Acoustic Measurement on Headset

K. Allen Woo

PLANTRONICS

Contents

- Human Ear & Orthotelephonic Reference

- Ear Simulators

- Type of Headsets

- Old and New Test Methods

- Compare of Type 3.3 and 3.4 Ears/ ITU-T SG12 Round Robin Experiment

- Conclusion

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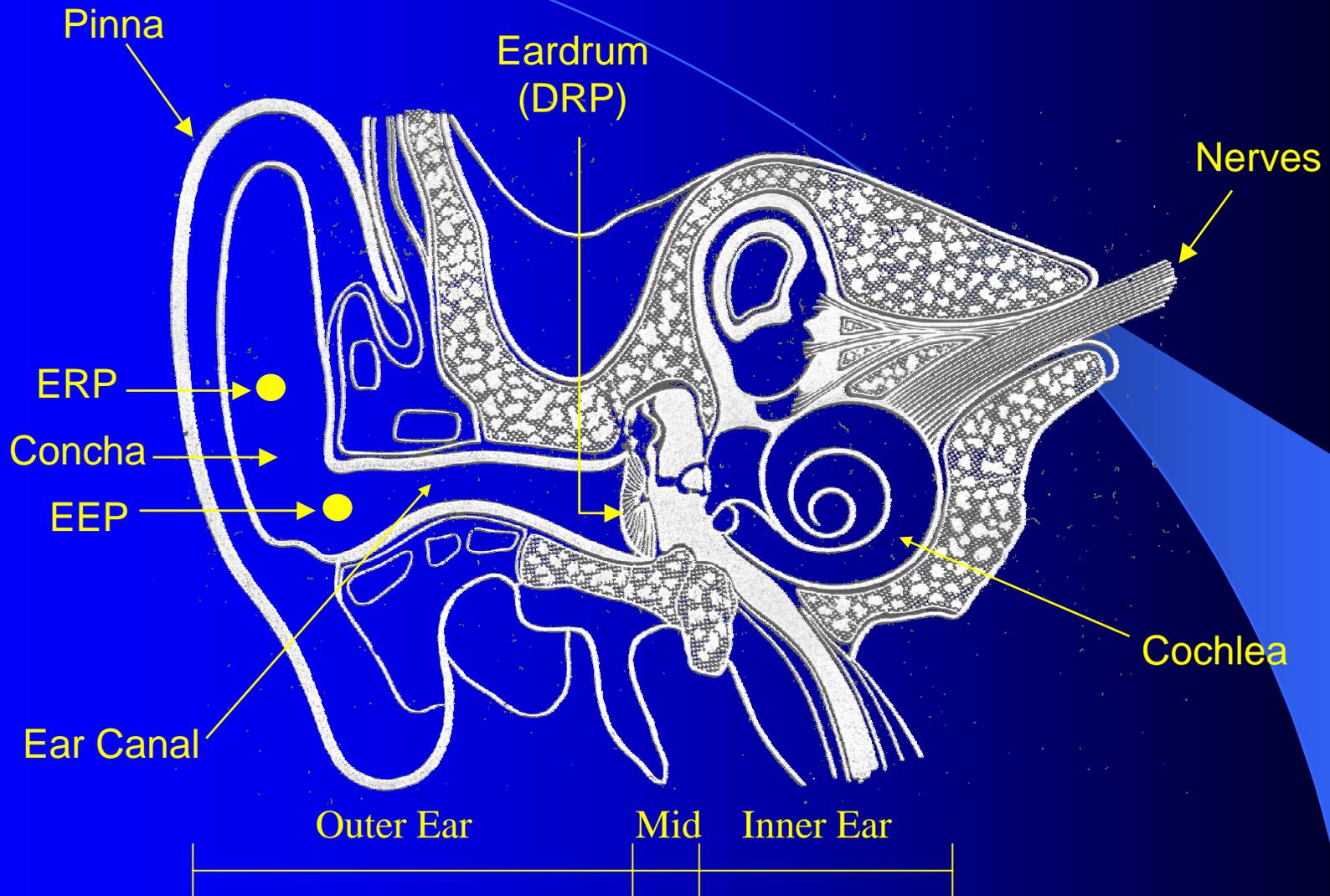
Human Ear

Drawing: John Bareham, Chair of IEEE STIT

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Ear Simulators as Defined in ITU-T P.57

Type of Ear	Description	Ref. Point	Up Freq. Limit
1	IEC 318 Ear Simulator	Erp	5 kHz
2	IEC 711 Occluded Ear Simulator	Drp	8 kHz
3.1	Concha Bottom Ear Simulator	Drp	8 kHz
3.2	Low and High Leak Simplified Pinna Simulators	Drp	8 kHz
3.3	IEC 959 Pinna Simulator	Drp	8 kHz
3.4	Pinna Simulator	Drp	8 kHz

