

A new ERA for CROS

Katie Cardona, Au.D.

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PHONAK
life is on

A new ERA for CROS.

Katie Cardona, Au.D.
Clinical Trainer, Phonak

Learning Outcomes

After this course, participants will be able to:

- List new Infinio products designed to address single-sided hearing loss
- Describe the steps to fit Infinio CROS in the Target software
- Describe the benefits of SmartSpeech technology available in Infinio CROS

What is UHL and what are
the challenges?



What is
Unilateral
Hearing
Loss (UHL)?

...any degree of permanent
hearing loss in one ear with
normal hearing in the opposite
ear.²



Prevalence and causes of UHL.

1 in 1000
identified at birth³

3 in 100
for school age children⁴

7.2%
of American adults⁵

- Congenital cytomegalovirus
- Cochlear malformations
- Bacterial meningitis
- Enlarged vestibular aqueduct
- Chiari malformation
- Premature birth
- Genetic causes
- Postnatal infections
- Sudden idiopathic hearing loss
- Head trauma
- Meniere's Disease
- Acoustic Neuroma
- Unknown causes

How does untreated UHL affect patients?

Audiological (e.g. Lieu, 2010; McKay, 2010, Snapp, 2017, Snapp 2019)

- Localization
- Awareness on deaf side
- Hearing in noise/ at a distance
- Increased listening effort?
- Difficulties hearing in noise & tinnitus presence more likely with UHL than bilateral HL (Pierzycki et. al., 2020)

Social-Emotional (e.g. Lucas et. al. 2017, Leterme et. al, 2015, Wie et. al., 2010, Snapp, 2019, Pierzycki et. al., 2020)

- Reduced social/psychological well-being
- Reduced quality of life
- Affects communication & social interaction
- Increased loneliness. Some outcomes worse than for bilateral HL

Educational (e.g. Bess et.al.,1988; Oyler et.al.,1986; Lieu et al. 2013)

- More likely to repeat a year of school
- More likely to need support services at school
- Speech and language delays

Challenges for people with unaidable hearing loss on one side

Perceived effort and fatigue studies show:



Children with unilateral hearing loss (UHL) who have the largest asymmetry between their ears report the **most overall fatigue**.



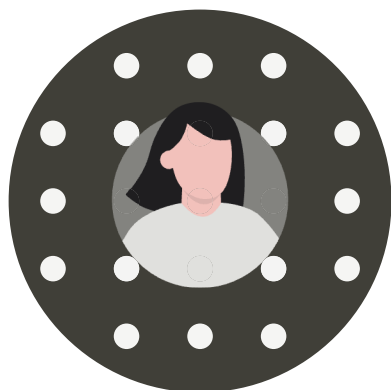
Adults with SSD are **5 times more likely** to report severe fatigue than adults with no hearing loss.



Listening effort and hearing fatigue are now known to affect people with UHL as much and **sometimes more than those with a mild-moderate hearing loss in both ears.**

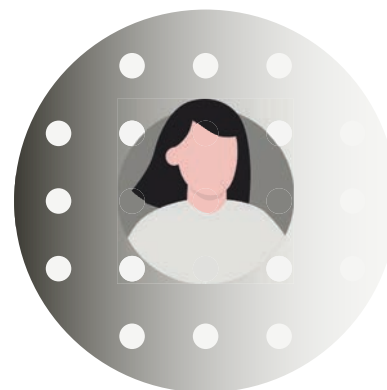
Challenges for people with unaidable hearing loss on one side

Normal hearing in both ears



No head shadow
Localize sounds accurately

Unilateral Hearing Loss



Head shadow
Localize target sounds mainly in
the field of the better ear

Unaidable unilateral hearing loss: Small population, big challenges



Difficulty hearing in noise

Less socializing
Increased listening effort and fatigue



Difficulty segregating sounds

Difficulty localizing sounds
Increased listening effort and fatigue



Difficulty understanding speech

Selective attention
Reduced work productivity
Increased listening effort and fatigue

Stewart, E. & Woodward, J. (2021). Out of the (Head) Shadow: A Systematic Review of CROS/BiCROS Literature. The Hearing Review, 28(8), 22-25. <https://www.hearingreview.com/inside-hearing/research/head>
Picou, E. M., Davis, H., Lewis, D., & Tharpe, A. M. (2020). Contralateral Routing of Signal Systems Can Improve Speech Recognition and Comprehension in Dynamic Classrooms. J Speech Lang Hear Res, 63(7), 2468-2482. https://doi.org/10.1044/2020_JSLHR-19-00411

How CROS systems help overcome hearing and well-being challenges

Improved
speech
intelligibility
in diffuse
noise¹

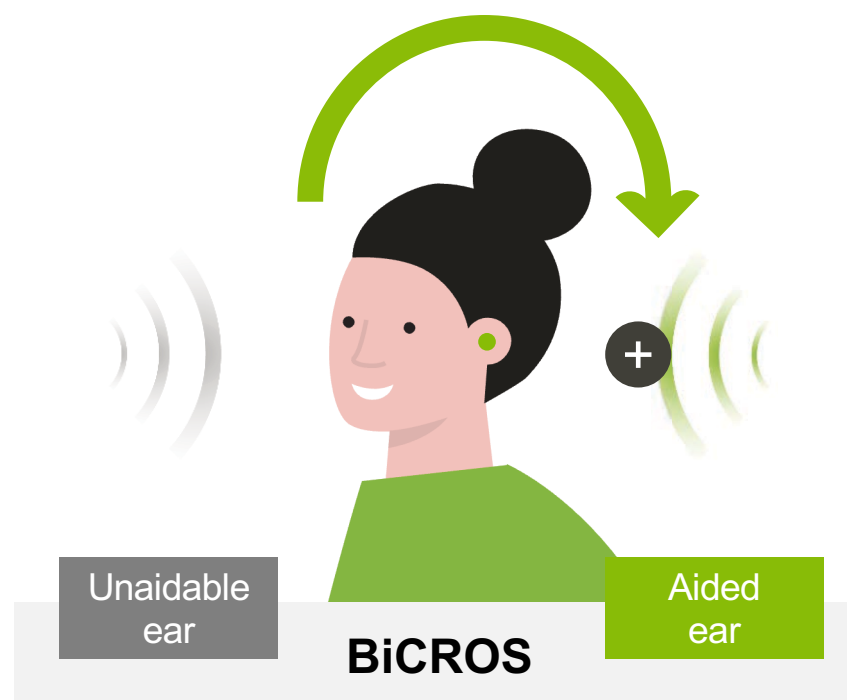
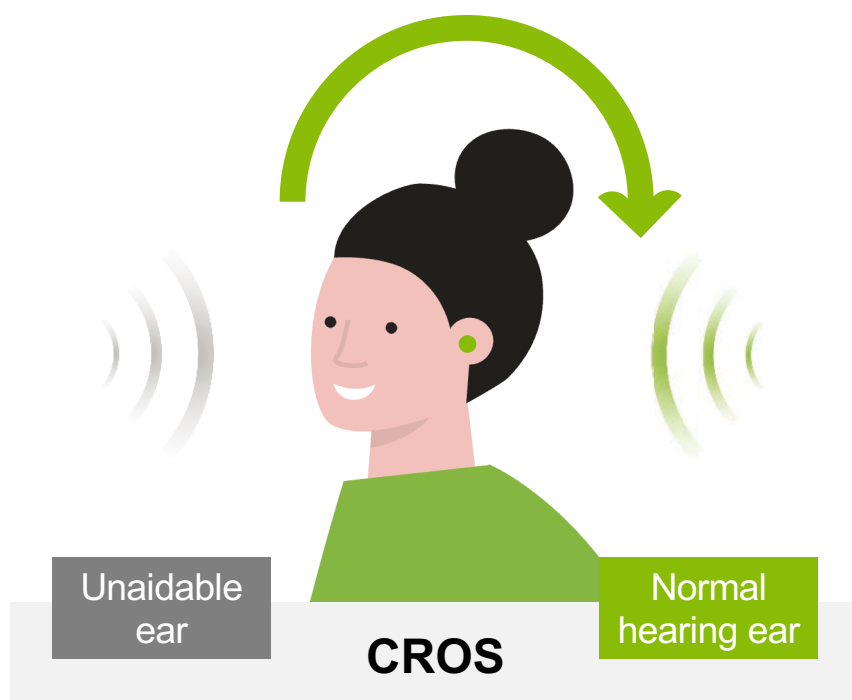
Improved speech
intelligibility in
noise when
speech is
presented to the
unaidable ear¹

Improved
subjective
quality of
hearing¹



1. Picou, E. M., Davis, H., Lewis, D., & Tharpe, A. M. (2020). Contralateral Routing of Signal Systems Can Improve Speech Recognition and Comprehension in Dynamic Classrooms. J Speech Lang Hear Res, 63(7), 2468-2482. https://doi.org/10.1044/2020_JSLHR-19-00411

How can CROS systems help?



A look back at Phonak CROS systems



2011
CROS



2015
CROS II



2016
CROS B



2018
CROS B-R



2021
CROS P



2023
CROS L



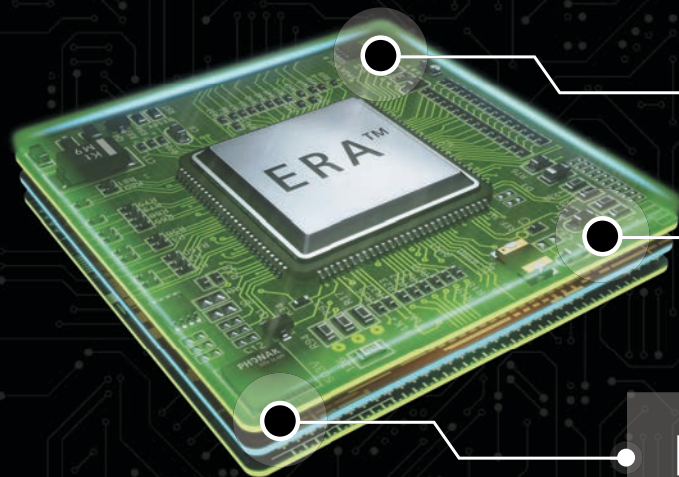
2024
CROS I

CROS Infinio

Compatibility:
Audéo I-R & CROS I-R



Introducing ERA, our new ultra-responsive chip for Infinio



Digital Sound
Processing

Connectivity

Power Management

Adaptive Phonak Digital (APD) - Hear it, live it, love it.

