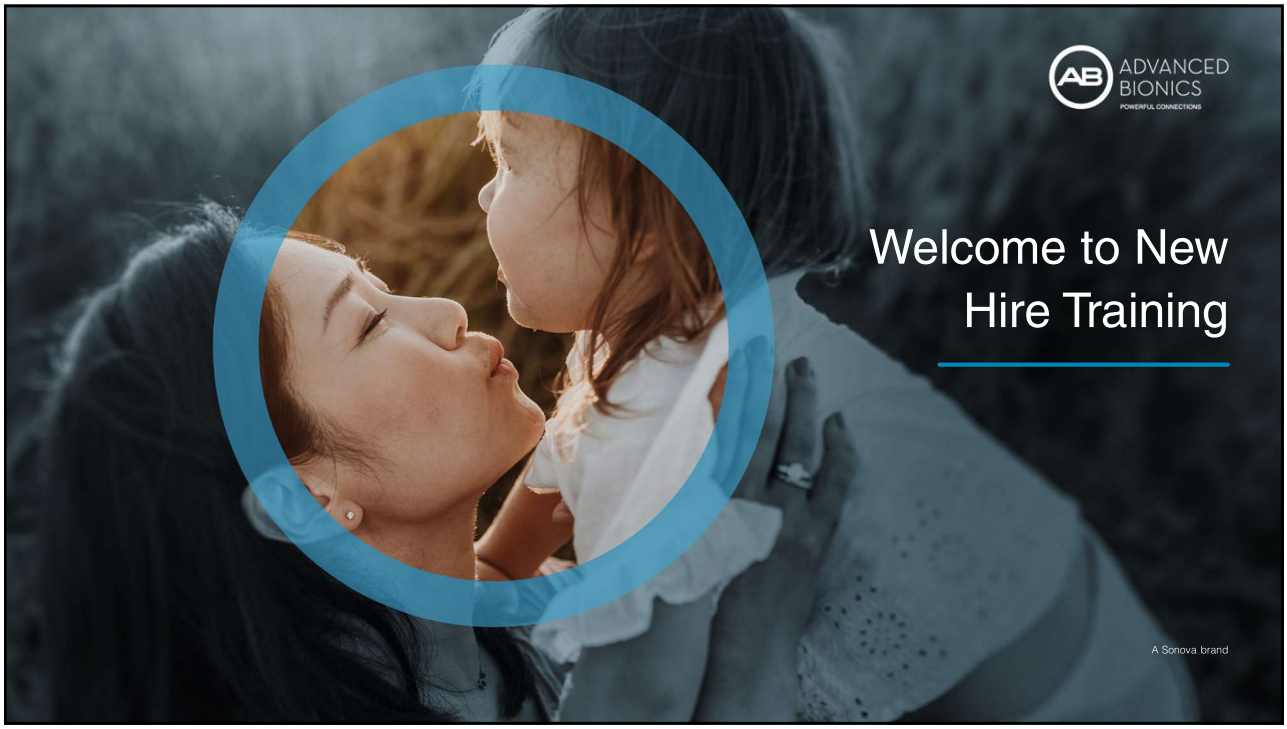
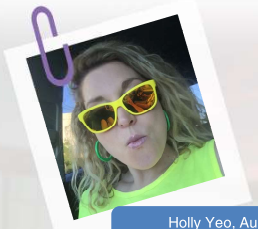


Education and Training Team



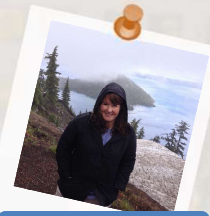
Holly Yeo, AuD
Sr. Manager of E&T



Rita Nicholson
E&T and Rehab Assoc.



Lori Hambrick, AuD
Principal Training Manager



Katie Vaden, AuD
Principal Training Manager

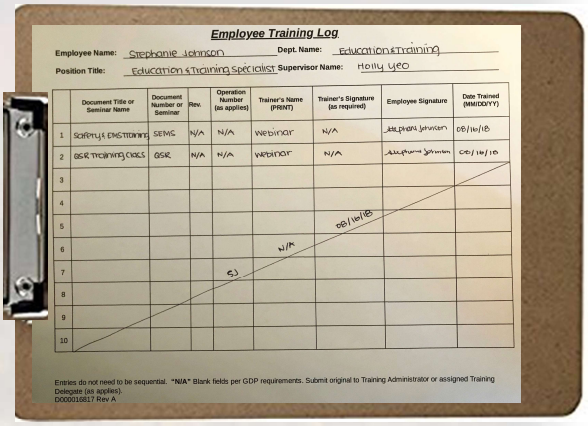


Stephanie Johnson, AuD
E&T Specialist



Chris Marr
Surgical E&T Manager

Training Logs



Employee Training Log

Employee Name: Stephanie Johnson Dept. Name: Education & Training

Position Title: Education & Training Specialist Supervisor Name: Holly Yeo

	Document Title or Seminar Name	Document Number or Seminar	Rev.	Operation Number (as applies)	Trainer's Name (PRINT)	Trainer's Signature (as required)	Employee Signature	Date Trained (MM/DD/YY)
1	Safety & Emotions	SEMS	N/A	N/A	Webinar	N/A	Stephanie Johnson	08/16/18
2	GSR Training Class	GSR	N/A	N/A	Webinar	N/A	Stephanie Johnson	08/16/18
3								
4								
5								
6								
7								
8								
9								
10								

Entries do not need to be sequential. "N/A" Blank fields per GDP requirements. Submit original to Training Administrator or assigned Training Delegate (as applies).
D000018817 Rev A

Exams

Oral Exam

- Role plays
- Competed virtually with panel

+ +

Written Exam

- Multiple choice and short answer
- Proctored via webcam
- Passing score: 90%

+

Surgical Exam (Clinical Specialists only)

- Open book with Surgical Exam Study Guide
- Password: SurgicalExam

Questions?

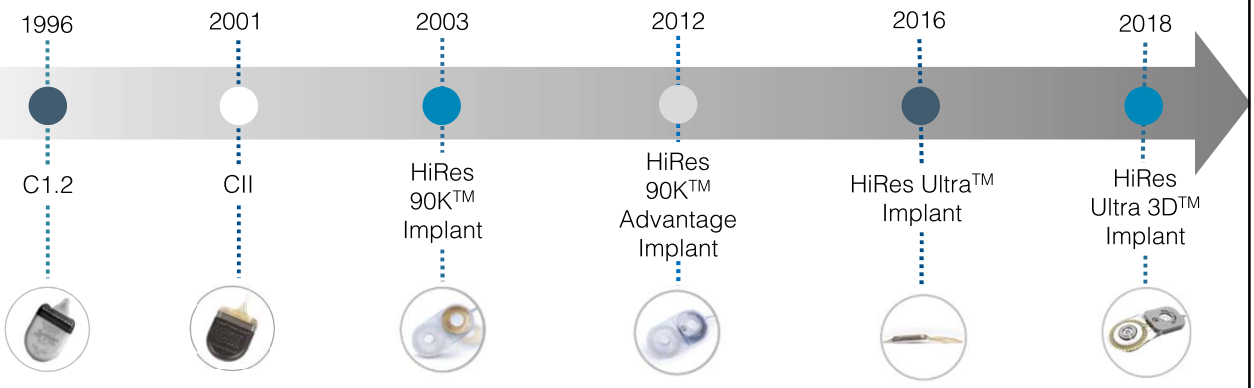
_ABEducation&Training@advancedbionics.com



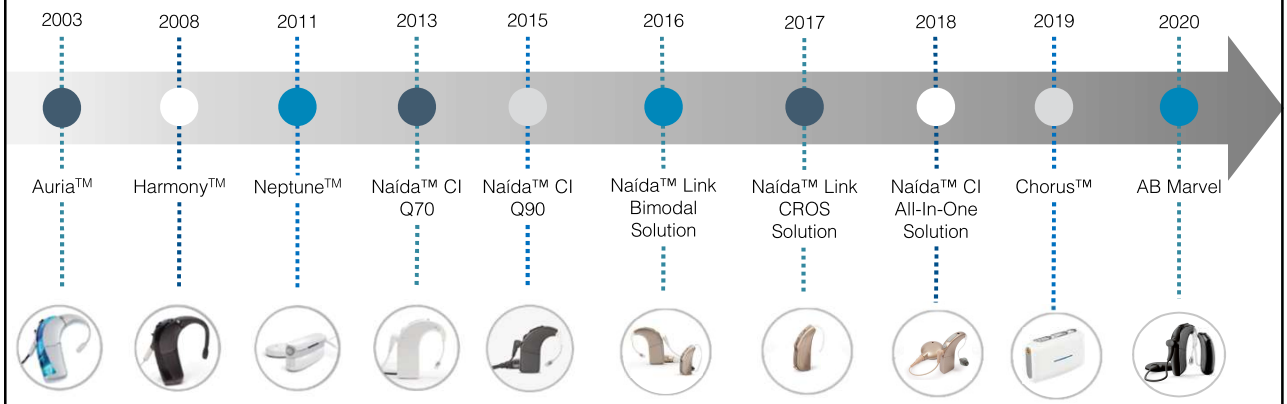
AB Device Evolution

New Hire Week

Internal Devices



External Devices*



*Since 2003



Candidacy

New Hire Week

A Sonova brand

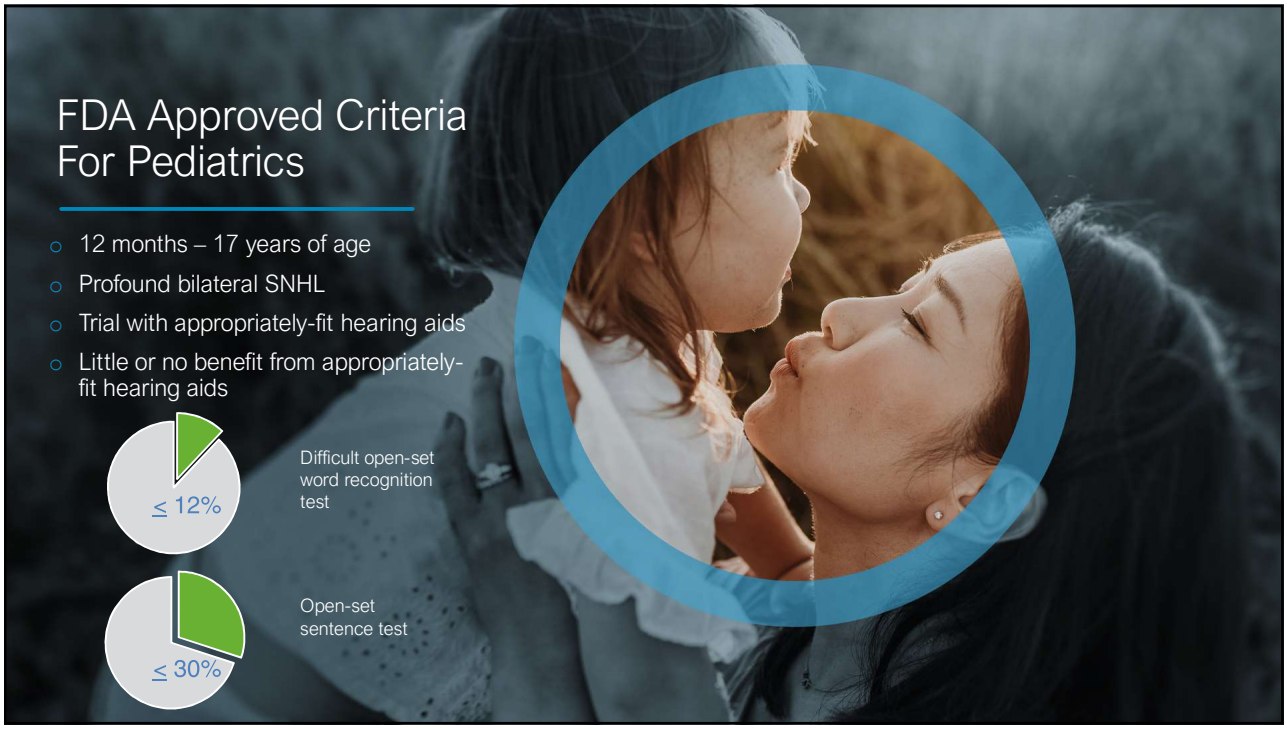
Knowledge Check

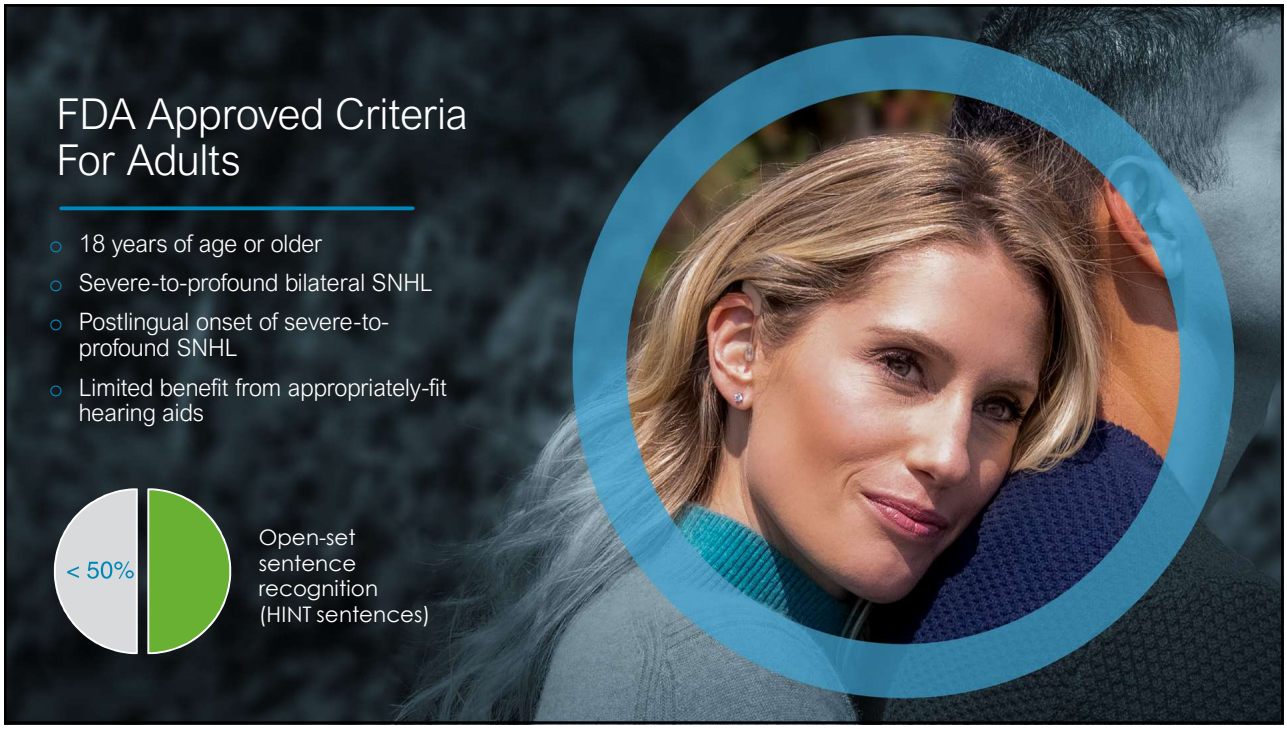
AB's Candidacy Guidelines

Review from pre-learning:

What are AB's FDA-approved guidelines for adult and pediatric candidacy?




FDA Approved Criteria For Pediatrics
12 months – 17 years of age
Profound bilateral SNHL
Trial with appropriately-fit hearing aids
Little or no benefit from appropriately-fit hearing aids
≤ 12%
Difficult open-set word recognition test
≤ 30%
Open-set sentence test


FDA Approved Criteria For Adults
18 years of age or older
Severe-to-profound bilateral SNHL
Postlingual onset of severe-to-profound SNHL
Limited benefit from appropriately-fit hearing aids
< 50%
Open-set sentence recognition (HINT sentences)

Knowledge Check

Candidacy

Review from pre-learning:

What are additional factors and considerations when determining cochlear implant candidacy?



