MEDICAL IMAGING TECHNOLOGIES

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- Relaxations and Sequences
- MRI Scan Purpose
- Differences Between CT MRI and PET

History of MRI

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- Th cs 1952 w

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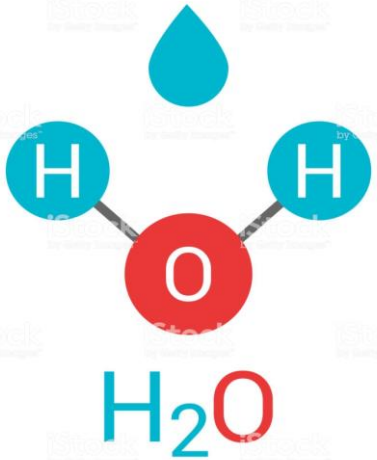
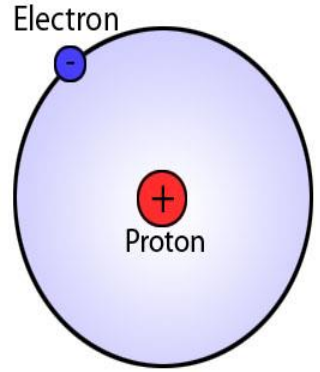
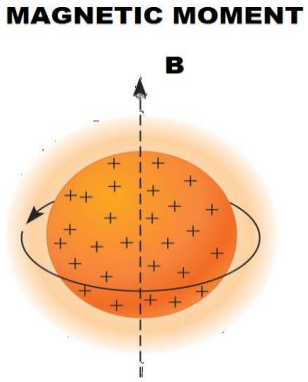
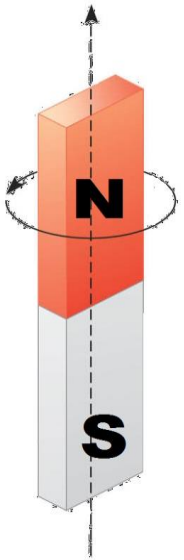
Our body consists approximately 60 – 70% Water

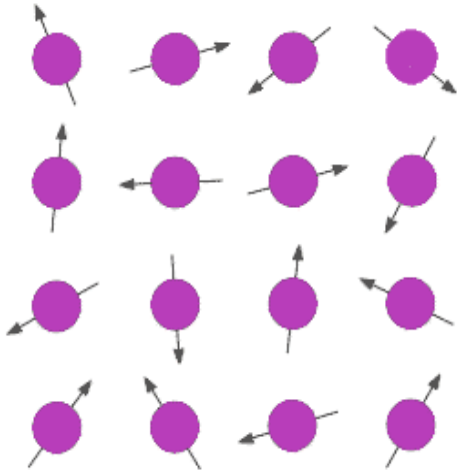
Water in itself includes Hydrogen which has highest sensitivity to magnetic resonance