APD
Marvel
Love at first
sound



APD 2.0
Paradise
There's nothing like
the sound of Paradise



APD 3.0
Infinio
Exceptional sound
quality from the first
moment



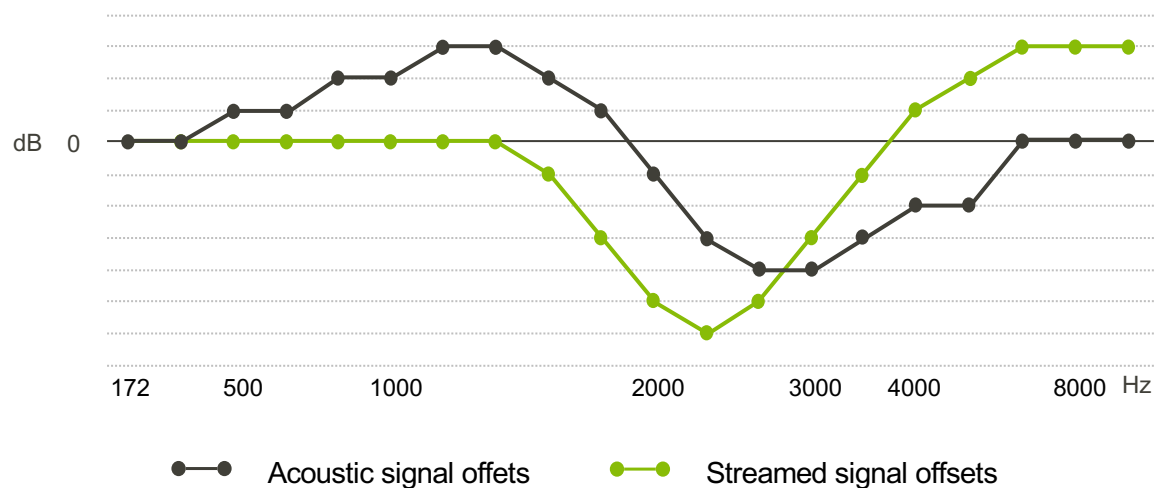
What is different
about APD 3.0?

The basis of APD 3.0 improvements



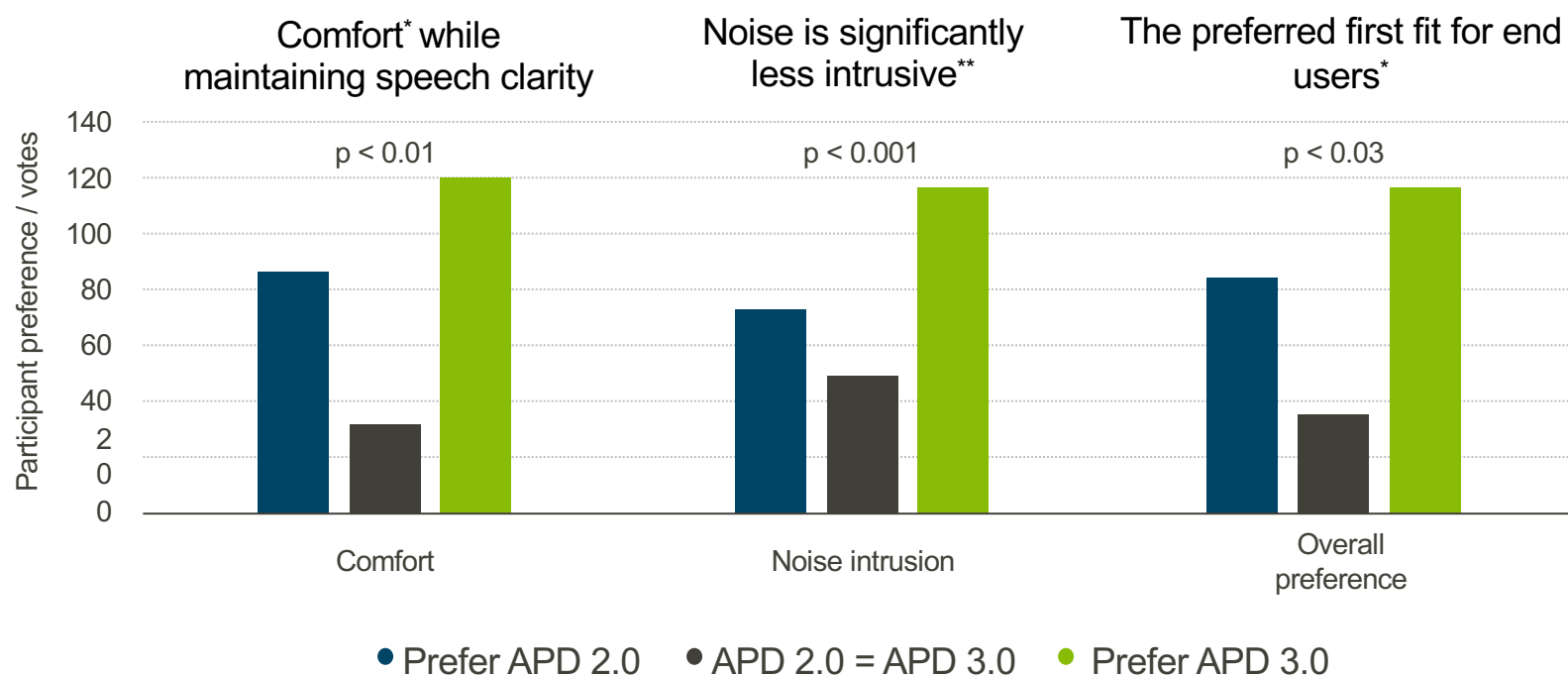
APD 3.0 Offsets relative to APD 2.0

Vented or occluded acoustics



- Applies to APD 3.0 and APD Contrast 3.0
- All AutoSense OS acoustic programs
- Streaming offsets based on Sennheiser headphones

The evidence



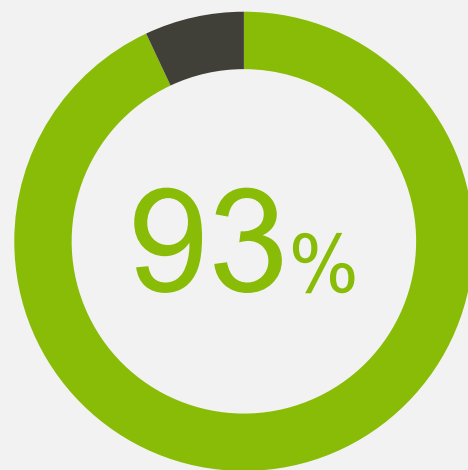
*compared to APD2.0

Phonak internal study results. N = 20 participants

**as rated by end users in a study comparing APD3.0 to APD 2.0

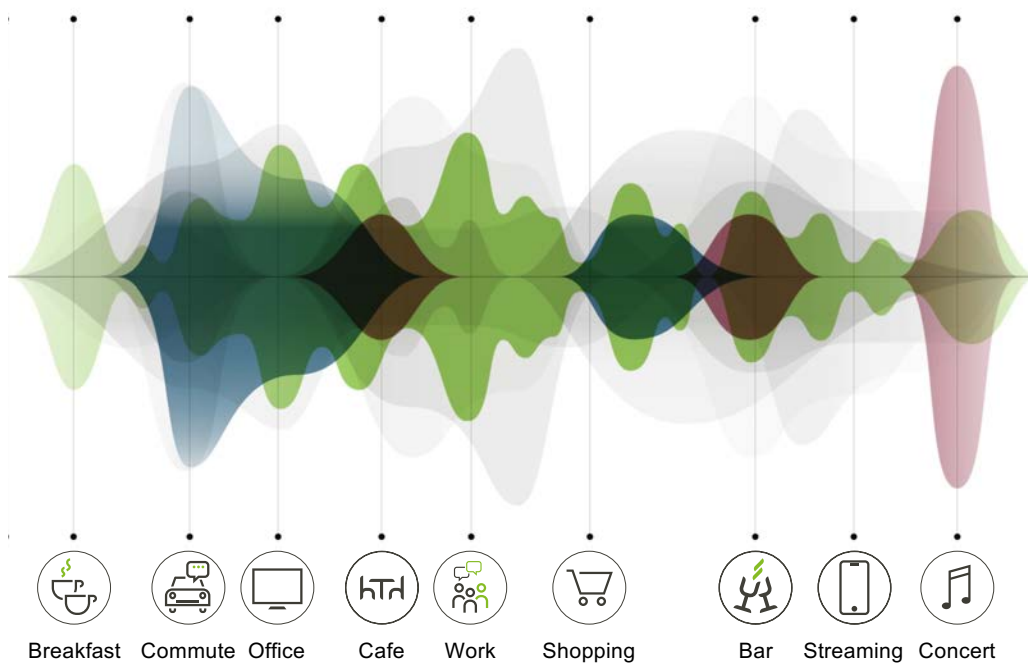
First fits are not all equal. Compared to the first fit of a key competitor...

APD 3.0 delivers first fit, instant comfort, instant love.



consumer satisfaction from the very first fit*

AutoSense OS



24 years of experience
in machine learning
using real-world sound recordings

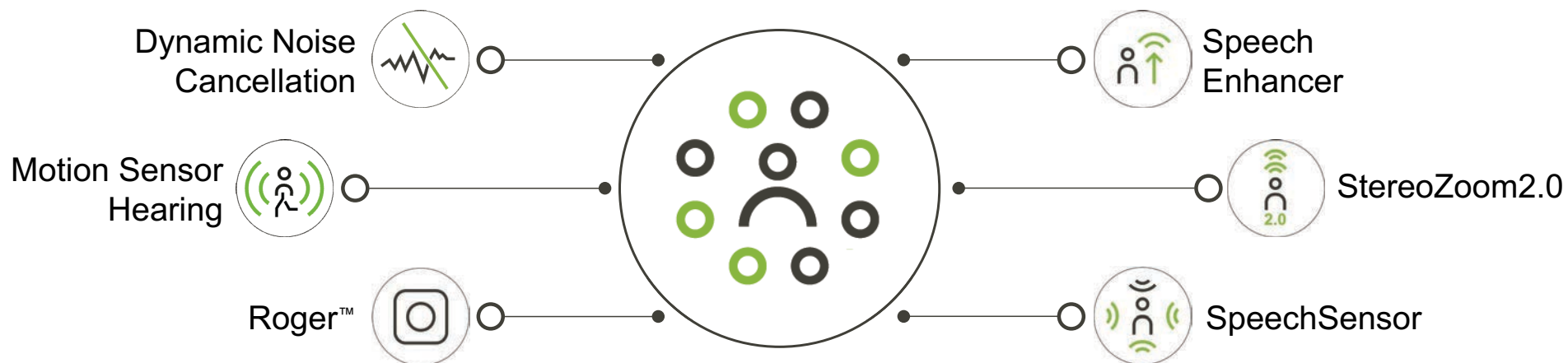


700 scans per
second
for real-time adjustment to the
environment



**Unique setting
combinations**
to meet the individual needs
of patients

Experience speech understanding with Phonak SmartSpeech™ Technology





90 Premium	
Speech in loud noise*	
Music	
Speech in car	
Comfort in noise	
Speech in noise	
Calm situation	
Streaming speech*	
Streaming music*	
Speech Enhancer	
StereoZoom 2.0*	
Dynamic Noise Cancellation*	
Motion Sensor Hearing*	
70 Advanced	
Music	
Speech in car	
Comfort in noise	
Speech in noise	
Calm situation	
Streaming speech*	
Streaming music*	
StereoZoom 2.0*	
Dynamic Noise Cancellation*	
Motion Sensor Hearing*	
Speech in loud noise* (manual)	