FDA Guidelines are specific to manufacturer:

True

False

6

Skill Practice

Candidacy Guidelines



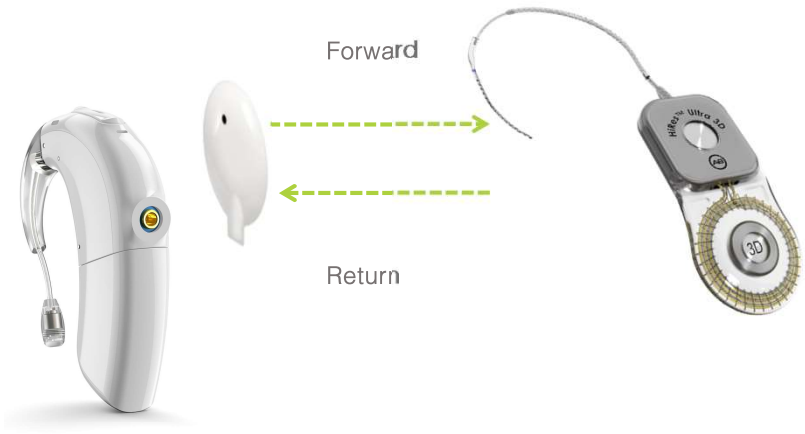


ADVANCED BIONICS
POWERFUL CONNECTIONS

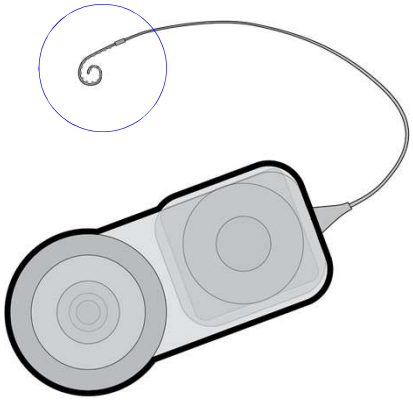
Internal Devices and Electrodes from AB

New Hire Week

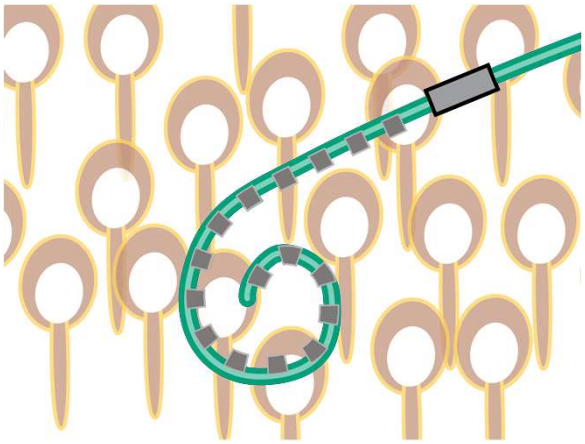
Bidirectional Communication Link



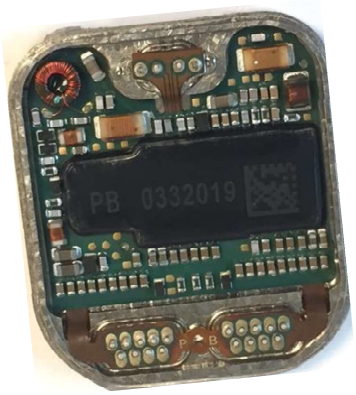
Bidirectional Communication Link



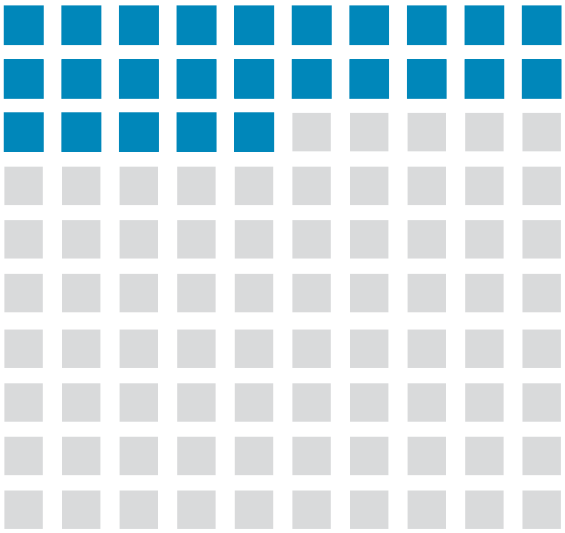
Bidirectional Communication Link



It's What is Inside That Counts



HiResolution™ Hearing Technology



Upgradeability

Only AB has untapped system capability for future upgrades.

In Use

Untapped Technology



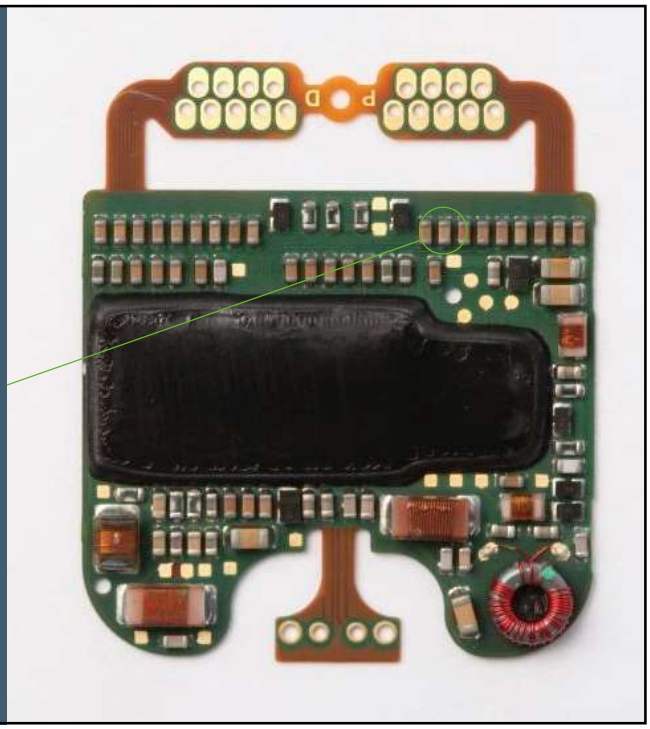


Ceramic Casing

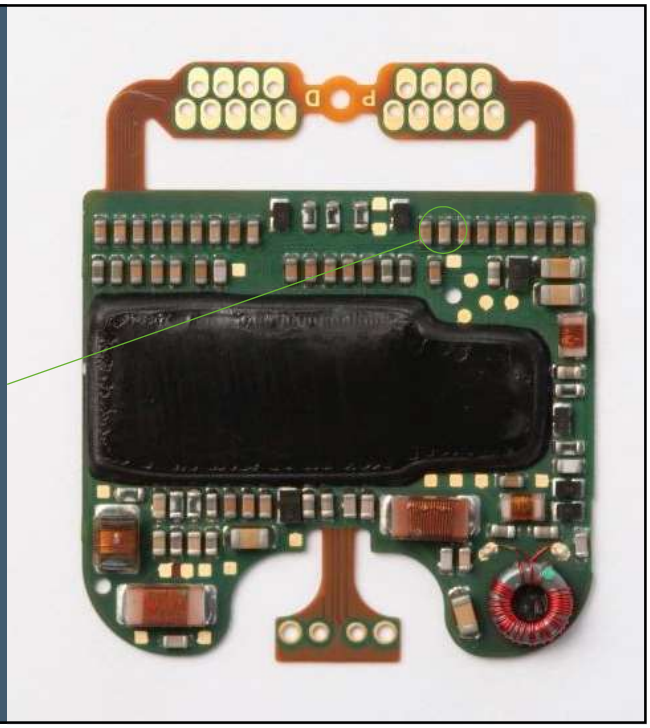


Titanium Casing

Capacitors provide protection against leakage of harmful direct current (DC) which can damage neural tissue



C1 device : 8 capacitors
CII/HiRes90k/Ultra:16 capacitors



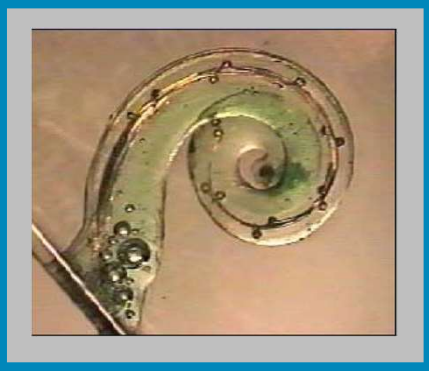
Key feature of our design

Allows for current steering

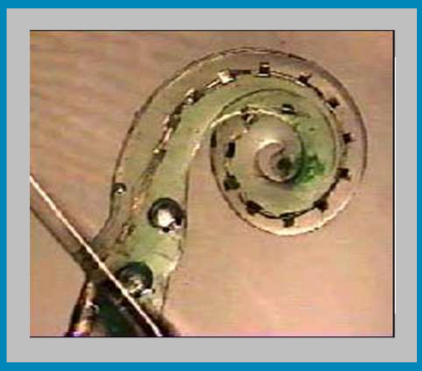
C1 device : 8 output circuits

CII/HiRes 90k/Ultra: 16 output circuits

Electrode Design Evolution



Spiral Electrode



HiFocus™ Electrode

Electrode Design Evolution

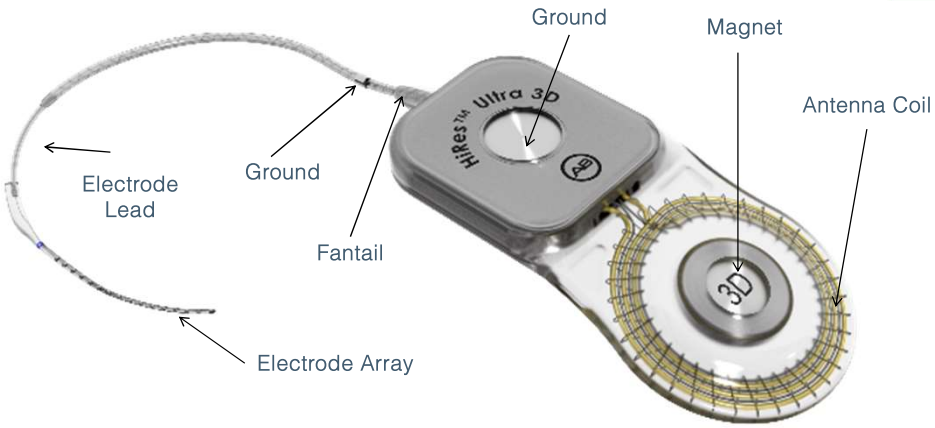


HiFocus™ Mid-Scala Electrode



HiFocus™ SlimJ Electrode

HiRes™ Ultra 3D Cochlear Implant



Knowledge Check

C1 vs. CII and newer

Review from pre-learning:

What are the differences between C1 and CII/HiRes 90k/Ultra/Ultra 3D?

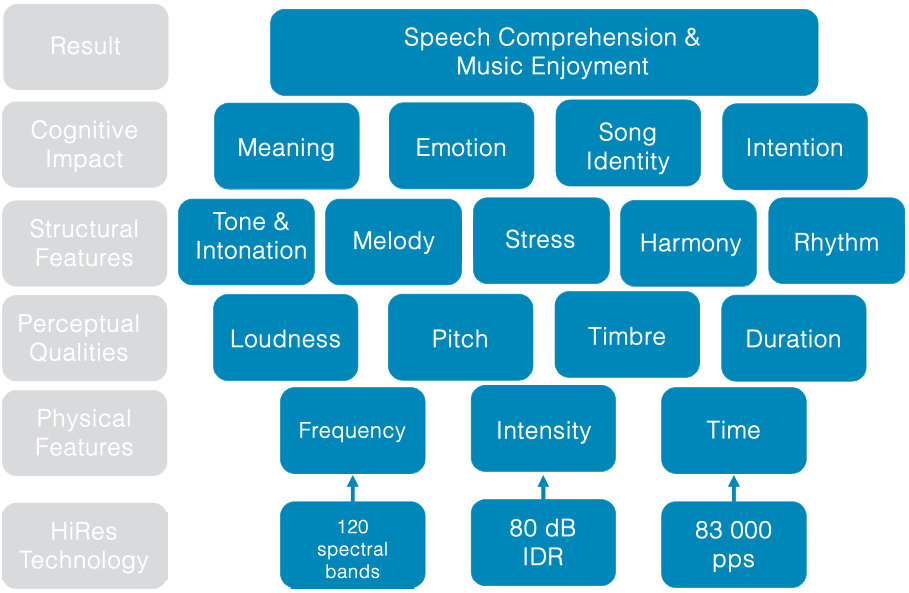


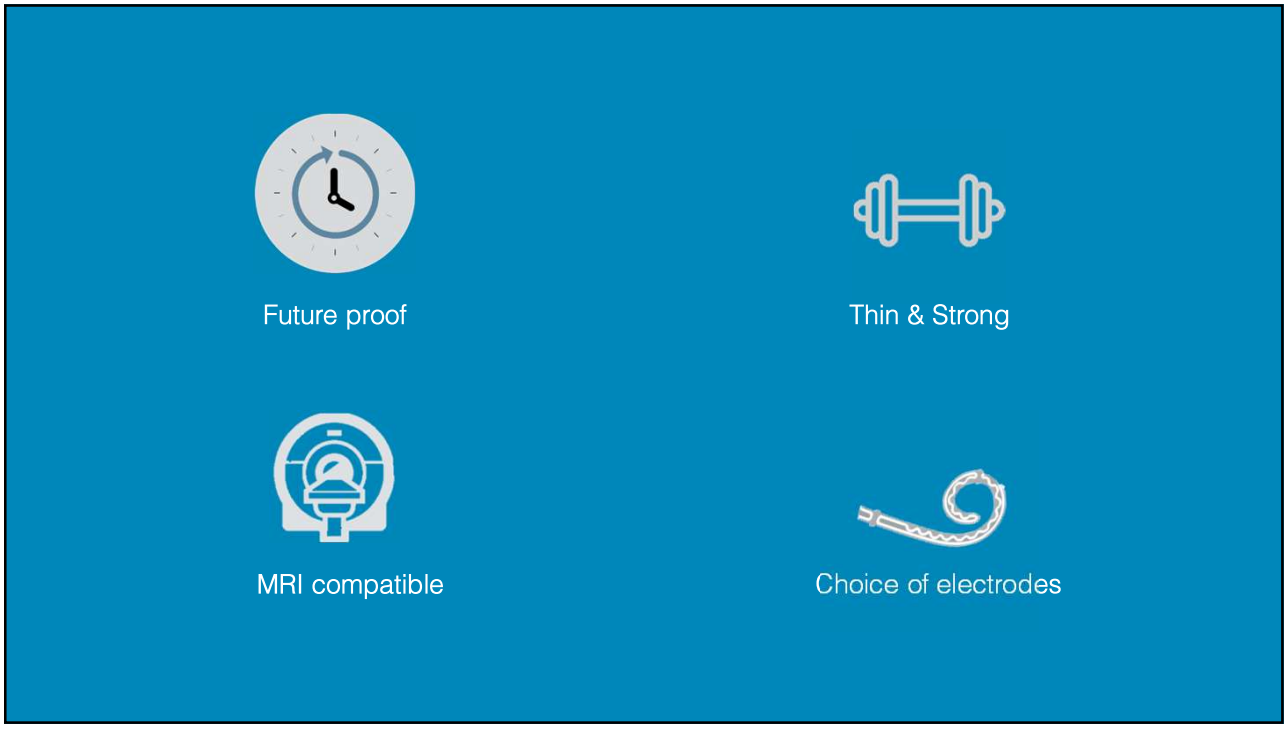
Future proof

Thin & Strong

MRI compatible

Choice of electrodes


Result
Speech Comprehension & Music Enjoyment
Cognitive Impact
Meaning
Emotion
Song Identity
Intention
Structural Features
Tone & Intonation
Melody
Stress
Harmony
Rhythm
Perceptual Qualities
Loudness
Pitch
Timbre
Duration
Physical Features
Frequency
Intensity
Time
HiRes Technology
120 spectral bands
80 dB IDR
83 000 pps


Future proof
Thin & Strong
MRI compatible
Choice of electrodes

Thin, Small, Discreet



Our impact testing has shown to go well beyond the required European standard of 2.5J

Impact testing



Impact Trauma



Future proof

Thin & Strong

MRI compatible

Choice of electrodes



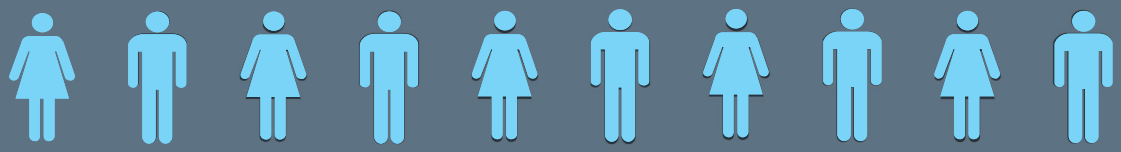
MRIs can diagnose conditions of the

Extremities Spine Organs Brain

30 million MRI scans are performed in the US each year-

that is close to one scan every second





1 in 10 Americans get an MRI exam in any given year

HiRes Ultra 3D



Hassle free MRI.

