AbstractID: 9628 Title: Comparison of Pulse-Echo Methods for Measuring Ultrasound Attenuation in the Liver

Purpose: Ultrasound attenuation in liver differs from normal values when diffuse disease is present. Additionally, clinical images suggest that many masses in the liver have attenuation that varies from that of background tissue. In this presentation we compare four attenuation measurement algorithms to determine strengths and weaknesses of each for determining global and local values of attenuation in liver.
Methods and Materials: Full frames of RF echo data were acquired from test phantoms using a Siemens Antares scanner equipped with the Axis Direct research interface. Signals were acquired using linear array transducers operating at a 6 MHz frequency. Data were analyzed offline using 4 different algorithms: "Video Signal Analysis" (VSA), a centroid frequency shift method (FS), Diffraction Corrected Spectral Cross-correlation (DCSC), and a conventional Reference Phantom Method (RPM). Both global estimates of ultrasound attenuation and low resolution attenuation coefficient images of uniform and "inclusion" phantoms were obtained. In a similar manner, attenuation is being measured in the livers of patients (under an IRB approved protocol) who are undergoing needle biopsies under ultrasound guidance. **Results**: The RPM provides accurate attenuation estimates, with acceptable variance, for uniform regions in phantoms. All methods are subject to attenuation image artifacts when the backscatter is not uniform, as shown with the inclusion phantoms. However, the DCSC appears to be the least susceptible to backscatter variations. Initial attenuation results in liver were obtained from a patient with a hemangioma, a tumor that exhibited lower attenuation and higher backscatter than background liver. Because of elevated backscatter, the DCSC method performed best. Additional liver samples are being processed. **Conclusion:** Modern machines provide RF data that can be used to measure acoustical properties of tissues. When measuring attenuation, the RPM performed best in uniform regions of phantoms, but the DCSC technique appeared to be least susceptible to backscatter variations.