SRII
Taking the high road to high frequency access

Christine Jones, AuD
The effects of high-frequency amplification on the perception of /s/ - children

Stelmachowicz et al. 2001

Male

Female

Child

2 3 4 5 6 9

2 3 4 5 6 9

2 3 4 5 6 9

> 55 dB HL (N=14) < 50 dB HL (N=4)
A1  Add screen shot and reference
Author, 3/2/2016
Searching for the optimal solution...

SoundRecover evidence

Peer reviewed

Non-peer reviewed
Nyffeler M. 2010: Geschaffen für erstklassigen Hörgenuss, tatsächlich binaural. AudioInfos 10:78-82
Word learning improves as a function of bandwidth

Pittman, 2010
SR activated commonly for all ages

Clinician recognized benefits

- Better detection, distinction recognition of high frequency consonants
- Improved access to environmental sounds
- Improved vocal quality
- Reduced feedback
Why SoundRecover is disabled

Of those surveyed:
- 40% routinely disable SoundRecover for mild losses
- 85% report that age does not seem to be a factor

In open question, they report:
- Disabled for rising, flat or mild hearing losses
- Disabled when Targets could be matched without it

Concerns mentioned:
- Always enabled in the fitting software
- Default settings seem too aggressive
- Patients report unnatural sound quality

Challenges from our own experience

We know for more profound hearing losses and for left corner and ski slope hearing losses

Trade-off between audiological benefit and sound quality

[Diagram showing trade-off between sound quality and audibility]
Trade-off – audiological benefit and sound quality

- Severe to profound hearing loss with no responses beyond 2 kHz
- SoundRecover enabled at maximum
- Minimal benefit – only loud inputs
- Stronger setting needed

But such settings introduce unacceptable sound quality

Phonak has led the way in modern day frequency lowering and we won’t rest on our success.

We will continue to innovate and develop this technology so that more people can experience the benefit of high frequency audibility and improved sound quality.
Parameter explanation

- **CT1**: below this lower cut-off frequency the output is always linear, no frequency compression applied

- **CT2**: beyond this upper cut-off, compression is always active, as with the original algorithm
  - between the cut-offs frequencies, compression is applied only when significant high frequency energy is present, thereby protecting and maintaining the familiarity of mid and low frequencies sounds

- **fOutMax**: maximum output frequency after frequency lowering - depends on audiogram

- Compression Ratio (**CR**): constant, fixed across the compressed range. SR2 allows an overall lower compression ratio.
The philosophy of SoundRecover2

- Maximize stimulation of the hearing nerve
- Protect the mid and low frequencies.
- Extend the benefits for more severe-profound hearing losses

Philosophy of the SoundRecover2

- **Maximize stimulation of the hearing nerve** by setting the initial $f_{OutMax}$ at the upper limit of audible bandwidth.
Protect the mid-frequencies by setting (CT2 or upper cut-off) high enough so that audible speech (without compression) is not affected.

Benefits of SoundRecover2 pre-calculation

Maximize stimulation of the hearing nerve by setting the fOutMax at the upper limit of the individual’s audible bandwidth.

Protect the mid and low frequencies by setting (CT2 or upper cut-off) high enough so that audible speech (without compression) is not affected.

Extend the benefits of SoundRecover2 for severe-profound losses by combining a lower starting point for compression (CT1 or lower cut-off) with a weaker compression ratio.

No risk of deprivation

No risk for distortion of mid and low frequencies

Overcomes the constraints of SoundRecover and provides benefit for more users
Original sound spectrogram

My name is Asa

SoundRecover vs SoundRecover2

SoundRecover at strongest settings

My name is Asa

SoundRecover2

My name is Asa
Protecting the vowel formants at various settings

Phoneme perception test
PPT: Detection

Detection Thresholds - Hearing Loss Class: Profound (n=10)

** Significant improvement with SR2

PPT: Recognition

Recognition Thresholds - Hearing Loss Class: Profound (n=10)

** Significant improvement with SR2
Scientific evidence – in progress

- Studies ongoing with
  - Susan Scollie and Danielle Glista at Western University (UWO)
  - Jace Wolfe at Hearts for Hearing, OK
  - Andrea Bohnert at Mainz University, Germany

- IJA in review: Jace Wolfe

- Publications:
  - Field Study News SoundRecover2
  - SoundRecover Insight
  - Best Practice Protocol Verification of SoundRecover2 for Pediatrics

SoundRecover2 and Phonak Target 4.3

SoundRecover2 will be available in all new pediatric and power form factors and technology levels.

- Enabled by default for moderate to profound hearing losses.
- Can be enabled for mild losses

<table>
<thead>
<tr>
<th>Parameter</th>
<th>SoundRecover2</th>
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</thead>
<tbody>
<tr>
<td>CT1</td>
<td>≥ 800Hz</td>
</tr>
<tr>
<td>CT2</td>
<td>≥ 1.6kHz</td>
</tr>
<tr>
<td>CR</td>
<td>1:1.05 to 1:4</td>
</tr>
<tr>
<td>fOutMax</td>
<td>≥ 2.7kHz</td>
</tr>
</tbody>
</table>
SoundRecover2 – overcomes the constraints

- Restores access to high frequency information while preserving high frequency discrimination and sound quality
- Maintains the familiarity of low and mid frequency sounds
- Retains the essence of our SoundRecover strategy, while allowing lower cut-off frequencies with weaker compression ratios
- Extends the benefits of SoundRecover to those with:
  - more profound hearing loss
  - left corner audiogram
  - ski slope audiogram

Thank you.

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