Pain free MRI.

Uninterrupted hearing.

Current MRI Hassles for CI recipients

- **With traditional magnets**
  - Magnet must be surgically removed prior to 3T MRI
  - No hearing between surgery and healing of wound
- **With other magnets approved for 3T MRI**
  - Serious restrictions on head orientation in the MRI magnetic field
  - At certain head angles torque may cause pain

Provides Alignment to External Field



MRI compatibility

	Magnet in	Magnet out
HiRes Ultra	1.5T	3.0T
HiRes Ultra 3D	3T	

Bandaging Protocol for HiRes Ultra



If the magnet is left in place, a simple bandaging protocol has to be followed.

No bandaging protocol needed for HiRes Ultra 3D

Internal

ADVANCED BIONICS
POWERFUL CONNECTIONS

Competitive Overview
3.0 TESLA MRI COMPATIBILITY

	Advanced Bionics[1] HiRes™ Ultra 3D	Cochlear[4] Nucleus® Profile™ Plus	MED-EL[7] Synchrony®	The Advantage of the AB Solution
DESIGN	Four rotating magnetic rods within a rotating frame	Rotating single disk	Rotating single disk	The AB multi-magnet assembly includes four individual magnets in a friction-free rotating frame. The frame provides alignment to the MRI field along one rotational axis, while the individual magnets provide alignment along the second axis of the field, achieving alignment in the 3D space. This results in a low torque system, regardless of the angle of the device to the MRI field. Low torque means no pain or discomfort for the patient.
ROTATIONAL AXES	2	1	1	
ROTATIONAL DIMENSIONS	3	2	2	
NUMBER OF MRIs WITHOUT IMPACT ON MAGNET STRENGTH AND/OR MECHANISM	200[1]	10[4]	Not provided	Having a system capable of a higher number of MRI procedures allows for the lowest likelihood of surgery to replace the magnet due to demagnetization or mechanical wear. Demagnetization may occur if a magnet is not aligned with the MRI field.
HEAD PLACEMENT RESTRICTIONS	None	• FDA - None • TUV - 15° off-axis limitation in 1.5T and 3T MRI fields.[5]	30° off-axis limitation[7] in 1.5 and 3 Tesla MRI fields.	Having no head placement restrictions allows for an easier set up inside the MRI room and ensures the procedure is not aborted due to patient pain and/or discomfort.
MAXIMUM FLAP THICKNESS	Up to 10 mm[2]	• Kanso - up to 6 mm[6] • Nucleus 7 - up to 9 mm[6]	Not provided	Offering full system functionality up to 10mm allows for clinical use over the wider patient population, both pediatric and adult.
INTERFERENCE WITH T-COIL	None	Yes, T-coil in Kanso cannot be used[6]	None	Interference with T-coil prevents connectivity via neck-loop receivers and access in public places where loop systems are in use.
MAGNET REMOVAL	Up to 5 times possible, easy removal from the top, same procedure as with all the HiRes family.[3]	Magnet can be removed from distal end. It is kept in a cassette that has to be slid out of the casing that remains in the silicone overmold.[6] Number of times unknown.	It requires magnet removal from the underside of the antenna coil and the use of specific surgical tools.[7]	If required for proper clinical diagnosis the magnet should be easy to remove and replace.
ANTENNA COIL CONSTRUCTION	Flexible silicone – same design as all HiRes family implants.	Frame for magnet retention and increased thickness. Stiffening element for magnet	Stiffening element for magnet retention.	A soft and flexible antenna coil allows it to conform to the contours of the skull and can be kinder to the soft tissue, particularly for the children.
HEAD BANDAGING REQUIRED	No	No	Optional	Compression bandaging of the head can often lead to pain and/or discomfort of the patient, as well as intervention by the HCP prior to the MRI procedure.

1. https://advancedbionics.com/us/en/home/professionals/hires-ultra-3d-cochlear-implant.html
2. Data on file
3. Instruction for Use, HiRes Ultra 3D cochlear implant, 029-M727-33C
4. Cochlear™ Nucleus® Implants Magnetic Resonance Imaging (MRI) Guidelines, D1747.NS.SSS-JUN19
5. Cochlear™ Nucleus® Implants Magnetic Resonance Imaging (MRI) Guidelines, D806535.SSS-APR19
6. Cochlear Americas Online Webinar, Introduction to the new Nucleus Profile Plus: Surgical and Audiological Considerations, June 2019
7. Manual - Medical Procedures for MED-EL CI Systems, AW33290_5.0

FOR INTERNAL USE ONLY

Skill Practice
HiRes Ultra 3D

Counsel on the advantages of HiRes Ultra 3D.



Future proof

Thin & Strong

MRI compatible

Choice of electrodes

Surgical Portfolio



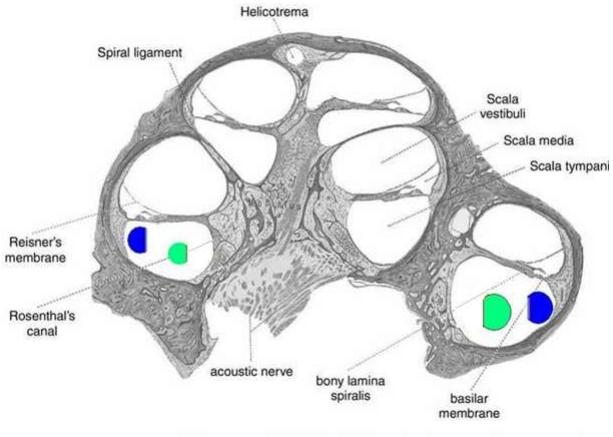
HiRes™ Ultra and Ultra 3D
cochlear implant

HiFocus™ SlimJ electrode



HiFocus™ Mid-Scala electrode

Electrode Positioning



HiFocus Slimj/1j = Lateral Wall

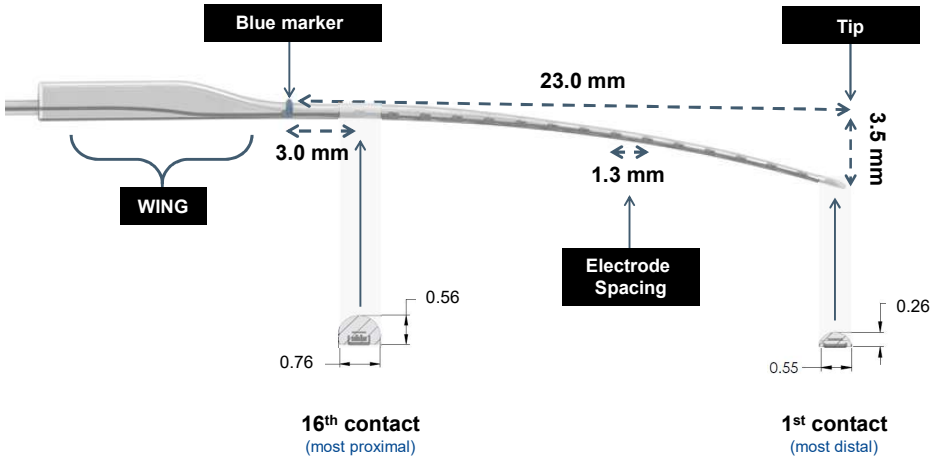
HiFocus Mid-Scala = Middle of Scala Tympani

Surgical Approach

Cochleostomy
Extended Round Window
Round Window

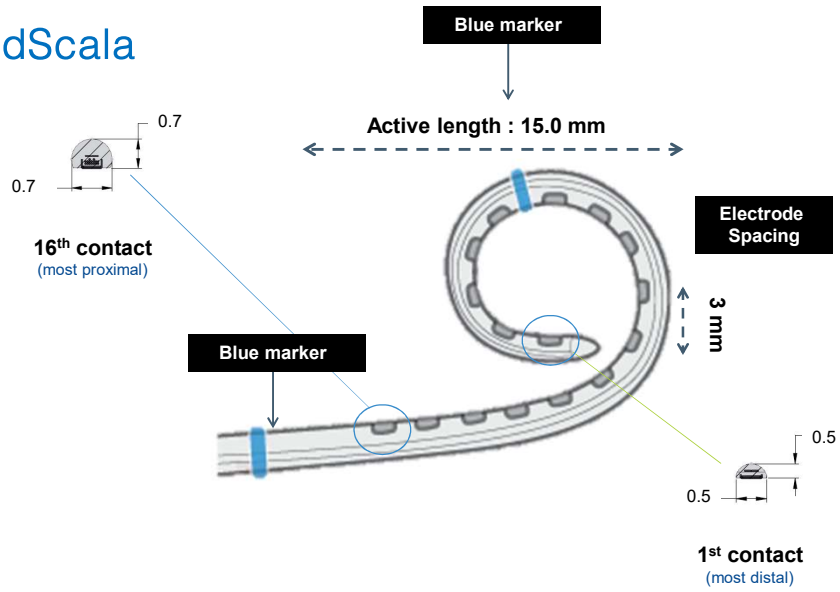


SlimJ

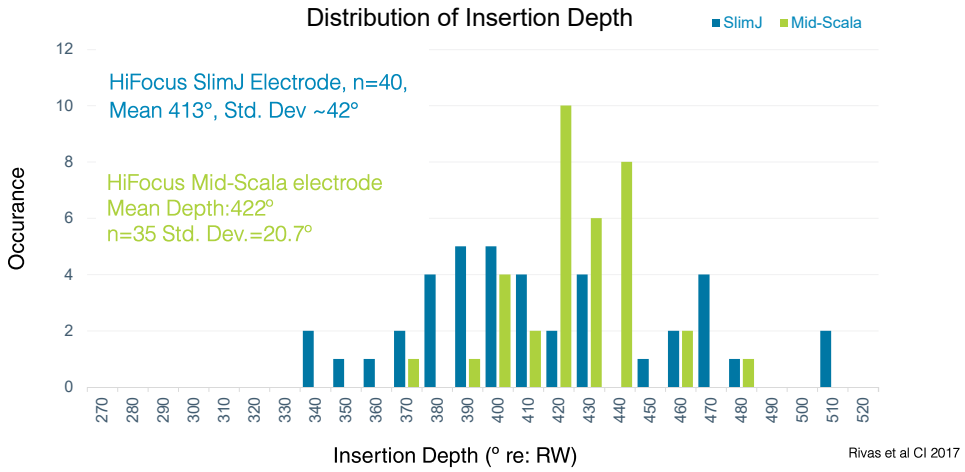


Dimensions for easy fit of the electrode in the Scala Tympani to facilitate cochlear structure preservation

MidScala



Full Spectral Coverage



Electrode Characteristics

Electrode type	HiFocus Slim J	HiFocus MidScala	HiFocus 1j
Placement	Lateral wall	Mid-Scala	Lateral Wall
Active length	~ 20 mm	~ 15 mm	~ 17 mm
Angular Insertion Depth	~ 420˚	~ 420˚	330˚ to 400˚ (Coch)
Electrode array tip diameter (distal)	0.5 x 0.26 mm	0.5 x 0.5 mm	0.4 x 0.6 mm
Electrode array base diameter (proximal)	0.76 x 0.56 mm	0.7 x 0.7 mm	0.8 mm



Reliability Report

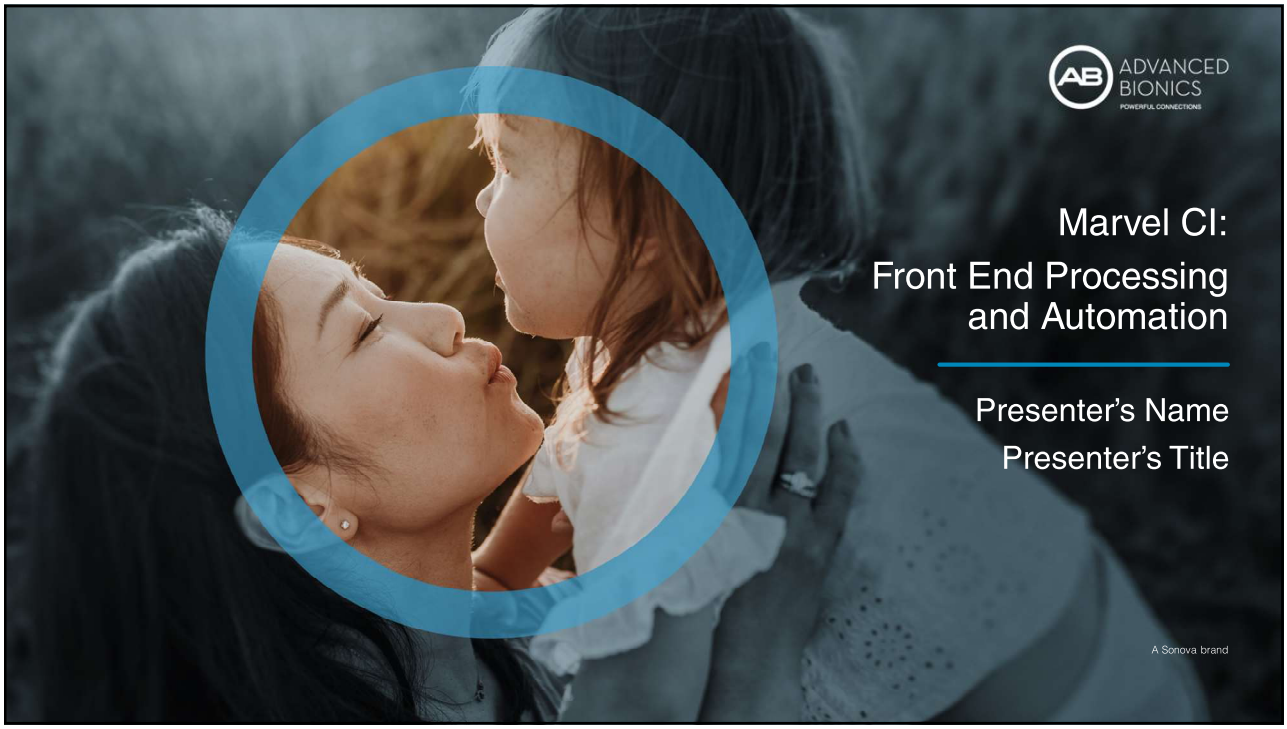
At AB, we are committed to report clear and accurate information about our cumulative survival rate (CSR)

Skill Practice

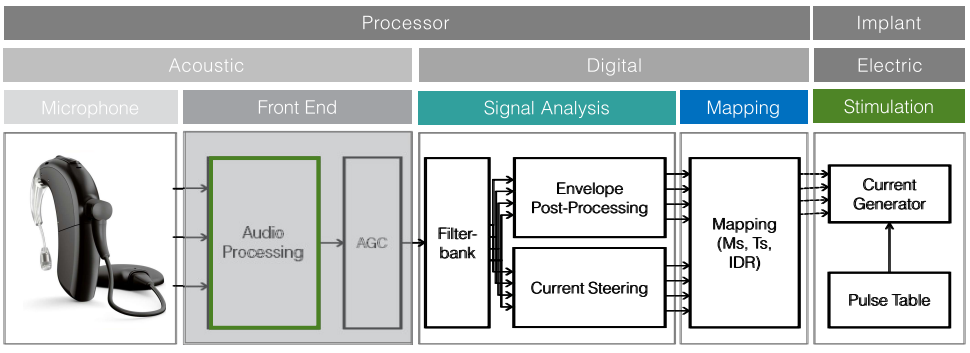
Reliability

"AB recently had a field action. I have reliability concerns with your internal device. Are your external devices reliable too?"