Example of Type 1 / IEC 318

B&K 4153

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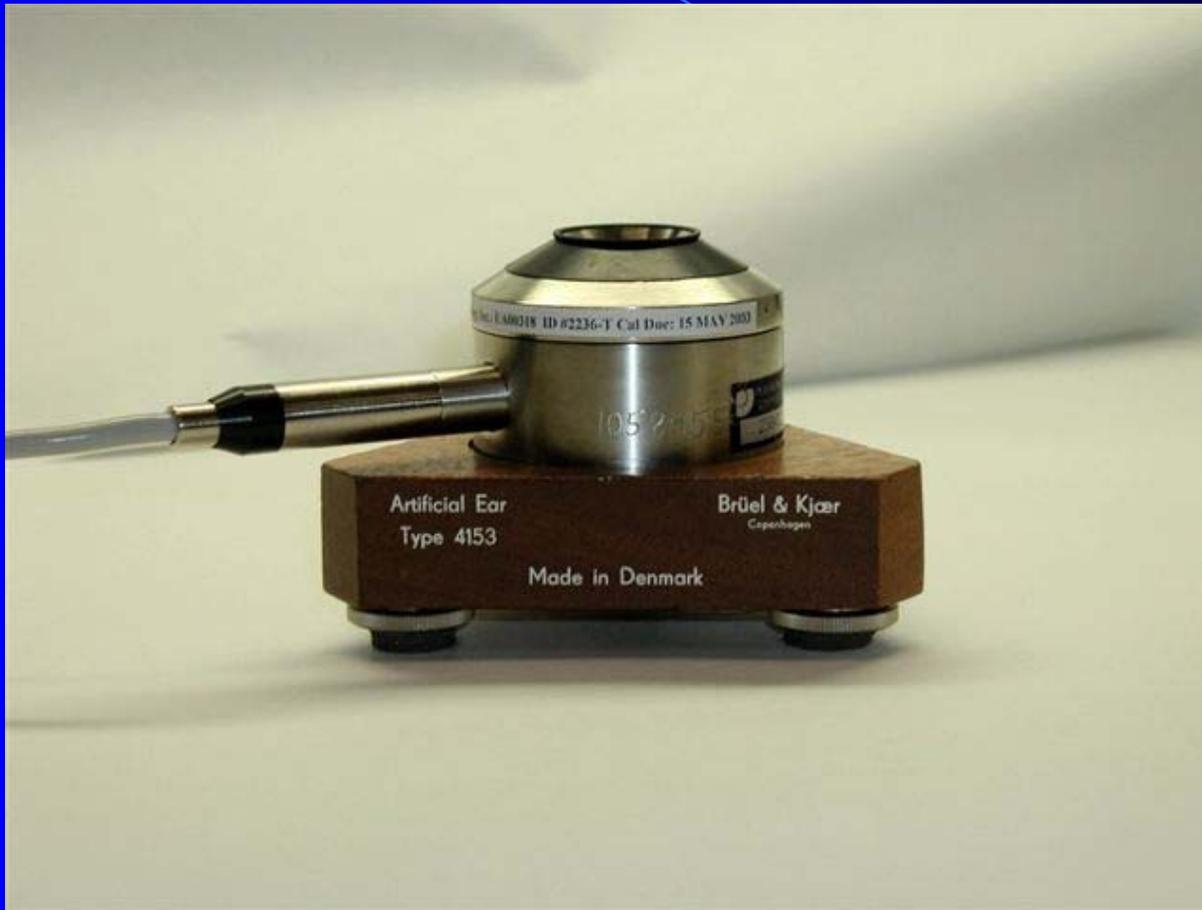
Example of Type 2 / IEC 711

B&K 4157

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Type 3.1

EEP

Flat Plate

Type 2 Ear

Drawing: ITU-T P.57

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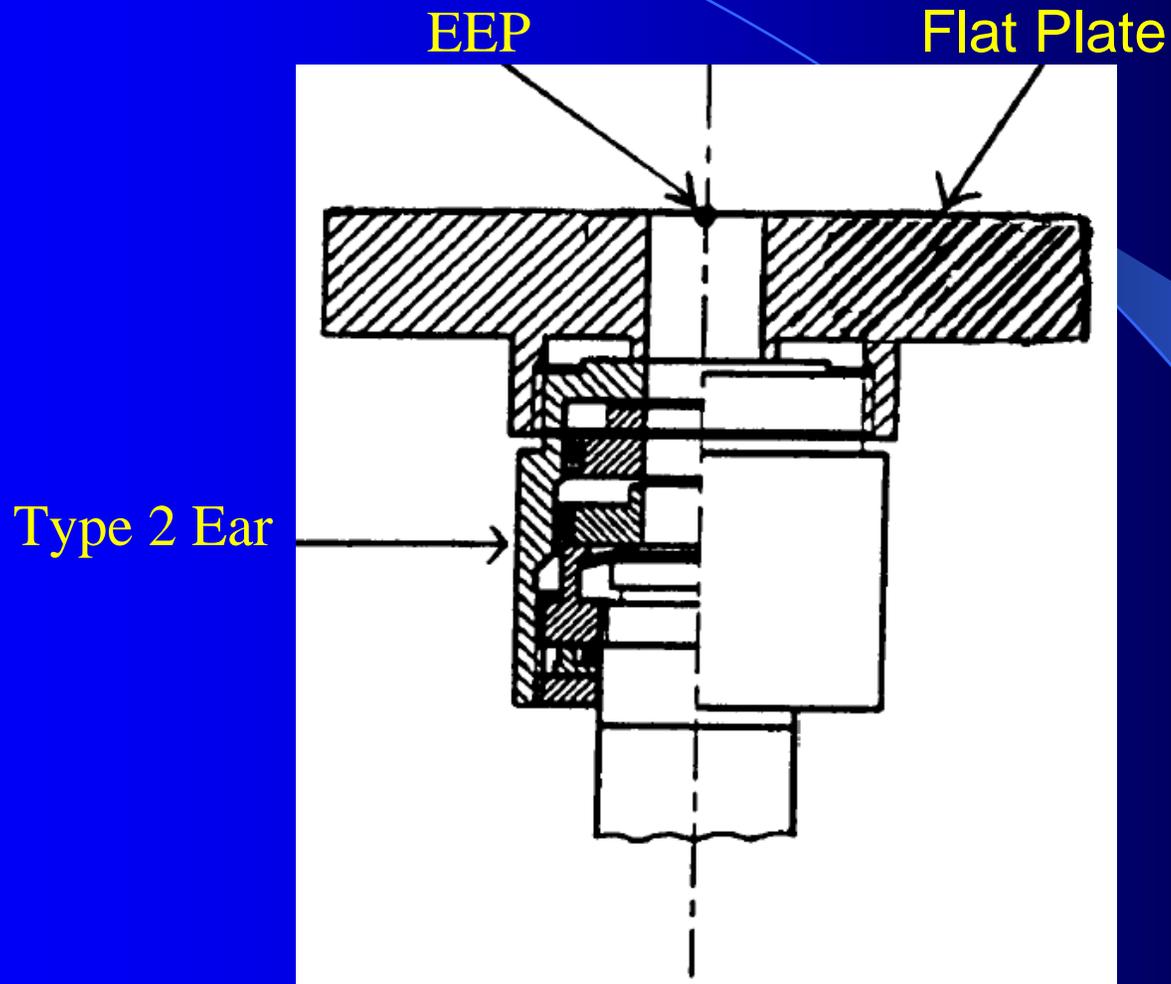
Example of Type 3.2 Low and High Leak

