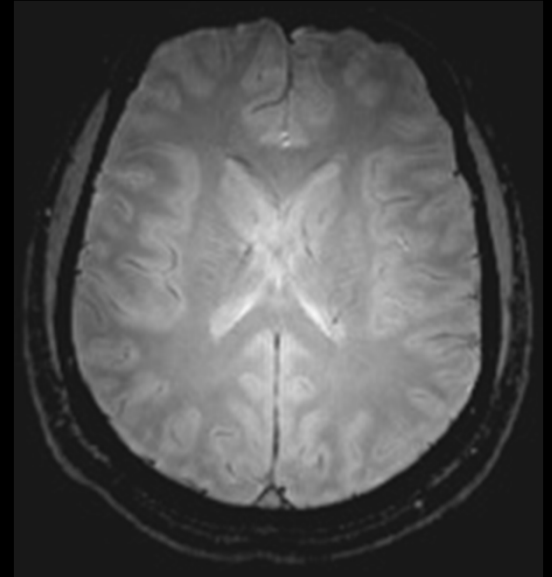
FA = 1



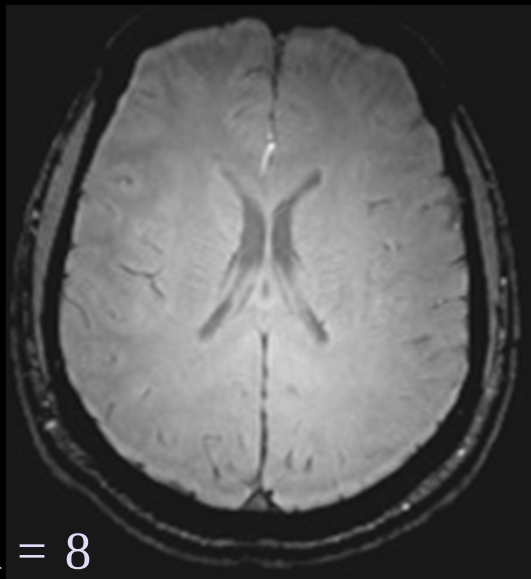
FA = 2



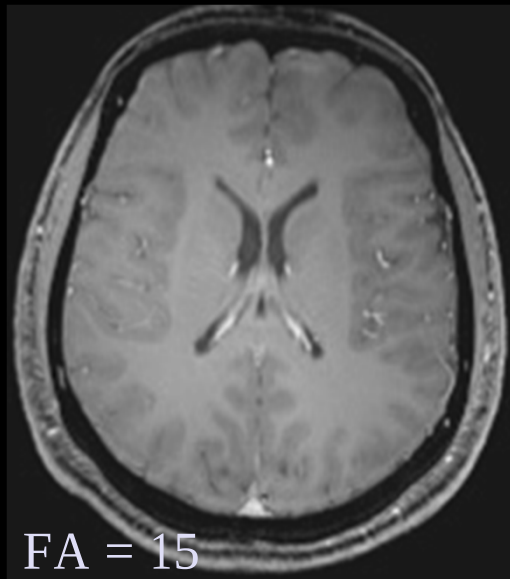
FA = 4



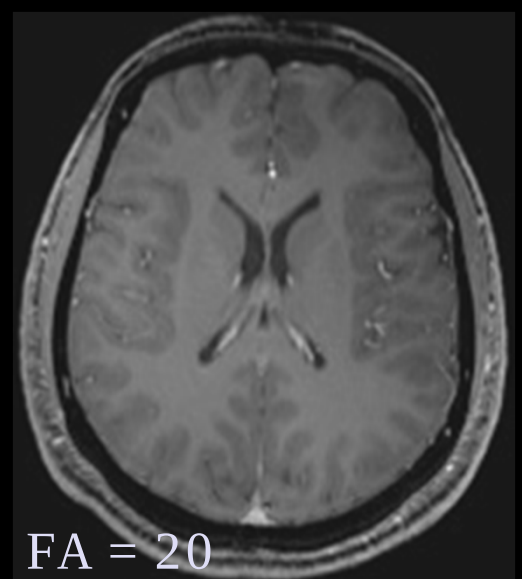
FA = 8



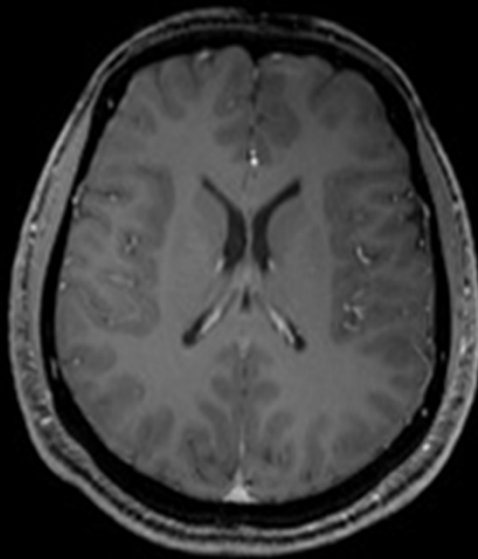
FA = 15



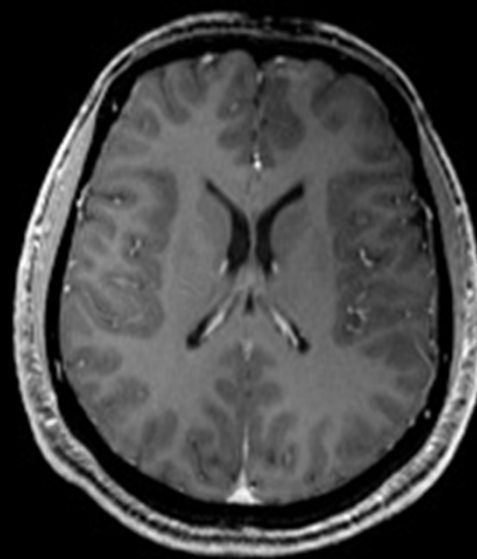