Sound Processing Pathway



Knowledge Check

AutoSense OS

Review from pre-learning:

What is AutoSense OS? What makes it unique?



Benefits of AutoSense OS

Optimized speech understanding in noise[3,4]

Reduced listening effort in noise

Top-rated streamed sound quality

AutoSense OS

How does it work?

AutoSense OS identifies the environment that the recipient is in.

- Analyzes incoming sounds every 0.4 seconds
- Classifies sounds based on this analysis
- Uses artificial intelligence to automatically activate the appropriate blend of settings, programs, and features specific to various listening environments



AutoSense OS

How does it work?

AutoSense OS is designed to draw upon multiple features to blend sound classes to create **over 200 distinct settings** based on the specific listening environment*.

Inputs are classified as **Acoustic** or **Streaming**.

Acoustic		Streaming
Calm situation	Speech in car	Media Speech
Speech in noise	Speech in loud noise	Media music
Comfort in echo	Music	
Comfort in noise		

*User experience with AutoSense OS may vary based on the listening situations encountered and may be limited by the user's selected settings.



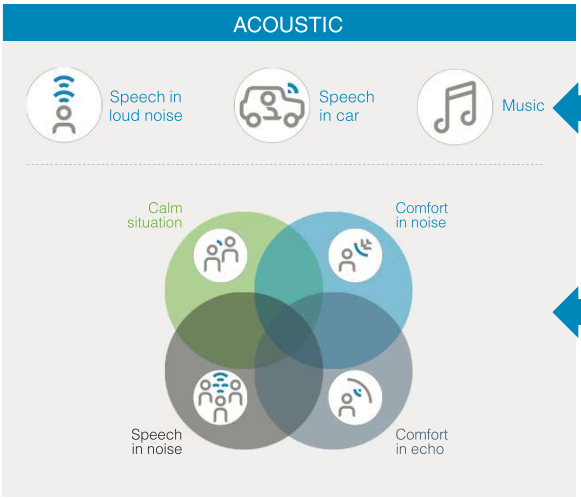
AutoSense OS

Automatic programs

Calm situation	Speech in noise	Speech in loud noise *Bilateral/Bimodal only	Speech in car	Comfort in noise	Comfort in echo	Music
Designed for speech understanding and listening comfort in 1:1 conversations and for quiet environments.	Designed for speech understanding and comfort when in noisy environments and groups.	Designed for speech understanding in noisy and crowded environments. StereoZoom focuses forward and is best for 1:1 communication.	Designed to improve communication in the car by reducing low-frequency engine noise and road noise.	Designed for listening comfort in noisy situations when no speech is present.	Designed for comfortable speech understanding in reverberant environments.	Designed to provide a more natural music experience by disabling comfort features and directional microphone technology.

AutoSense OS

Acoustic input



Exclusive programs

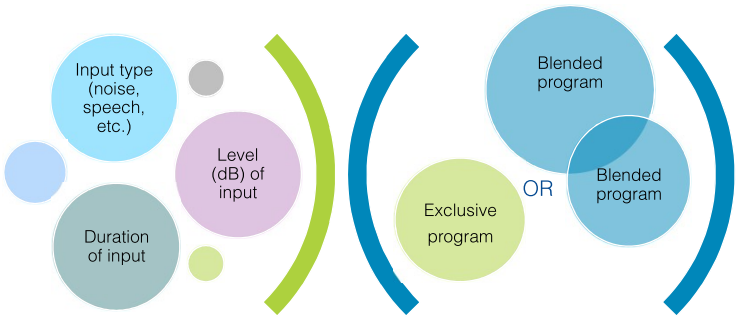
Non-exclusive programs that can be blended

What is the probability that the recipient is in a specific environment?



AutoSense OS

How does it work?



AutoSense OS analyzes the environment

Environment type (program) is selected

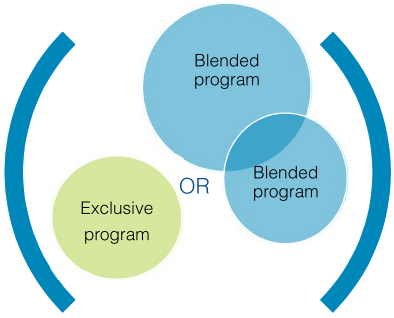
AutoSense OS

Transition speed

The transition speed setting in Target CI determines the time it takes to switch from one program or a different blend of programs in AutoSense OS.

Transition speed is dynamic and will change depending on the environment.

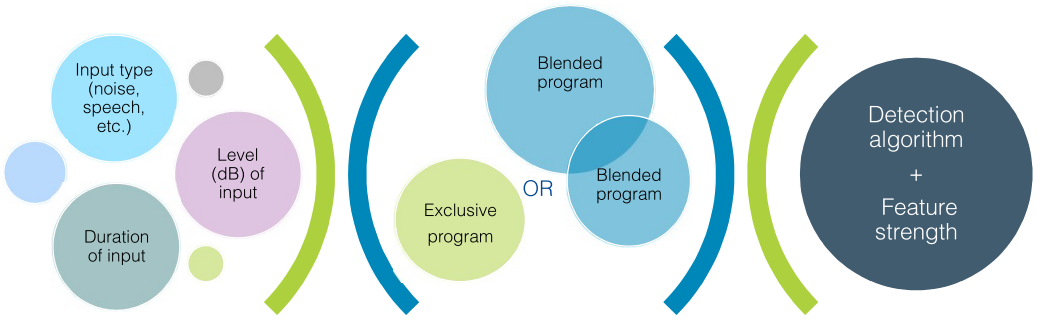




Environment type (program) is selected

AutoSense OS

How does it work?



AutoSense OS analyzes the environment

Environment type (program) is selected

Feature is applied

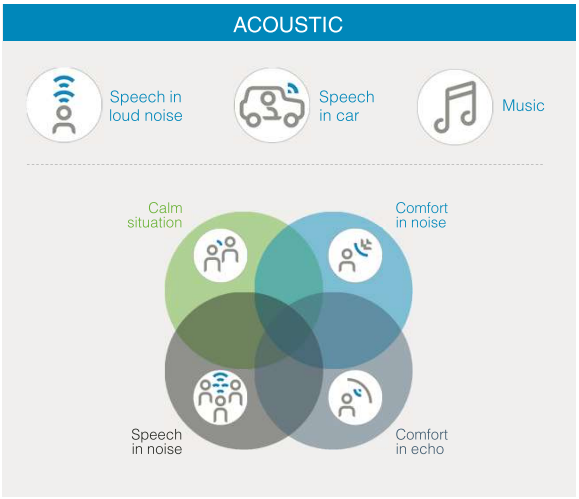
AutoSense OS

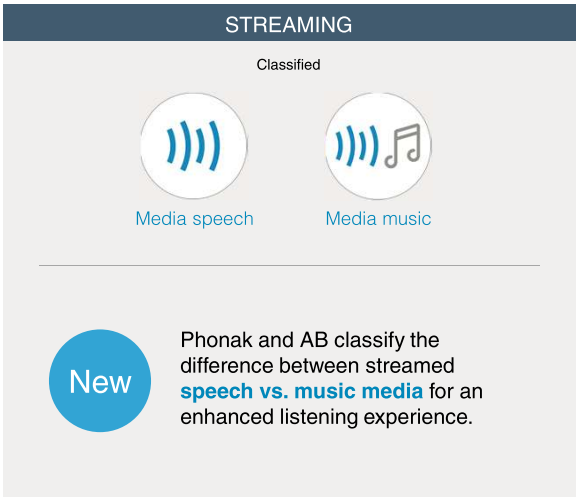
How does it work?



AutoSense OS

Streaming input

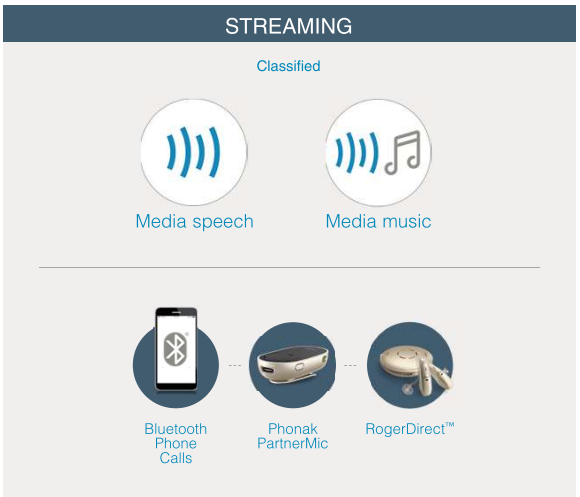


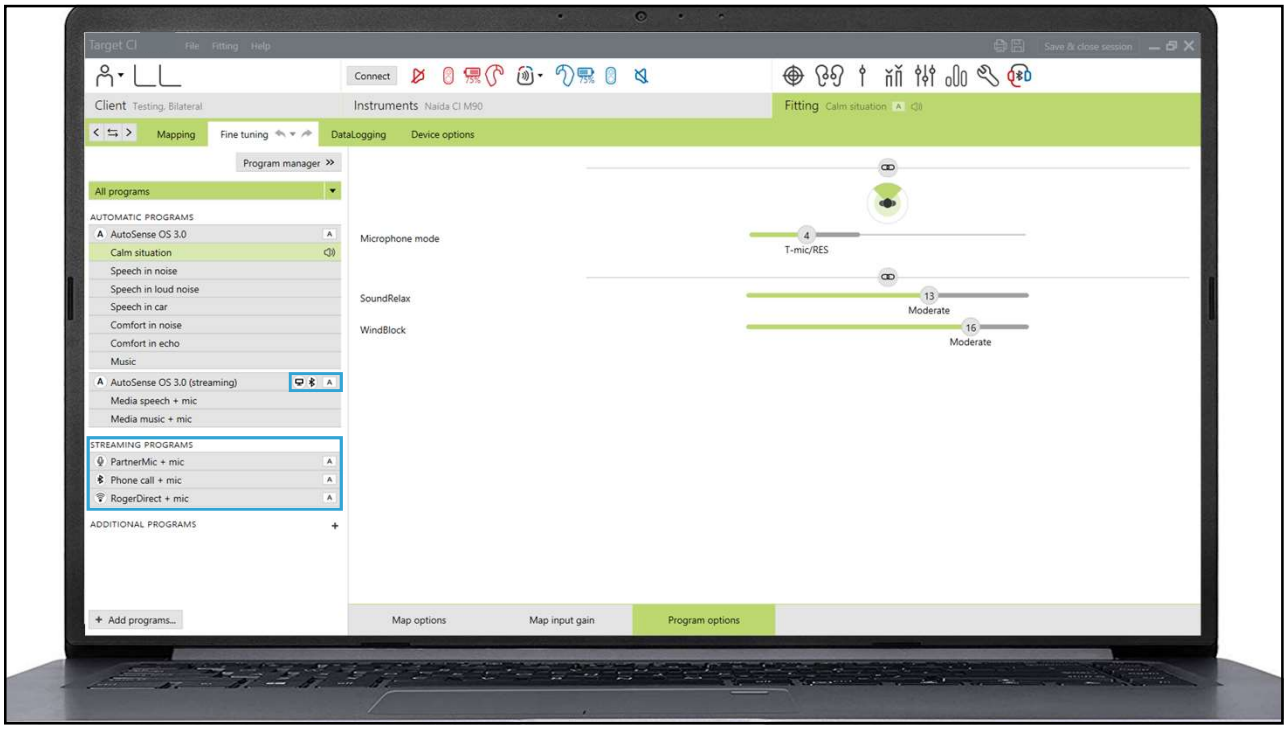


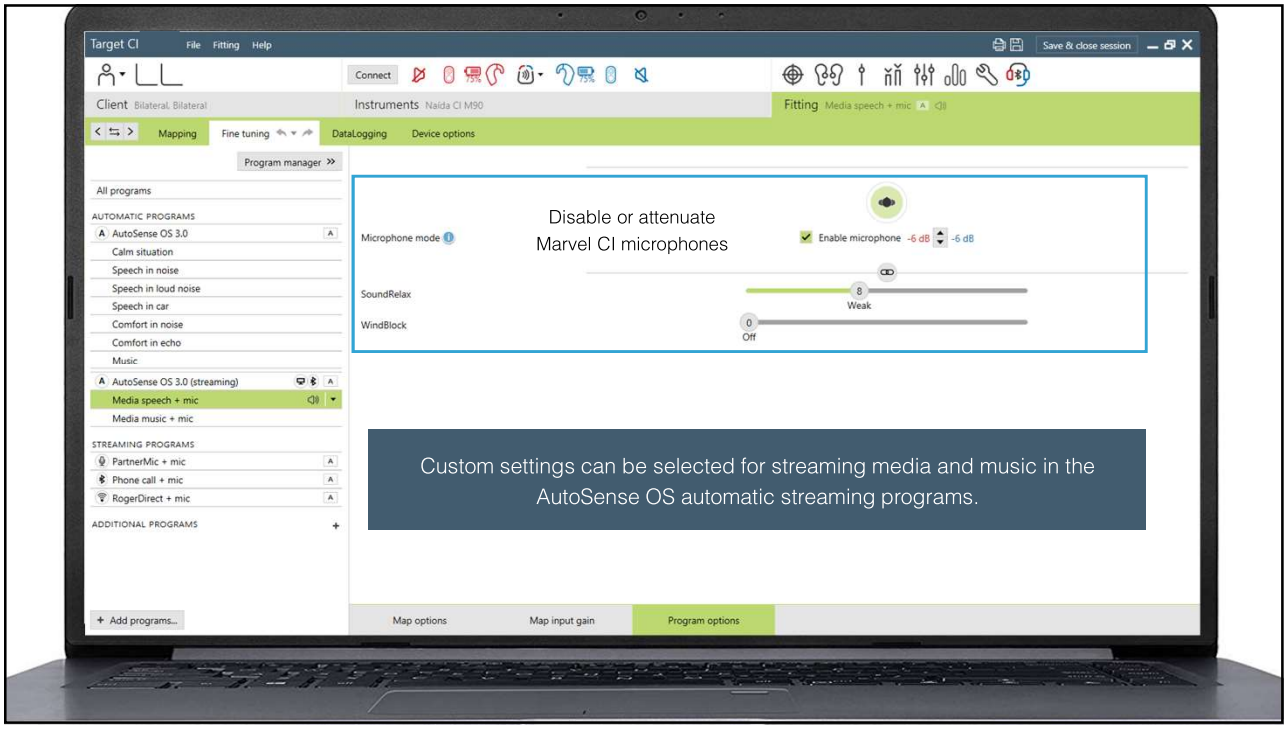
AutoSense OS

Streaming input

Additional streaming programs can automatically detect the presence of streamed input from Bluetooth phone calls, Phonak PartnerMic, or Roger microphones.




