AbstractID: 8406 Title: Ultrasound Scanners: Performance Expectations and Assessments

Ultrasound Scanners: Performance Expectations and Assessments

Broadband transducer array technology, along with flexible, digitally controlled beam forming, results in scanner capabilities that significantly exceed those of earlier generation machines. With frequency bandwidths exceeding 70%, ultrasonic transducers no longer are considered resonance devices. This enables multi-frequency operation, tissue harmonic imaging, and application of codes in the transmitted waveform to yield enhanced penetration at higher frequencies. Resolution comparisons between conventional and enhanced modes may be done using simple phantoms that contain anechoic cylinders at different depths. Most scanners utilize at least 128 acquisition channels, enabling extensive electronic control of focusing and aperture size. New, portable scanners generally incorporate fewer channels, and their imaging performance, particularly at larger depths is degraded compared to full-console "lab-based" scanners. For both scanner types, beam width in the slice thickness direction still results in the worst measure of spatial resolution. 1 ½ dimension transducers and transducers having frequency selective elevation apertures provide improved slice thickness control.

Learning Objectives
1. State the techniques used to provide a wide frequency bandwidth in ultrasound transducers
2. Describe advanced signal processing schemes in ultrasound, including harmonic imaging and coded excitation, and state their advantages over conventional processing
3. Discuss relative advantages of point targets, anechoic cylinders and anechoic spheres when making assessments of gray scale imaging performance
4. List techniques that enhance slice thickness resolution of ultrasound transducers, and identify the most effective method.