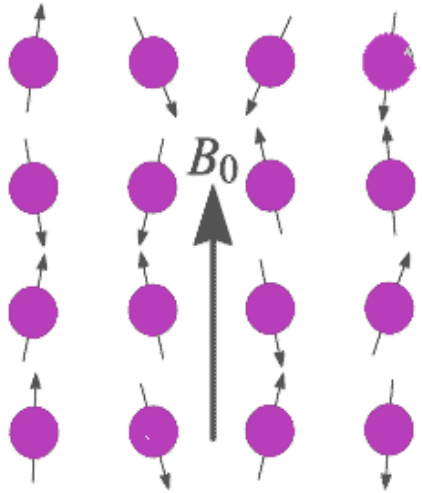




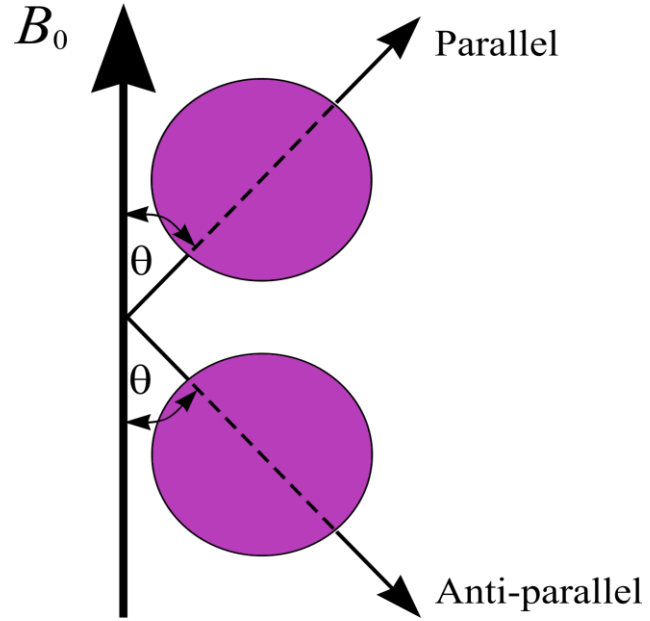


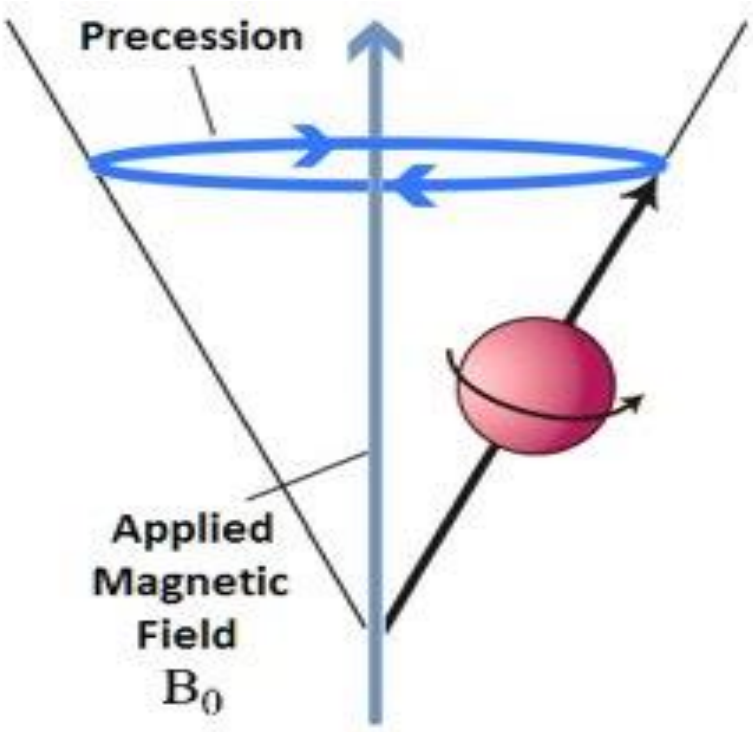


No External Magnetic Field

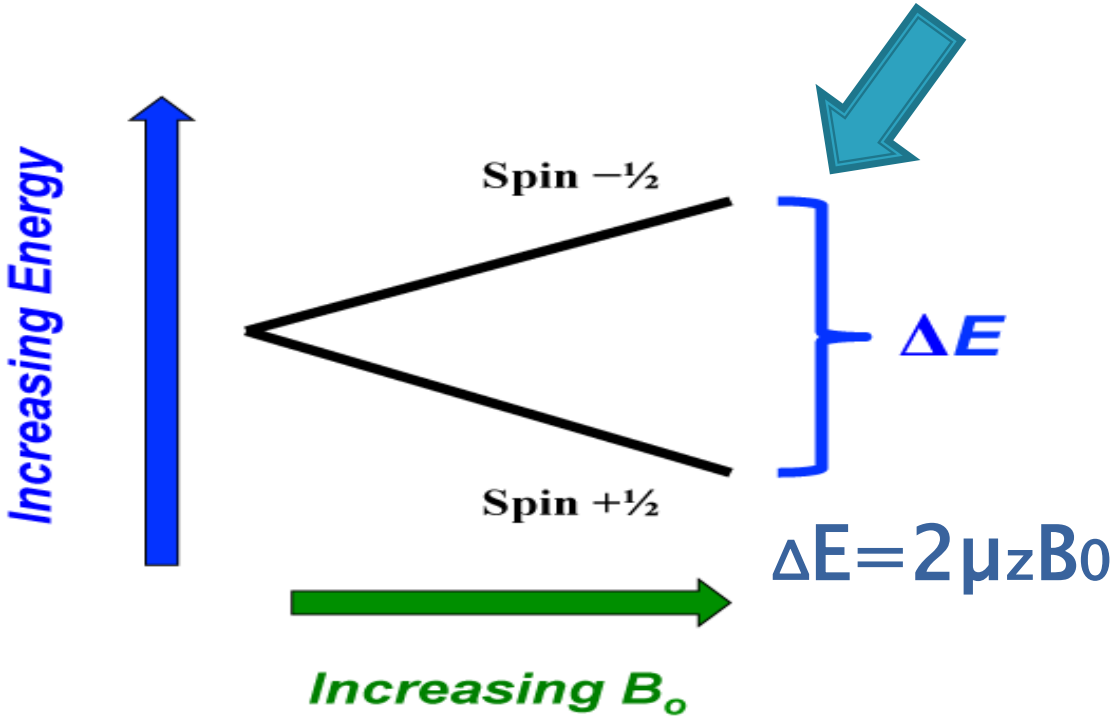


Applied External Magnetic Field B0



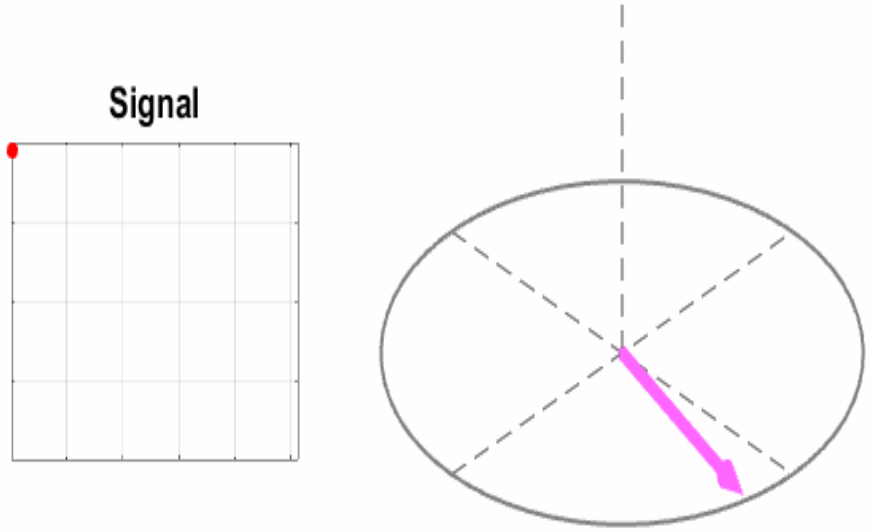


