A Simple Way to Estimate Aided In-Situ Audibility

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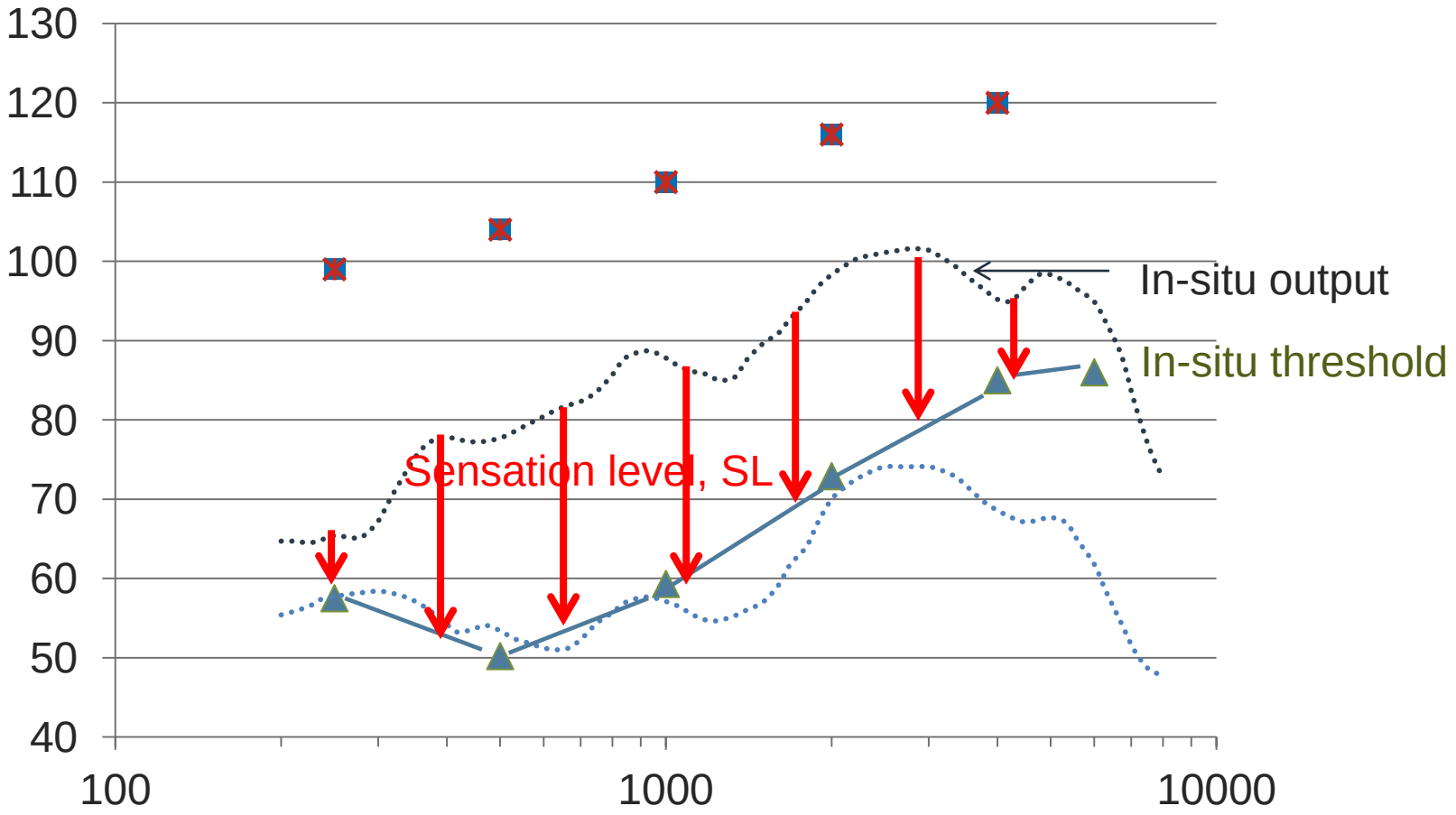
WIDEX®
HIGH DEFINITION HEARING

REM is the gold standard of measuring and verifying SPL in the earcanal

Only < 30% dispensers use REM on a regular basis

Is REM needed if our interest is in the audibility of an aided sound?

WHAT DO WE GET WITH REAL-EAR MEASUREMENTS?



