

AES High Res Audio technical committee meeting notes – NYC, October 18, 2018

Attending:

Bob Stuart	MQA
Bob Katz	Digital Domain
John Dawson	Jade Electronics
Josh Reiss	QMUL
Oles Protsidym	ProStudioMasters
Cam Ruffle-Deignan	Listen, Inc.
Steven Temme	Listen, Inc.
David Rich	Secrets of HiFi
Pat Dennis	Nissan
Daniel Davidsen	3C Sound ApS
Wieslaw Woszczyk	McGill
Hyunkook Lee	Univ. of Huddersfield
Vicki Melchior	DSP Consultant

Current activities:

1) John Dawson's tutorial, "Power Amplification for High Resolution Audio", was given Oct 17. Broadly it covers John's measurement of the loads and characteristics presented by many headphones and loudspeakers, a survey of amp classes from A, A/B up to G, their trade-offs and characteristics, and associated distortions. An audio recording can be purchased from Mobiltape* and John will provide a PDF of the slides on request (email to John Dawson jadeelectronics@outlook.com).

* www.mobiltape.com/2018-audio-engineering-society-145th-convention

2) The special JAES issue on high res should appear in March. A previous HRA special issue was published in 2004, and this new issue will address the many changes of the past 15 years, and current ideas on what influences high res sound.

3) "AES Inside Track" is a monthly spotlight on a technology area now part of the AES website (have to log in as a member to see it). We're invited to write one on high res audio for May. What's included is a short blurb on the subject, but more important, a curated list of important papers, videos, documents etc. (good PR!)

New activities solicited:

1) Please think about what we can do for Dublin (and beyond). Tutorials, workshops, masterclasses, document ideas all welcome.

2) Dublin (March, 2019) – Jamie Angus will do a "part 2" of Jamie's Milan tutorial on "Modern Sampling", addressing Finite Rate of Innovation and sparse/compressive sampling.

3) Other ideas:

- a) a presentation on loudspeakers aimed at high res-specific issues. Needs scoping out.
- b) tutorial on modern DAC, ADC issues, e.g. modulator issues, pumping noise floor and solutions, dynamic range, 32b word usage, chip vs discrete design (dCS, MSB, Meitner), multistage nature of converters and things that go wrong because of it
- c) document on listening test requirements specific to high res tests – seems much needed based on past listening test papers
- d) workshop on the meaning of “Lossless”? (could be more useful at CES than AES)

Bob Katz/Hyunkook Lee presentation:

Bob and Hyunkook gave a short presentation, eliciting much discussion, about the new listening test ideas they are working on. The tests evolve from their hypothesis that ABX fails often in HRA because it lacks enough resolution to discern fine differences that seem audible otherwise, particularly to mastering engineers.

Their test involves mixing small amounts of reverb (responsible for ambience) with close-miked signals (i.e. dry signals) in a controllable manner. The test has three parts:

- a) Determine the jnd (just-noticeable-difference) of incrementally added reverb using a classic staircase 1-up, 2-down test. This reference level varies for each listener.
- b) Use this value in an ABX test. It should be audible. Expect this may fail.
- c) Also do the comparison with an MOA (method of adjustment) test using faders. This is classically the way mix engineers work, matching addition of a signal to the levels of that signal in a previous mix. In other words, set the signal+controlled-reverb as the reference, then have the listener incrementally add/subtract reverb to a dry signal until it matches the reference, using faders to continuously change the added reverb.

The goal is to compare performance of the tests themselves. MOA is a preferred method in psychophysics for comparing signals that vary in multiple defining parameters, and is regarded as quite sensitive. Ambience tests are relevant to HRA because ambience, depth, and spatiality are among the greatest roots of HRA. Hyunkook proposes using signal detection theory as well as percent correct in analyzing ABX, to separate bias from sensitivity.

Discussion was wide ranging. Top points:

- various problems in MOA, especially getting listeners to refine exactly where the match point is rather than jumping somewhere into the range. Results can thus be noisy. It's a stressful test, especially with many repetitions needed for good statistics. Reverb can be masked by the direct sound, even for wide movement of faders. Listeners can cheat, choose halfway point between top/bottom fader position.
- will involve training, careful music selection
- signal detection theory presupposes that tests use a single “look” per trial, i.e. listen to a,b,x, once, then decide. The ITU (itu-r-b.1116) standard, commonly used in most audio

tests, uses repeats, looping, and unlimited switching before each decision. In SDT, repeats and switches would change the listener's response criterion and invalidate the bias analysis.

- how many trials for good statistics; avoid averaging of data from users or conditions

Josh Reiss – short summary of software available from the audiology community

Josh briefly summarized software available from the audiology community that he's been experimenting with. Included are a number of models for predicting the results of listening tests by predicting jnd's in situations involving the detection of a quiet signal, or overlapping sounds as they merge into one. The models simulate 1-up, 2-down listening tests for jnd using probability, Poisson distributions, etc.

Josh has tried to run HRA vs. standard resolution with these models to check their applicability but finds that most models do an automatic downsample to 44.1 kHz or below. Also the most advanced of them just predict loudness levels. So as of yet, no real use although an interesting approach.