Target CI
File Fitting Help
Save & close session
Connect
Client Testing, Bilateral
Instruments Naida CI M90
Fitting Calm situation
Mapping
Fine tuning
DataLogging
Device options
Program manager
All programs
AUTOMATIC PROGRAMS
AutoSense OS 3.0
Calm situation
Speech in noise
Speech in loud noise
Speech in car
Comfort in noise
Comfort in echo
Music
AutoSense OS 3.0 (streaming)
Media speech + mic
Media music + mic
STREAMING PROGRAMS
PartnerMic + mic
Phone call + mic
RogerDirect + mic
ADDITIONAL PROGRAMS
Add programs...
Microphone mode
4
T-mic/RES
SoundRelax
13
Moderate
WindBlock
16
Moderate
Map options
Map input gain
Program options


Target CI
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RogerDirect + mic
ADDITIONAL PROGRAMS
Add programs...
Microphone mode
Disable or attenuate
Marvel CI microphones
Enable microphone -6 dB -6 dB
SoundRelax
8
Weak
WindBlock
0
Off
Map options
Map input gain
Program options
Custom settings can be selected for streaming media and music in the AutoSense OS automatic streaming programs.

AutoSense Sky OS 3.0

AutoSense Sky OS 3.0

World's First

Dedicated pediatric operating system

AutoSense Sky OS 3.0 is the world's first dedicated pediatric operating system for a cochlear implant sound processor[3].



AutoSense Sky OS 3.0

Comfort Features

Marvel CI Comfort Features

SoundRelax	WindBlock	EchoBlock
Automated comfort feature that attenuates sudden loud sounds to provide a more comfortable listening experience	Automated comfort feature that reduces wind noise and improves comfort when in the presence of wind	Improves comfort and ease of listening when in environments with echo or reverberation

Comfort Features

SoundRelax

SoundRelax is an automated comfort feature that attenuates sudden loud sounds to provide a more comfortable listening experience.

SoundRelax suppresses loud impulse noises, such as, slamming doors and clattering dishes and silverware.

With Marvel CI, SoundRelax parameters have been optimized, making SoundRelax even more effective.



SoundRelax

Comfort Features

WindBlock

WindBlock is an automated comfort feature that reduces wind noise and improves comfort when in the presence of wind.

For faster detection and analysis, WindBlock uses information from dual microphone ports.

- Compares low frequency input
- Uses closely spaced microphones

Unlike other systems, the instruments can remain in directional mode while still effectively managing wind noise.



WindBlock

Comfort Features

EchoBlock

Comfort feature that calculates reverberation and applies attenuation to the frequencies in which it is present

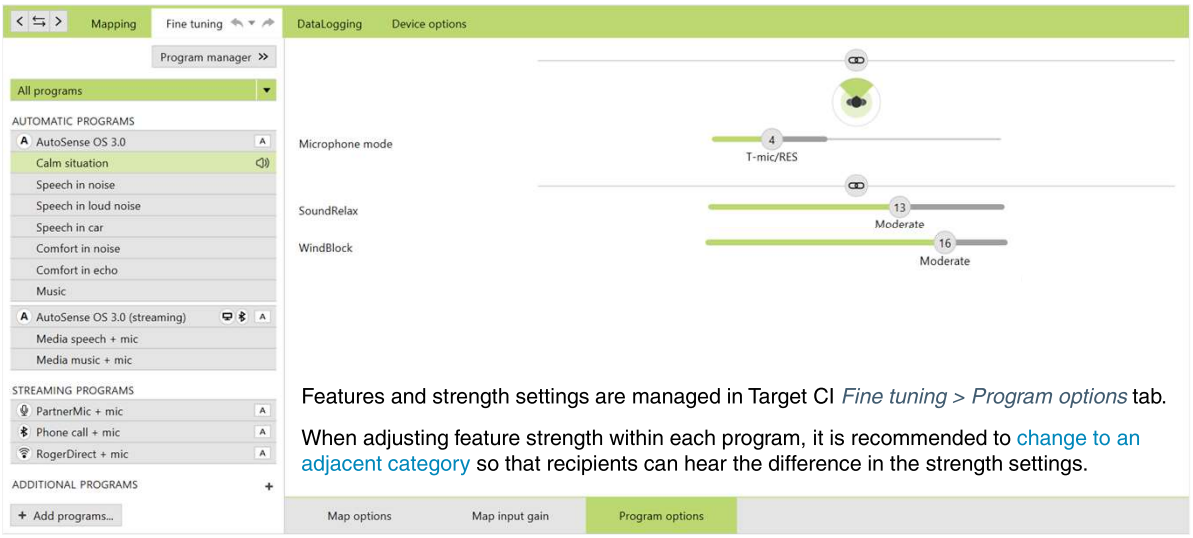
Improves comfort and ease of listening when in environments with echo or reverberation



EchoBlock

Target CI

Applied features



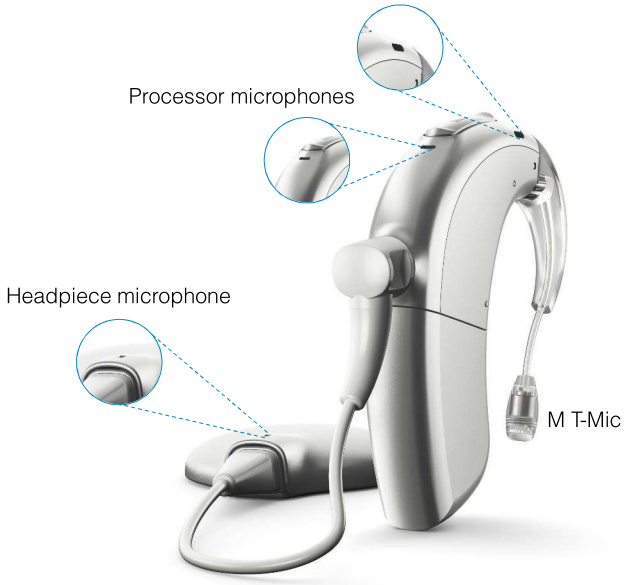
Features and strength settings are managed in Target CI *Fine tuning > Program options* tab.

When adjusting feature strength within each program, it is recommended to change to an adjacent category so that recipients can hear the difference in the strength settings.

Microphone Modes

Marvel CI

Microphones



Marvel CI Microphone Modes



Omnidirectional



T-Mic™/Real Ear Sound (RES)



Fixed Directional



UltraZoom + SNR Boost



Headpiece Mic



StereoZoom

Marvel CI Microphone Modes

Omnidirectional



Omnidirectional

Picks up sound from all directions with equal gain

Front processor microphone is utilized



Marvel CI Microphone Modes

T-Mic/RES



Omnidirectional

Picks up sound from all directions with equal gain

Front processor microphone is utilized



T-Mic™/Real Ear Sound (RES)

T-Mic: Omnidirectional microphone placed at the opening of the ear canal to take advantage of the pinna effects for improved speech understanding in quiet and in noise

Real Ear Sound: Directional microphone designed to simulate the pinna-related directional cues that are normally captured by the T-Mic



M T-Mic

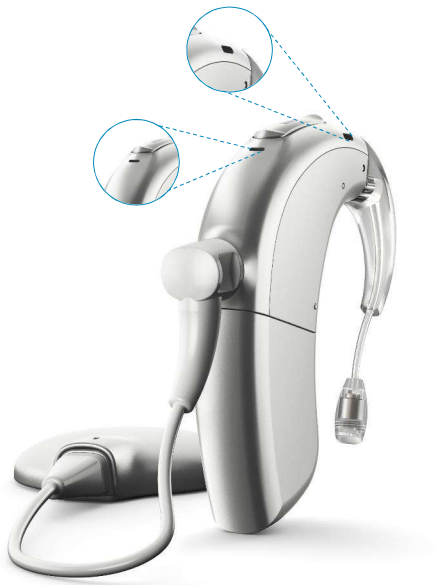
Real Ear Sound (RES)

Static beamformer designed to simulate the spatial cues that the M T-Mic offers:

- Omnidirectional response in the low frequencies
- Directional response in the high frequencies



Marvel CI Microphone Modes





Fixed Directional

Uses a fixed beamformer to improve hearing in noise

Utilizes the front and rear processor microphones for the beamformer

Beamformer null is always at 180 degrees, pointed toward the back

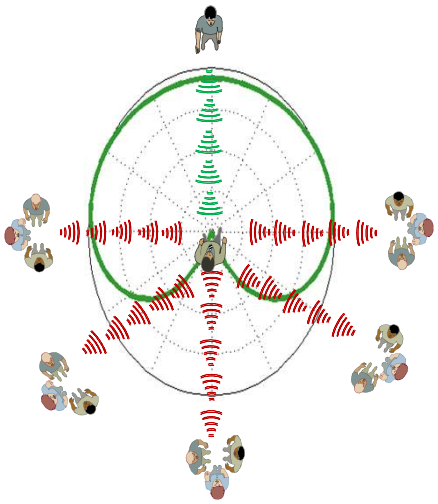
Available Microphone Modes



UltraZoom

Adaptive multi-channel dual-microphone that automatically focuses on sound from a speaker in front for improved speech understanding in noise.

UltraZoom



Available Microphone Modes



UltraZoom

Adaptive multi-channel dual-microphone that automatically focuses on sound from a speaker in front for improved speech understanding in noise.



UltraZoom + SNR Boost

UltraZoom combined with an additional adaptive Phonak algorithm to improve speech understanding in noise by providing further attenuation of sounds from the back.

SNR Boost

- Available when UltraZoom is active
- Uses beamformer to measure signal-to-noise ratio in each frequency band by comparing the sound level coming from the front (signal) against the sound level coming from the back (noise)
- Frequency bands that have a low signal-to-noise ratio are attenuated



Marvel CI Microphone Modes

StereoZoom



UltraZoom + SNR Boost

UltraZoom combined with an additional adaptive Phonak algorithm to improve speech understanding in noise by providing additional attenuation of sounds from the back



Headpiece Mic

Omnidirectional microphone that is used when wearing Marvel CI off the ear with the M Waterproof Battery or M Wearing Clip

Marvel CI Microphone Modes

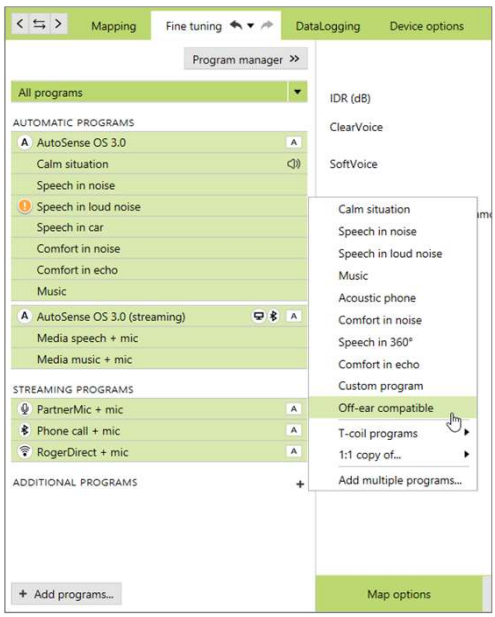
Headpiece Mic



Headpiece Mic

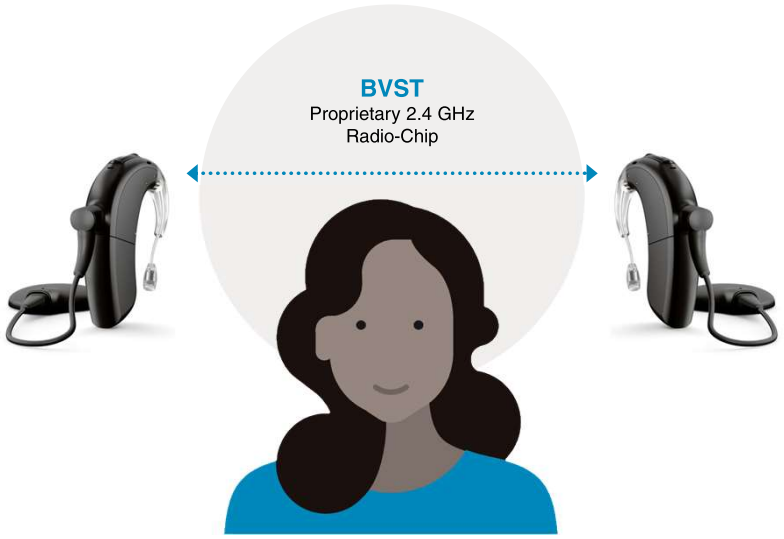
Omnidirectional microphone that is used when wearing Marvel CI off the ear with the M Waterproof Battery or M Wearing Clip

Manual Off-ear compatible program must be added by in Target CI by the recipient's programming clinician



Binaural VoiceStream Technology™ (BVST)

Marvel CI



BVST

StereoZoom



Designed to focus on one person in a noisy situation with less listening effort e.g. in a restaurant.

Available in the Speech in Loud Noise program

ZoomControl



Designed to focus on speech coming from the left, right, front or back of the listener e.g. in a car.

Available in the Speech in 360 program

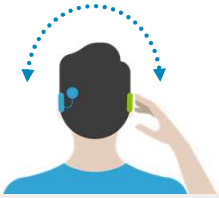
DuoPhone



Simultaneously stream phone calls to both devices.

Available in the Acoustic Phone program

QuickSync



Instantaneously changes programs and volume on both devices with one touch.

Automatically enabled and available in all programs

Available Microphone Modes

Binaural VoiceStream Technology



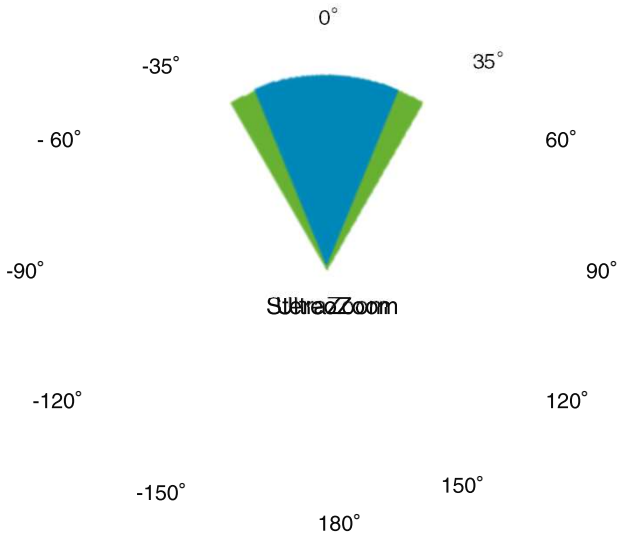
StereoZoom

Bilateral beamformer that uses four microphones to create a narrow focus for communicating in extreme noise.

- StereoZoom is adaptive in Marvel CI..
- StereoZoom is automatic when used with AutoSense OS.

StereoZoom

- Uses four microphones (two from each device)
  - Creates a narrow focus for communicating in extreme noise



Available Microphone Modes

Binaural VoiceStream Technology



StereoZoom

Bilateral beamformer that uses four microphones to create a narrow focus for communicating in extreme noise.

- StereoZoom is adaptive in Marvel CI.
- StereoZoom is automatic when used with AutoSense OS.



ZoomControl

Enables selection of the listening direction (front, back, left, or right) to improve communication in noisy environments

- ZoomControl is available in a manual Speech in 360 program (not part of AutoSense OS).
- ZoomControl can be programmed to be fixed or automatic.

Speech in 360°

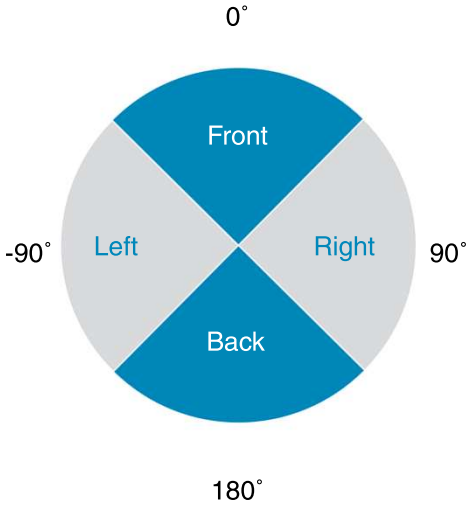
ZoomControl in the Marvel platform



Static beamformer that uses BVST

Four directional quadrants are defined

Allows for **manual** or **automatic** selection of the default direction



Speech in 360°

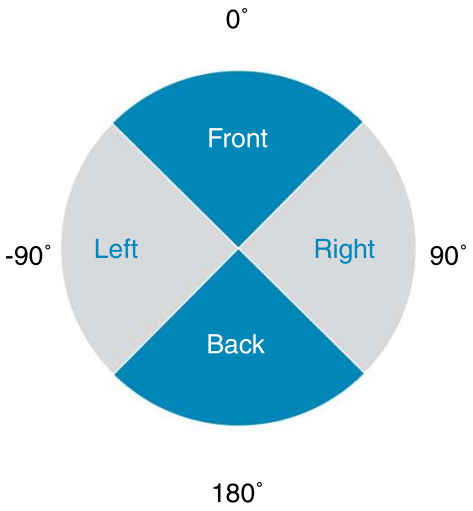
ZoomControl in the Marvel platform

Automatic

- Both devices work together to recognize the direction of focus and the main speech target (front, back, left or right)
- If no speech is detected, devices remain in Real Ear Sound (RES)

Manual

Devices are programmed to focus on one of the four listening directions (front, back, left or right)



Available Features

Binaural VoiceStream Technology

DuoPhone

Streams the signal in real time to the other device so the caller's voice is heard in both ears without the need for any additional accessories and is included in the Acoustic Phone program.

