

Most ultrasound scanners are PC-based, software driven systems, with extensive use of application specific integrated circuits for preprocessing and digital beam forming, and utilization of DSP boards for post-processing. With wide bandwidth transducers these systems enable multi-frequency selection, native tissue harmonic and contrast harmonic modes, and use of digital codes and chirps for improving sensitivity. Multi-row array transducers can provide improved slice thickness, and may lead to phase aberration corrections in future systems. However, some multi-D arrays still suffer from reduced sensitivity, particularly in Doppler applications. Extended field of view and 3-D acquisition and display are becoming common on many systems. Acquisition of 3-D data is done by free-form scanning and tracking, mechanically scanned array probes, and more recently 2-D arrays. Several manufacturers offer scanners that have “research modes,” to provide users access to raw digital data and ability to manipulate controls beyond traditional functionality. The status of these machines will be discussed.

#### Educational Objectives

1. Identify the role of the beam former in enhancing ultrasound image quality
2. Describe harmonic imaging and distinguish narrow band harmonic from pulse inversion harmonic, explaining the source of signals from each.
3. Give rationale for use of multi-row transducers, and state advantages and disadvantages of present implementations of this technology.
4. Identify features provided by research ultrasound machines.