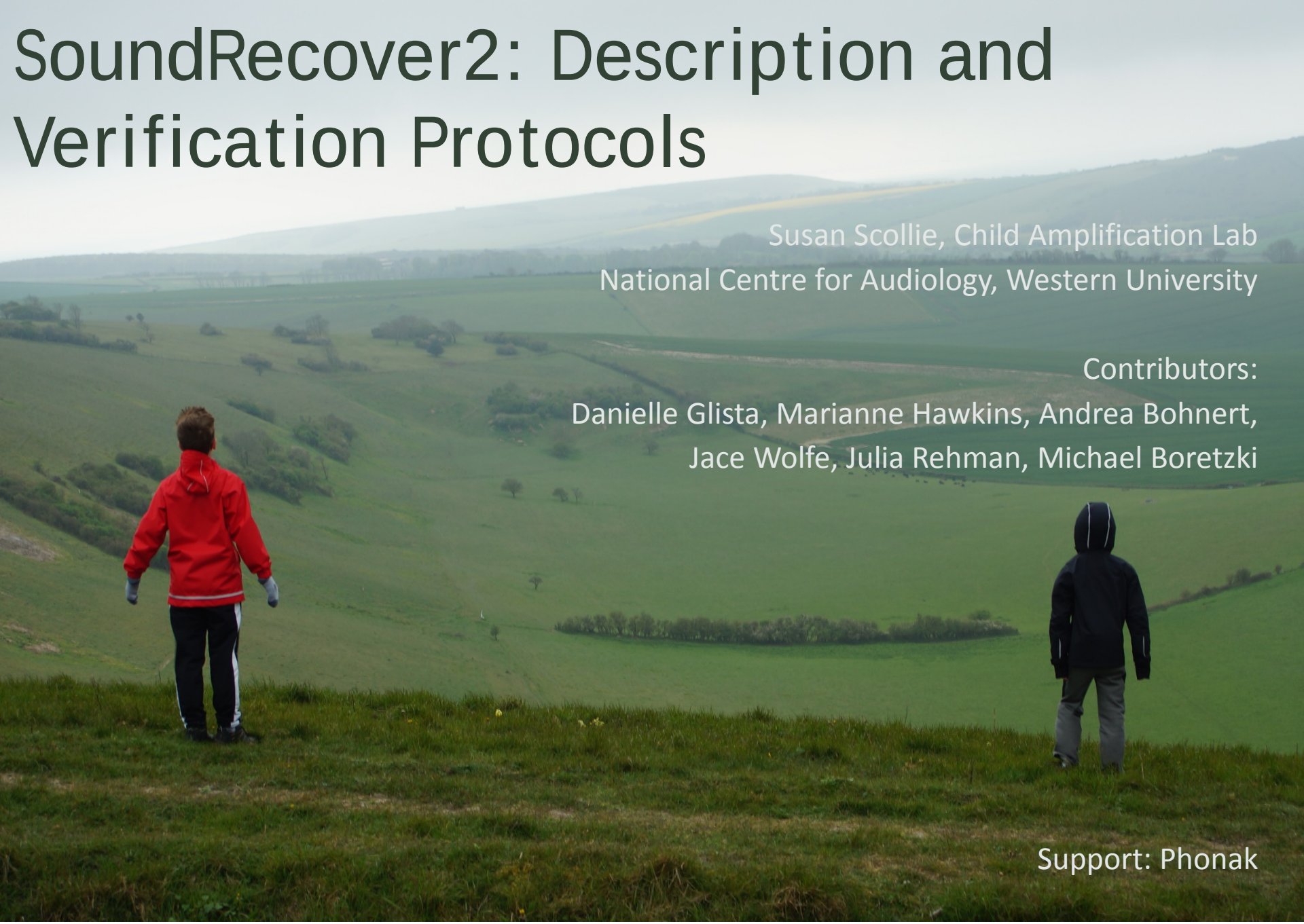
SoundRecover2: Description and Verification Protocols



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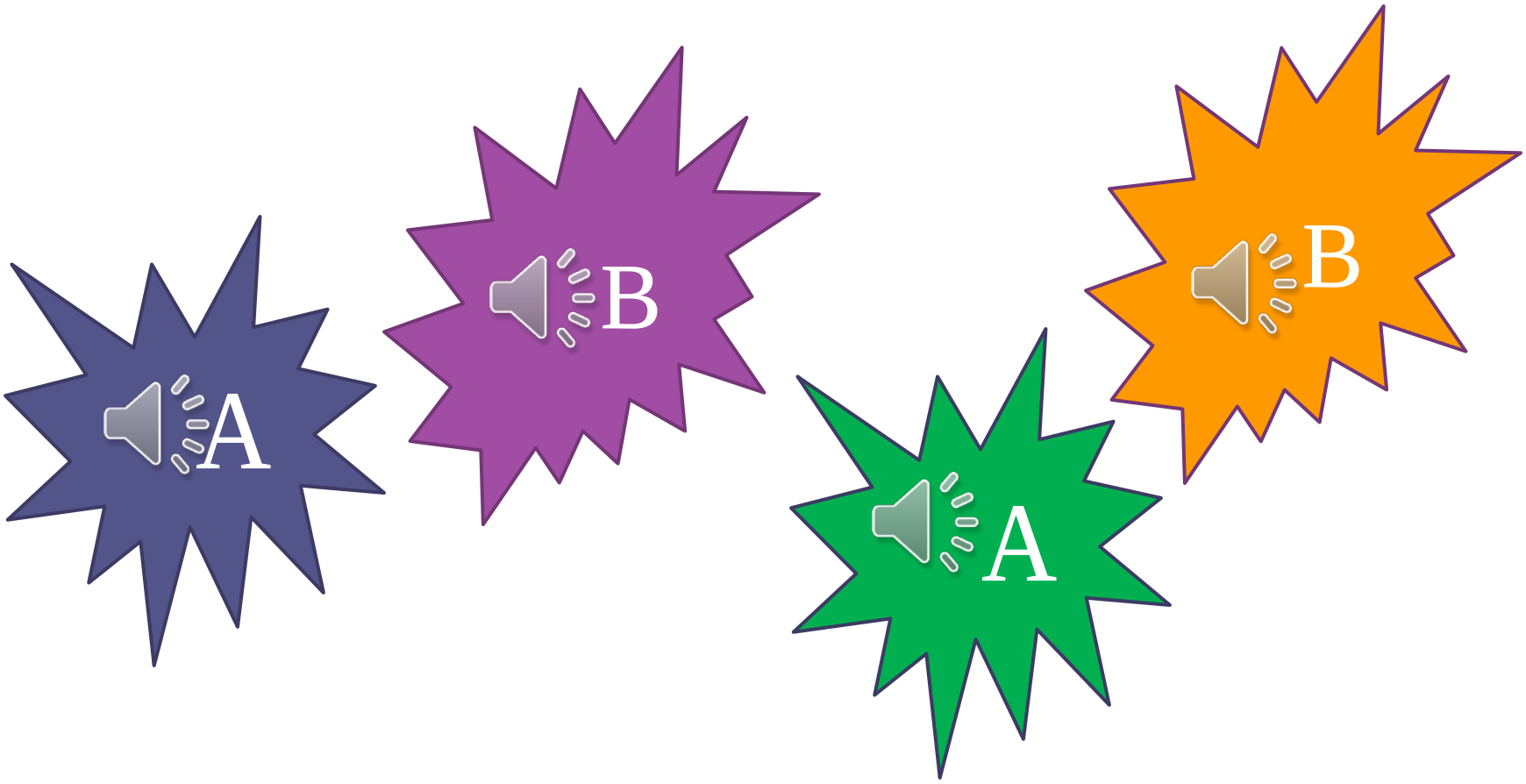
Support: Phonak


A
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B

The term “frequency lowering” is an umbrella term for a family of different processors.

- Today I will will focus on frequency compression.