FA = 20



FA = 20



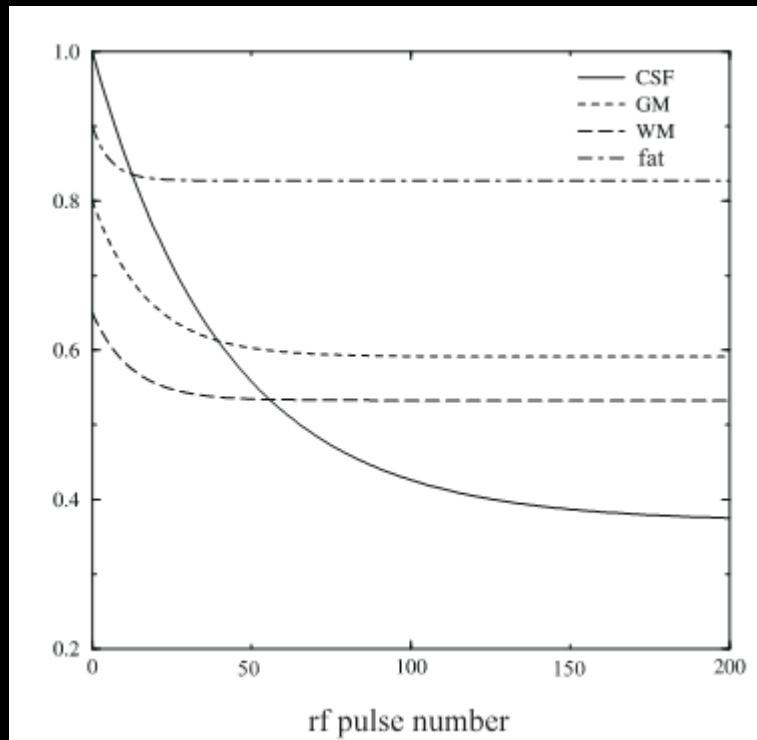
FA = 30



Approach to Steady State

$$\hat{\rho}(\theta, T_E) = \rho_0 \sin \theta \frac{(1 - E_1)}{(1 - E_1 \cos \theta)} e^{-T_E/T_2^*}$$

$$E_1 \equiv e^{-T_R/T_1}$$



$$T_R = 40 \text{ ms}$$

$$\theta = 10^\circ$$