B&K 4195 Low Leak and High Leak

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Example of Type 3.3

B&K 4128 HATS

114 AES Workshop   K. Allen Woo
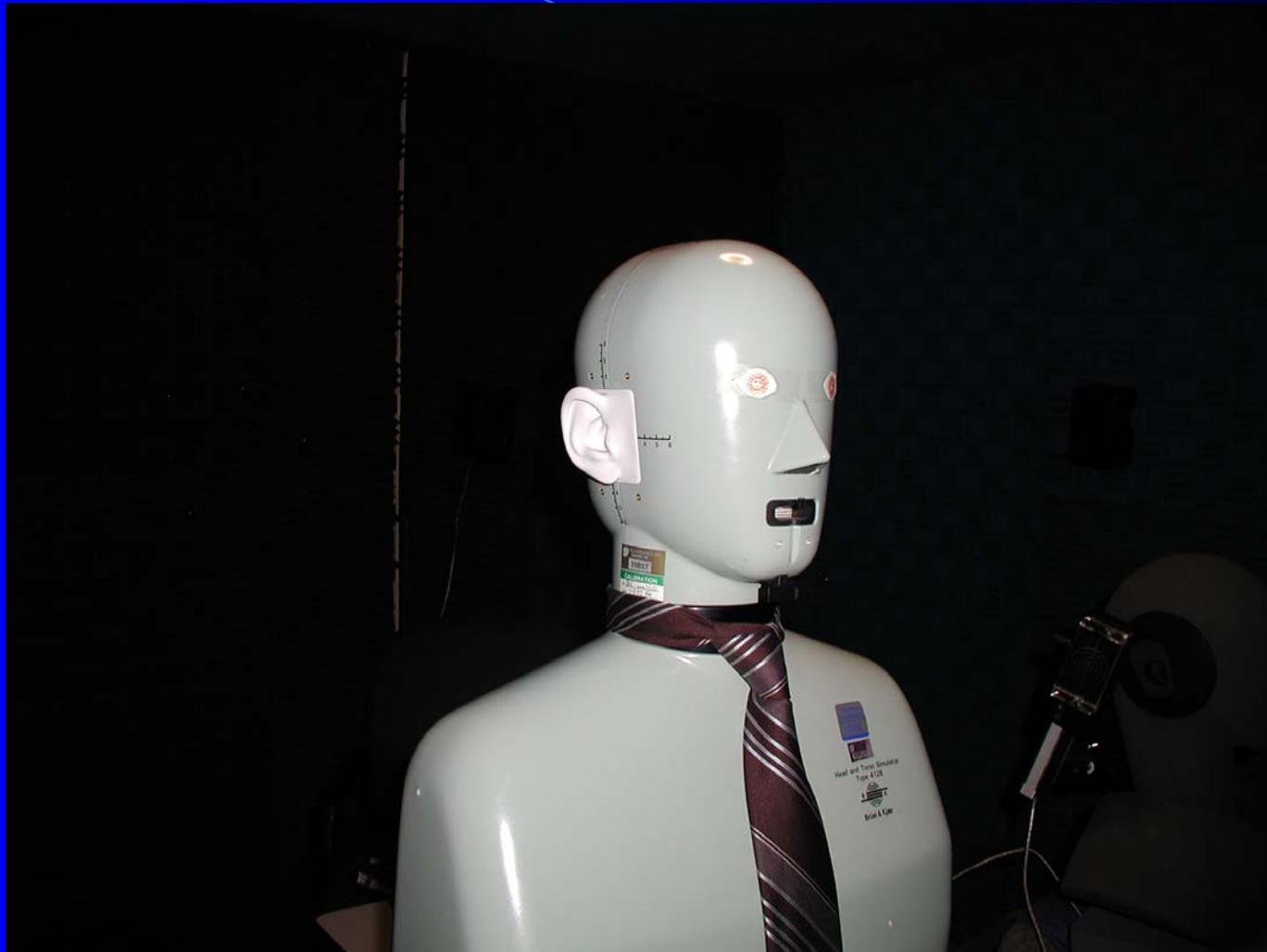
Example of Type 3.4

Head Acoustic HATS

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Examples of Headsets

Insert type Hedsest

Intra-concha Headset

Intra-concha Headset

Surap-concha Headset

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Examples of Headsets (Cont.)