Sensation Level (SL)

or the information on the audibility of specific sounds can be achieved through simpler and more accurate means (as in a coupler) .

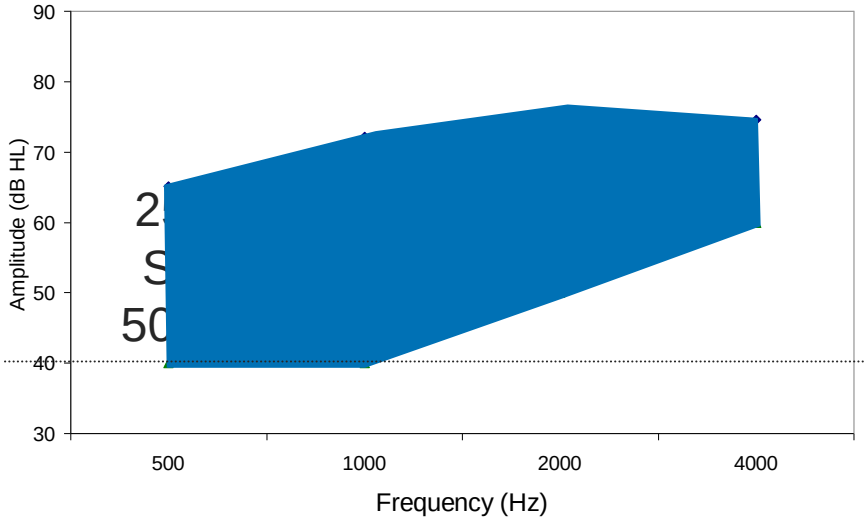
THREE REQUIREMENTS

- Hearing aids generate sounds for in-situ threshold measurement
- Hearing aids measure the input levels of sounds and estimate their in-situ output
  - Both functions have been possible with DSP hearing aids in the last 15 years
- HA in-situ threshold and output calibrated on same coupler

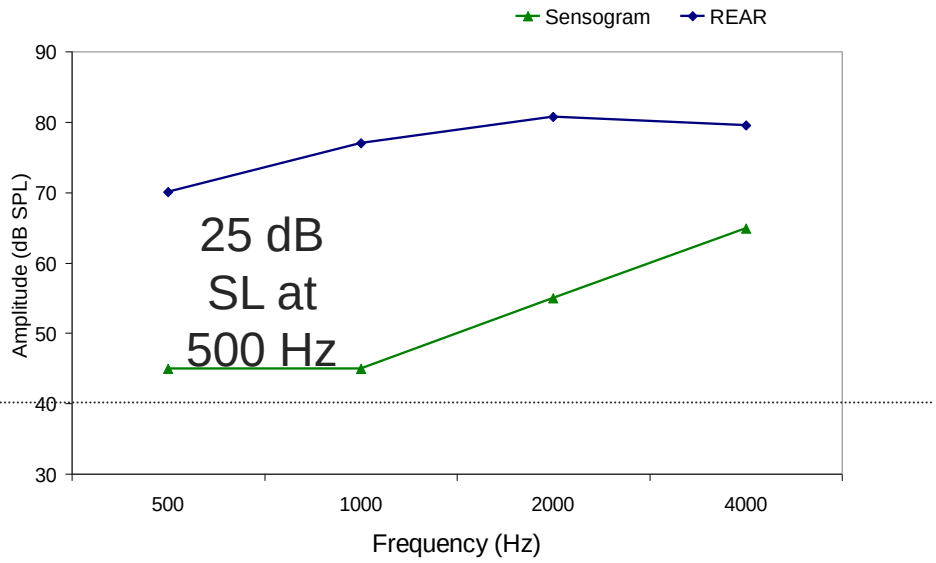
- Difference in the hearing aid in-situ threshold and the in-situ output as measured in a coupler is the SL
- This SL should be the same as the SL measured using REM