- For a recent review of all types::

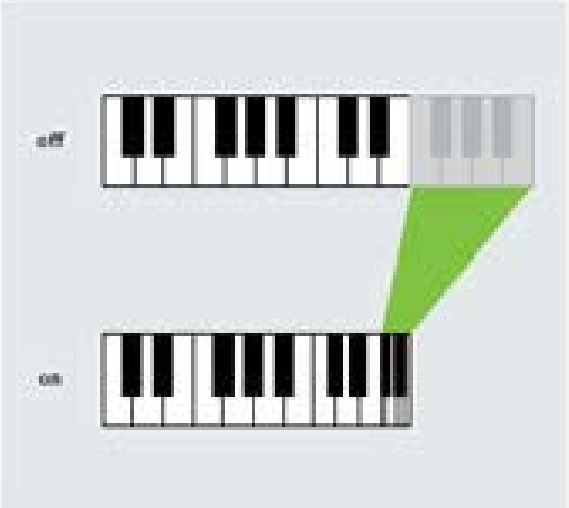
  Alexander JM. (2016) :

  http://www.audiologyonline.com/articles/20q-frequency-lowering-ten-years-18040

Section 2.
The processor

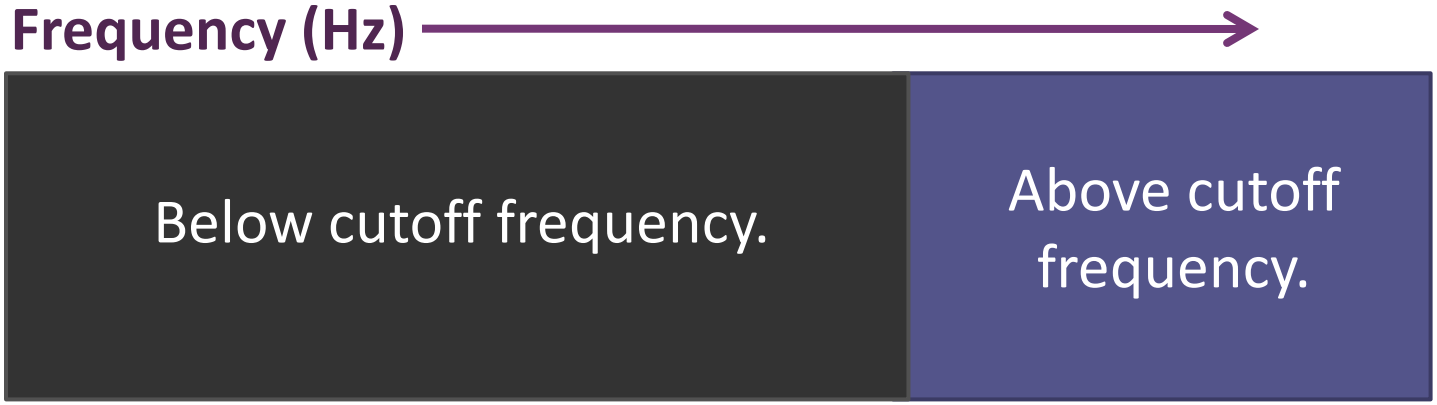
Resources on this:

1) https://www.phonakpro.com/content/dam/phonakpro/gc_us/en/products_solutions/pediatrics/documents/best_practice_protocols/028-1528-03-Best-Practice-Protocol-SoundRecover2.pdf
2) Alexander JM. (2016) :
   http://www.audiologyonline.com/articles/20q-frequency-lowering-ten-years-18040



Nonlinear frequency compression, or SoundRecover, now has two types: fixed and adaptive.

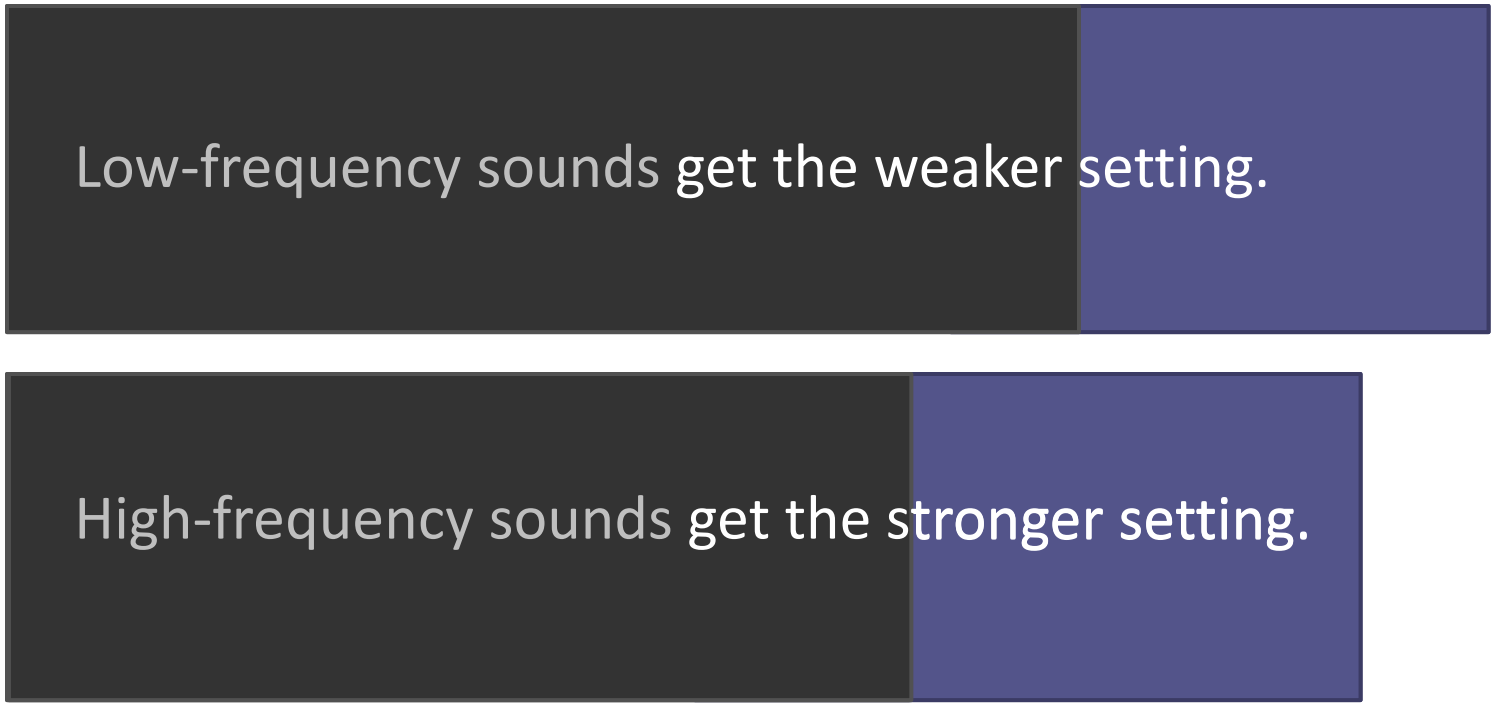
SoundRecover
(now sometimes called SoundRecover1)



SoundRecover2

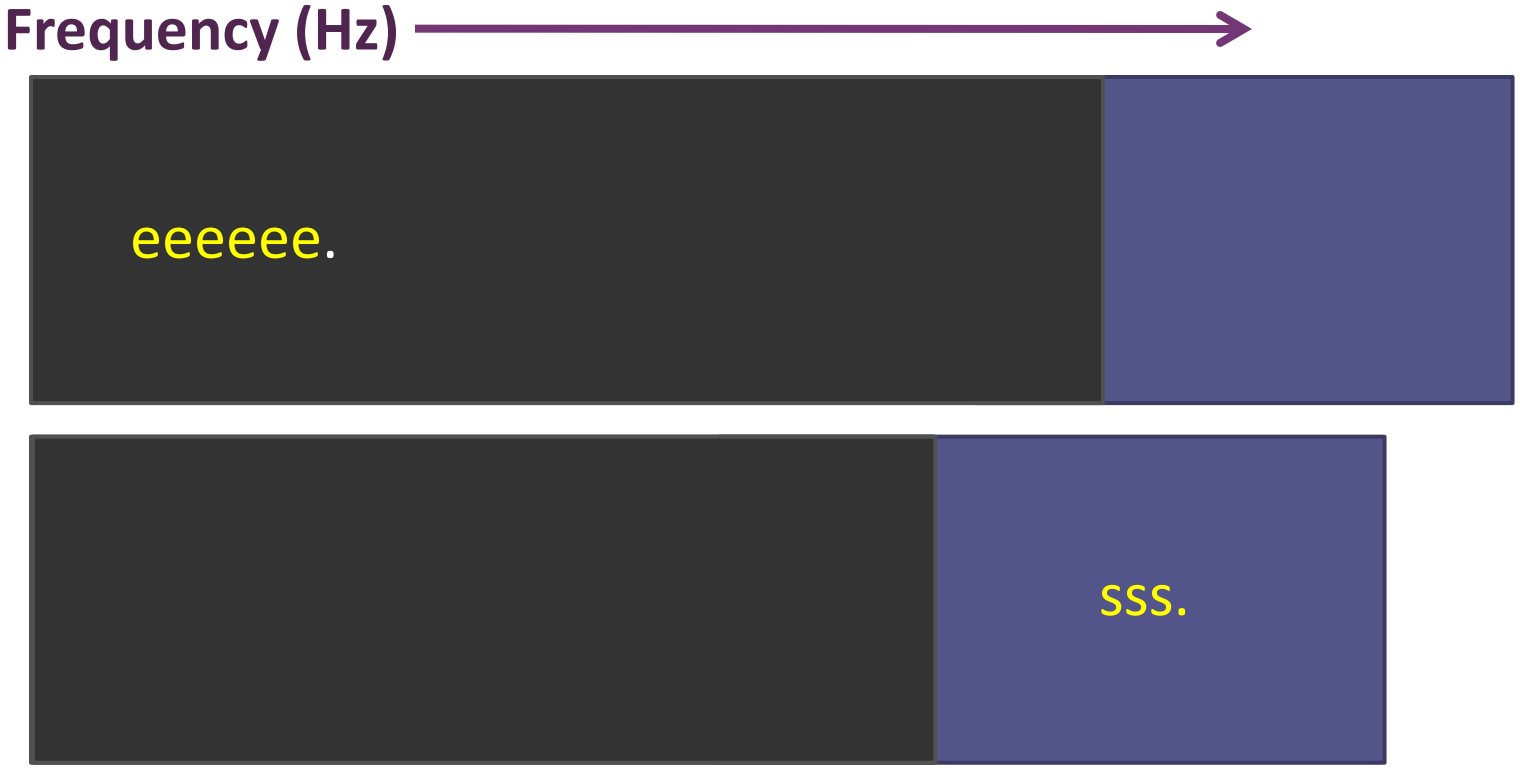
(This is new. It rapidly adapts between two settings.)
(What causes it to adapt? The short-term input spectrum.)

