كلية المأمون الجامعة

قســـــــم تقنيات الأشـــــــعة

المرحلة الثالثة

Equipment Techniques of Magnetic Resonance Imaging

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MSc Medical Imaging / MRI Applications

Lecture 5

RF Receiver (RFr)

The RF reception system is an essential component of MRI machines, responsible for receiving the signals generated by the interaction of protons with the magnetic field after being excited by RF pulses. The system consists of several engineering components that work together to convert these signals into data that can be processed to form images.

1- *Captures the weak signals emitted by protons as they return to their original state. Its design focuses on achieving high sensitivity and spatial accuracy.*

2- *Low Noise Amplifiers (LNAs): Amplify the weak signals to levels that can be processed. They must have low noise to maintain signal quality.*

3- *Analog-to-Digital Converters (ADCs): Convert analog signals into digital signals. They must feature high accuracy and sufficient conversion speed.*

Impact of the RF reception system on imaging:

1- *Improving image quality: A sensitive and low-noise reception system enhances the SNR (Signal-to-Noise Ratio), leading to high-quality images.*

2- *Spatial resolution: Using specialized receive coils improves spatial resolution and fine detail accuracy.*

3- *Reducing interference: Interference suppression units improve signal quality by preventing interference between transmission and reception signals.*

Radiofrequency (RF) coils

》 *The RF signal is in the range of 10 to 100 MHz.*
   a typical set of clinical image measurements.

》 *[B1] A conventional symbol for the RF strength.*

》 *[B1] is :*

   Mxy ⇔ *Mz*

Receive coil

x

↑ B1

Bo

z

y
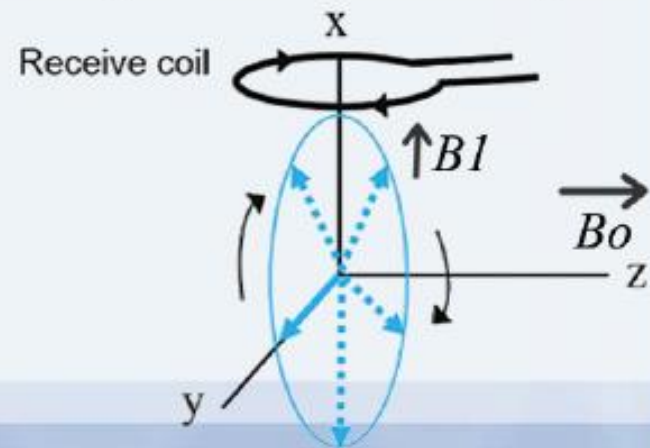
Radiofrequency (RF) coils

There are many types of RF coil (RF r) :

≫ 1- Surface Coils , include :

a- simple surface coils

b- phased array coil .

c- synergy surface coil.
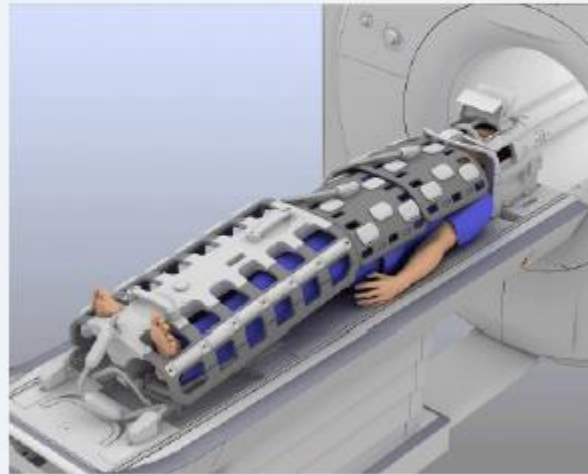
≫ 2- Volume Coils (include : birdcage coil)

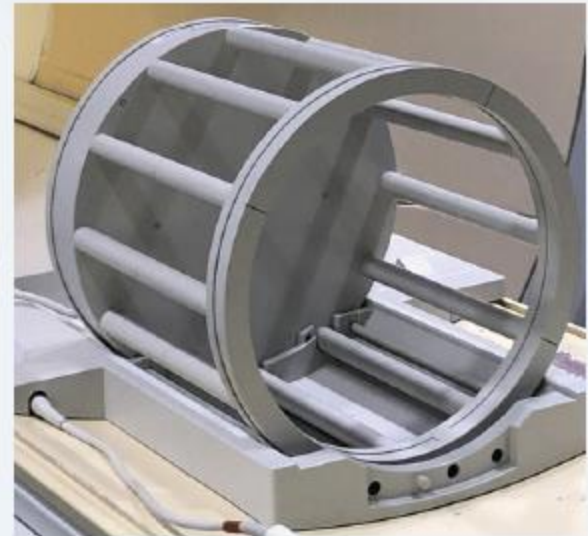# 1- Surface Coils , include :
a- simple surface coils

1- Surface Coils , include :
b- phased array coil .

1- Surface Coils , include :

c- synergy surface coil.

Volume Coils