Supra-aural Headset

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Old Test Method

Supra-aural Headset Tested on Type 1 Ear Simulator

New Test Method Compare to Real Use
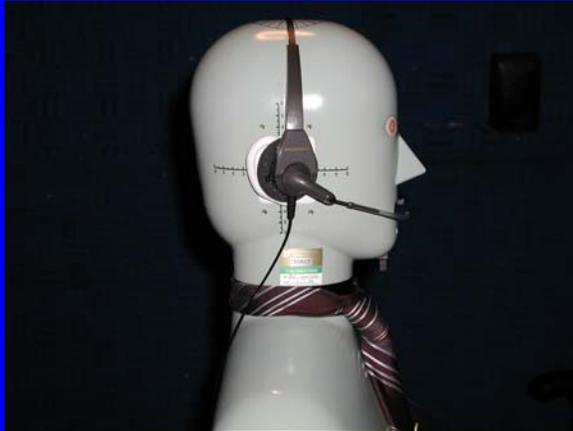
Type 3.3 HATS

Type 3.4 HATS

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Questions

- What are the repeatabilities of testing on Type 3.3 and 3.4?

- Do Type 3.3 and 3.4 provide the same results?

- Do the measurements on Type 3.3 and 3.4 correspond to the measurements on real human ear?

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ITU-T SG12 Round Robin Study

- Four labs were participated: Plantronics, Head Acoustics, GN Netcom and B&K.

- Thirteen different type of headsets were used: insert, intra-concha, supra-concha and supra-aural, but did not include circum-aural.

- A small microphone inside ear technique was used for both HATSs and real ear measurements on headset speakers.

- Headset microphones were measured only on HATSs.

- Each headset speaker were measured 5 times on the same 3.3 and 3.4 HATSs by each operator. (Two operators for each lab).

- Each speaker were measured 5 times on each human subjects in each lab. (Twelve subjects for each lab).

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Round Robin Results on Insert Type Headset
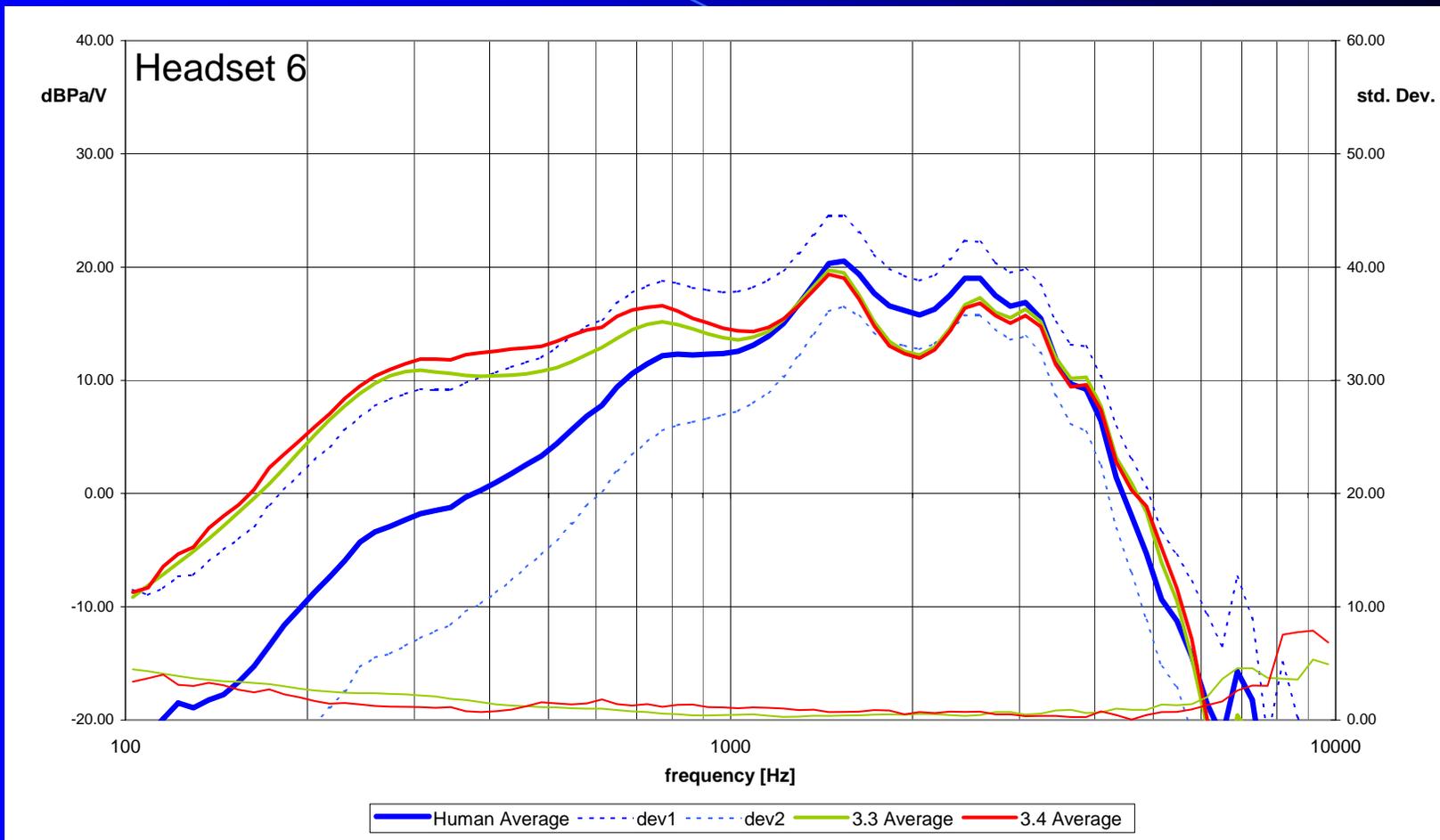
Headset 6