Phonak Target 10.0 File Fitting eService Help

Client Bell, Dessie Instruments Audéo I90-Sphere Fitting < Party noise Save & close

Feedback & real ear test AudiogramDirect Global tuning **Fine tuning** DataLogging Device options

Program manager >>

ALL PROGRAMS

▼ AUTOMATIC PROGRAMS 8

- AutoSense OS
- Calm situation**
- Speech in noise
- Spheric speech in loud noise
- Speech in car
- Comfort in noise
- Music
- AutoSense OS (streaming)
- Media speech + mic
- Media music + mic

> STREAMING PROGRAMS 3

ADDITIONAL PROGRAMS +

Hearing aid microphone

Real ear sound 4

Speech enhancer 14 Moderate

21%

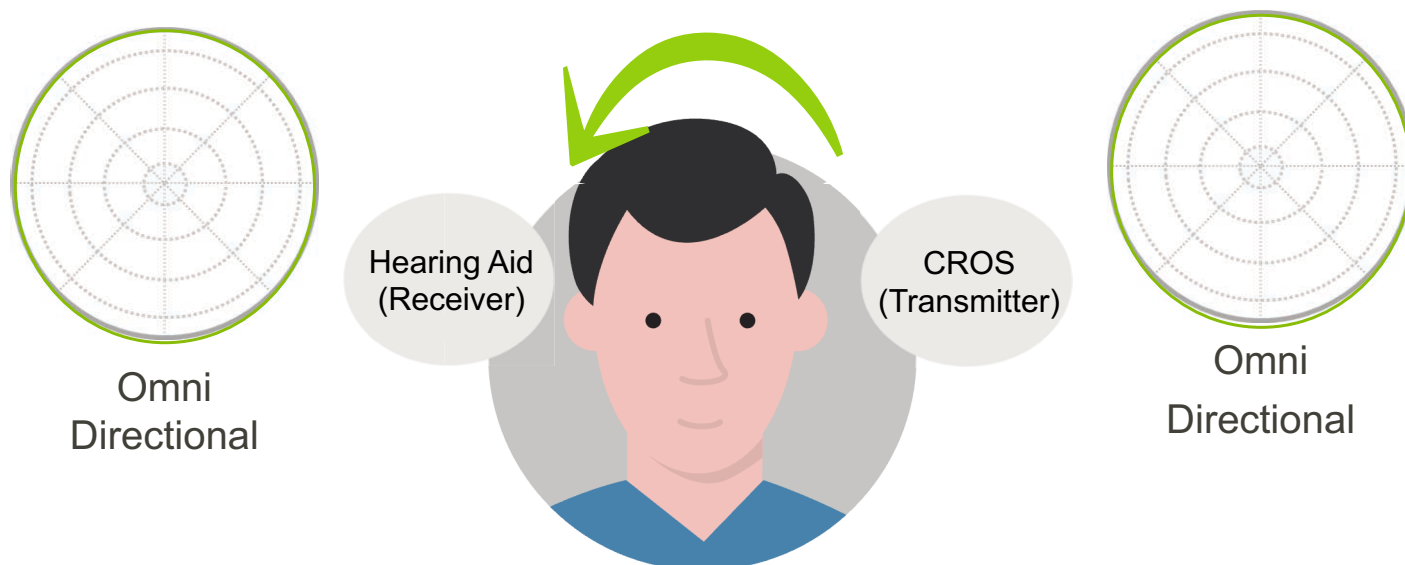
less fatigue at the end of the day¹

Improved memory and comprehension performance¹

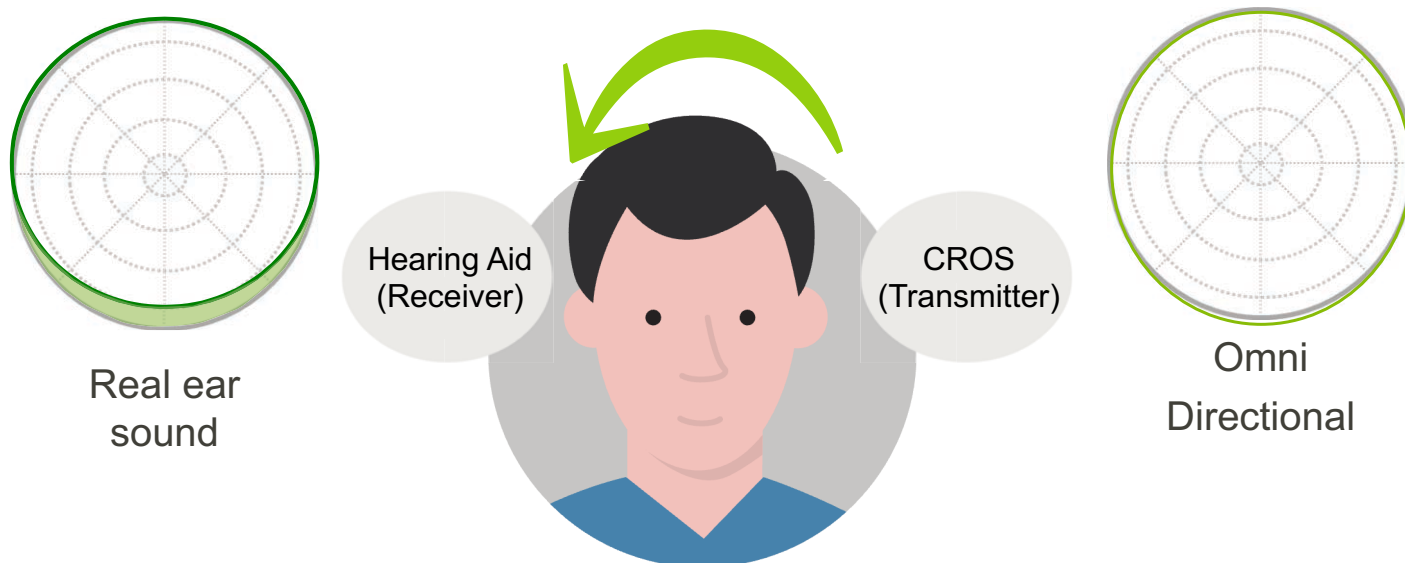
*Speech Enhancer on versus off

1. Latzel, M, Heeren, J and Lesimple, C. (2024) "Speech Enhancer reduces listening effort and fatigue." Phonak Field Study News retrieved from www.phonak.com/evidence