Frequency (Hz) →

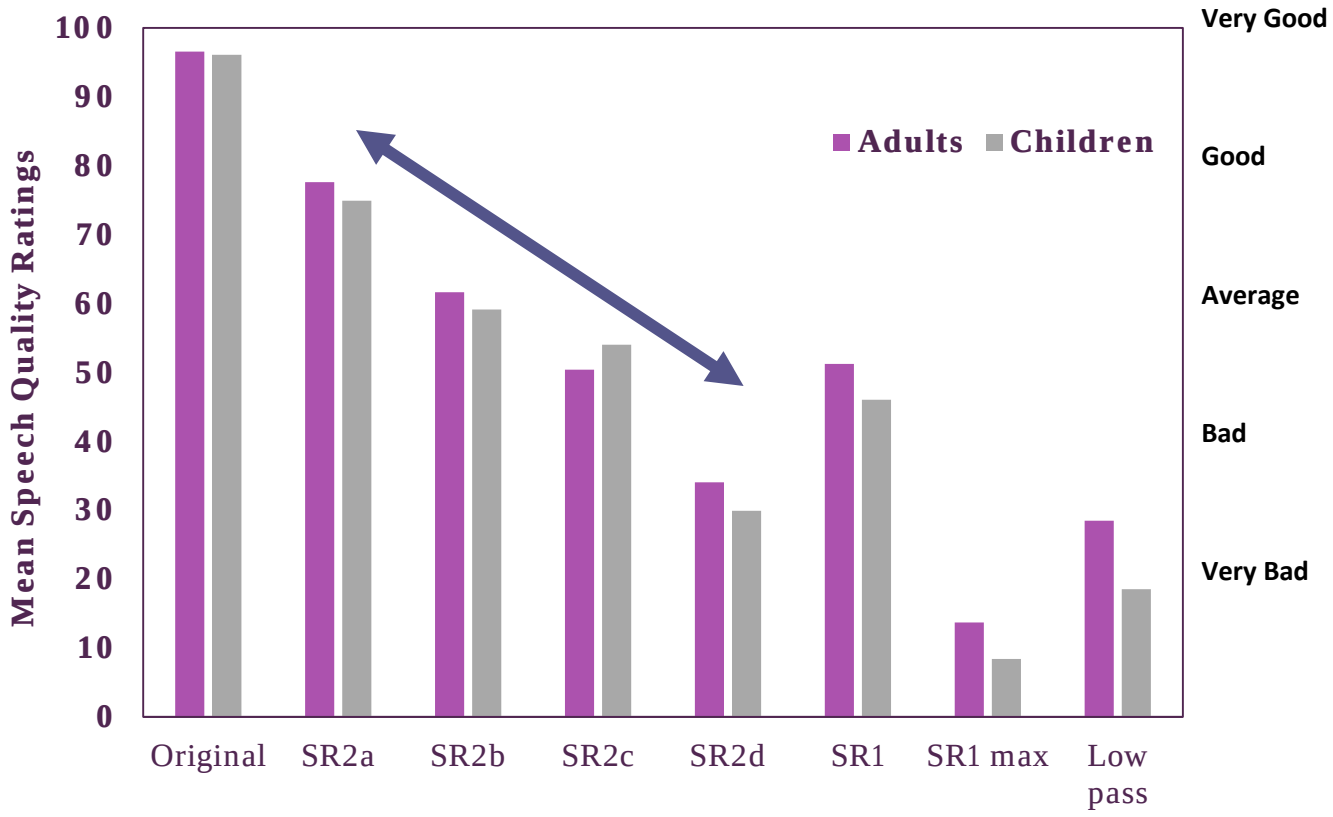


SoundRecover2

(we can think about speech sounds to understand why this was developed.)



SR2 produces a measureable improvement in sound quality. (normal hearing shown here)



Glista et al poster

SR2 sound quality in our participants who have hearing loss.

1) *Higher ratings overall (they are candidates).*
2) *Higher ratings for fine tuned settings (appropriate for each listener).*
3) *Higher ratings with more adaptive settings (the settings that allow the weak setting to "kick in" for most vowels).*

Questions….?

- Benefit?
- More acceptable?
- Better vowel discrimination?
- Use of stronger settings with higher acceptance?
- Own voice production?

- How to fit it and compare to SR1?

Section 2. Verification (fitting) Protocols

Online Resources:

1) https://www.phonakpro.com/content/dam/phonakpro/gc_us/en/products_solutions/pediatrics/documents/best_practice_protocols/028-1528-03-Best-Practice-Protocol-SoundRecover2.pdf

2) http://www.audiologyonline.com/articles/update-on-modified-verification-approaches-16932

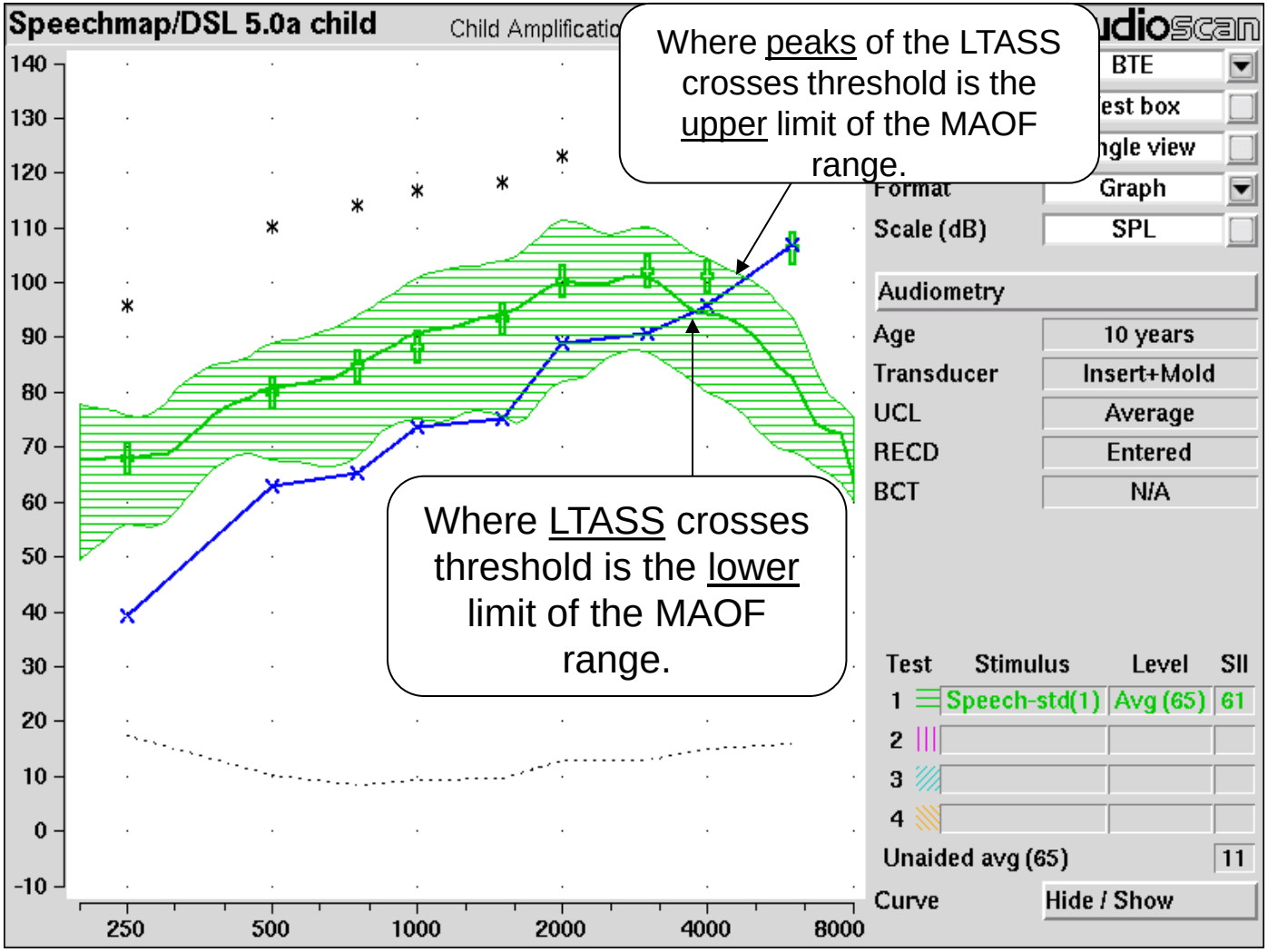
3) http://www.dslio.com/?page_id=166

Our fitting protocol:

