Purpose:
Establish the ability of our 3D breast scanner to present 360 degree compounded reflection images coincident and registered with speed and attenuation maps generated by the same machine.

Methods:
We generate a 3D map of speed and attenuation using our unique algorithms and data acquisition hardware. From these we use the eikonal equation and ray tracing to correct for refraction and attenuation loss. The back-propagated reflected energy is thus placed in the correct position in a fixed coordinate system, independent of view, allowing 360 degree compounding.

To recover 'posterior beam' artifacts that are part of the BI-RADS criteria we generate 'clock views' at each hour position by compounding over 3 views.

The reflection data acquisition hardware consists of 3 linear arrays of 192 elements, each 0.375 mm in width. The arrays are focused for short, medium and long ranges with overlapping fields of view to yield a conglomerate large field of view. They are 4, 7.5, and 14 mm tall, respectively, with geometric foci of 20, 45, and 70 mm, respectively. The array centers are 105 mm from the scanner axis of rotation and are tilted upward 10 degrees from the horizontal to aid in data acquisition near the chest wall. By utilizing data from each array in its appropriate field of view we preserve vertical resolution. The arrays are 46 degrees apart and views are collected at 60 positions, 6 degrees apart, for all arrays.

Results:
We present correlated panels of our speed and reflection images that compounded over a 360 degree aperture for patient cases with both benign and malignant biopsy results in comparison to sonography.

Conclusions:
Our unique DICOM compliant 3D volumes of speed, attenuation and reflection provide high resolution information precisely coincident and registered not available with any other form of ultrasound imaging .

Funding Support, Disclosures, and Conflict of Interest:

TechniScan, Inc., Salt Lake City, Utah