CONCEPT OF SENSATION LEVEL

Hearing Aid Coupler



Real-Ear Measure



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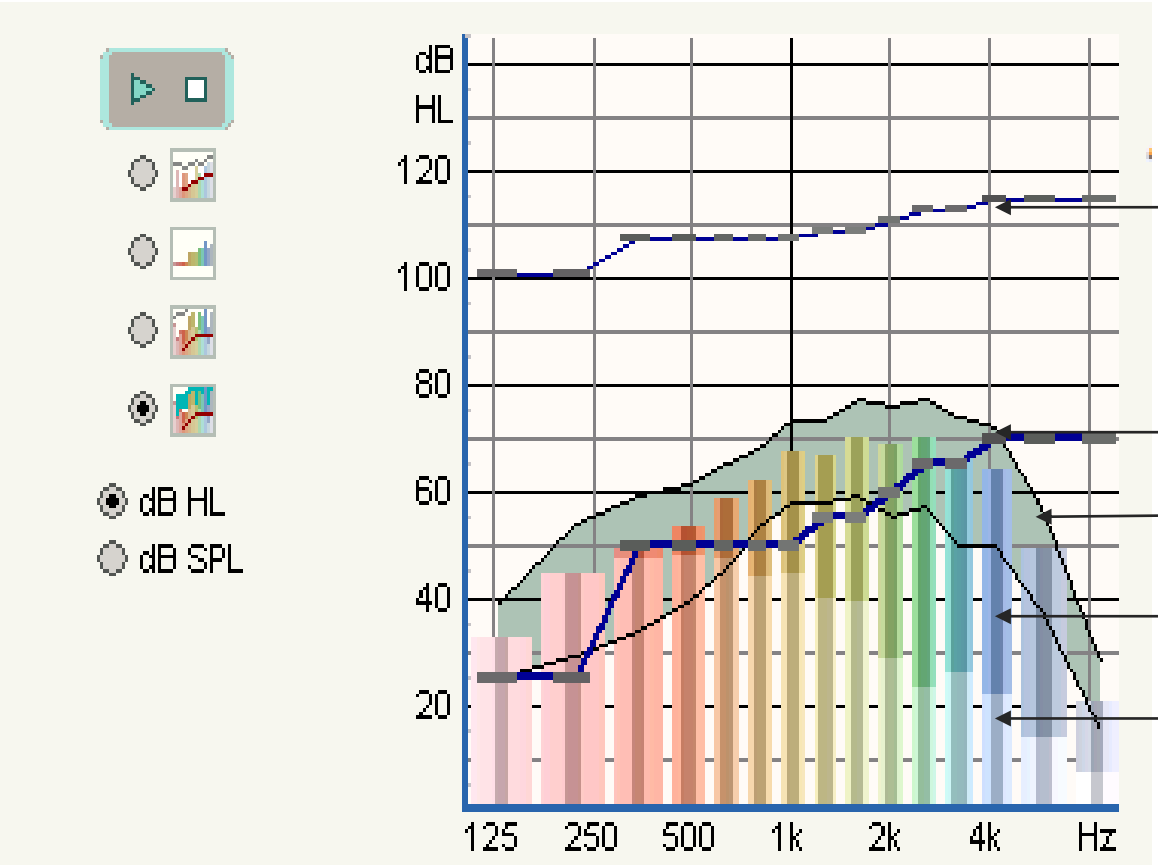
IMPLEMENTATION - SOUNDTRACKER



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DETERMINING EQUIVALENCE OF SL

Step 1 - Determine the sensogram threshold behaviorally. Note the level (in ST)

Step 2 - Measure the sound pressure level in the earcanal at threshold using a real-ear measurement system. Note the level

Step 3 – Repeat steps 1 and 2 for all basic frequencies

Step 4 – Present a broadband signal from the REM to the hearing aid (ISTS on Verifit, Composite on Frye) for 10 seconds (until response stabilizes)

Step 5 – Examine the averaged output of the hearing aid on the SoundTracker. Note the peak of the average output at the 4 frequencies. This is the simulated output.

Step 6 – Examine the averaged output of the hearing aid as measured on the REM. Note the peak output at all 4 frequencies. This is the REM aided output.