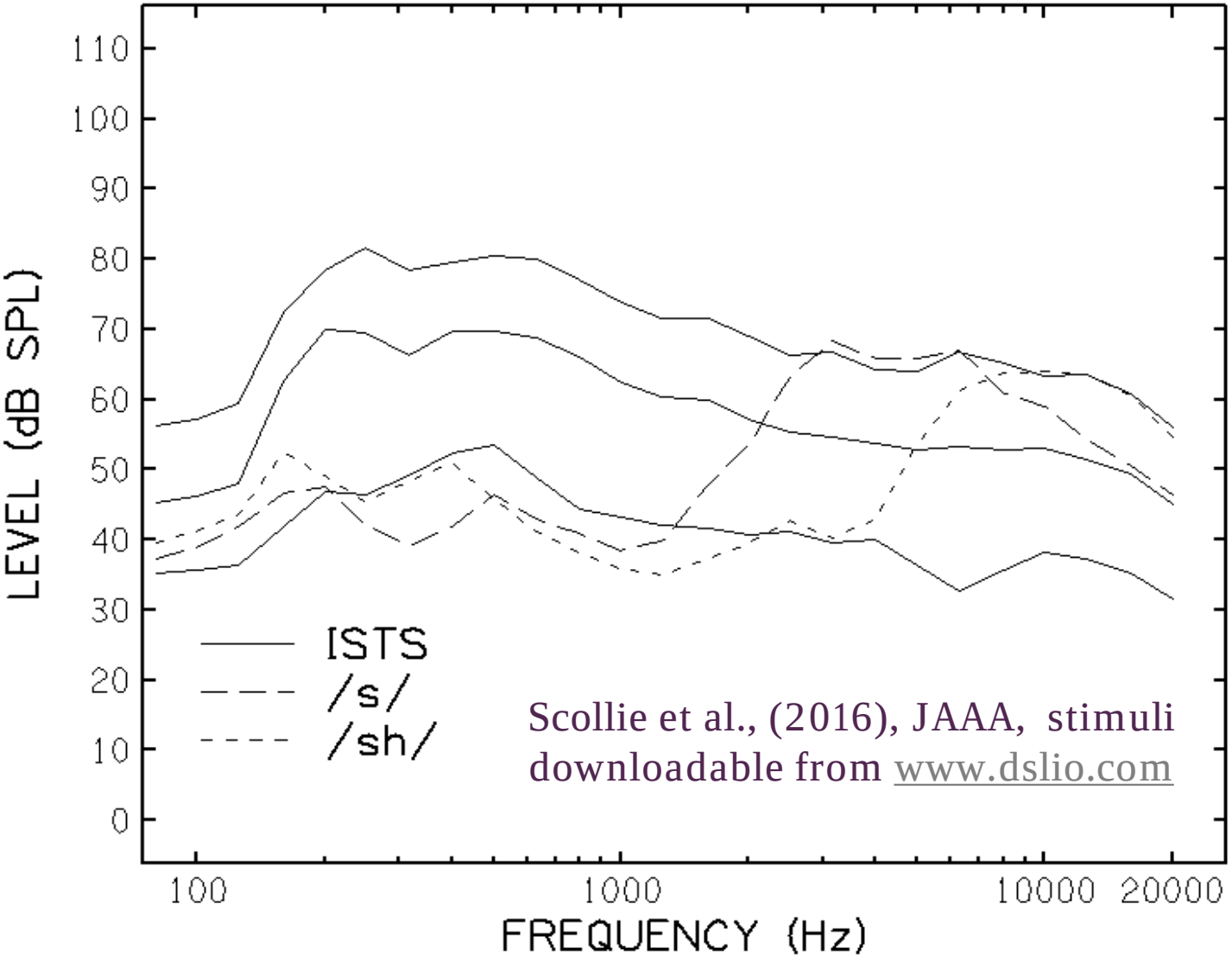
- Verify and tune the hearing aid to DSL5 (FL off) to give the maximum possible aided bandwidth.
  - Find the Maximum Audible Output Frequency (MAOF) range. (picture on next slide)
- Assess candidacy:
  - Measure aided /s/. Does the upper corner fall within the MAOF?
- Fit frequency lowering if indicated:
  - Tune to the weakest possible setting that moves the upper shoulder of /s/ into the MAOF.

Major concept 1: MAOF range

(acknowledgement to BTNRH for coining this term – see McCreery refs)