Available Features

Binaural VoiceStream Technology



DuoPhone

Streams the signal in real time to the other device so the caller's voice is heard in both ears without the need for any additional accessories and is included in the Acoustic Phone program.



QuickSync

Allows for easy, simultaneous adjustments to volume and program settings on two hearing instruments with the press of one button and is automatically enabled for bimodal or bilateral recipients.



DirectTouch

Allows recipients to select the desired direction for DuoPhone and/or ZoomControl by simply using the program button on the side on which the recipient wants to focus.

Marvel CI

Programs

Marvel CI includes programs that comprise AutoSense OS, dedicated streaming programs, and allows for manual programs to be added.

AutoSense OS

Acoustic	Acoustic	Streaming	Streaming	Manual
Calm situation	Speech in car	Media Speech	PartnerMic	Off-ear compatible
Speech in noise	Speech in loud noise	Media music	Phone call	Acoustic phone
Comfort in echo	Music		RogerDirect	Speech in 360°
Comfort in noise				

AutoSense OS Acoustic Programs

Summary



AutoSense OS Streaming Programs

Two streaming programs are included within AutoSense OS.

1. Media Speech
2. Media music

For these programs, AutoSense OS is actively analyzing the streamed signal and optimizing the sound for speech signals vs. music signals.

Standard Streaming Programs

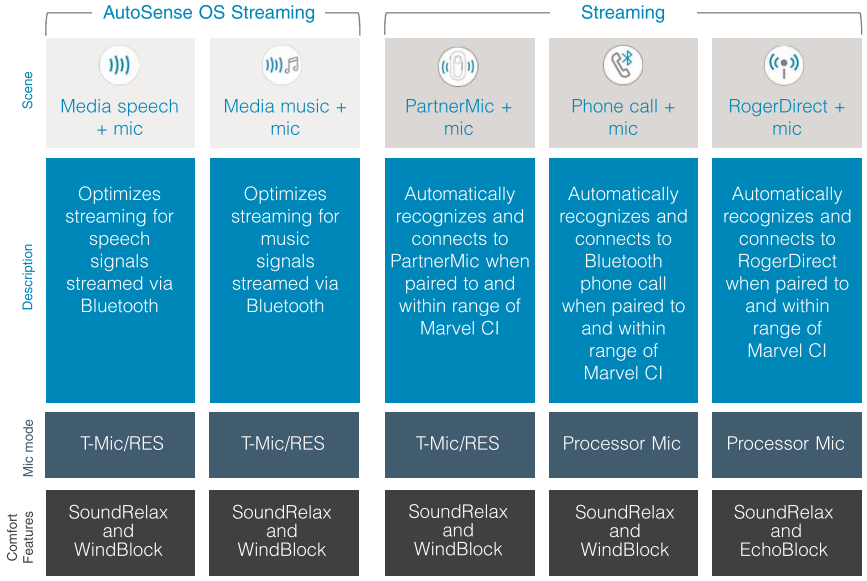
Three streaming programs are NOT included within AutoSense OS.

1. PartnerMic
2. Phone call
3. RogerDirect

For these streaming programs, Marvel CI automatically identifies the signal input and streams this signal for the recipient.

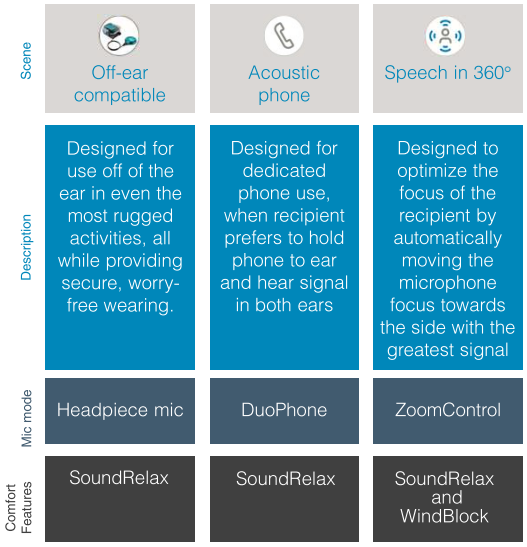
Streaming Programs

Summary



Manual Programs

Summary



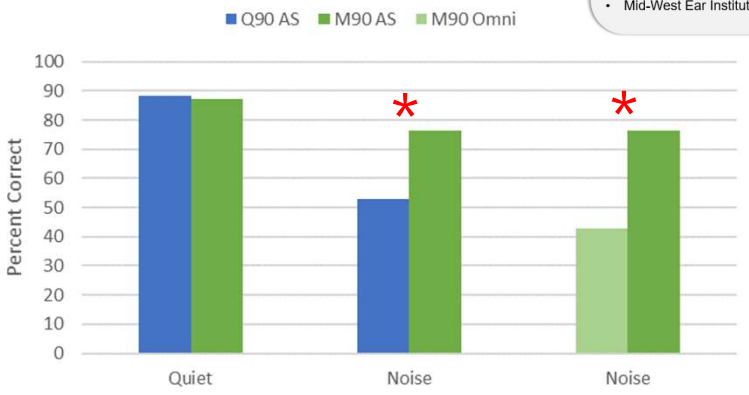
AutoSense OS Multi-Center Study

Multi-Center Study

Participating Centers
- Vanderbilt University
- Washington University
- University of Colorado
- Austin ENT
- Tampa Bay
- Mid-West Ear Institute

"I felt like my hearing with the new model was better. **Car noise was reduced, wind noise did not seem to be as much of a problem**. I was in several restaurant situations and felt **I could hear well**. I tried it in a small group setting and always had to use my Roger mic, **I tried it without Roger and was able to hear all of the conversations** – that was a really nice experience."





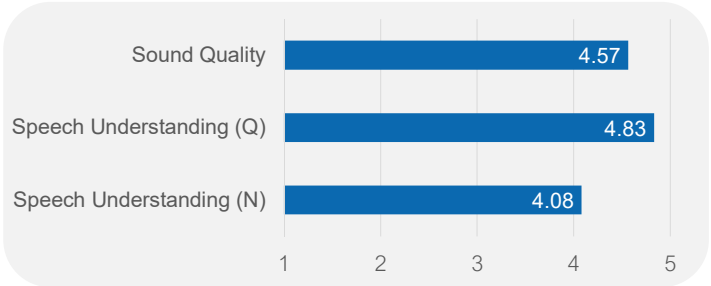
Data are shown from 10 subjects. Red symbols show significant differences.

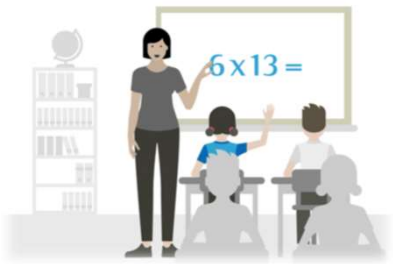
Advanced Bionics. Data on file.

AutoSense OS

International multi-center study

Participating Centers
- Shaba Hearing and Speech Clinic, Mumbai, India
- Dr. Manoj's ENT Super Specialty Institute & Research Center (MESIARC), Calicut, India





Rating scale key:

1= very poor, 2= poor, 3= moderate, 4=good, 5= very good

Advanced Bionics. Data on file.

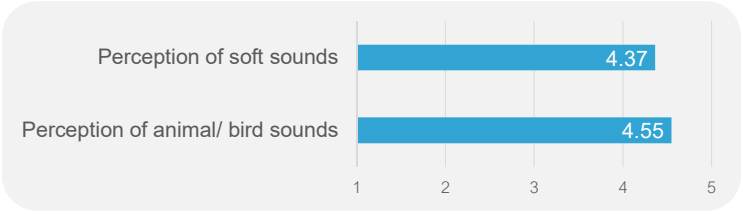
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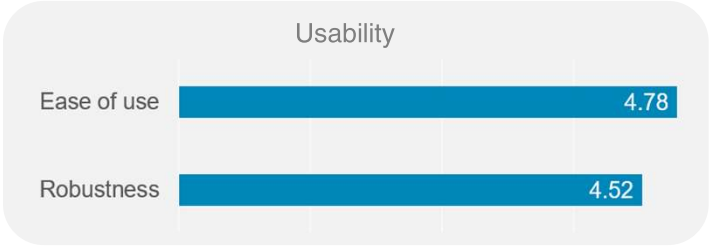
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AutoSense OS

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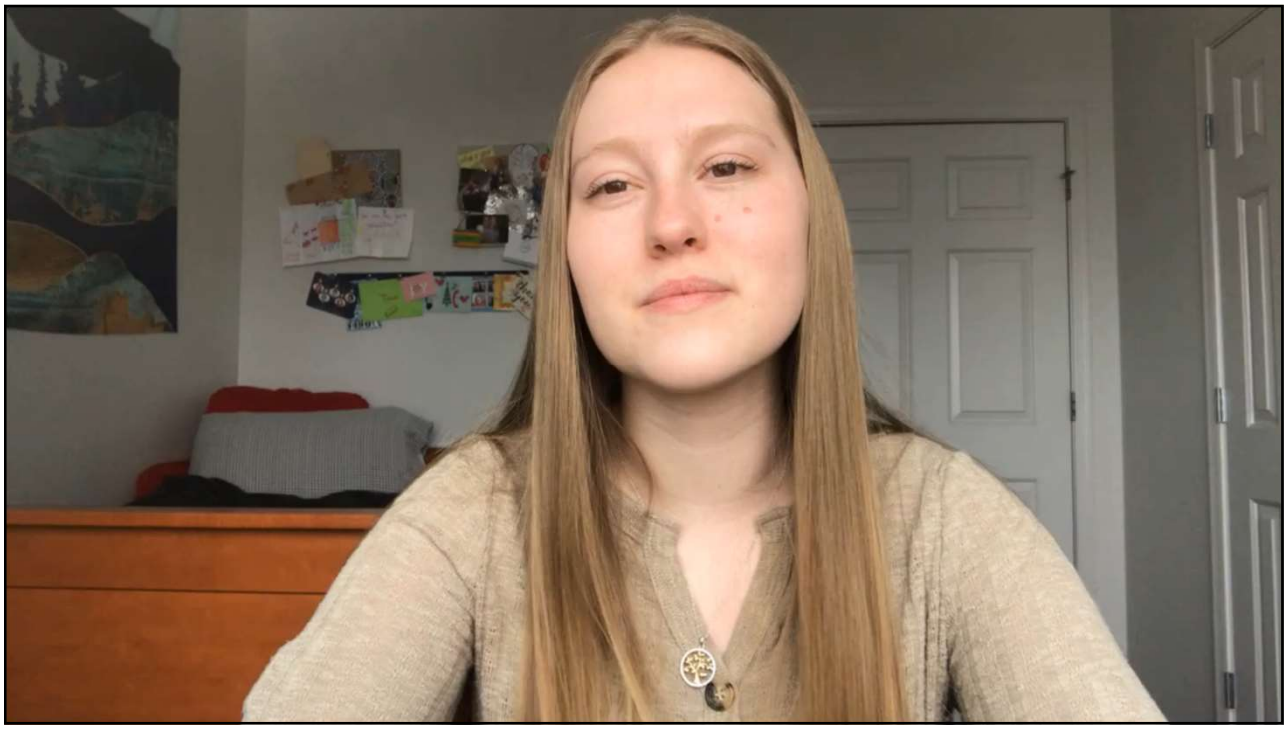


Rating scale key:

1= very poor, 2= poor, 3= moderate, 4=good, 5= very good



Advanced Bionics. Data on file.



Skill Practice

AutoSense OS

Most of my recipients have preferred manual programs with their previous devices.

I don't really trust AI or these automatic programs. Why should I recommend AutoSense?



Skill Practice

AutoSense OS

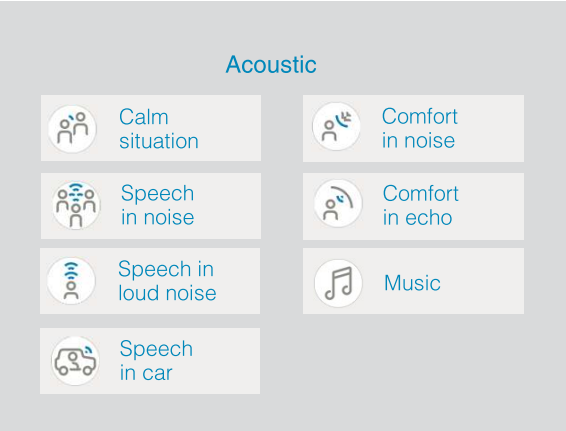
Is AutoSense OS just like Cochlear's SCAN?



Knowledge Check

There are seven acoustic programs available in AutoSense OS. How many programs are non-exclusive blending programs?

Answer: 4



Knowledge Check

Which programs below are exclusive programs?

A. Calm Situation
B. Music
C. Speech in noise
D. Speech in loud noise
E. Comfort in noise



References

1. Rodrigues, T. and Liebe, S. (2018). Phonak AutoSense OS™ 3.0. The new and enhanced automatic operating system. Phonak Insight, retrieved from www.phonakpro.com/evidence, accessed October 17, 2018.
2. Legarth, S., Latzel, M., & Rodrigues, T. (2018). Media streaming: The sound quality wearers prefer. Phonak Field Study News, retrieved from www.phonakpro.com/evidence, accessed October 16th, 2018.
3. Advanced Bionics (2016). Bimodal StereoZoom Feature: Enhancing Conversation in Extreme Noise for Unilateral AB Implant Recipients. White Paper.
4. Advanced Bionics (2015). Auto UltraZoom and StereoZoom Features: Unique Naída CI Q90 Solutions for Hearing in Challenging Listening Environments. White paper.
5. Feilner, M., Rich, S., & Jones, C. (2016). Automatic and directional for kids - Scientific background and implementation of pediatric optimized automatic functions. Phonak Insight, retrieved from www.phonakpro.com/evidence, accessed July 13th, 2017.
6. Advanced Bionics data on file. D000023832.

Disclaimer

This document is for review purposes only and is not intended to replace the HiRes® Surgeon's Manual for HiFocus® Helix and HiFocus® 1j Electrodes, 9055112-002, and the HiRes 90K® Surgical Video, CI-8167.