Step 7 – The sensation level (SL) of the SoundTracker is step 5 – step 1 (3)

Step 8 – The sensation level (SL) of the REM is step 6 – step 2 (3)

Fifteen hearing impaired and 5 normal listeners with Clear 440 in vented earmolds

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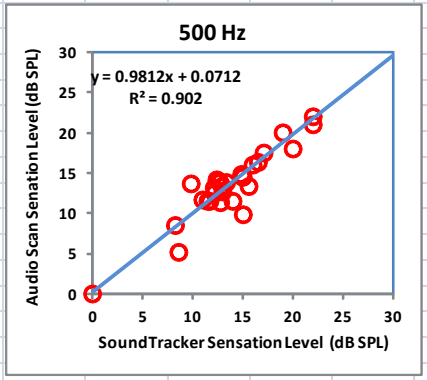
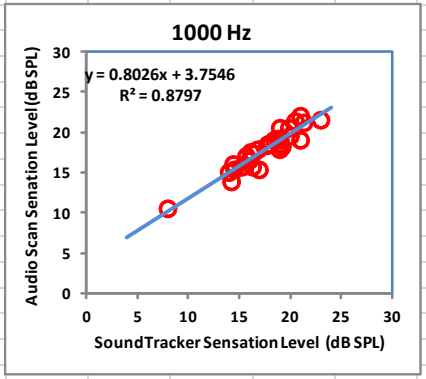
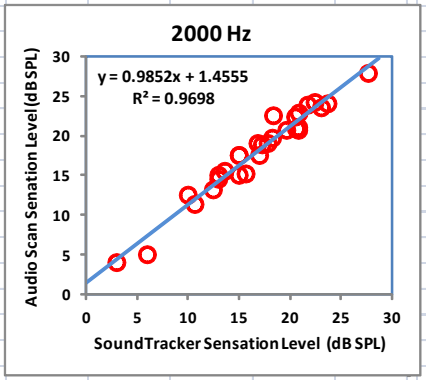
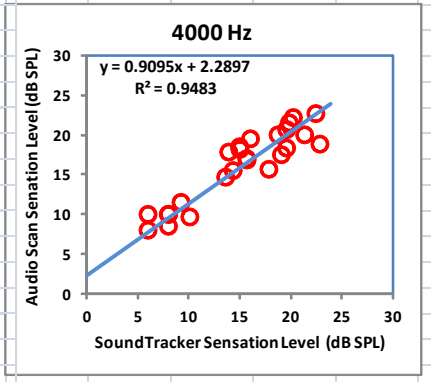
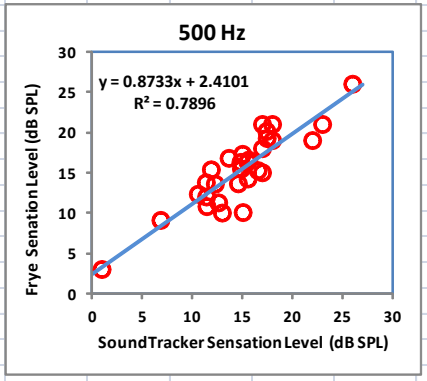
COMPARING SENSATION LEVELS BETWEEN SOUNDTRACKER AND VERIFIT & FRYE