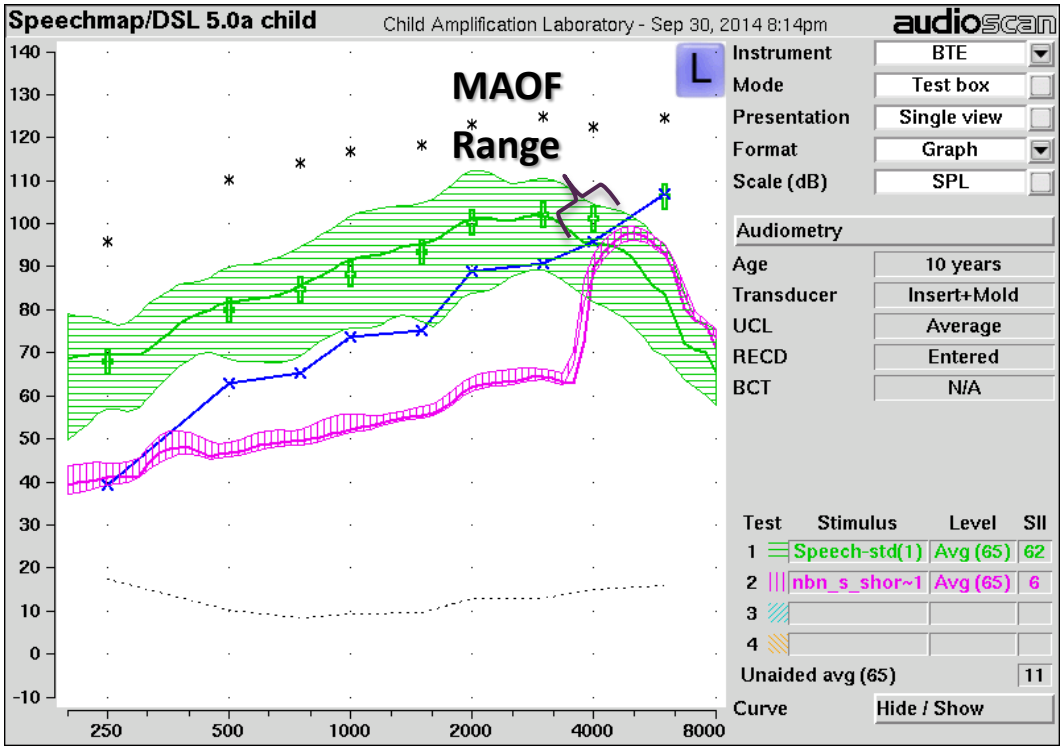


Major concept 2: Calibrated /s/

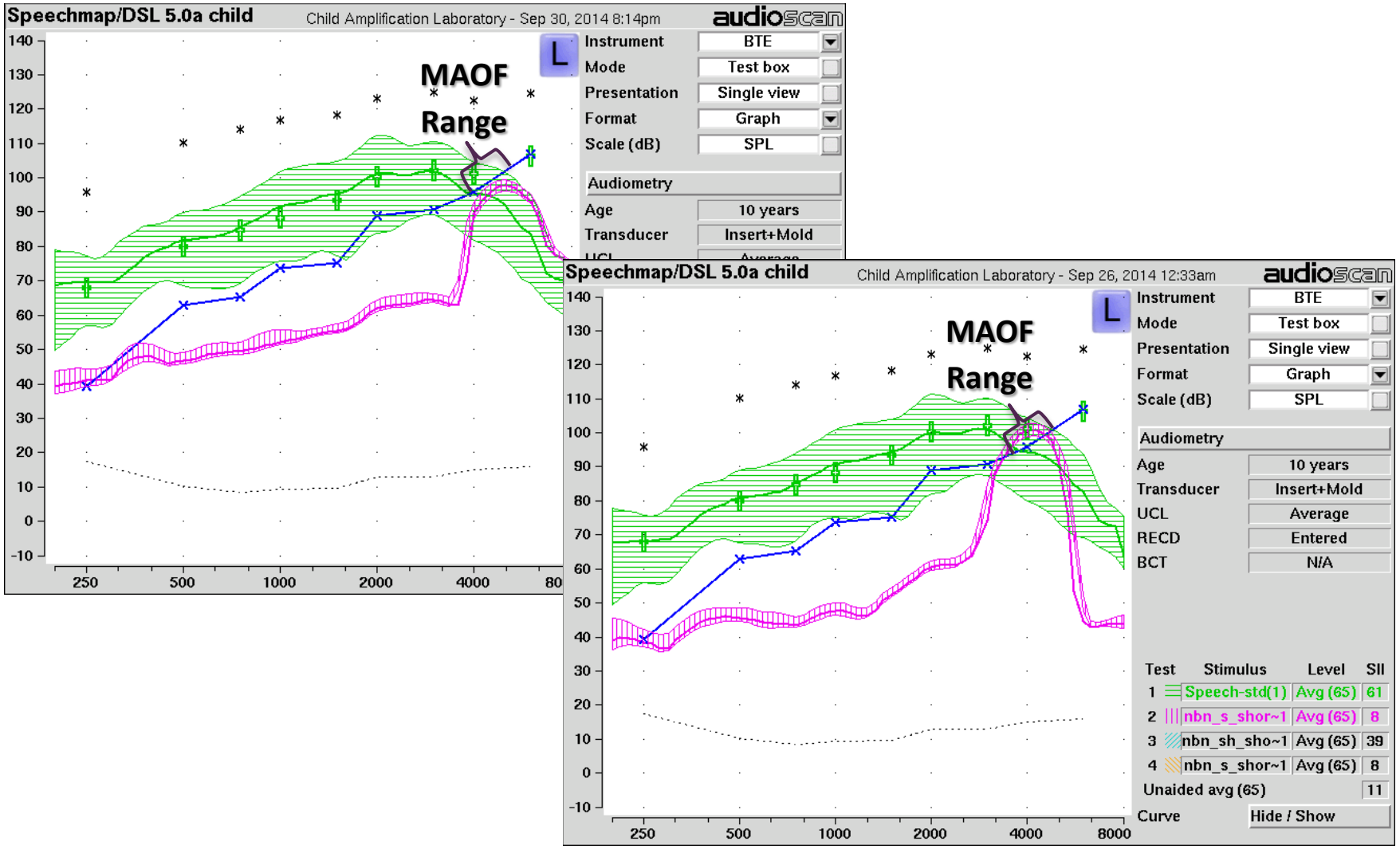


Scollie et al., (2016), JAAA, stimuli downloadable from www.dslio.com

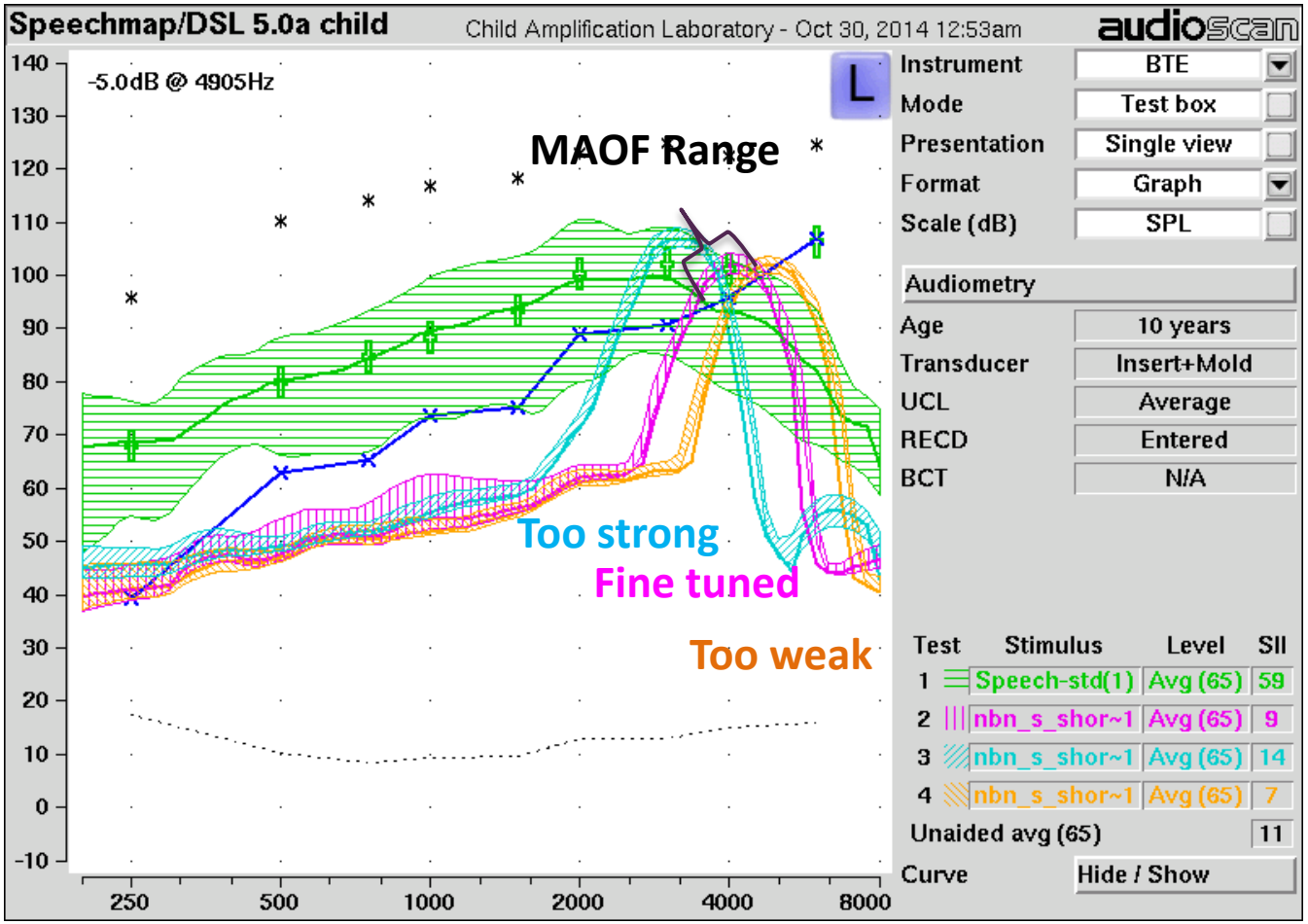
In this example, frequency compression is turned off. The “s” is below threshold, because it is above the MAOF.



Here, the “s” has been lowered in frequency, and is now audible.



Major Concept 3: Weakest possible setting. Fine tuning of the processor helps us to avoid settings that are too weak or too strong.

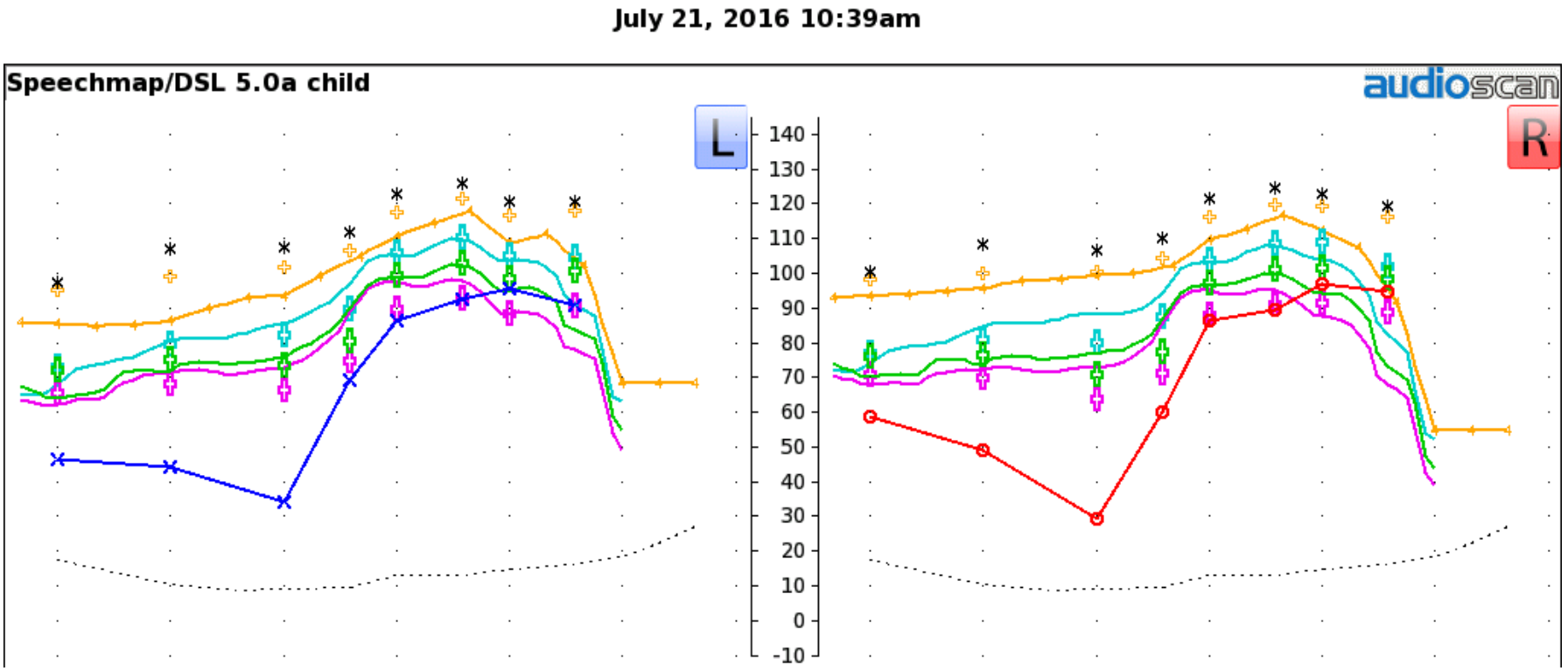


Weakest possible settings that still ensure audibility of /s/ strike an effective balance between improving audibility and optimizing sound quality.