Advanced Bionics® does not endorse or recommend any procedures other than those stated in the HiRes 90K® Surgeon's Manual for HiFocus® Helix and HiFocus® 1j Electrodes, 9055112-002 and the HiRes 90K® Surgical Video, CI-8167.

ab- away from
abduct to draw away from the midline
ABI Auditory Brainstem Implant. Neurofibromastosis type II (NF2) is a condition that may result in bilateral acoustic neuromas. The tumors and their removal may cause profound bilateral deafness. Because the auditory nerve is compromised, patients with NF2 are unable to receive a cochlear implant to restore a sensation of hearing. Electrical stimulation of the auditory pathway can provide hearing in such people. This is possible be means of an auditory brainstem implant (ABI). An ABI system is designed to restore some hearing in people who become deaf when surgery to remove auditory nerve tumors damages the nerves.
ABR Auditory Brainstem Response. An objective measure (the patient does not have to "participate" in the testing). (1) Electrodes are placed on the scalp. (2) Tones are presented to the ear. (3) Person conducting the test looks for a neural response (electrical activity) from the brain. This method is used to test newborns for their responses to loud and soft sounds
abscess a localized area of pus contained within a cavity
ac- away from
access the ability to obtain needed medical care
acute with sudden onset and of short duration
acou-, acu- to hear
acoustic neuroma/tumor a benign tumor within the auditory canal arising from the eighth cranial (acoustic) nerve
acquired obtained after birth; not congenital
acr-, acro- extremity, peak
AD right ear
ad- toward
ADA Americans with Disabilities Act
adduct move toward the midline
aden- gland
adipose fatty, fat
aditus an entrance, opening
adrenalin a hormone secreted by the medule of the adrenal gland, also called epinephrine
aer- air
AEV Average Electrical Voltage (measuring the direct output of the ICS device)
afferent carrying toward, as toward the central nervous system
ag- to, toward
agenesis absence or abnormal development of a part such as an organ or tissue
alb- white
ALD Assistive Listening Device
ambi- both
ambulatory surgery center (ASC) any distinct entity that operates exclusively for the purpose of providing surgical services to patients not requiring hospitalization
amphi- on both sides; on all sides
amplitude magnitude; range of movement of a vibrating object
ampulla a flask like structure or dilation of a tube
ana-, an- up, back, again
"anaceph" aka "anceph" name of an antibiotic given (usually 1.0 gram) to patients following CI surgery
anatomic directions *superior—anterosuperior, posterosuperior; inferior—anteroinferior, posteroinferior*
anatomical position the body standing erect, facing the observer, with arms at the side and palms forward
andr- man
anesthesiologist a doctor who specializes in the care of patients prior to, during, and after surgery
anesthetist a nurse or technician trained to administer anesthetics
angi- vessel, blood vessel
ankl- crooked
anomaly a deviation from normal
anoxia oxygen deprivation
annular ring-shaped
annulus a ring, a ringlike figure, part, structure. The annulus is the ringlike frame around the tympanic membrane of the eardrum
anomalous abnormal
ante-, anter- front, before
anterior toward the front; away from the back
anti, ant- against, counter

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antrum a cavity or hollow space, specially in bone; ***mastoid antrum***, an air space in the mastoid portion of the temporal bone, communicating with the tympanic cavity and the mastoid cells, also called the *antrum tympanicum*, *tympanic antrum*, and *mastoid cavity*
A-P anterior posterior
aperiodic not periodic, irregular
apert- to open
apex summit or top
aphasia a collective term meaning the inability to express, recognize, or comprehend language or symbols
apic- extremity, top
aplasia failure of some tissue or organ to develop
apo- separated or derived from
apposition the fitting together
Aq. abbreviation for water
arch-, archi- beginning, origin
areola a minute space within tissue
areolar tissue a meshlike form of connective tissue
artery a vessel that carries blood away from the heart
arthr-, arthro- pertaining to joints
articulation 1. a joint or juncture of bones. 2. movement and placement of the articulators during speech production
artifact a structure or tissue that has been changed from its natural state by mechanical electrical, chemical, or other artificial means
AS left ear
as- to, toward
aspect a side or surface facing in a particular direction: *the ventral aspect of the body*
aspirate 1. to remove fluid from a body cavity with an aspirator. 2. to inhale fluid into the bronchi and lungs
at- to, toward
atmo- pertaining to steam or vapor
atmospheric pressure pressure of the atmosphere, which amounts to about fifteen pounds per square inch at sea level
atresia the congenital absence or poor development of a body opening (e.g., a heart valve); an abnormal condition in which a normal opening or tube in the body is closed or absent
articulate unite by means of a joint
atropic withered
attenuate to decrease the amplitude or energy of a signal; to decrease
attrition a wearing down or away by friction
AU both ears
audi- to hear
auditory closure Most hearing adults "hear" about 50% of what is said. They assume the rest of the information
auditory (ear) canal hollow tube through skull bone
auditory nerve sends information from the cochlea to the brain
aur- ear
auricle the part of the external ear that protrudes from the side of the head
authorization as it applies to managed care, authorization is the approval of care, such as hospitalization. Preauthorization may be required before admission takes place or before care is given
auto- 1. acting or directed from within. 2. self
autoimmune a condition where the body's immune system is unable to distinguish between foreign particles and the body's own cells and, as a result, attacks normal body tissue
autoimmune disorder a disease that results when the immune system attacks the body's own tissues, as in rheumatoid arthritis
autonomic self-controlling; functionally independent
autosomal pertaining to an autosome
autosome any ordinary paired chromosome alike in males and females, as distinguished from sex chromosomes
avascular not supplied with blood vessels, i.e., the *avascular* plane
axial projection
axis 1. an imaginary line passing through the center of the body. 2. the line about which a rotating body turns
axis cylinder the conducting core of a dendrite or axon
axon the efferent (usually) process of a neuron
BAHA Bone Anchored Hearing Aid
bar- pressure, weight
basi- foundation, base
basilar membrane the membrane in the cochlear duct that supports the organ of Corti
Basitracin a fluid with an antibiotic which is used to irrigate the wound
benign refers to a tumor that is non-cancerous; its cells do not proliferate, nor do they invade surrounding tissues
bi- two
bifid divided into two parts
bifurcate to divide into two branches
bilateral pertaining to both sides
blade a wide, flat structure
blast-, blasto- germ; pertaining to bud or budding; often used in embryology

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BOA (audiology) Behavioral Observation Audiometry. Used during the first few months of a baby's life, this behavioral testing consists of observing changes in an infant's behavior when sound is presented

bolus a rounded mass, usually of food

basilar artery migraine a common cause of vertigo, dizziness that occurs when the blood supply to the inner ear is reduced by a spasm of the artery leading to the ear

basilar membrane the membrane found at the base of the cochlea

benign paroxysmal positional vertigo the most common cause of dizziness, this problem is caused when small debris in the inner ear is dislodged and floats into the semicircular canal

bone the dense, hard supportive tissue that comprises most of the skeletal framework composed chiefly of calcium salts (calcium phosphate)

bone (structure & composition) Bone is composed of several layers of different materials. The outermost layer, the periosteum, is a thin, tough membrane of fibrous tissue. It gives support to tendons that secure the muscle to the bone and also serves as a protective sheath. This membrane encloses all bones completely except at the joints where there is a layer of cartilage. Beneath the periostium lie the dense, hard layers of bone tissue called compact bone. Its composition is fibrous rather than solid and it gives bone its resiliency. Encased within these layers is the tissue that makes up most of the volume of bone called cancellous or spongy bone because it contains little hollows like those of a sponge. Blood vessels course through every layer of bone, carrying nutritive elements, oxygen, and other products. Bone tissue also contains a large number of nerves.

bone, pneumatized bone which contains a substantial number of air cells

bone, sclerotic bone which has hardened due to a proliferation of connective tissue, usually originating in chronic inflammation (i.e., otitis media)

bone pate a combination of bone dust, blood, tissue, and water which has been suctioned as the surgeon drills the mastoid and bony beds. These materials are usually trapped in a cannister which is attached to the suction tube—*not recommended at for packing the facial recess or bone bed.*

bony spicule a small needlelike bony structure or part

BPB Battery Powered Bion

brain stem the part of the brain connecting cerebrum to the spinal cord; responsible for the control of vital functions, such as breathing and blood pressure

ca. (L. circa) approximately

calcify to harden by the deposits of calcium salts

canal a duct or passageway; a tubular structure

cannula a tube inserted into a bodily cavity to drain fluid or insert medication

carotid artery the vessel that lies behind the middle hear and ascends through the carotid foramen into the cranial cavity, supplying the brain with oxygenated blood

carrison aka Rongeur clipper. Used to cut ("clip") and remove bone when creating the bone bed

cartilage tissue that covers the ends of bones to protect and cushion joints from friction; also tissue of the external ear and nose

cartush a stimulating probe connected to the NIM which helps to identify the location of the facial nerve

CAT computerized axial tomography

cata- down; negative

catheter a tubular medical device for insertion into canals, vessels, passageways, or body cavities to permit injection or withdrawal of fluids or to keep a passage open

caudal toward the tail, away from the head

cav- hollow

cavity a hollow or space within or between structures

centi- hundred

cephalic pertaining to head

cera- wax

cerebrospinal fluid (CSF) a fluid that circulates through the ventricles and around the surface of the brain and spinal cord; it cushions it from the bony cavity encasing it, and filters and transports waste, hormones, and other substances from the brain to the venous blood

cerumen waxlike secretion in the external canal of the ear; earwax

cholesteatoma a tumor (like "skin") usually growing in the middle ear or mastoid and may develop as the result of otitis media. This condition has the potential to grow and eventually "plug" up the mechanics (of the ossicles [malleus, incus stapes])

chorda tympani nerve The chorda tympani nerve originates from the facial nerve. It carries taste sensation from the anterior two-thirds of the tongue and conveys signals to the salivary glands.

CID (audiology) Central Institute for the Deaf. A hearing test

CIM Ceramic (Coors) Injection Molding

-cide killing, destructive

cilia tiny, hairlike projections on cell surfaces that move in a wavelike manner

CIM Ceramic Injection Molding

CIS Continuous Interleaved Strategy

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closed set (audiology) a limited number of possible responses from which to choose (i.e., five picture cards, objects, etc.). For example, an audiologist will present a patient with five picture cards and ask the patient to "show me the shoes". See "open set".

CNC (audiology) Consonant/Nucleus/Consonant. 10 prerecorded lists of 50 frequently used monosyllabic words

co- together

cochlea a fluid-filled spiral resembling a snail shell with 2½ turns; consists of a hollow spiral passage in the temporal bone full of microscopic hairs that stimulate nerve cells in response to sound waves; the height of the cochlea is approximately 5mm.

cochlear aqueduct This structure contains perilymph and courses somewhat obliquely but essentially parallel and inferior to the Internal Auditory Canal (IAC) adjacent to the jugular foramen. There is a widely held belief that perilymph originates from and is a dialysate of cerebrospinal fluid (CSF) and is transmitted to the interior of the otic capsule via the cochlear aqueduct. In addition, the cochlear aqueduct is believed to function in the equilibration of inner ear and CSF pressure. The narrowness of the cochlear aqueduct likely serves as a buffer protecting the inner ear from the wide variations in CSF pressure. The lateral extremity of the cochlear aqueduct communicates with the scala tympani within the distal basilar turn of the cochlea adjacent to the round window. (*Imaging of the Termporal Bone,* 3rd Edition, p. 247).

cochlear microphonics minute quantities of electrical energy generated within the cochlea. The electrical energy has properties analogous to those of the acoustic stimulus

cochlear nerve the nerve through which impulses travel from the hair cells of the cochlea to the brain

coding the process of choosing codes which properly identify and define medical services and procedures and diagnoses

Cogan's Syndrome an autoimmune-related disease. Pathologically, cellular debris and new bone formation have been noted within the membranous labyrinth. (*Imaging of the Termporal Bone,* 3rd Edition, pp. 283-284)

collimation in radiology, the elimination of the peripheral (more divergent) portion of an x-ray beam by means of metal tubes, cones, or diaphragms interposed in the path of the beam

com- with, together

computed tomography (CT scan) a non-invasive procedure that takes cross-sectional images of the brain or other internal organs; to detect any abnormalities that may not show up on an ordinary x-ray

con- with, together

concave resembling the hollow inner surface of a part of a sphere; having a curved or depressed surface

concha a shell-like organ or structure

conductivity ability to transmit an electrical impulse

congenital present at birth but necessarily hereditary; describes something which was acquired while the individual was still developing in the uterus. For example, a congenital defect is a defect that is not found in the individual's genes but developed for some other reason while the individual was a fetus

contraindicate to advocate the inadvisability of:

coronal projection

contra-, counter- against, opposed

contralateral opposite side

convex resembling the rounded external surface of a part of a sphere

corona crown

coronal plane a vertical plane or cut, from side to side, dividing the structure into front and back halves

corpus, corp- body

cortex the outer layer of an organ

cortical bone bone in the area of the cortex (surface) area of the skull

COSM Combined Otolaryngological Spring Meetings

CPT (Current Procedural Terminology) a system from the AMA of procedure codes and descriptions

crani- skull

crest a ridge, especially a bony prominence

cribriform perforated like a sieve

crus leg or leg like part. *pl.* crura

CSF (CerebroSpinalFluid) the watery fluid that fills the spaces in and around the brain and spinal cord

CT scan *see* computed tomography; also called computerized axial Tomography (CAT); a scanning method that uses computerized x-ray images to provide a three-dimensional picture of an internal part of the body

CU Clinical Unit. Usually an arbitrary unit of measurement

-cule little

cupula, cupola a vault or dome located on a roof

curette a surgical instrument shaped like a scoop or spoon, used to remove dead tissue or growths from a bodily cavity

cusp a pointed eminence

cut- skin

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cutaneous membrane the skin; composed of epidermal and dermal layers

Cytomegalovirus (CMV) Disease viral infection or postnatal viral infection, usually transmitted in utero, that may cause hearing loss and other serious central nervous system disorders

DC Direct Current. Current flowing in one direction. May cause tissue and bone growth

de- down, from, negative

debulk (debulking of tunor) the surgical removal of as much of a tumor as possible, although the surgeon is unable to remove the whole thing

deci-, dec- ten

decibel (dB) a quantitative unite of relative sound intensity or sound pressure, based on the logarithmic relationship of amplitudes or pressures of two sounds, one of which serves as the reference

deep away from the surface; toward the center

demi- half

dendr- tree, branching

dendrites the receptive portion of a nerve cell; dendrites are found along the *lateral* wall of the scala tympani

dermis the deep layer of the skin; composed of dense, irregular connective tissue

dielectric a nonconductor of electricity

dielectric partitions nonconductive separations

digastric having two bellies

dilate to expand or enlarge

dilation enlargement

diphasic occurring in two phases

distal away from the body or from the medial axis

DME durable medical equipment

dorsal pertaining to the back

D.O. doctor of osteopathy (bones)

drillout in ear surgery, to drill straight into the basal turn of the cochlea using the round window (if it can be seen), measuring *1.5-2.0mm inferior to the oval window* (if the round window cannot be seen), or finding and following new bone growth (new bone tends to have a white color while mature bone can look yellowish) as far as the surgeon considers it safe to do so and hopefully to find an open upper segment within the cochlea

duct a tube through which body fluids pass

dura mater one of the meninges (membranes) that cover and protect the brain and spinal cord; the dura mater lines the inside of the skull

dura patch a 2cm cloth square which is threaded with a long string. Used to help close dura and sigmoid sinus tears.

dysostosis defective ossification

dysplasia/dysplastic abnormal development of tissues, organs, or cells

e- out from

ec- out of

EABR Electrical Auditory Brainstem Response

EAS Electric Acoustic Stimulation

-ectomy surgical removal of

edema an abnormal accumulation of fluid in body parts or tissues; swelling

ef- out of

efferent conduction from central region to periphery

effusion the seeping of fluid into a cavity

e.g.* (L. *exempli gratia) for example

elasticity the property of returning to initial form following deformation

elastic tissue connective tissue consisting of yellow elastic fibers

Electrical Field Imaging (EFI) ...

electrode the surface of contact between a metallic and nonmetallic conductor. A terminal or metal plate through which electrical energy is applies to or taken from the body

electroencephalography, EEG recording of electric currents generated in the brain

electromyography, EMG recording the electrical energy generated by active muscles

electrolyte a substance that breaks down into ions when in solution and is capable of conducting an electric current (i.e., saline, salt water, Tissusol, Ringers Lactate, NaCl [Sodium Chloride])

embryo in human development, this is from about two weeks after fertilization until the seventh or eight week of pregnancy

embryogenesis a process of differentiation which results in the formation of embro-like structures from undifferentiated cells

emesis vomiting

-emia blood

eminence projection or prominence, particularly on the surface of a bone

endolymph fluid within the labyrinth of the ear

endosteum a layer of cells lining the inner surface of bones

enlarged vestibular aqueduct see Vestibular Aqueduct Syndrome (VAS)