Round Robin Results on Intra-concha (Earbud) Headset
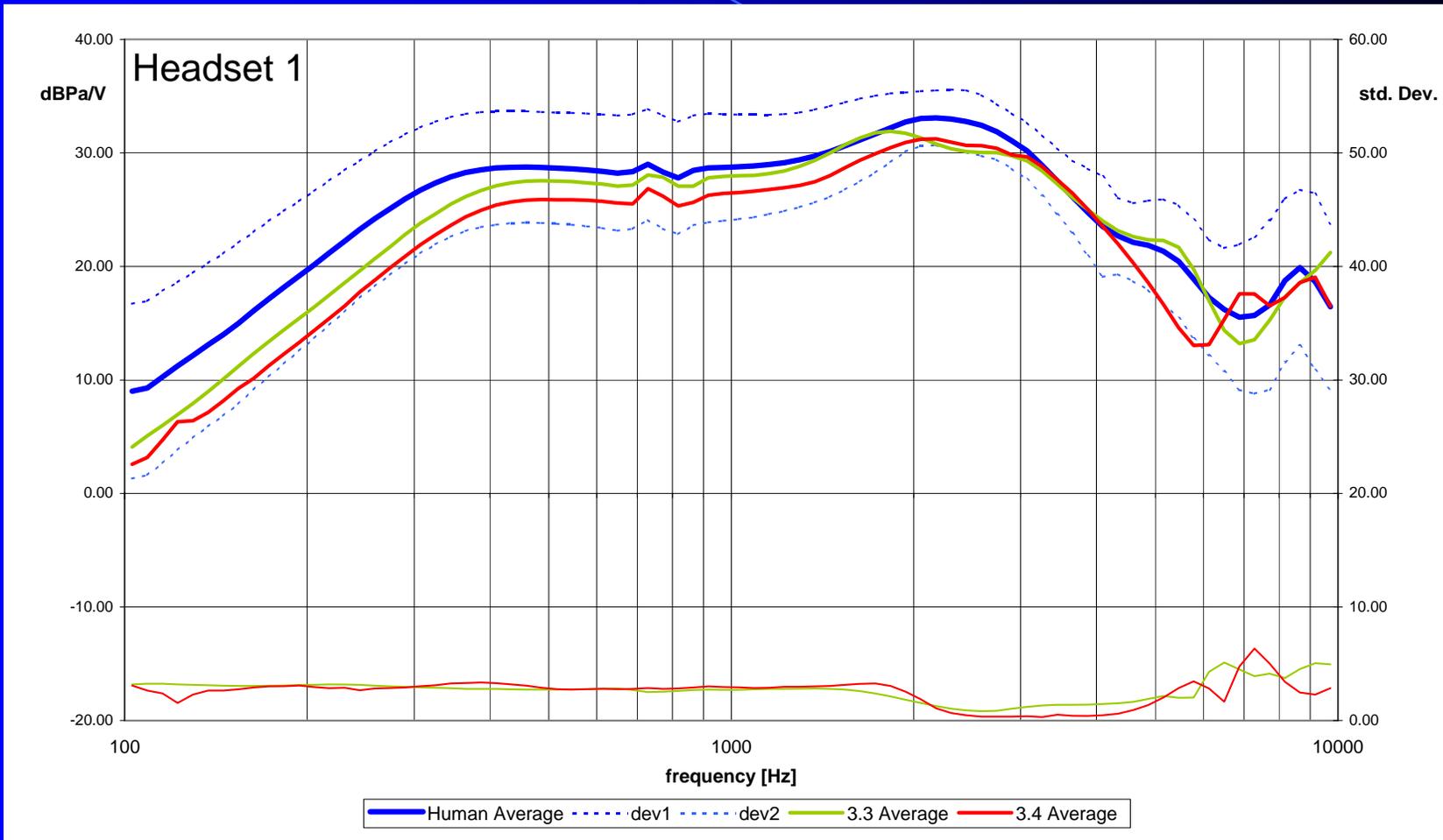
Round Robin Results on Intra-concha Headset