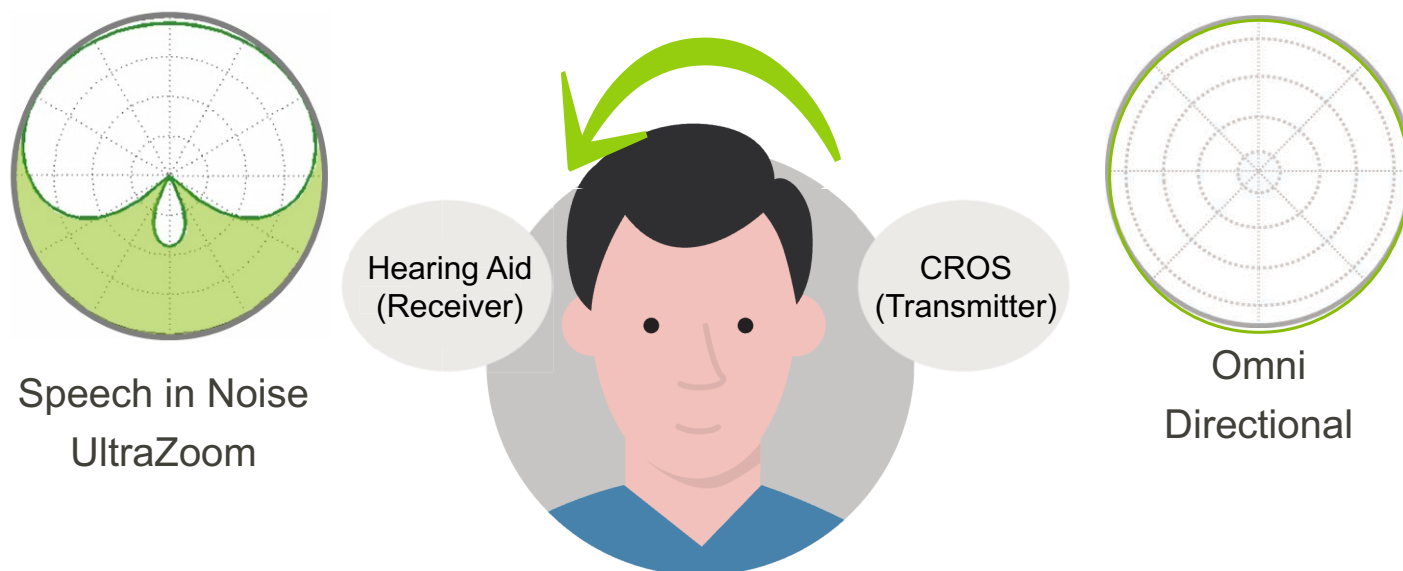
Evolution of CROS



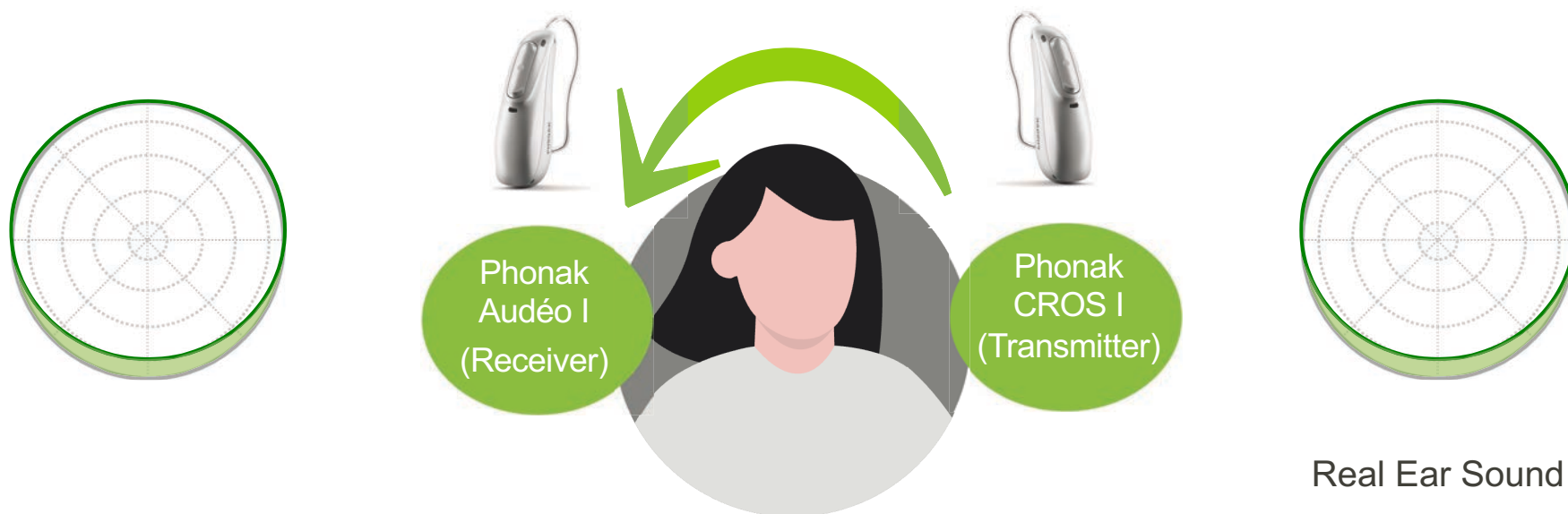
Evolution of CROS



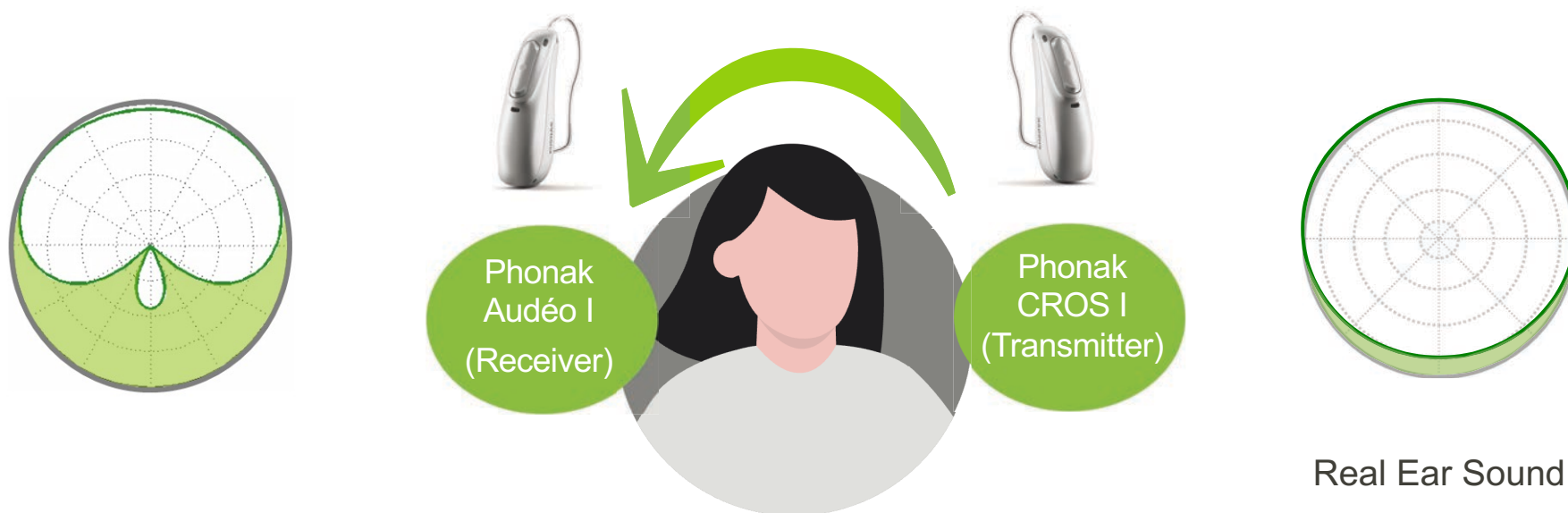
Evolution of CROS



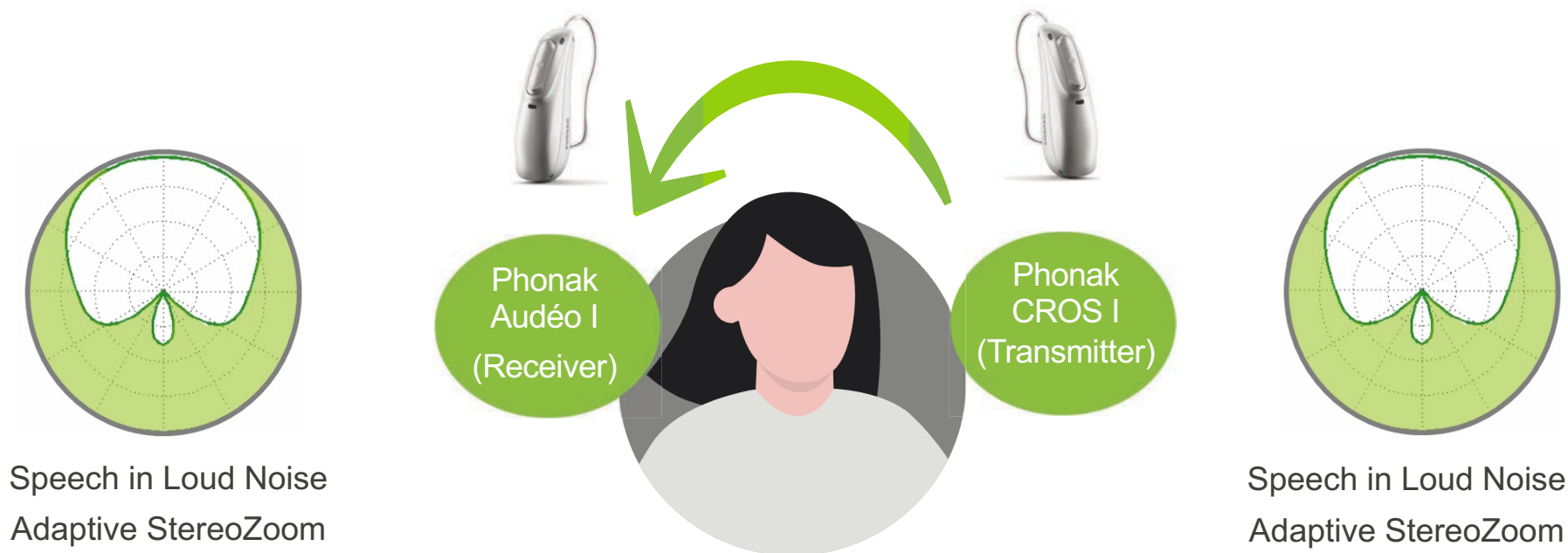
CROS Infinio in Calm



CROS Infinio in Speech in Noise



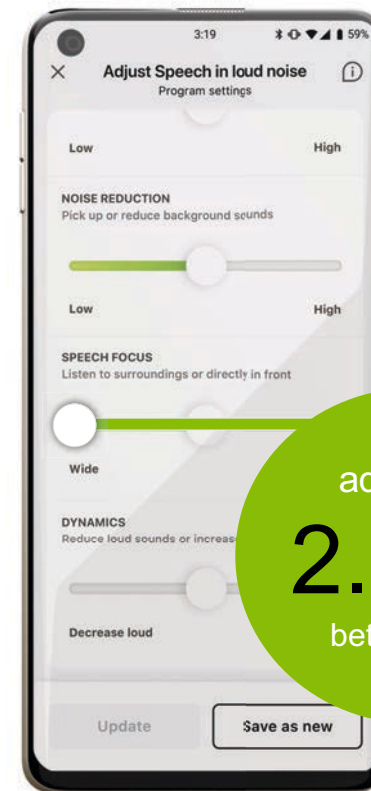
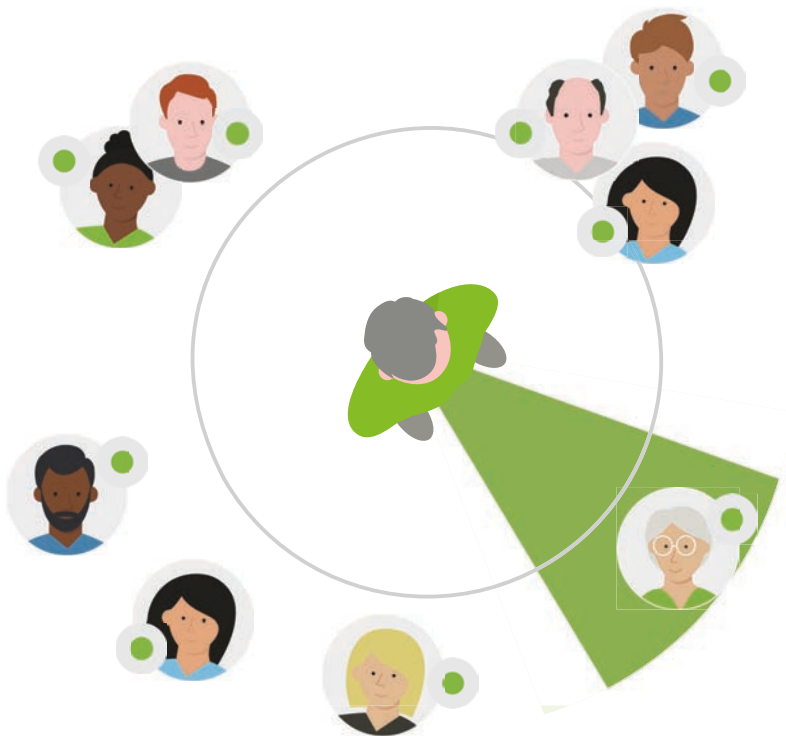
CROS Infinio in Speech in Loud Noise