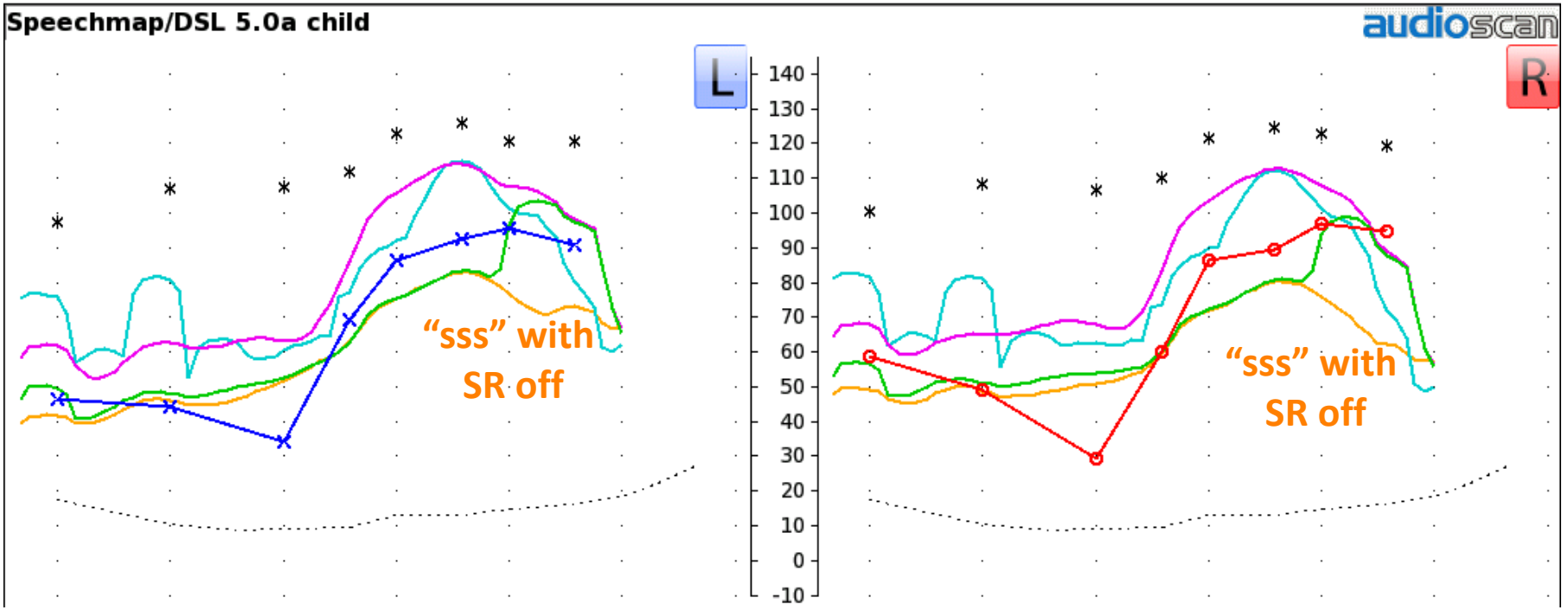
Our fitting protocol (again):

- Verify and tune the hearing aid to DSL (FL off) to give the maximum possible aided bandwidth.
  - Find the Maximum Audible Output Frequency (MAOF) range. (picture on next slide)
- Assess candidacy:
  - Measure aided /s/. Does the upper corner fall within the MAOF?
- Fit frequency lowering if indicated:
  - Tune to the weakest possible setting that moves the upper shoulder of /s/ into the MAOF.

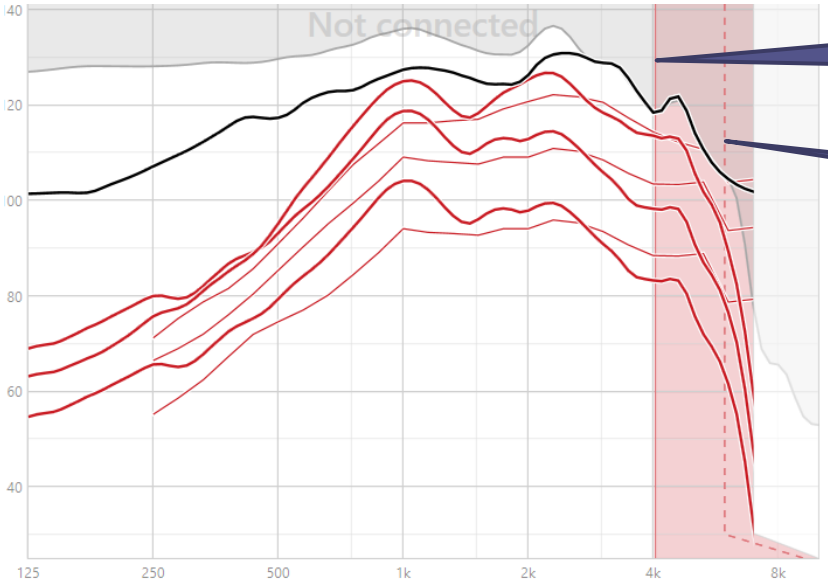
Does this give you enough information to judge candidacy?



How about now?



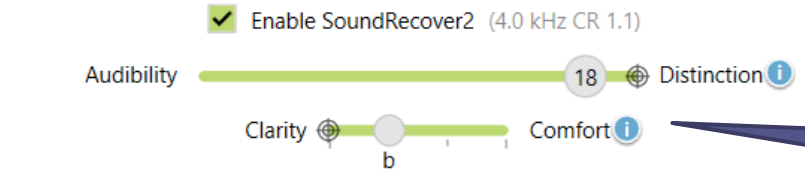
Software settings that control this:



Displays CF1
(stronger setting)

Displays CF2
(weaker setting)

Link/unlink ears.



← Stronger / weaker →

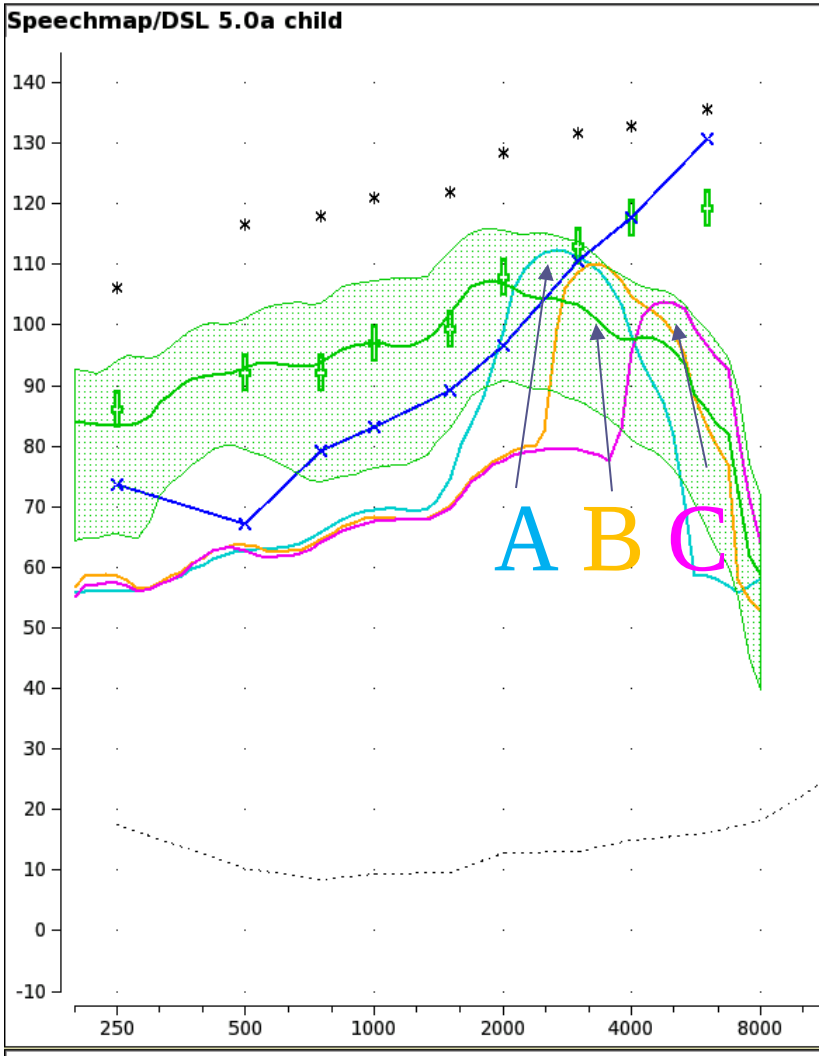
← Stronger / weaker →

Using a fitting protocol across three collaborating sites: will we fit consistently?

