**QIBA Ultrasound Shear Wave Speed (SWS) Combined Call:**
**System Dependencies *and* Phantom-System Measurement Testing Subcommittees**
Friday, May 2, 2014; 11 AM CT
Draft Call Summary
***Notes provided by Dr. Wear***

**In attendance**

***Mark Palmeri, MD, PhD (Co-Chair)***
***Keith Wear, PhD (Co-Chair)***
Kevin Parker, PhD (guest speaker)
S. Kaisar Alam, PhD
Michael Andre, PhD
Paul Carson, PhD
Jun Chen, PhD
Shigao Chen, PhD
Steven Fick, PhD
Jérémie Fromageau, PhD
Brian Garra, MD
Christopher Hazard, PhD
Jennifer Kugel, MS (RT)
Ted Lynch, PhD
Mike MacDonald, PhD
Stephen McAleavey, PhD
Kathy Nightingale, PhD
Nicholas Rognin, MSc, PhD
Vijay Shamdasani, PhD
Daniel Sullivan, MD
Hua Xie, PhD

**RSNA**
Joe Koudelik
Julie Lisiecki

**Moderator:** Keith Wear, PhD

**Agenda:**

1. Presentation: "Shear Wave Dispersion in Liver—highlights from the recent UMB "Festschrift" issue," by Professor Kevin Parker, University of Rochester.
2. Brief discussion of latest round of CIRS phantoms to be measured by Duke and Mayo.
3. Discussion of list of parameters that we would need from any raw data acquisitions saved during the clinical arm of QIBA studies so that Mayo & Duke can offline process the data an create similar numerical datasets.

**General Discussion:**

**Presentation: "Shear Wave Dispersion in Liver—highlights from the recent UMB "Festschrift" issue," by Professor Kevin Parker, University of Rochester.**

*Lossy tissue models for shear wave dispersion*

If the choice for the best tissue model is uncertain, and bandwidth is limited, it is often useful to use a linear model for shear wave speed dispersion. Parker and Baddour (*Ultrasound Med Biol.* 40, 4, 675-684, 2014) use a theoretical model to show the effects of dispersion on propagating shear waves. The model represents the velocity as the convolution of the elastic solution, a frequency-dependent attenuation function, and a function that describes distortion from quadratic phase. Carstensen and Parker (*Ultrasound Med Biol.*, 40, 4 655-674, 2014) consider physical models of tissue in shear fields.

*Lean vs. steatotic liver dispersion, ex vivo animal results*

Barry *et al.* (*Ultrasound Med Biol.*, 38,2 175-182, 2012) reported measurements in 7 lean mice and 7 obese mice that showed that dispersion is significantly greater ($p<0.003$) in obese mice. Subsequently, Barry *et al.* (*Ultrasound Med Biol.*, 40, 4, 704-713, 2014) showed similar findings in 70 mice. Dispersion slope was 0.02 m/s per 100 Hz in lean mice and 0.33 m/s per 100 Hz in fatty mice. Future study will include increasing the numbers of test livers, the fine gradation of steatosis, and conducting *in vivo* experiments.

**Brief discussion of latest round of CIRS phantoms to be measured by Duke and Mayo.**

Shigao Chen's group at Mayo tested one set of phantom samples that CIRS made most recently. Their results suggest that the samples have some dispersion, but not a lot. Kathy Nightingale's group at Duke also tested these new samples, and found that they are not as dispersive a previous batch. Duke might send the more dispersive phantoms to Mayo for testing. The previous batch provided dispersion levels near the midrange for human liver. The recipe for that batch might be adequate for our purposes.

**Discussion of list of parameters that we would need from any raw data acquisitions saved during the clinical arm of QIBA studies so that Mayo & Duke can offline process the data an create similar numerical datasets.**

Mark Palmeri prepared a draft list for discussion:

## Motivation

Acquiring "raw" RF/IQ data from the commercial scanners has been deemed important for research sites to process the data and to generate the equivalent numerical simulation data for additional analysis. To that end, the raw data vectors themselves are not just needed, but additional metadata surrounding the data acquisition must also be recorded with each dataset. The following is a list of the parameters that are necessary, and a list of optional parameters that would be interesting to also collect, but not critical to the downstream analyses.

## Necessary Parameters

- Probe Specifications
    - Elements
        - Height
        - Width
        - Pitch
        - Center Frequency
        - Bandwidth
    - Lens Focus
    - Radius of Curvature (if curvilinear)
    - Max # Elements
- Acoustic Radiation Force Excitation (for each excitation if multiple are used, e.g., SSI)
    - Frequency
    - F/#
    - # of cycles / duration
    - Focal Depth (relative to ROI)
    - Additional focal information for "off-angle" excitations
- Region of Interest / Displacement Tracking
    - Size
        - Depth (absolute position relative to focal depth)
        - Lateral
    - Lateral Beam Spacing
    - Pulse Repetition Frequency
    - RF/IQ Sampling Frequency
    - Tracking Beam
        - Transmit
            - Focus
            - F/#
            - # of cycles
            - Frequency
        - Receive
            - Focus
            - F/#
            - Dynamic?
            - Aperture Growth?

## Optional Parameters

- Parallel receive beam-forming
- Compounding
- Harmonic tracking
- Other signal processing steps willing to be shared

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**May Schedule:**

| *Date* | *Time (CT)* | *Day* | *Committee/ Subcommittee* | *Moderator* |
|---|---|---|---|---|
| 05/09/2014 | 11:00 am CT | Friday | US SWS Technical Committee | Dr. Hall |
| 05/30/2014 | 11:00 am CT | Friday | US SWS Clinical Applications Subcommittee | Dr. Samir |

**Conferences for Ultrasound** on QIBA Wiki

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