Audéo I 90 – Speech in Loud Noise part of AutoSense OS automatic program

Audéo I 70 – Speech in Loud Noise is a manual choice program

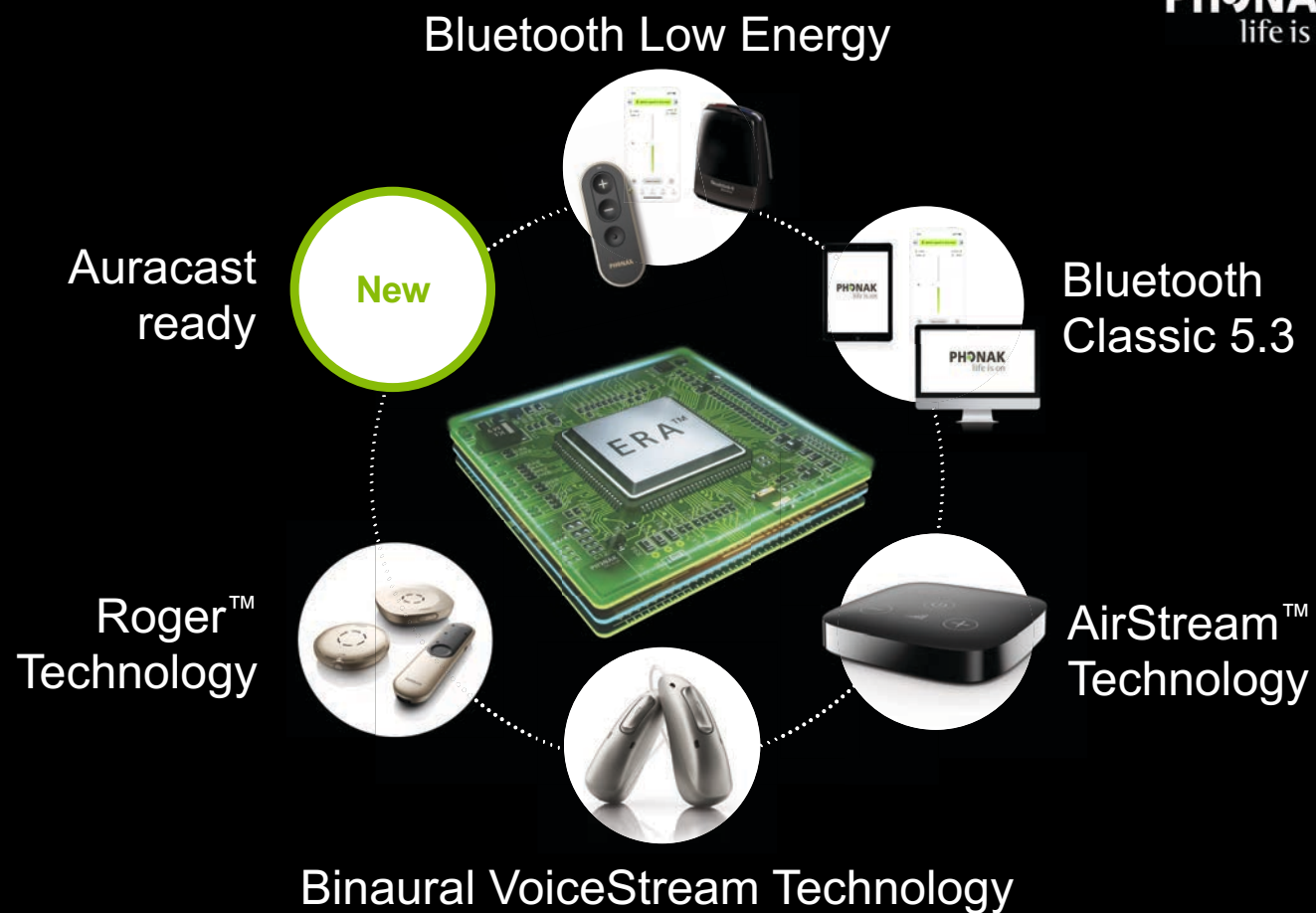
StereoZoom 2.0 for maximum benefit in CROS



What's new in Audéo I-R

		Phonak SmartSpeech™ Technology			Comfort		ASOS environments update	
Core features	Performance level	Speech Enhancer	StereoZoom 2.0 (AutoSense OS)	StereoZoom 2.0 (manual program)	SoundRelax	Real Ear Sound	Speech in Car	Comfort in Echo
New ERA chip New AutoSense 6.0 APD 3.0	Premium (90)	X	X	X	X	X	X	No longer required
	Advanced (70)			X	X	X	X New	
	Standard (50)				X New	X	X New	
	Essential (30)					X New		

Phonak CROS
system connects
to the world
around you



Stable, Smart, Effective

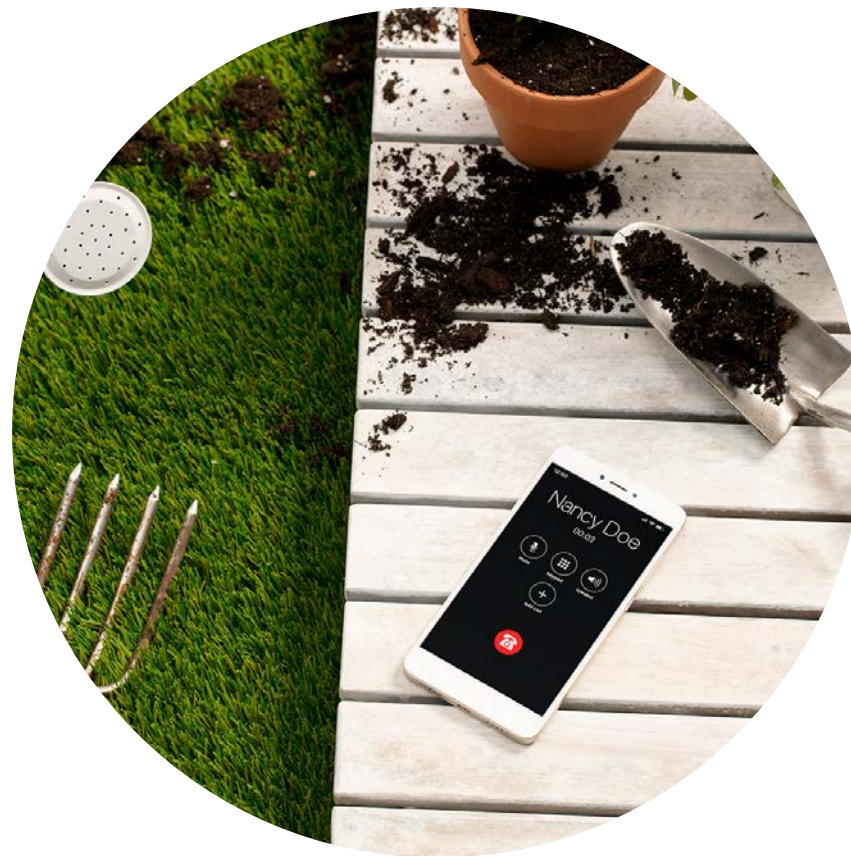
What's new

- Patented antenna design¹
- Up to 6x higher transmission power*

Benefit

- New level of stability & efficiency
- Uninterrupted hands-free calls
- Streaming across up to 2x the distance*

1. Corresponding patent number: US10841716 B2
*compared to Lumity



CROS I-R compatibility



CROS I-R



Audéo I-R

*Not compatible with Audéo I-Sphere



Charger RIC
Infinio



ChargerGo RIC
Infinio

Battery life with the CROS I-R solution

16hrs
with AutoSense alone



Charging Time		Battery Life
180 min		0% - 100%
120 min		0% - 70%
60 min		0% - 40%
15 min		30 min for fitting

*Not compatible with Audéo I-Sphere

Audéo & CROS Infinio—A color for everyone



Copper

Sienna red

Atlantic
green

Our design. Ready for rain, ready for dust, ready for life.



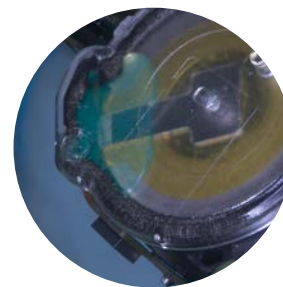
Parylene-coated internal circuitry



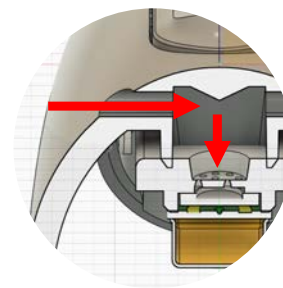
Protected housing



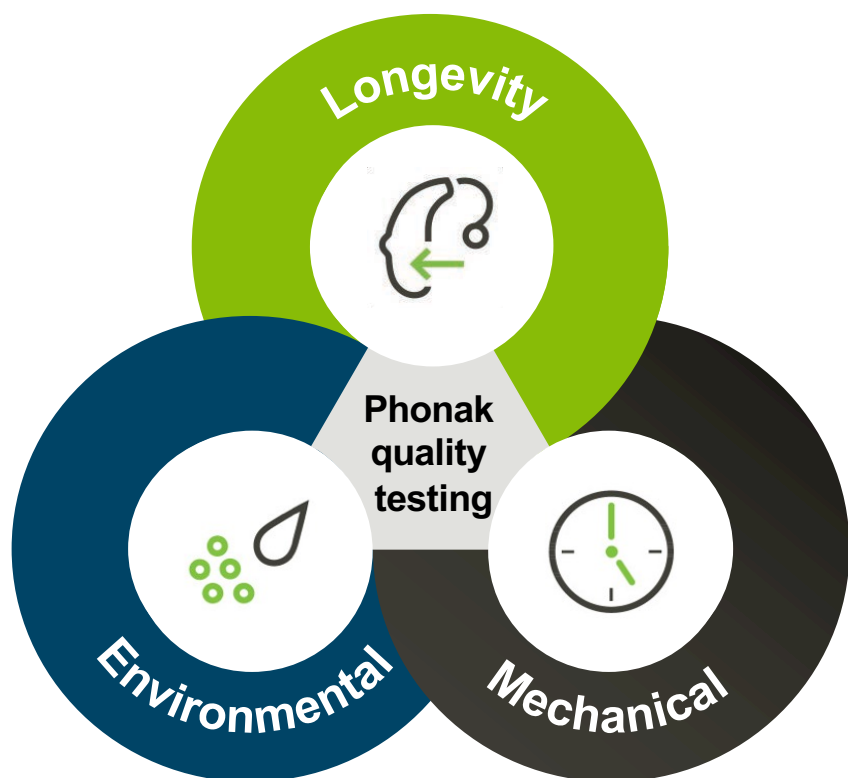
Fully encapsulated battery



Improved microphone protection



Infinio quality is verified with robust testing



Infinio hearing aids went through:

10,000
hours of rigorous tests
to ensure durability

Testing with Audéo Infinio

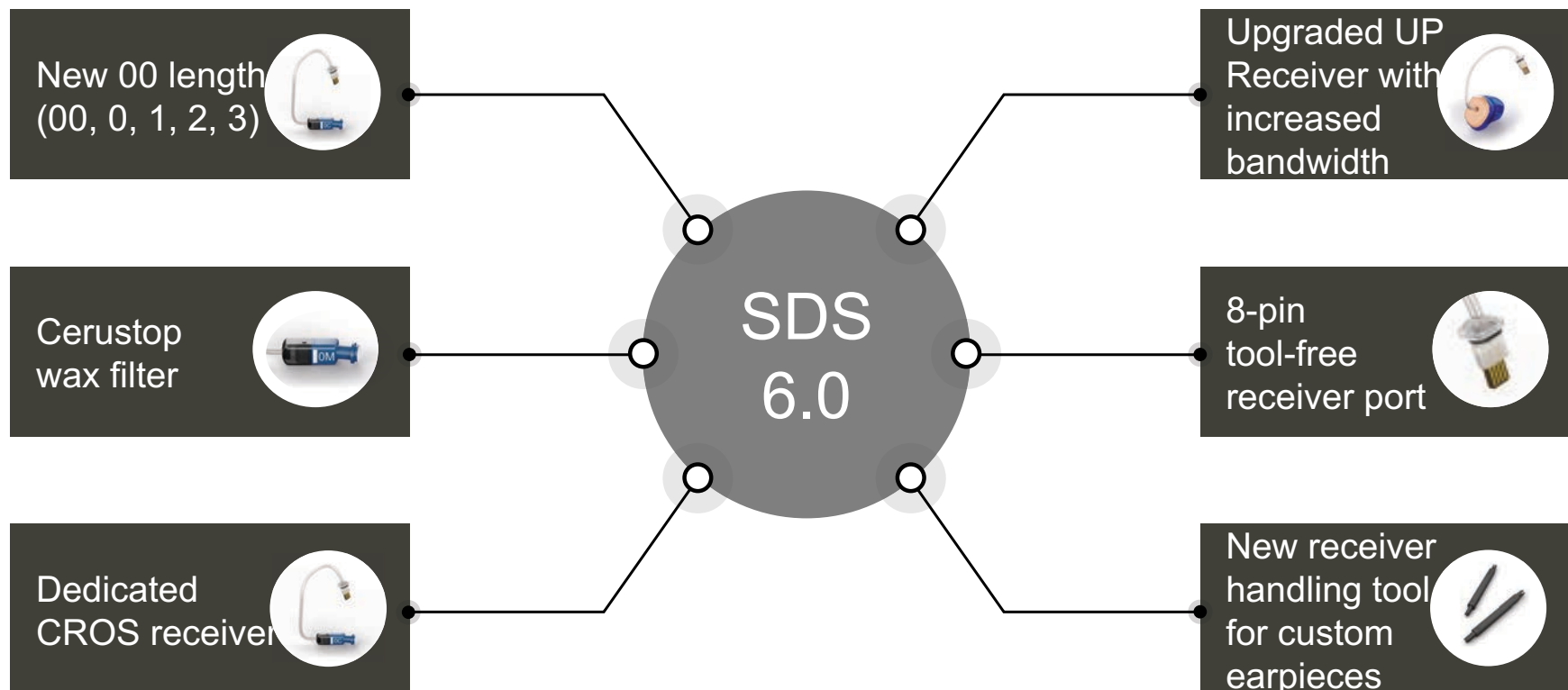
Beyond IP68 requirements

Additional testing includes:

- Organic Material Aging Test
- Humidity Test
- Shock Test
- Charging Contacts Test
- Electronic Aging Test
- Condensation Test
- Chemical Resistance Test



SDS 6.0



Phonak ERA™, our new ultra-responsive chip for Infinio

**Industry leading
universal connectivity**

Improved power management

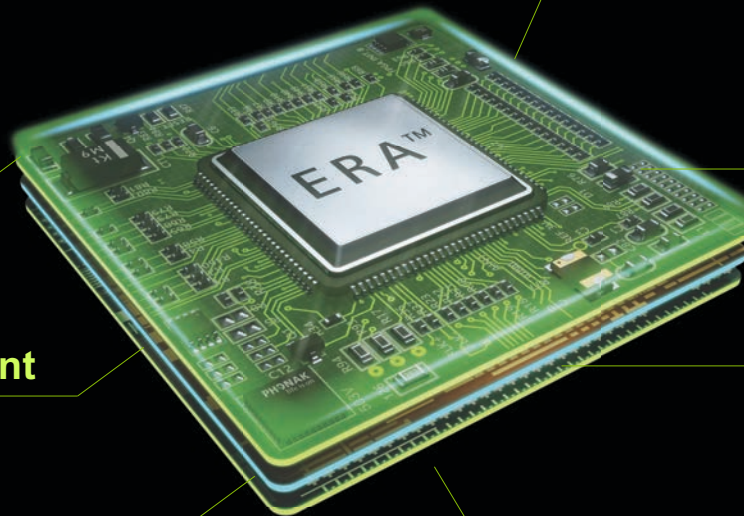
Up to 6x transmission power

**Exceptional sound
quality**

**Streaming across
up to 2x the distance**

Ultra-Responsive

Shifts seamlessly



Additional CROS option—Lumity

CROS L



Audéo L-RT



CROS L



Naída L- PR



Sky L-PR



**12.5
hours***



*Battery life of a CROS L system (both HA & CROS device)

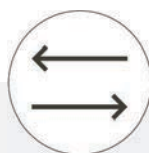


CROS in Target.

Connection to Phonak Target



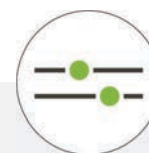
Connect to
**Phonak
Target**
using
**Noahlink
Wireless**



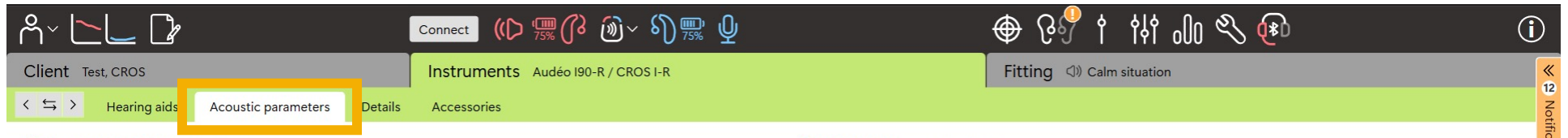
Enable
BVST



CROS
transmitter
is active
during
the fitting
process



Fine tuning
is done in
real time



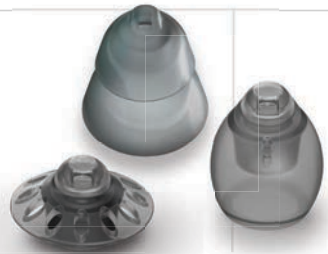
AI Dome Proposer

used to determine dome recommendation based on successful fittings around the world

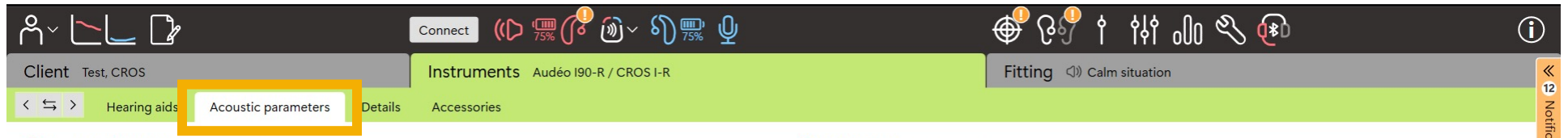
Recommendation based on

- Hearing thresholds – especially asymmetrical hearing loss
- Fitting formula
- Experience level (New)
- Binaural vs. monaural fitting (New)

Acoustic code	XXXXXX	
Earpiece	Vented dome	 ▼
Dome size	Small	▼
Receiver / AV	M	 ▼ Check
Wire length	OM R	▼



Earpiece	CROS Tip	▼
Cable length	— select —	▼



Acoustic Optimized Vent (AOV)

- Patented algorithm by Sonova
- Venting length and shape to maximize the vent effect
- Modelled in 3D before production
- Many different vents are possible



Coupling options

Solution 1



CROS Tube 6.0



Domes

Solution 2



CROS Tube 6.0



SlimTip

Solution 3



CROS Tip

FITTING FORMULA

 Adaptive Phonak Digital 3.0 

 Not available

 HEARING AID MICROPHONE



±0 steps

 CROS MICROPHONE



±0 steps

HEARING AID



±0



CROS balance

CROS



±0



Initial fitting

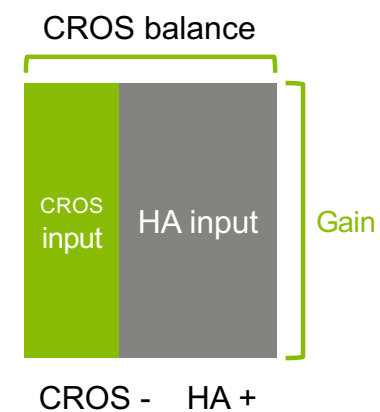
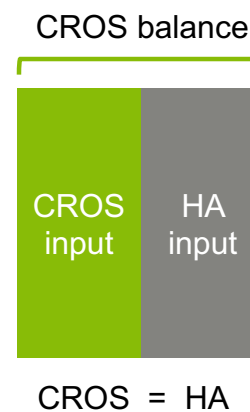
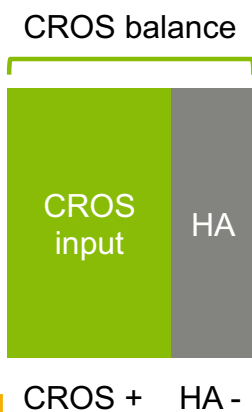
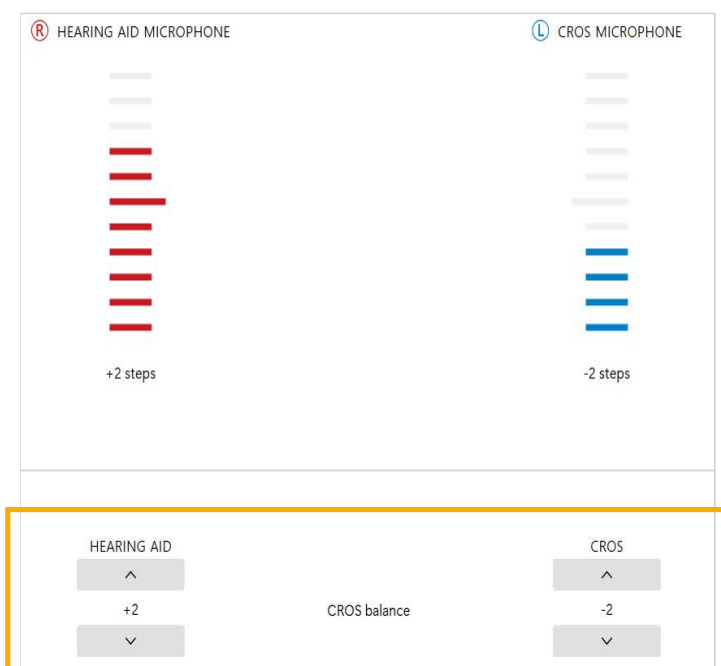
TargetMatch 2.0

CROS balance

SoundRecover

Tinnitus balance

CROS Balance in Target



The screenshot displays the Phonak fitting software interface for the Audéo I90-R / CROS I-R device. The top bar shows the client name "Test, CROS", instrument details, and the current fitting mode "Fitting" with the selected program "Speech in loud noise". Below this are tabs for "Feedback & real ear test", "AudiogramDirect", "Global tuning", "Fine tuning", "DataLogging", and "Device options".

