

The purpose of this course is to acquaint participants with recent signal processing techniques and modes on ultrasound instruments. Emphasis is on second harmonic imaging, a processing and display mode implemented on most scanners. Harmonic imaging was originally applied to enhance echo signals due to nonlinear scattering by ultrasound contrast agents. However, the modality is much more commonly used in “native tissue harmonic” mode, where echoes originating from nonlinear components of propagating acoustic beams are detected and displayed. The source of these echo signals and the advantages and disadvantages of harmonic imaging will be described. When applied effectively, harmonic imaging provides significant improvements in image quality compared to that obtained using conventional signal processing. A primary reason for harmonic imaging’s improved image quality is reduction of acoustic noise caused by reverberations within overlying tissues. Other contributors to high quality ultrasound images include spatial and frequency compounding and speckle reduction. These techniques also will be described and placed in context with harmonic imaging.

Learning Objectives

After completing this course, participants will:

1. Describe the origin of harmonic echo signals for both conventional and contrast agent imaging modes;
3. Contrast resolution and penetration capabilities for harmonic imaging and linear imaging;
4. Identify clinical situations where harmonic imaging is used advantageously;
5. Describe how harmonic imaging is used to enhance detection of contrast agents;
6. State the benefits of spatial and frequency compounding, and speckle reduction.