RF Pulse



Larmor F

Frequency
Larmor eq
MRI refers
moment o



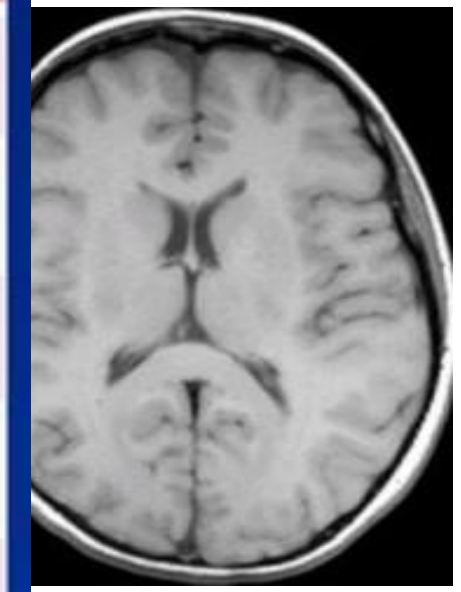
Nucleus or Particle	Gyromagnetic Ratio (γ) in MHz/Tesla
^{1}H	42.58
^{3}He	-32.43
^{13}C	10.71
^{19}F	40.05
^{23}Na	11.26
^{31}P	17.24
electron	-27,204