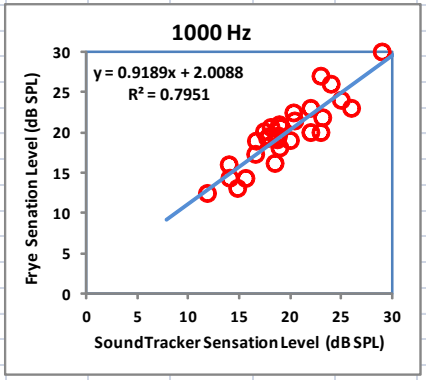


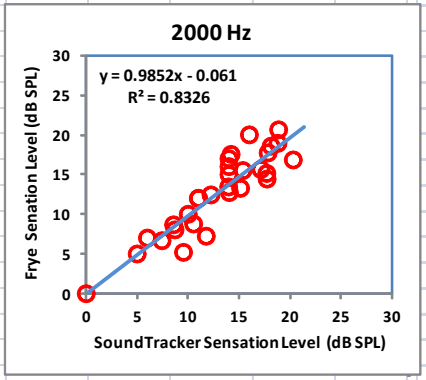


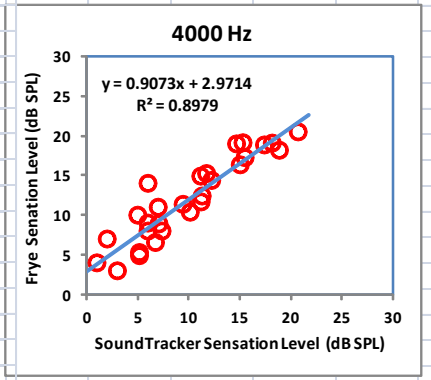












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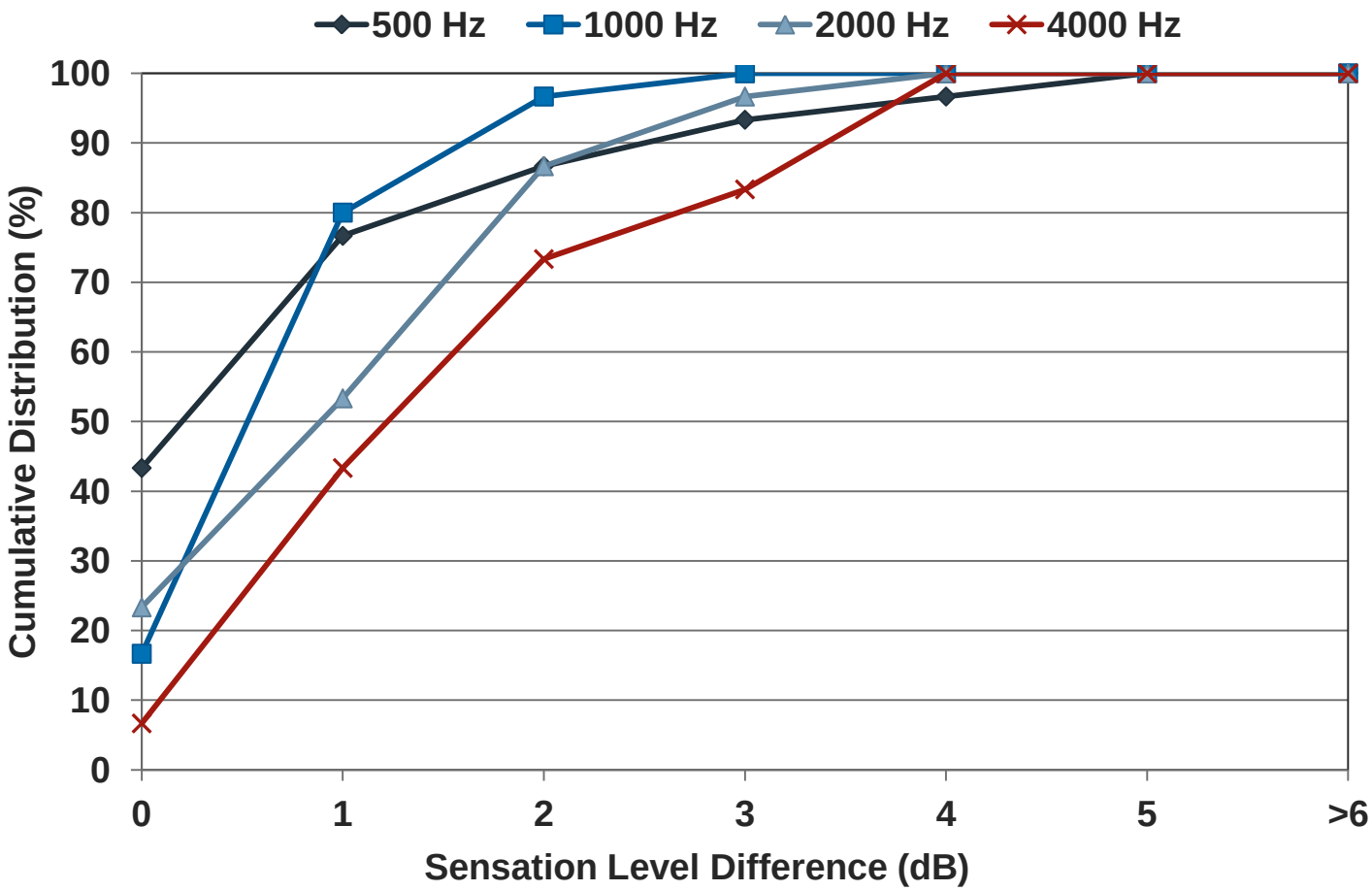
SENSATION LEVEL DIFFERENCE BETWEEN SOUNDTRACKER AND VERIFIT