Headset 2

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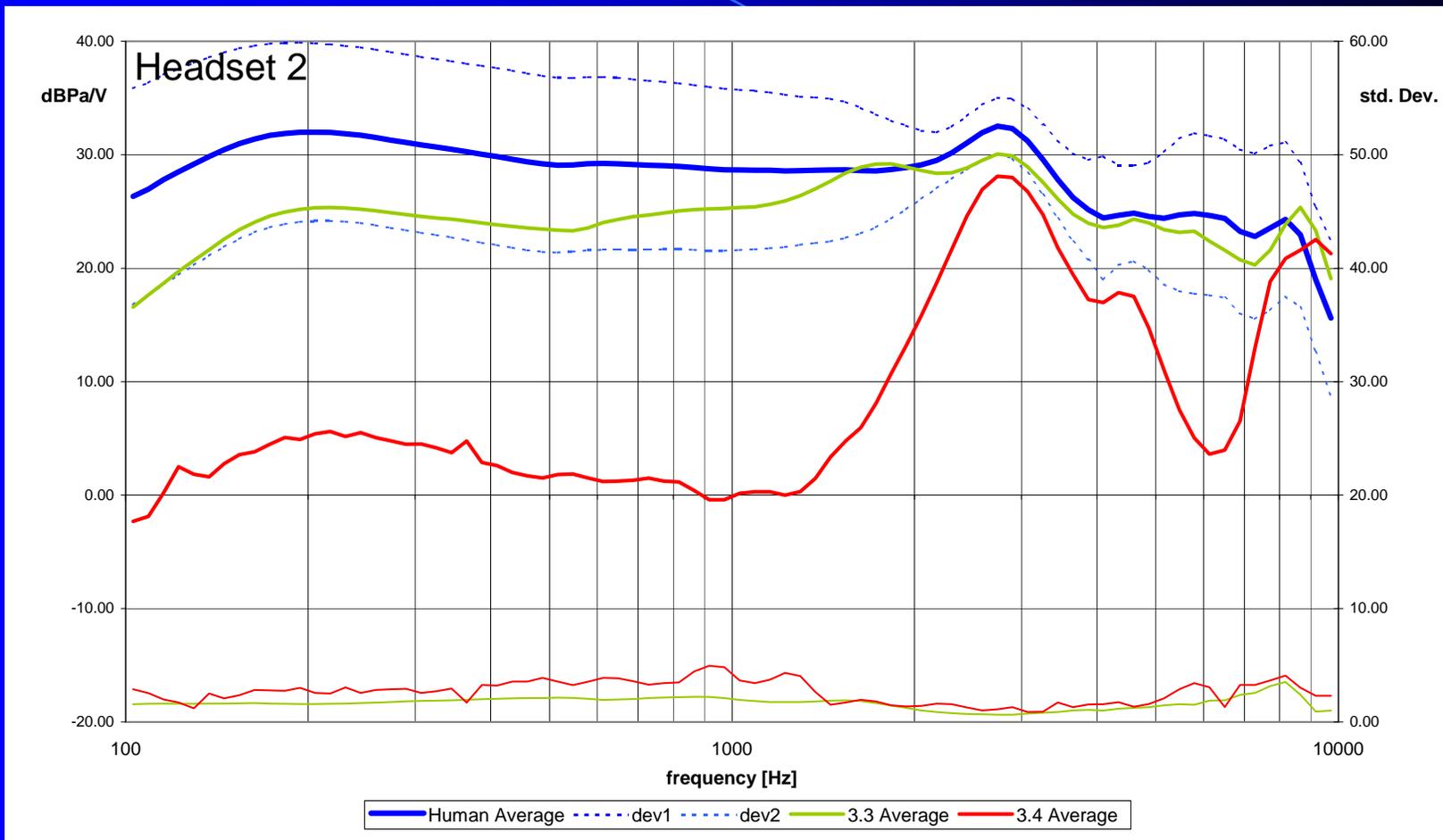
Round Robin Results on Supra-concha Headset
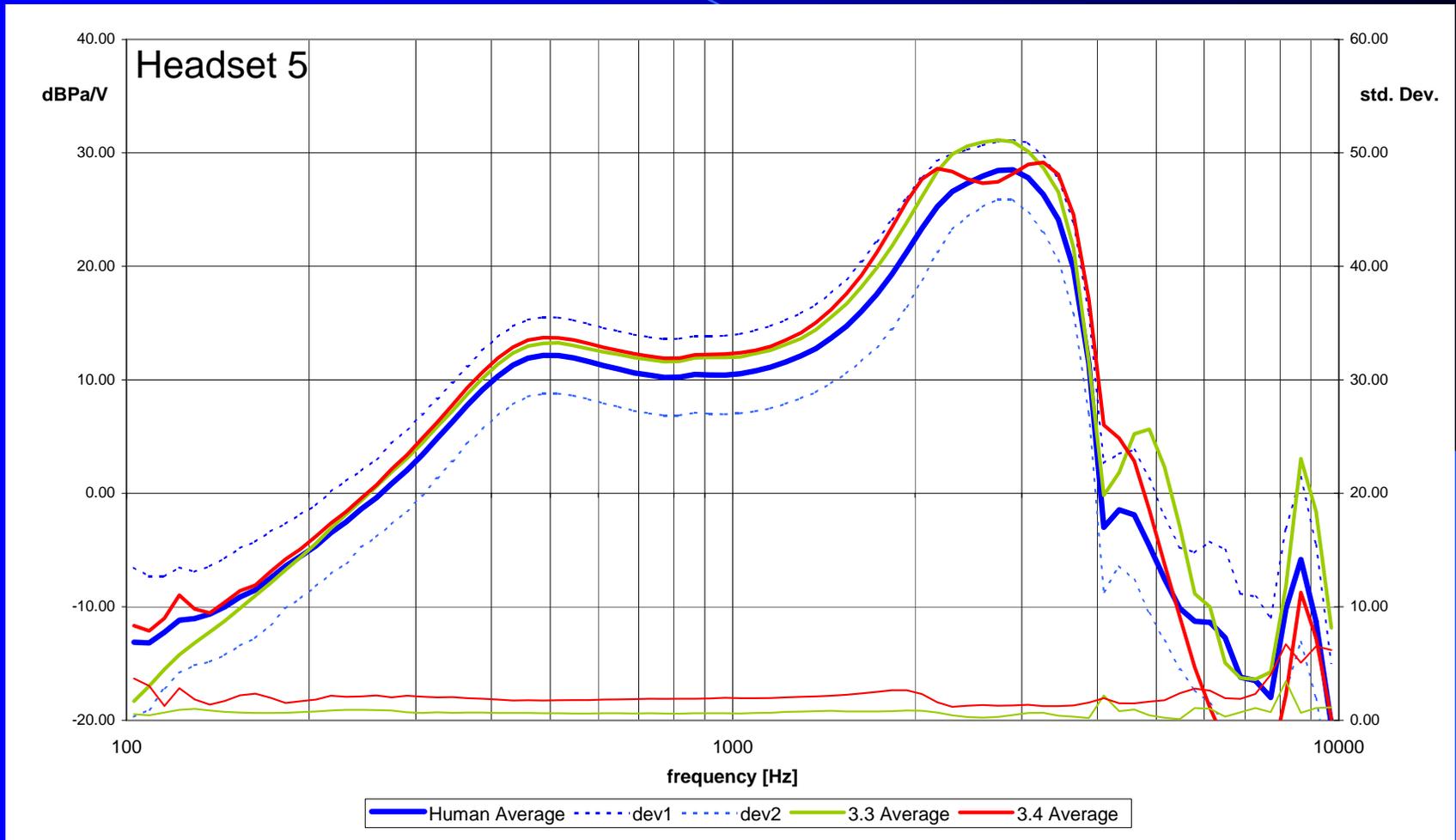
Headset 5

