



Professional Ultrasound Services

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Reflection: The Foundation of Sonographic Images

1. Definition

- a. To cast back
- b. Examples in daily life
 - i. Mirror
 - ii. To “reflect” on something

2. Cause of Sonographic Reflection

- a. Acoustic impedance (Z) difference at an interface and structure of interface
- b. Define Z
 - i. Product of velocity and density
 - ii. $Z = \rho v$
 - iii. Measure in Rayls
 - iv. Characteristic of medium
- c. Degree of difference = amplitude of echo reflection (Simple difference in Rayls; not full formula)
 - i. Typical impedances (**p.26**)
 - ii. Example: bone/ muscle: $7.8 - 1.7 = 6.1$ rayls difference
 - iii. Example: Kidney/ liver: $1.62 - 1.65 = (-0.03)$ rayls
- d. Angle of insonation
 - i. Normal incidence
 - ii. Oblique incidence
- e. Coefficients
 - i. $T = 1 - R$ (**p. 29**)
 - a. I_i = incident sound beam intensity
 - b. T = transmitted energies
 - c. R = reflected energies
 - ii. Intensity Reflection Coefficient
 - iii. Intensity Transmission Coefficient

3. Types of Sonographic Reflection:

- a. Specular
 - i. Mirror-like
 - ii. Normal incidence
 - iii. Reflecting surface larger than resolving capabilities of beam
 - iv. Image Examples

- b. Non-specular
 - i. Rayleigh scattering
 - ii. Factors influencing scattered intensity (**p.32**)
 - 1. Dimension of scatterer
 - 2. Number of scatterers present
 - 3. Inhomogeneity of scatterer
 - 4. Frequency of incident beam
 - iii. Image Examples