The main area is divided into two sections. On the left is the "Program manager" which lists various programs under categories like "ALL PROGRAMS", "AUTOMATIC PROGRAMS", and "STREAMING PROGRAMS". The "Speech in loud noise" program is currently selected and highlighted in green.

On the right is the "Fine tuning" section, which contains several sliders and settings for the selected program:

- StereoZoom 2.0**: Slider set at 24 (Moderate).
- Dynamic noise cancellation**: Slider set at 8 (Weak).
- Motion sensor hearing**: A button labeled "Change here".
- Activation in AutoSense**: A button labeled "Change here".
- SoundRelax**: Slider set at 8 (Weak).
- NoiseBlock**: Slider set at 8 (Weak).
- Soft noise reduction**: Slider set at 0 (Off).
- WindBlock**: Slider set at 16 (Moderate).
- WhistleBlock**: Slider set at 20 (Strong).

At the bottom of the interface, there are additional tabs for "Gain & MPO", "Program options" (which is active), "Audibility fine tuning", "SoundRecover2", "Automatic fine tuning", and "Tinnitus balance".

Client

Test, CROS

Instruments

Audéo I90-R / CROS I-R

Fitting

Calm situation

<

↔

>

Feedback & real ear test

AudiogramDirect

Global tuning

Fine tuning

DataLogging

Device options

HEARING AIDS

R: SN95027346
L: SN51642915

ROGER RECEIVER

R: No Roger receiver installed

SERVICES

Reports...

Check warranty

Available apps

Phone compatibility

Hearing aid support

Accessory & charger support

Behavior

Standard

Streaming

Phone call

SHORT PRESS

R: Volume
±10 dB (±5 steps)

L: CROS balance*

* An increase will increase CROS and
reduce hearing aid side and vice versa

LONG PRESS

Program change
AutoSense OS (Startup)
Button down has same function

DOUBLE TAP

No function in Standard

BUTTON FUNCTIONS

Volume

Program change

Accept/end call

Mute/unmute mic (not for phone call)

TAP CONTROL

Accept/end call

Pause/resume streaming

Start/stop voice assistant

Training & sensitivity...

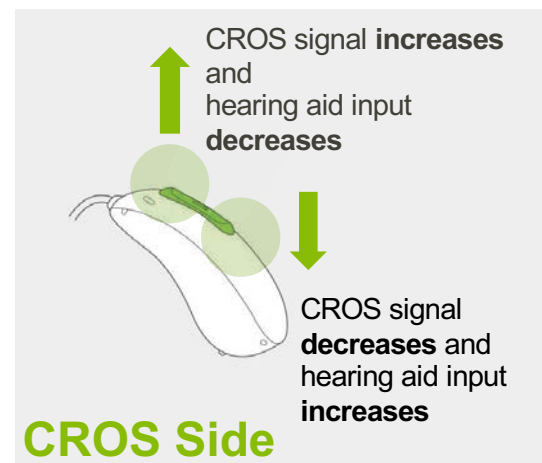
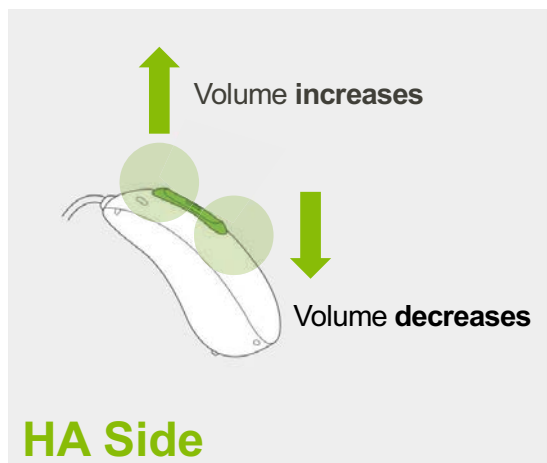
Manual controls

Bluetooth

Signals & alerts

Startup

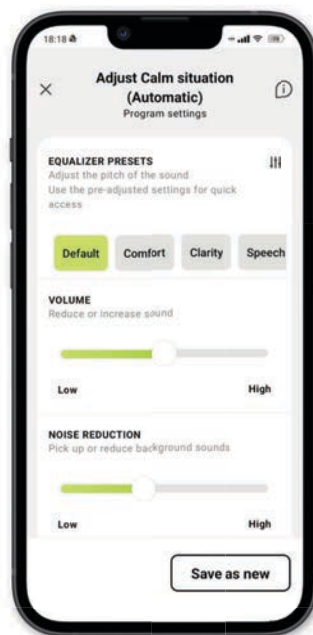
Notifications



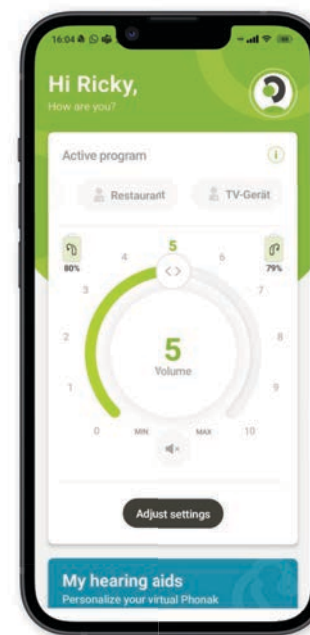
BUTTON FUNCTIONS ☒ Volume ☒ Program change ☒ Accept/end call ☐ Mute/unmute mic (not for phone call) TAP CONTROL ☐ Accept/end call ☐ Pause/resume streaming ☐ Start/stop voice assistant - Training & sensitivity...			
Manual controls	Bluetooth	Signals & alerts	Startup

myPhonak and myPhonak Junior apps for an optimized listening experience

- Access Remote Support appointments
- Adjust volume of CROS system
- View battery life status
- Option to “Stay Connected” to the app



myPhonak:
CROS Infino
CROS Lumity
CROS Paradise



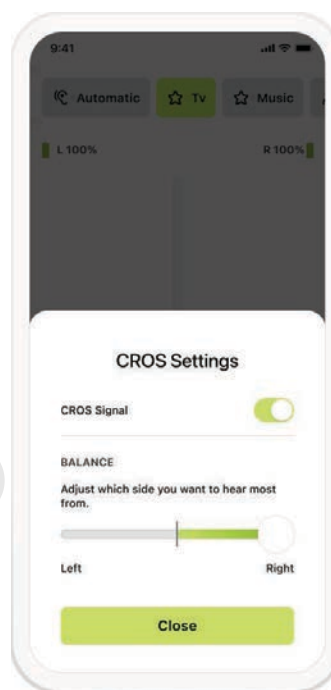
myPhonak Junior:
CROS Lumity
CROS Paradise



* Requires compatible hearing aid

Coming soon with myPhonak 6.9! CROS mute and CROS Balance

CROS Balance
patient's left or
right side

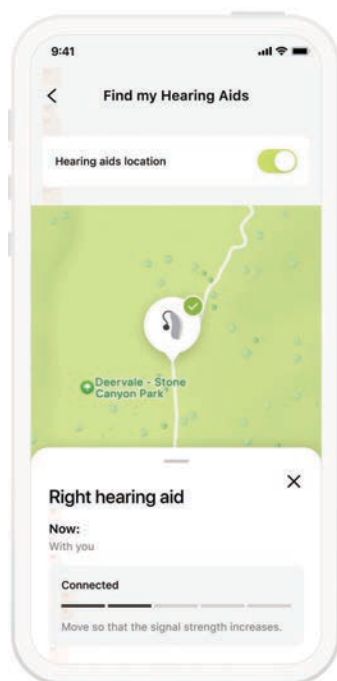


CROS mute
available when
activated in
Target

BUTTON FUNCTIONS

- ✓ Volume
- ✓ Program change
- ✓ Accept/end call
- ✓ Mute/unmute mic

Coming soon with myPhonak 6.9! Find my hearing aids



Compatible with Infinio rechargeable devices including CROS

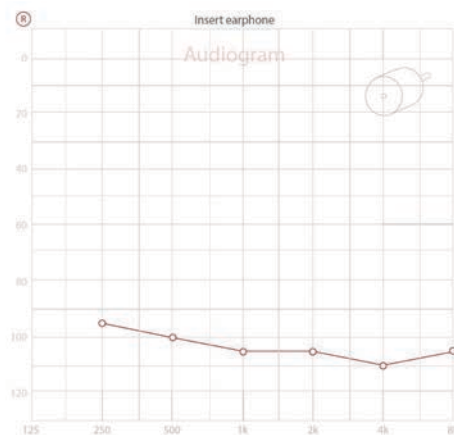
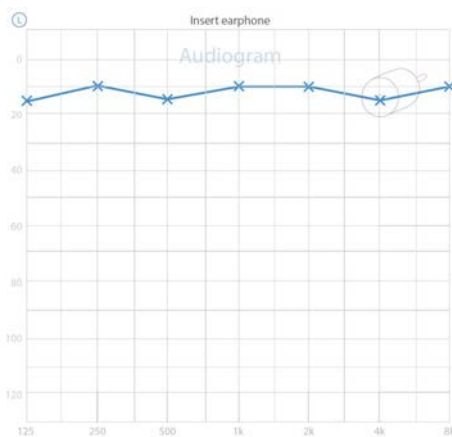
Indicates the last connection point

Gives guidance as you get closer



Verifying CROS.