Round Robin Results on Supra-aural Headset with Open Foam Cushion
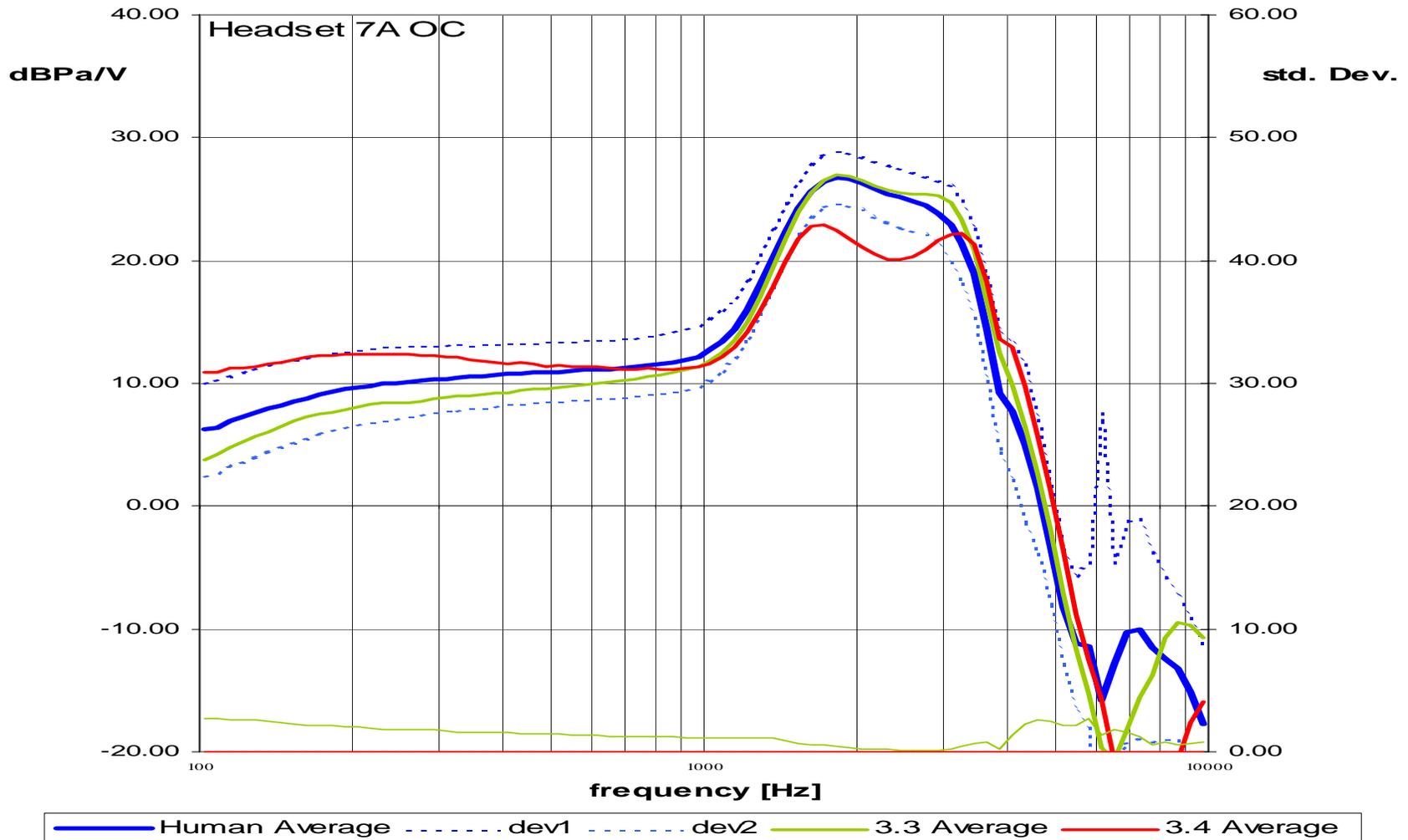
Round Robin Results on Supra-aural Headset with Leatherette Cushion
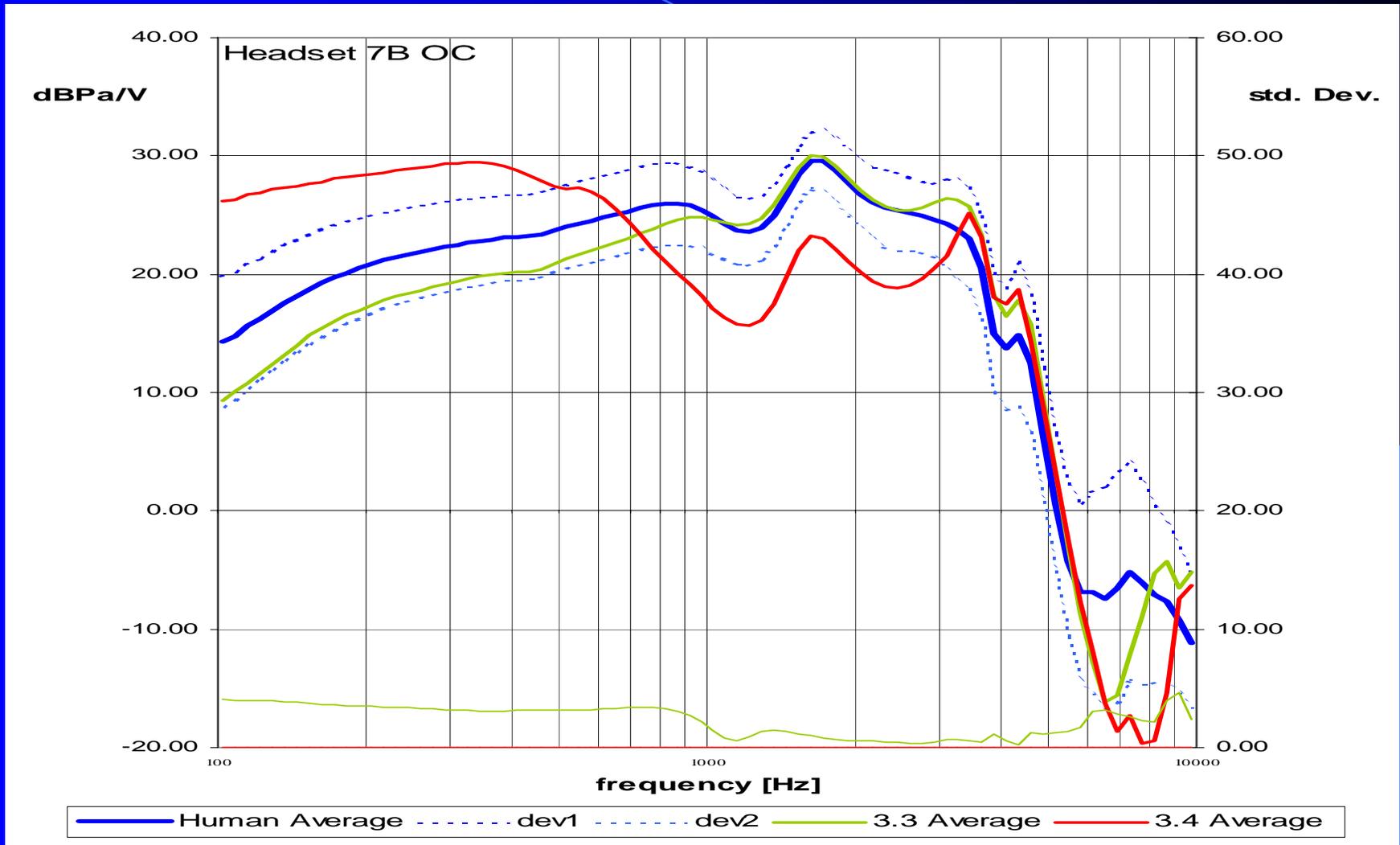
Preliminary Observation from the Round Robin Experiment

- Following manufacturer's RTP or RWP or aiming to a real use position the repeatability of both HATSs are relatively good for both speaker and microphone for most type of headsets.

- Microphones are more position sensitive, especially for noise canceling microphones.

- Type 3.3 and 3.4 do not give the same results on speaker measurements for some type of headsets.

- Type 3.3 gives better correlation to real human ear on speakers measurements for most type of headsets.

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Conclusion

- HATS does not always correlate well with real ear measurements, yet, it is the best among all the available ear simulators today.

- The HRTFs of HATS are reliable only up to 8 kHz.

- Headsets shall be coupled to HATS with manufacturer's RWP or in a position that reflects a real use position.

- A minimum of 5 measurements by completely repositioning the headset is recommended.

- For some microphones a position jig may be needed to obtain a repeatable measurement.

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