Relaxation

When RF pulse is stopp
is retransmitted and hydr

T2-transverse (spin-spi
which the transverse c
magnetization (Mxy) de

Tissue	T1 (msec)	T2 (msec)
Water/CSF	4000	2000
Gray matter	900	90
Muscle	900	50
Liver	500	40
Fat	250	70
Tendon	400	5
Proteins	250	0.1- 1.0
Ice	5000	0.001



T2<<T1

e Matter

Sequences

SE is generated by two su… pulses, typically 90°… …radient

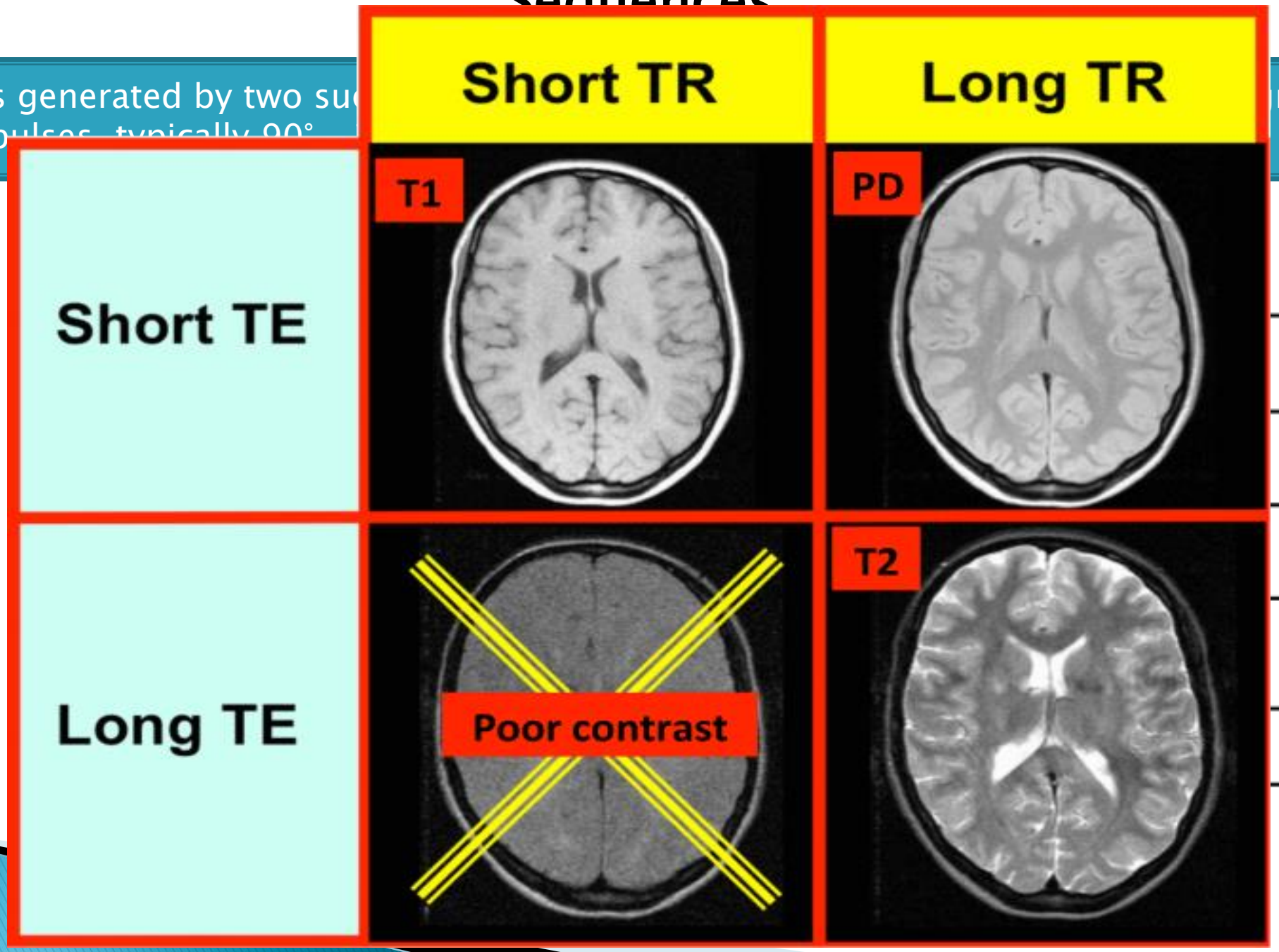
RF

Slice

Phase

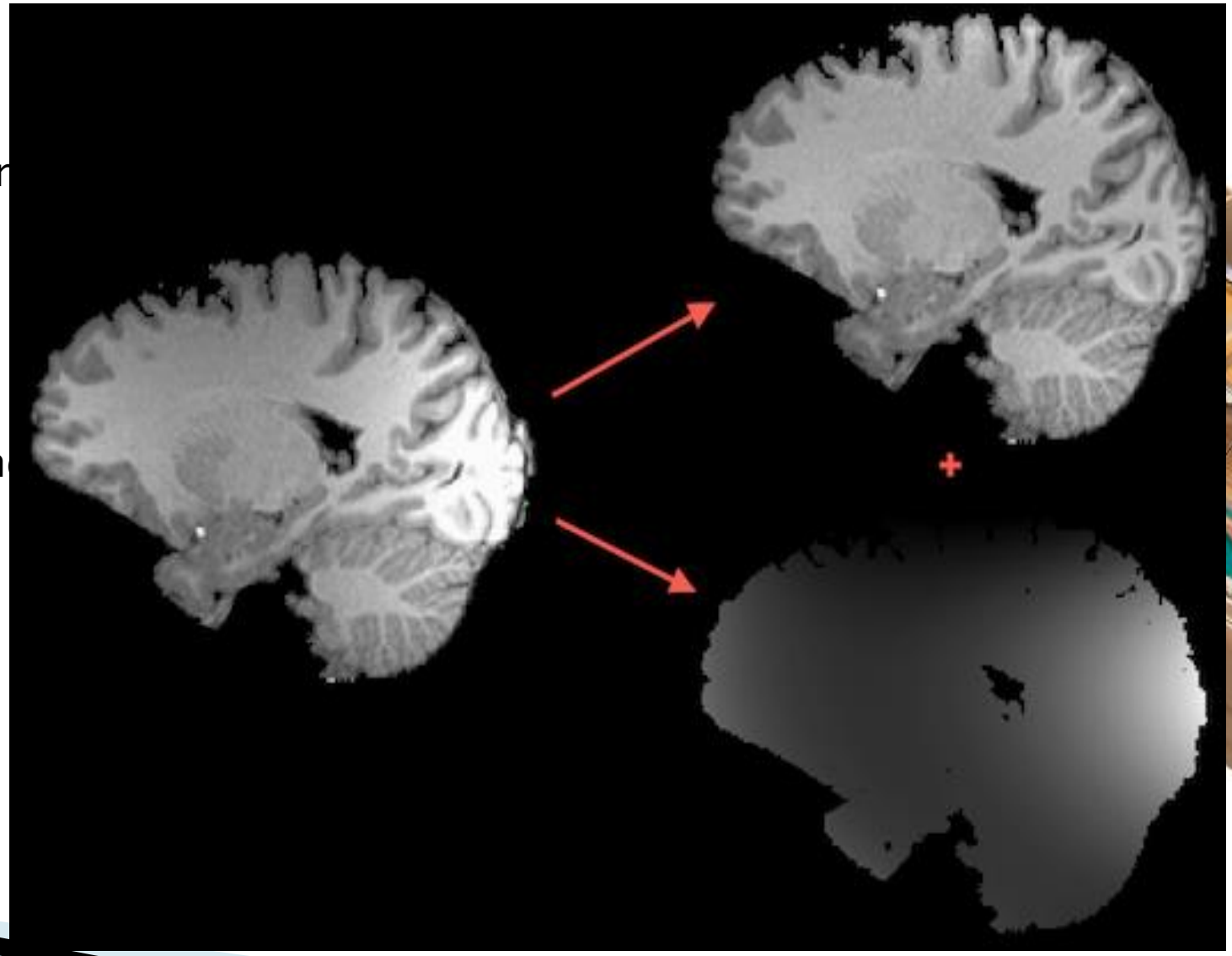
Readout

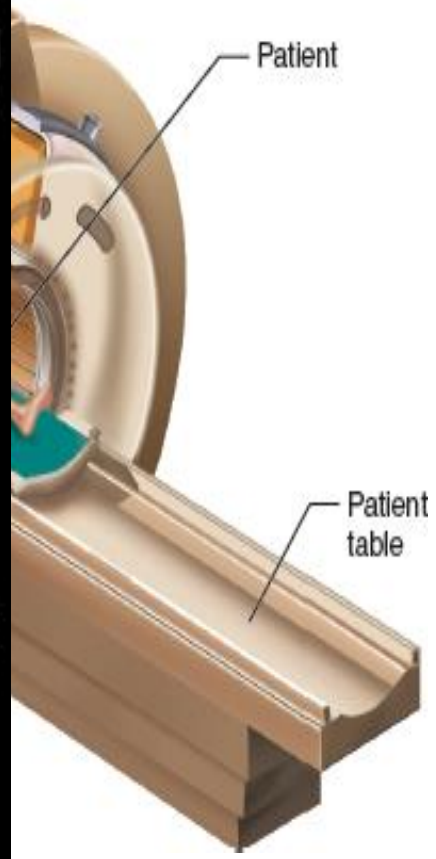
Echo time



Structure of MRI machine

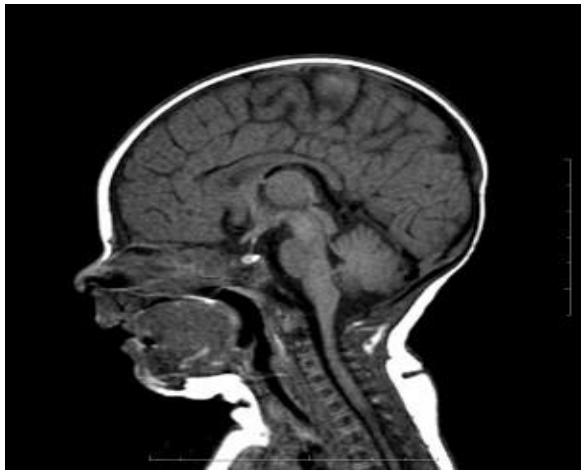
- Permaner
- Resistive
- Supercon





MRI Scan Purpose

- Brain and spine
- Blood vessels in the brain for stroke
- Musculoskeletal disorders and injures
- Congenital heart defects in neonates
- Certain types of cancer treatment
- Bone marrow disease
- Cardiovascular system
- Urinary tract



Differences

MRI	CT	PET
Detailed pictures in soft tissues	Less detailed compared to MRI scan	Less detailed than MRI scans
Bony structures are less detailed compared to CT	Bony structures are more clear and detailed	Shows extent of disease
No known side effects on radiation and very few side effects on MRI contrast scans	Little side effects. Frecquent radiations with CT scans might rarely cause cancer	Ionising radiation. Not recommended in routine clinical practice
Due to the structure and sound, claustrophobia patients may need to take anethstesia	Scan procedure is very simple and does not require anesthesia	Can help in monitoring treatment and shows it's effectivness
Duration of MRI scans is much longer than CT	CT scan procedure is quick compared to MRI	Reveals disease earlier, can diagnose faster
Hight cost	CT scans are less expencive than MRI scans	Can detect whether a mass is benign or malignant
Patients with metals or certain medical implants are not able to undergo MRI's due to the magnetic fields pulses	CT scan can be performed with no risk to medical implant or metal	Can detect abnormalities before there is an anatomical change

Thank you for your attention