The typical CROS audiogram



Setup:

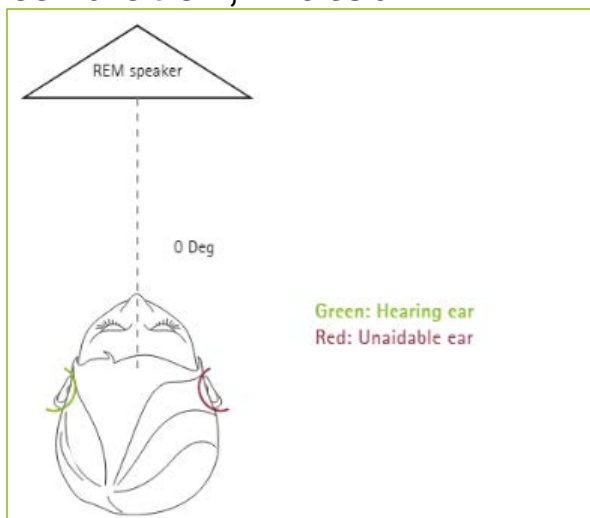
- Connect HA & CROS in Target
- Remain in startup program

Step 1. Probe mic setup-on better ear

Step 2. Select RIC in REM system instrument menu

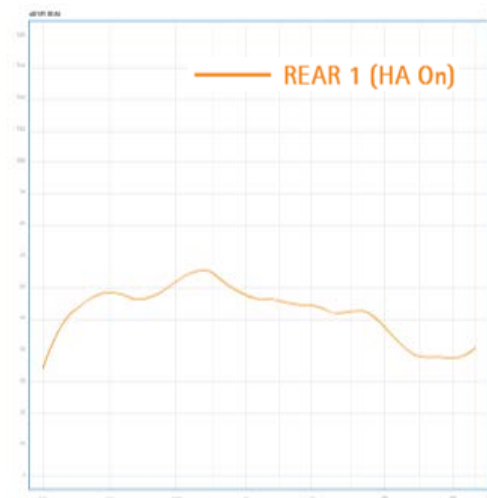
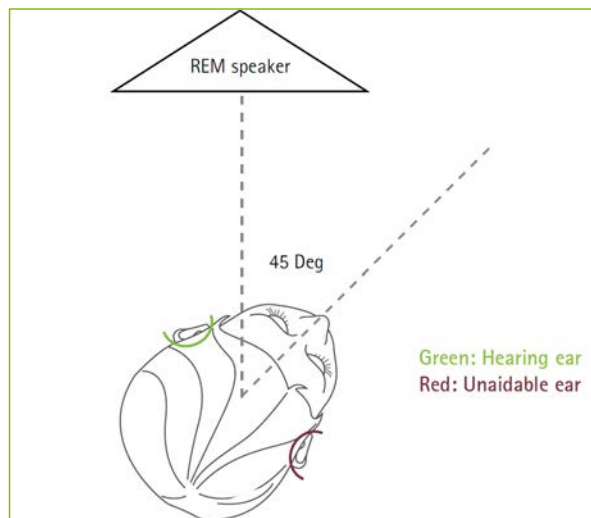
Orientation of the ear relative to the test speaker

Step 3. Perform open REM calibration, **muted**



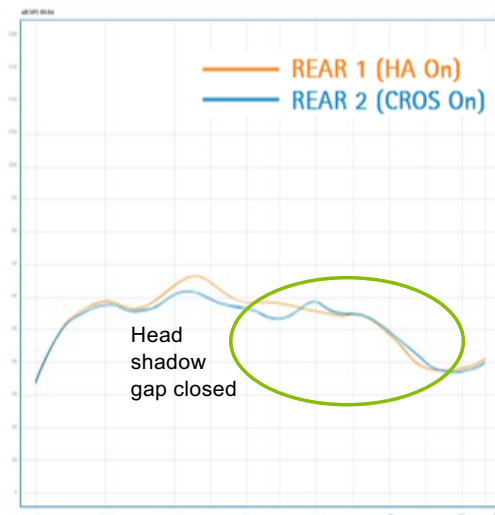
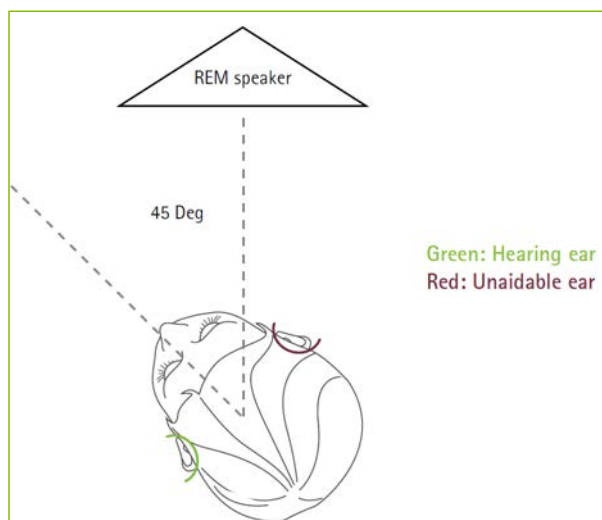
Probe measurement in
"Hearing ear"

Step 4. REAR 1 with **HA unmuted, CROS muted**

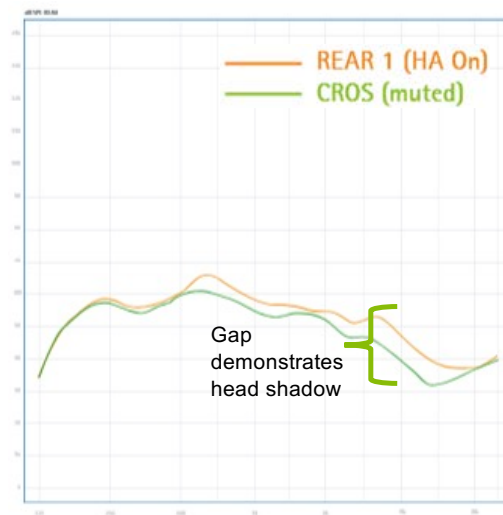


Orientation of the ear relative to the test speaker

Step 5. REAR 2 with CROS **unmuted**

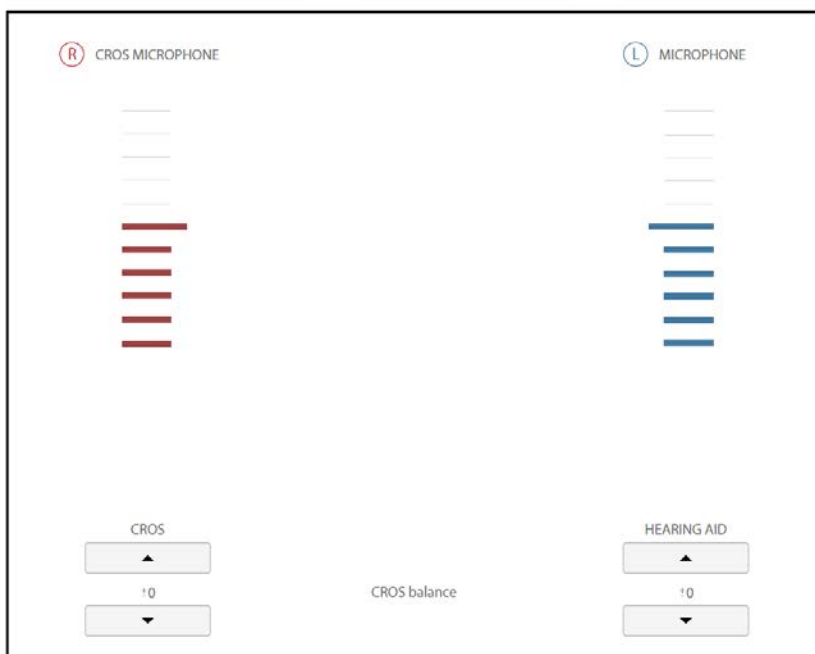


Step 6. REAR3 for head shadow effect



Software adjustments

Fitting Calm situation  Global tuning  CROS balance



Fitting Calm situation  Fine tuning  Gain & MPO

MPO	75	90	98	101	102	106	108	105	99	89
ALL	250	500	750	1k	1,5k	2k	3k	4k	6k	8k
G80	1	1	3	8	13	18	22	20	14	5
G65	1	3	8	13	17	24	29	27	22	13
G50	1	2	11	16	21	29	35	33	28	20
CR	1	1	1,3	1	1,4	1,5	1,7	1,8	1,9	2,1

Verification measurements with a CROS system



A Sonosera brand

CROS L Verification Guide.

Introduction

Most clients present with bilateral, aidable hearing loss. However, some people have hearing loss in only one ear, known as unilateral hearing loss (UHL). People with UHL may experience challenges communicating in noise, at a distance, in quiet and when localizing sounds (Lieu et al., 2013; Snapp et al., 2017; McKay et al., 2008). Contralateral routing of signal (CROS) supports clients with unaidable UHL, where one ear has normal hearing, and the other has an unaidable hearing loss. A CROS transmitter is worn on the unaidable ear to pick up signals and wirelessly transmits them to a hearing aid (HA), which is worn on the ear with normal hearing.

Alongside UHL where the affected ear is unaidable, some people may also develop hearing loss in the other ear, resulting in an asymmetric hearing loss. Bilateral microphones for Contralateral Routing of Signal (BICROS) is ideal for clients with unaidable UHL who also have a hearing loss in their better hearing ear. A microphone is worn behind both ears. Again, the signal from the unaidable ear is transferred from one ear to the other. However, this

The role of verifying CROS fittings using probe microphone measures

While the benefits of binaural amplification for clients with aidable hearing loss in both ears are often immediately evident, they may initially be more subtle for those with unaidable UHL. Mueller & Hawkins (1992) reported that such clients sometimes find it challenging to reliably report whether their CROS system is operational.

Thus, probe microphone measures present an ideal, objective way for verifying that a CROS/BICROS system is functioning well and overcoming the head shadow effect (Pumford, 2005). Further support for utilizing probe microphone measures comes from MarkeTrak findings for conventional hearing aid fittings, showing those clients receiving best fitting practice experience greater reduction in hearing handicap compared to those that don't (Kochkin, 2011a), and that clients receiving both verification and validation measures required on average 1.2 less visits compared to those that did not (Kochkin, 2011b).

As a result, the use of this system is essential to ensure





PHONAK
life is on

Bring the
conversation back

The benefits of CROS Infinio



1

Improved speech understanding in noisy environments*¹

2

Follow** conversations wherever they are coming from*¹

3

Improved subjective ease of communication and sound quality¹

4

Universal connectivity to smartphones, TV, Roger and more

5

Easy to use and rechargeable

1. Stewart, E. & Woodward, J. (2021). Out of the (Head) Shadow: A Systematic Review of CROS/BiCROS Literature. *The Hearing Review*, 28(8), 22-25. Retrieved from <https://www.hearingreview.com/inside-hearing/research/head>, accessed October 7, 2021.

* when using a CROS system compared to unaided

** Follow - means awareness of conversation for the wearer to attend to

CROS I-R is powered by a lithium-ion rechargeable battery

Unlock a world of possibilities with Infinio

I'm less worn out physically and mentally

I miss fewer words throughout the day

I feel like less of a burden

I'm more aware of my environment

Social situations are less daunting



I can recognize the nature of sounds more quickly

I feel safer overall

I don't have to keep turning!

It's easier to hear in a classroom setting

I can hear speech from my weak side



Together,
we change lives ●