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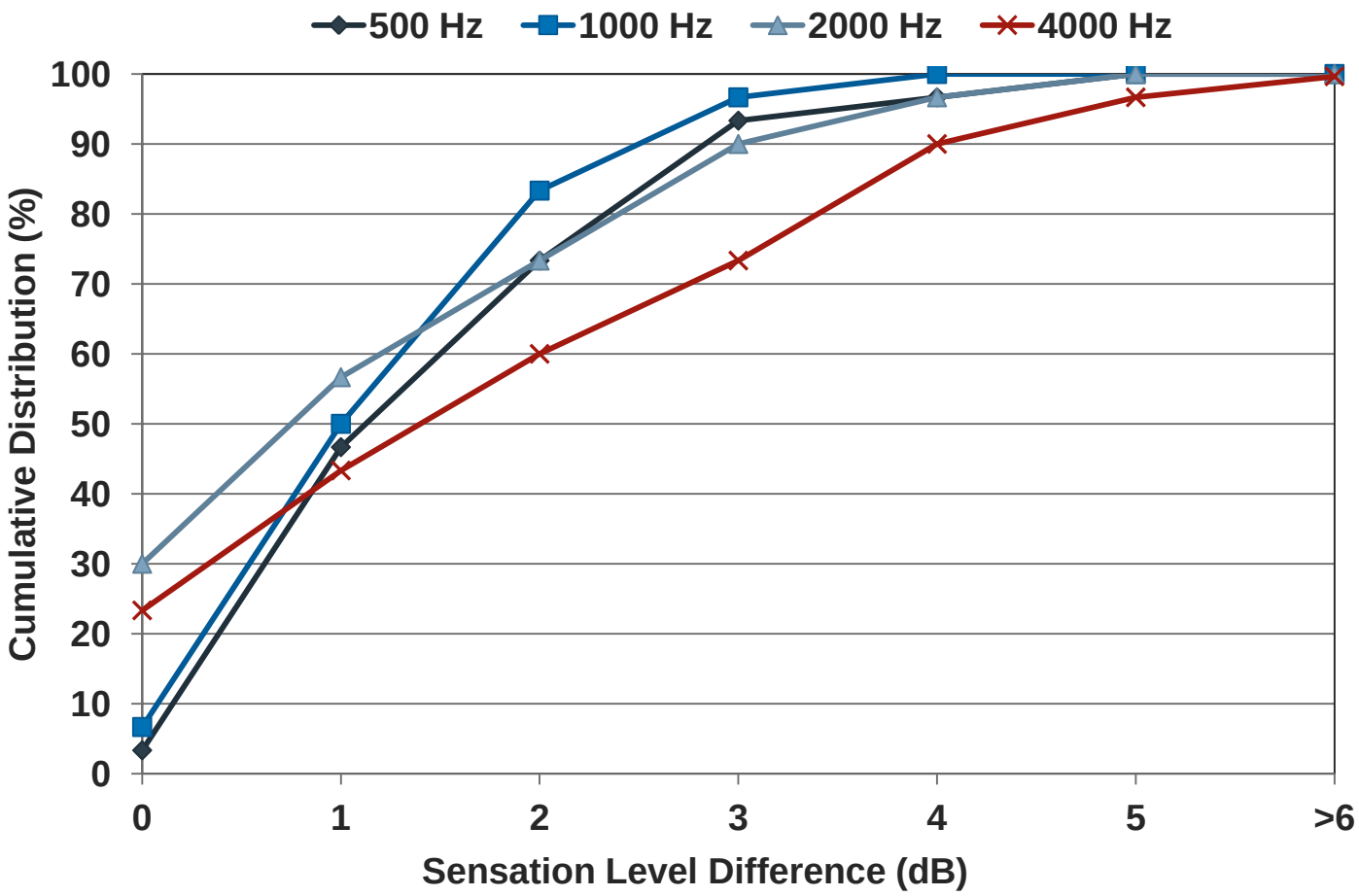
SENSATION LEVEL DIFFERENCE BETWEEN SOUNDTRACKER AND FRYE



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CONCLUSIONS

- Examining the sensation level (SL) on the fitting software may be a reliable, accurate and efficient way of studying the audibility of any sounds
  - As long as the hearing aid is capable of in-situ threshold measurements
  - As long as the in-situ thresholds and output of the hearing aid are calibrated on the same coupler
- This approach is not meant to replace the usefulness of real-ear measurement systems
  - It does not measure absolute SPL
  - It estimates the audibility of aided external sounds and not the SPL of internally generated sounds such as the occlusion effect
  - Accuracy depends on manufacturer’s implementation