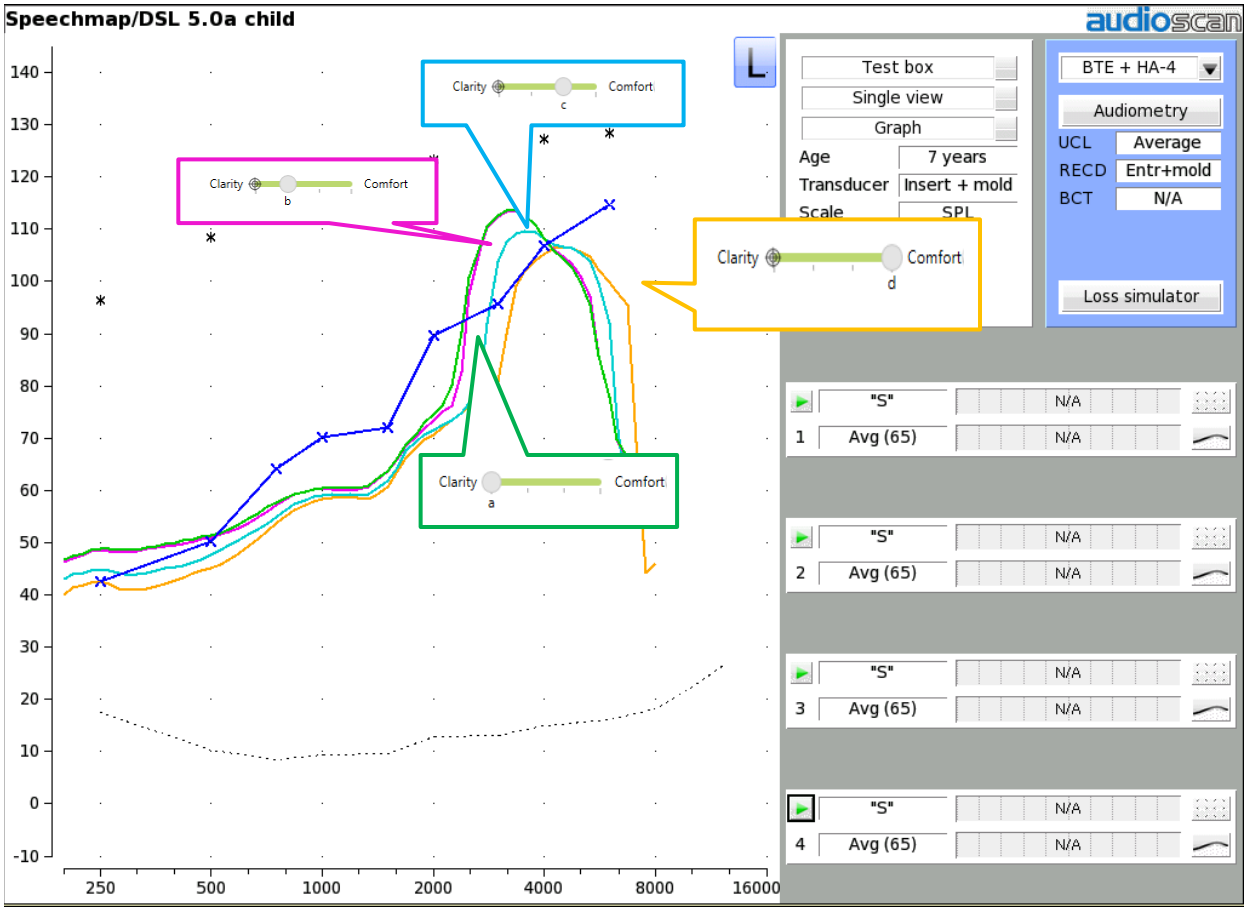
Site 1: Child Amplification Lab, UWO.
Site 2: University of Mainz, Germany.
Site 3: Hearts for Hearing, Oklahoma.

42 ears in total, fittings as part of a real world clinical field trial of SR2.

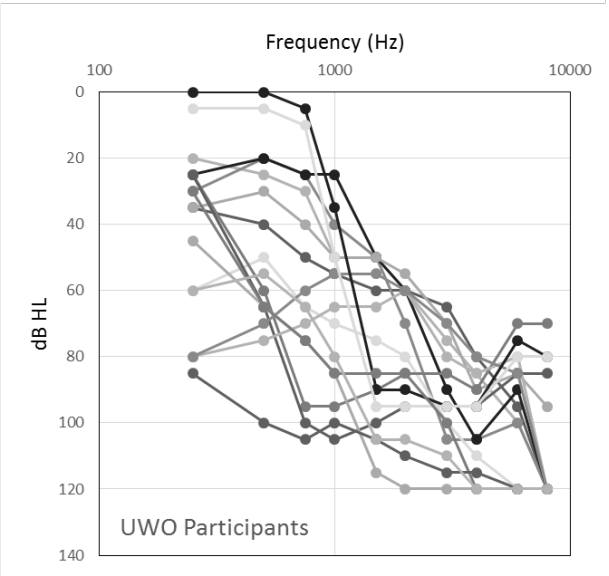
Tune the top slider.
Which setting would you choose?

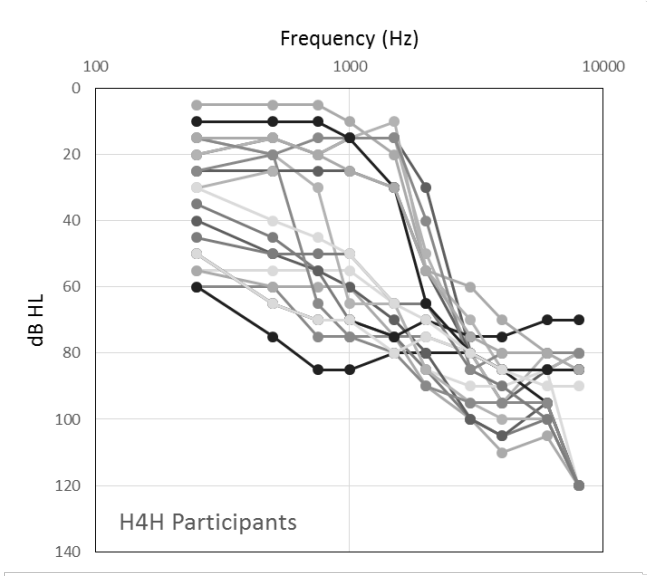


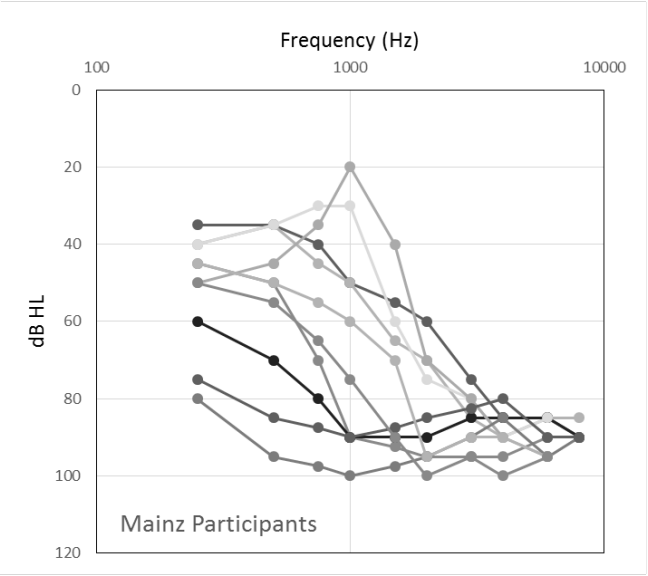
Tune the bottom slider.
Which setting would you choose?



