

**QIBA Ultrasound Shear Wave Speed (SWS) Combined Call:
System Dependencies and Phantom-System Measurement Testing Subcommittees**

Monday, December 16, 2013; 1 PM CT

Call Summary

Notes provided by Dr. Wear

In attendance

Keith Wear, PhD (Co-Chair)

Michael Andre, PhD

Paul Carson, PhD

Shigao Chen, PhD

David Cosgrove, MD

Steven Fick, PhD

Brian Garra, MD

Timothy J. Hall, PhD

Anis Hadj Henni, PhD

Ted Lynch, PhD

Mike Macdonald, PhD

Kathy Nightingale, PhD

Nicolas Rognin, MSc, PhD

Matthew Urban, PhD

RSNA

Joe Koudelik

Julie Lisiecki

Moderator: Keith Wear, PhD

1. The call summaries from 2013-11-18 (Phantom subcommittee) and 2013-11-15 (System Dependencies subcommittee) were approved.
2. Updates
 - a. Progress on MRE phantom measurements: Dr. Andre said that UCSD is ready to make MRE measurements. Dr. Chen will follow up with the Mayo group to find status of their measurements. The Mayo group will send phantoms to UCSD for measurements. UCSD will make both MRE and ARFI-based measurements on the MRE phantoms.
 - b. Progress on Dr. Madsen's development of viscoelastic phantoms: Dr. Madsen's group has made some phantoms that are currently being measured. They will send some samples to Rheolution for mechanical testing. They seem to have resolved some earlier problems and will know a lot more in a week.
 - c. Investigation of simulation packages:
 - i. Dr. Urban commented that KWave is free while PZFlex is prohibitively expensive for many people. Mayo has done comparisons between KWave and PZFlex. Both handle nonlinearity, attenuation, and arrays. Dr. Urban has an ongoing discussion with Dr. Palmeri on appropriate choices for transducer geometry in simulations.
 - ii. Dr. Nightingale commented that Gianmarco Pinton's KZK code will be made available. However, since it is nonlinear, it is more computationally intensive than Field II.
 - iii. Dr. Wear reviewed the SimSonic platform. SimSonic was developed by Emanuel Bossy at Institut Langevin, CNRS-ESPCI ParisTech, Paris, France. SimSonic has many attractive features (free, C source code available, handles 1D and 2D arrays, handles fluid and solid media that can be anisotropic and heterogeneous). However, SimSonic does not allow for absorption, which makes it unsuitable for modeling acoustic propagation in the liver. Versions of SimSonic with absorption are currently under development and beta-testing.
3. Dr. Wear gave a presentation on standardization in bone densitometry. In bone densitometry, standardization is improved using cross-calibration measurements, T-scores, and/or device-specific thresholds.
 - a. Cross-calibration measurements between two or more systems may be achieved by making measurements with the systems on the same target set. The target set may be either a set of phantoms or human volunteers. The common dataset can be used to generate linear regression equations to convert measurements from one system to values expected from another system.
 - b. With T-scores, measurements are referenced to a database. In bone densitometry, the reference population can be normal women aged 20 – 40 yr. The histogram of bone density measurements from the reference population is fit to a Gaussian curve and can be characterized by mean μ and standard deviation σ . In order to calculate the T-score, the measurement x (e.g., bone mineral density or shear wave velocity) is transformed by $T\text{-score} = (x - \mu) / \sigma$.

c. Usually, T-score thresholds are fixed (e.g., $T > -1$: normal; $-2.5 < T < -1$: osteopenia; $T < -2.5$: osteoporosis). However, in some cases, diagnostic performance may be improved by using device-specific thresholds measured using clinical trials.

4. Dr. Wear reviewed Review of “Development of oil-in-gelatin phantoms for viscoelasticity measurement in ultrasound shear wave elastography” by Nguyen, Zhou, Robert, Shamdasani, and Xie, *Ultrasound in Med. & Biol.*, 40, pp. 168-176, 2014. The authors constructed a set of phantoms with gelatin concentrations ranging from 3-7%, castor oil concentration ranging from 0-40%, 2% graphite, and 7% n-Propanol. They used a Philips iU22 with a C5-1 curvilinear transducer. They tracked at a depth of 4 cm and lateral positions of 1.4, 2.7, 4.0, 5.3, and 6.6 mm. They used push pulses with a pulse repetition frequency of 70 Hz, which resulted in shear waves with a fundamental at 70 Hz and harmonics at 140, 210, and 280 Hz. They found that shear modulus and viscosity could be controlled by adjusting concentrations of gelatin and castor oil.

Proposed January Call Schedule:

<i>Date</i>	<i>Time (CT)</i>	<i>Day</i>	<i>Committee/ Subcommittee</i>	<i>Moderator</i>
01/10/2014	11:00 am CT	Friday	US SWS Technical Committee	Dr. Garra
01/17/2014	11:00 am CT	Friday	COMBINED: System Dependencies / Phantom System Testing & Measurement Subcommittees Call	Dr. Palmeri
01/31/2013	11:00 am CT	Friday	US SWS Clinical Applications Subcommittee	Dr. Samir

It was proposed that there be a combination call for the System Dependencies/ Phantom subcommittees due to the number of people that overlap on both subcommittees. A first try for this will be this December call. If successful, a call schedule will be determined for the combined group.

RSNA Staff attempt to identify and capture all committee members participating on WebEx calls. However, if multiple callers join simultaneously or call in without logging on to the WebEx, identification is not possible Call participants are welcome to contact RSNA staff at QIBA@RSNA.org if their attendance is not reflected on the call summaries. [QIBA wiki](#)