

Basics of Ultrasound

Introduction: Ultrasound is fast, portable, and becoming prevalent at the bedside. The technology continues to improve and it is important to recognize key concepts of B Mode Imaging (Brightness Mode). This presentation attempts to emphasize key components within the field of ultrasound (US).

Objectives: By the end of the session the participant will be able to ...

1. Recognize and identify the **3** colors on an ultrasound monitor.
2. Recognize and identify the **4** sides of an ultrasound transducer and monitor.
3. Recognize **5** basic concepts of physics (W.A.T.E.R.) essential to ultrasound.

3 Colors:

Black = Anechoic = Fluid or Artifact

Gray = Hypoechoic = "Soft" Tissue or Artifact

White = Hyperechoic = "Hard" tissue or Artifact

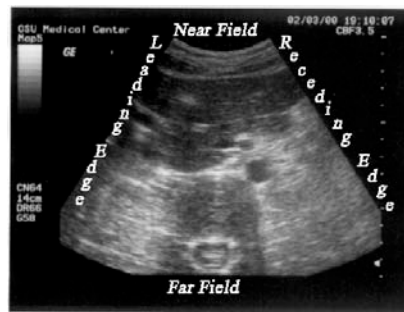
4 Sides of an US Transducer and Monitor ("Sound Flashlight")

Transducer

1. Back=Cord connects to "box"
2. "Face" or "Footprint"=matching layer that contacts gel and the patient
3. Indicator=Leading Edge
4. No Indicator=Receding Edge

Monitor

1. Top=Near Field=Fresnel Zone=Closest to the transducer face
2. Bottom=Far Field=Fraunhofer Zone=Farthest away from the transducer
3. Left Side=Leading Edge=Indicator (Remember LL, Left Leading)
4. Right Side=Receding Edge= No Indicator (Remember RR, Right Receding)



5 Concepts of Physics → W.A.T.E.R.

Wavelength: Waves → 1. Electromagnetic 2. Mechanical

Attenuation: Weakening of US signal 1. Reflection, 2. Absorption, 3. Scatter

Transducer: 1. Epoxy, 2. Backing, 3. Piezoelectric Crystal, 4. Matching

Energy: US → ALARA 1. Thermal effects 2. Nonthermal (Cavitation)

Resolution: Axial and Azimuthal (higher frequencies=better resolution)

Conclusion: Ultrasound is safe and appropriate to image human tissue. Recognizing human anatomy as shades and echoes on a screen takes a systematic approach. By applying key physics

concepts to the transducer and monitor, the beginning operator can learn how best to recognize ultrasound anatomy and pathology.