Audiograms



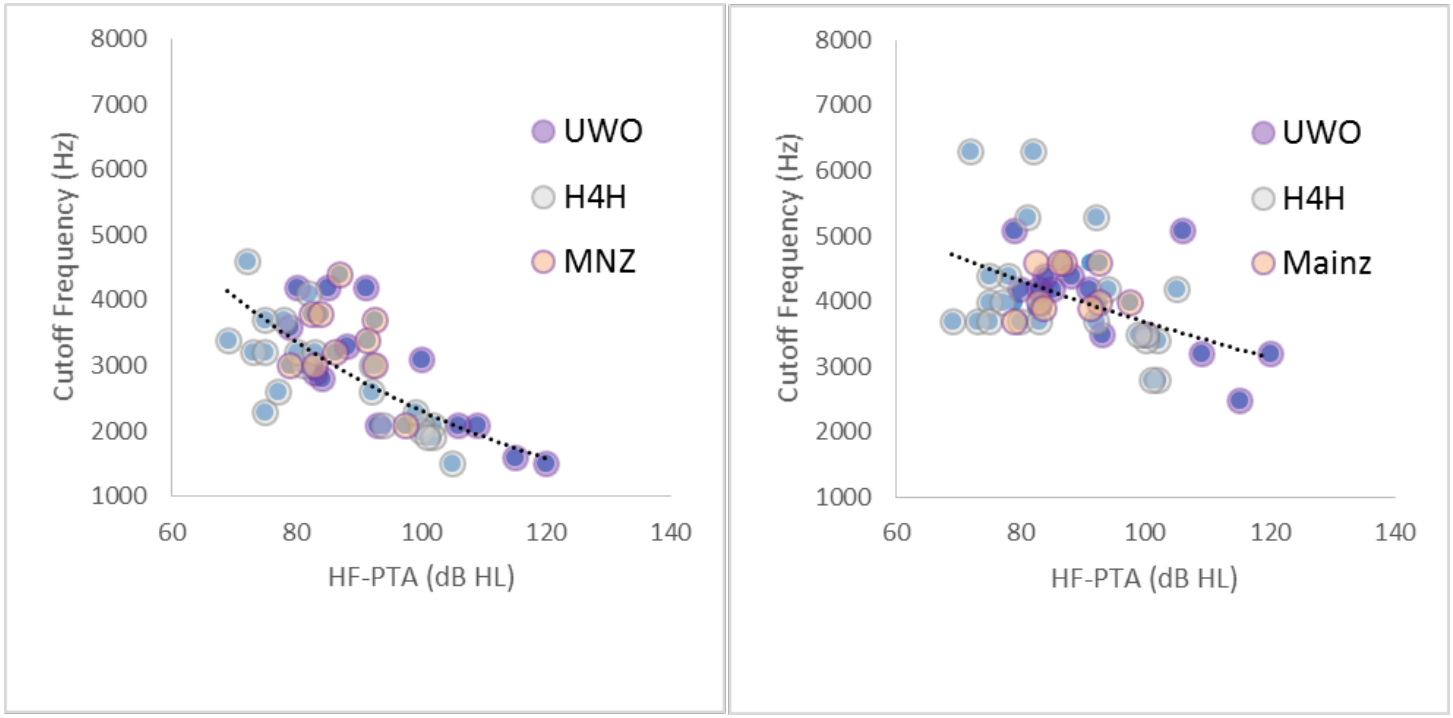




Fine tuned per ear (de-coupled the ears in programming).
Noise reduction off during verification.

Match /s/ audibility to MAOF using Audibility slider for SR2.
Cross-check weakest possible setting of the comfort slider that maintains /s/.

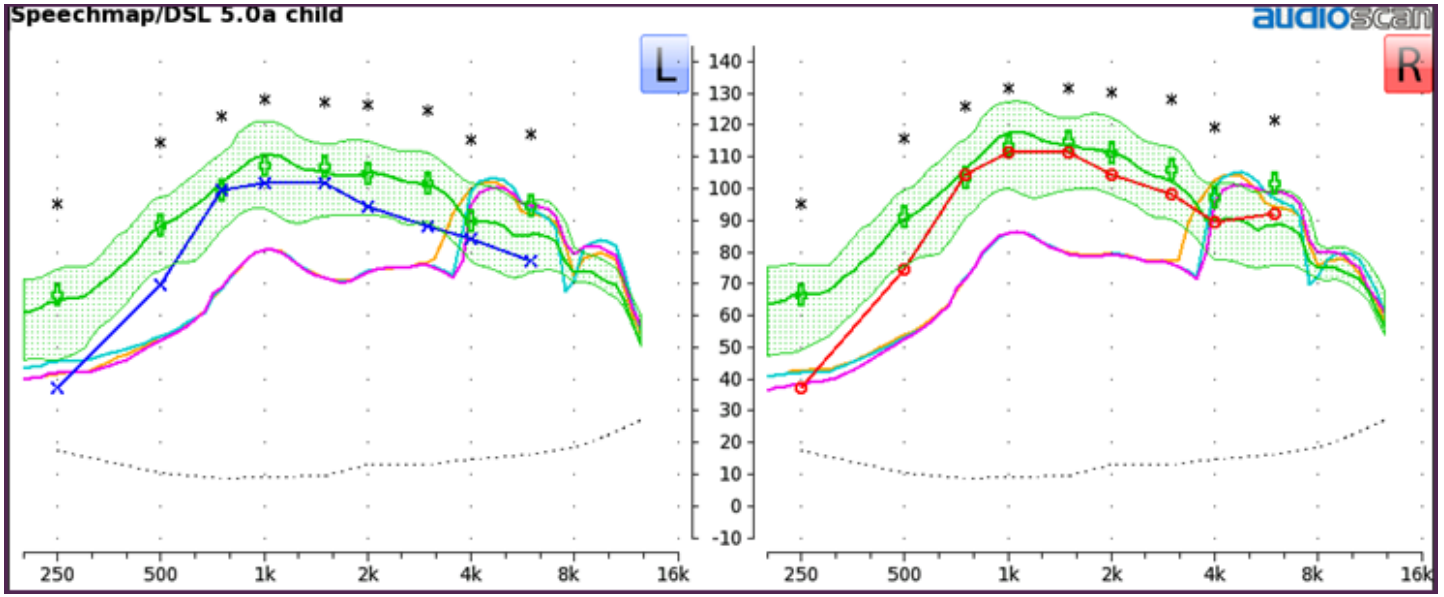
All 3 sites tuned SR1 and SR2 to stronger settings as hearing loss was greater.



Clinical field trial outcomes are still under analysis & data collection. We are looking at detection, recognition, and preference. Glista et al poster at this meeting showed 2 cases.

This case showed clear SR benefit.

- Preferred SR2, better CNC scores with SR2.
- Better sound quality, s-sh, vowels with SR on vs off.
- PPT results better with SR2 for 9000 Hz /s/.



- *Results vary with degree of hearing loss… a full data set is needed.*

SoundRecover2:
Fine tuning. Sound quality.

Selected References

Alexander, J.M. (2016, September). 20Q: Frequency lowering ten years later - new technology innovations. AudiologyOnline, Article 18040. Retrieved from www.audiologyonline.com.

Rehmann, J., Jha, S. & Allegro Baumann, S. (2016). SoundRecover2 – the adaptive frequency compression algorithm. Phonak Insight Paper, April 2016. Retrieved from www.phonakpro.com.

American Academy of Audiology (AAA). (2013) Clinical Practice Guidelines on Pediatric Amplification. https://audiology-web.s3.amazonaws.com/migrated/PediatricAmplificationGuidelines.pdf_539975b3e7e9f1.74471798.pdf.

Scollie, S., Glista, D., Seto, J., Dunn, A., Schuett, B., Hawkins, M., Pourmand, N. & Parsa, V. (2016). Fitting frequency-lowering signal processing applying the American Academy of Audiology Pediatric Amplification Guideline: Updates and protocols. J Am Acad Audiol, 27, 219-236.

Glista, D., Hawkins, M. & Scollie, S. (2016). An update on modified verification approaches for frequency lowering devices. AudiologyOnline, Article 16932. Retrieved from www.audiologyonline.com.

Glista, D., Hawkins, M., Scollie, S., Wolfe, J., Bohnert, A & Rehmann, J. (2016). Pediatric verification of SoundRecover2. Phonak Best practice protocol, April 2016. Retrieved from www.phonakpro.com.

Glista, D. Hawkins, M. Salehi, H., Pourmand, N., Parsa, V. & Scollie, S. (2016). Evaluation of sound quality with adaptive nonlinear frequency compression. Poster presented at the 7th International Pediatric Audiology Conference: A Sound Foundation Through Early Amplification 2016, Atlanta, USA.

McCreery, R.W., J. Alexander, M.A. Brennan, B. Hoover, J. Kopun, and P.G. Stelmachowicz. (2014) The influence of audibility on speech recognition with nonlinear frequency compression for children and adults with hearing loss. *Ear and Hearing*. 35(4):440-447.

McCreery, R.W., M.A. Brennan, B. Hoover, J. Kopun, and P.G. Stelmachowicz. (2013) Maximizing audibility and speech recognition with nonlinear frequency compression by estimating audible bandwidth. *Ear and Hearing*. 34(2):e24-e27.