ENT ear, nose, throat

enzyme a catalytic substance, usually produced by glands, which has a specific effect of promoting chemical change

EOB (Explanation of Benefits) a form included with a check from the insurance carrier which explains the benefits that were paid and/or charges that were rejected

epidermis the most superficial, outer, nonvascular, nonsensitive layer of the skin

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epinephrine *see* adrenalin; a hormone that increases heart and respiratory rates, dilates the coronary blood vessels, increases alertness, and elevates metabolic rate

epithelium tissue that forms the protecting and/or secreting surfaces of the body

-esis action

etiology the causes of the disease or abnormal condition

et al. (L. et alii) and others

eustacian tube (a.k.a auditory tube) a tube connecting the middle ear to the throat (nasopharynx), this keeps air pressure inside the ear equal to the air pressure outside

ex- out, away from

excise to remove a part, foreign body, or organ by cutting

facial nerve The facial nerve enervates the muscles of the face (facial expression).

facial nerve sheath a thin layer of bone covering the facial nerve

facial recess A collection of air cells lying immediately lateral (to the side of) to the facial nerve at the external genu (bend). This recess may serve as a route to the middle ear

F.A.C.S. Fellow of the American College of Surgeons

fallopian canal the facial canal. The facial nerve passes through this canal in the temporal bone.

fascia a sheet of fibrous connective tissue that encases the body beneath the skin and separates muscle bundles from one another

FDA Food and Drug Administration

fenestra a window or small opening

fibrous capsule threadlike tissue which surrounds the implanted ICS receiver package

fibrous tissue Connective tissue containing bundles of white fibers and a fluid ground substance; found in tendons, ligaments, and such membranes as the dura mater

fibrosis development of excess fibrous connective tissue in an organ in response to previous tissue damage or disease; the growth of scar tissue p

autonomic self-controlling; functionally independent

FIS Fully Implantable System

fistula a small hole in the membrane of the inner ear resulting in fluid leakage into the middle ear (i.e., perilymph fistula), an abnormal duct or passage from an abscess, cavity, or hollow organ to the body surface or to another hollow organ

formant

foramen a hole or opening through a bone or in an organ

force an influence that produces or tends to produce a change in motion

fossa a depression in a bone

fossa incudis the bony area where the incus rests, also incus bridge

frontal, fronto- anterior position or pertaining to forehead

frontal (coronal) plane a longitudinal (lengthwise) plane that divides the body or an organ into anterior and posterior parts

FTS Fine Time Structure

gangli-, ganglio- knotlike

ganglion a group of nerve cell bodies located outside the central nervous system. Ganglion cells are found along the *medial* wall of the scala tympani

gelfoam an absorbable gelatin sponge

gene the biological unit of inheritance, which is transmitted by the chromosome

general anesthesia a type of anesthetic which involves the patient being kept in a state of carefully controlled consciousness , with a mixture of very potent drugs, so that the operation is painless. The patient is completely unconscious during the surgery using this method

-genesis formation

genetic inherited

geniculate, genu bent, like a knee

gestation the period of time from conception to birth; the length of pregnancy

gestational of or relating to gestation

neuro-otology that part of otology dealing especially with portions of the nervous system related to the ear

gland a cell, tissue, or organ that producers and discharges a substance used elsewhere in the body

glomus ball

granulation tissue tssue that appears in the early stages of wound healing; composed of different cell types and young blood vessels

gusher see *Perilymph Gusher*

hecto- one hundred

helix a coiled structure or part

Helon a viscous (having a relatively high resistance to flow) liquid used for cataract surgery which keeps the eye taut and raises the lens so that the cataract can be pulled out

hertz (Hz) a symbol to replace the term cycles per second (cps); after Heinrich Hertz, physicist

histology the branch of anatomy dealing with the microscopic structure of tissues

HL Hearing Loss

homeostasis a state of body equilibrium or stable internal environment of the body (where any bleeding has been controlled)

hook region an area just inside the cochleostomy to be avoided when inserting the spiral electrode array

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hydrocephalus a usually congenital condition in which an abnormal accumulation of fluid in the cerebral ventricles causes enlargement of the skull and compression of the brain

hydrops abnormal accumulation of serous fluid in the tissues or in a body cavity

hypo- under

hypoplasia incomplete or arrested development of a body or part

hypotympanic air cells = hypocochlear air cells air cells "under" the cochlea

IAC internal auditory canal

IAM internal auditory meatus

I&D incision and drainage

ibid. (L. ibidem) in the place cited

ICCE Independent Computer Controlled Electronics

idiopathic of unknown causation

i.e. (L. id est) that is

immune system complex network of specialized cells and organs that work together to defend the body against attacks by "foreign" invaders such as bacteria and viruses

impedance the apparent resistance of a mechanical or electrical system to the absorption of energy

impulse a stimulus carried by the nervous system

in-, im- 1. in, into. 2. not

incisive pertaining to cutting

incus middle bone in the ossicular chain of the middle ear; shaped somewhat like an anvil

Ineraid a multi-channel cochlear implant device developed ca. 1982. It had six electrodes and four channels

inferior (caudal) pertaining to a position near the tail end of the long axis of the body (towards the feet)

informed consent the right to have information explained to you so that you fully understand and agree to the proposed treatment and understand the potential risks

inherent natural to organism; intrinsic, innate

inhibit to arrest or restrain a process

inner ear a maze of bony chambers called the osseous, or bony, labyrinth, located deep within the temporal bone, and just behind the eye socket. The three subdivisions of the bony labyrinth are the cochlea, the vestibule (situated between the semicircular canals and the cochlea), and the semicircular canals

in situ in the natural or original position

intensity measure of energy flow per unit of area per unit of time

in vivo in a real-life situation

invasive describes a medical or surgical procedure which requires the skin to be cut open and/or objects to be inserted into the body

ion an electrically charged atom or group of atoms formed by the gain or loss of one or more orbital electrons

ipsi- self

ipsilateral situated on the same side of the body

-ism condition

iso- equal

isolated cochlea occurs when the 8th nerve does not connect to the cochlea. It is often seen when the internal auditory canal is narrow; it is difficult to know how accurate an MRI is in showing the lack of total connection vs. some fiber contact between the auditory branch of the eighth nerve and the cochlea itself; the ultimate way to manage this would be to do a promontory stim EARB assuming that the child has no response to sound bilaterally and assuming that there is no acoustic ABR.

ISP Implantable Speech Processor

-itis inflammation

IV intravenous

-ize to treat

Jacobson's Nerve 2-3mm away from the round window. Related to the salivary (glossal-pharyngal) nerve. See Glasscock, 4th Ed., pp. 596, 606

jitter slight cycle-to-cycle variations in vibratory period

jugular bulb part of the jugular vein which drains blood from the head and neck lies inferior (below) the middle ear

jugular veins the vessels that drain blood from the head and neck towards the heart

juxta- near, beside

K- potassium

keloid- a firm, raised, smooth overgrowth of scar tissue that develops after a wound to the skin. Patients who are prone to the growths may find that they appear after any kind of skin damage, including cuts, burns, acne, insect bites, tattoos, piercings for jewelry, and minor surgery. They are harmless, although large keloids may be unsightly.

kilo- thousand

labyrinth intricate maze of connecting pathways, as in the inner ear

labryrinthitis inflammation or infection of the internal ear including the semicircular canals, vestibule, and cochlea. Labyrinthitis occurs without warning and is accompanied by severe vertigo that lasts for days

lamina a thin layer or plate

lateral away from the midline of the body; away from

lateral sinus = sigmoid sinus a vein about the size of your thumb in the area of the mastoid. It drains blood coming from the brain to the heart. *The sigmoid sinus becomes the jugular vein*

lenticular pertaining to or shaped like a lens

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lesion a tissue injury or wound

ligament a cord of fibrous tissue that connects bones

LIM a Line Isolation Monitor is an urgent-sounding alarm that activates if power is lost for a critical piece of electrical equipment. The LIM alarm activates if it is necessary to switch over to emergency power during surgery

linea line

linea temporalis the temporal line

local (anesthesia) temporarily numbing a small area by injecting a local anesthetic into the skin so that minor procedures like stitching cuts can be done painlessly

loupe a small magnifying glass usually set in an eyepiece and used chiefly by watchmakers and jewelers

lumbar CSF drainage cerebrospinal fluid drainage in the part of the back and sides between the lowest ribs and the pelvis

lumen the space inside a tube, blood vessel, or hollow organ

lymph the watery fluid in the lymph vessels collected from the tissue spaces

-lysis disintegration

MAB Medical Advisory Board

magnetic resonance imaging (MRI) a tomographic technique producing cross sectional images of the brain and spine in multiple planes

malleus the largest auditory ossicle, which is shaped somewhat lake a hammer (L. hammer)

mastoiditis inflammation of part or all of the mastoid area

mastoid antrum an air space in the mastoid portion of the temporal bone, communicating with the tympanic cavity and the mastoid cells; also called *antrum tympanicum*, *tympanic antrum*, and *mastoid cavity*

maternal rubella German measles and three-day measles usually contracted by the mother during the first trimester of her pregnancy

maxilla the right or left upper jaw

measles an acute, contagious virus disease, usually occurring in childhood. Its symptoms include the eruption of red spots. It is usually self-immunizing. Also called "rubeola"

meatus a tube-like passageway or its opening through bone, a canal

meatus acusticus externus, external acoustic meatus the passage of the enternal ear leading to the tympanic membrane, called also the *external auditory meatus* or *external auditory canal*

medial toward the midline (middle) of the body

malignant to health; characterized by progressive and uncontrolled growth (especially of a tumor)

membrane a thin layer of tissue that binds structures, divides spaces or organs, and lines cavities. (L. thin skin)

membranous ampulla a part of a semicircular canal in the inner ear that regulates balance

membranous labyrinth the tubular structure housing the components of the inner ear (vestibule, semicircular canals, and cochlea)

meninges the three membraneous layers that cover and protect the brain and spinal cord

meningitis inflammation of the meninges of the brain or spinal cord

Meniere's Disease a severe form of vertigo caused by an increase in fluid pressure in the inner ear

Middle ear cavity air-filled cavity

modiolus the central pillar or columella (little column) of the cochlea

Mondini Deformity Mondini deformity (incomplete partition) constitutes 55% of all inner ear malformations. In a Mondini Deformity, the cochlea develops only 1 1/2 turns and lacks the interscalar septum and osseous spiral lamina. This results in a combination of the apical and middle turns of the cochlea and explains the term incomplete partition. Vestibule, semicircular canal, and endolymphatic duct/sac deformities occur in 20% of cases. By definition, basilar turn development is normal. These patients often have a large vestibular aqueduct as well as a large endolymphatic duct and sac. The development of the organ of Corti and auditory neural population is variable. Successful cochlear implantation has been performed in a number of these cases. As the basilar turn of the cochlea is typically present, high-frequency hearing often persists to a variable degree. (*Imaging of the Temporal Bone,* 3rd Edition, pp 252-253).

MRI magnetic resonance imaging; a non-invasive procedure that produces a two-dimensional view of an internal organ or structure, especially the brain and spinal cord

mucous membrane (mucosa) membrane that forms the linings of body cavities open to the exterior

mucosa the soft, pink skin-like layer that lines many of the body's cavities and tubes

mucus a sticky, thick fluid, secreted by mucous glands and mucous membranes, that keeps the free surface of membranes moist

mumps an acute, inflammatory, contagious disease of the salivary glands, especially the parotids (salivary glands located below and in front of each ear), and, sometimes, of the pancreas, ovaries, or testes. It is caused by a virus

muscle fiber long, cylindrical, multinucleated cells with striations that make up a muscle

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mylinated ("mylinated/mylenated neurons")
NaCl- .9% Sodium Chloride = Saline
NAD National Association for the Deaf
neck constricted portion of a structure that serves to join its parts
necrosis the death or disintegration of a cell or tissues caused by disease or injury; a condition which can lead to gangrene
nerve bundle of neuron processes (axons) outside the central nervous system
neural ...
Neural Response Imaging (NRI) ...
neuroma any tumor derived from cells of the nervous system; a tumor developed on, or connected with, a nerve, especially one consisting of new-formed nerve fibers
neuro-otology that part of otology dealing especially with portions of the nervous system related to the ear
neuro-otologist a physician who specializes in neuro-otology
neurons cells of the nervous system specialized to transmit messages throughout the body; nerves
non-invasive relating to a technique that does not involve puncturing the skin or entering a body cavity
normal hearing 20 dB (decibels) to 120 dB
NPO Latin *non-per-os,* nothing by mouth
Nucleus 22 First FDA-approved multi-channel system (1985 adults, 1990 children). 22 electrodes. Uses various developments in speech coding strategy
O Right Ear
OAE (audiology) Oto-Acoustic Emissons Test. An objective measure (the patient does not have to "participate" in the testing). The hair cells of the cochlea move in response to electrical stimulation. This hair cell movement generates a sound which can be measured
obliteration to remove completely
occipital relating to the area toward the back of the head and occipital bone
occlusion closure or obstruction
-oid likeness, resemblance
-oma tumor
-opathy disease of
open set (audiology) a patient will be presented with a series of verbal cues (i.e., spoken words) and *no visual cues*. Talking on the telephone is an example of open set. See "closed set"
orbit the bony cavity containing the eye
origin attachment of a muscle that remains relatively fixed during muscular contraction
organ of Corti organ lying against the basilar membrane in the cochlear duct which contains receptors (hair cells) that receive vibrations and generate nerve impulses for hearing
origin the proximal attachment of a muscle, which is its most stationary point
osseous bony, composed of bone
osseous spiral lamina the bony lumen of the cochlea. Bony shelf in the cochlea projecting out from the modiolus onto which the inner margin of the membranous labyrinth attaches and through which the nerve fibers of the hair cells course
ossification the formation of bone; besides the natural ossification of growing tissue, there is the so-called accidental ossification which sometimes follows certain abnormal conditions,such as the ossification of an artery or of a cochlea; the development and mineralization of developing bone
-osis disease, condition of
ossicles, ossicular chain the three tiny bones which strengthen and transmit sound waves to the inner ear; the three bones of the middle ear: hammer (malleus), anvil (incus), and stirrup (stapes)
ossify to convert or harden into bone.patient
osteon a system of interconnecting canals in the microscopic structure of adult compact bone; unit of bone
osteogenesis the formation or growth of bone
-ostomy to form an opening or outlet
otic pertaining to the ear
otic capsule osseous portion of the cochlea containing the membranous labyrinth
otogenic originating within the ear
otitis an inflammation of the ear
otitis media *middle-ear infection*. Inflammation of the middle ear is a fairly common result of a sore throat, especially in children, whose auditory (Eustacian) tubes run more horizontally. In otitis media, the eardrum bulges and often becomes inflamed. When large amounts of fluid or pus accumulate in the cavity, an emergency myringotomy (lancing of the eardrum) may be required to relieve the pressure.
oto- ear
otologist a physician who specializes in otology
otology that branch of medicine which deals with the medical treatment and surgery of the ear, and its anatomy, physiology, and pathology
oval window membrane that covers the opening between the middle ear and inner ear. Pass on vibrations to fluid in the inner ear
-otomy to incise (cut into)

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otosclerosis abnormal growth of bone in the inner ear, which prevents structures within the ear from working properly, resulting in a gradual loss of hearing; a hereditary disorder in which ossification of the labyrinth of the inner ear causes tinnitis and eventual deafness

PACU Post Anesthesia Care Unit

palpate to examine with the hand, to feel

palpation examination by touch

Palva flap the periostial layer, also known as the periostium—a layer of tissue close to the skull

para- beside

paralysis the loss of muscle function

parasympathetic

paresis slight or partial paralysis

parietal pertaining to the walls of a cavity

parotid located near the ear

pars a part or portion of an area or structure

patency the openness (lack of obstruction) of a bodily passage or duct

patent open

pathogen disease-causing microorganism (e.g., some bacteria, fungi, viruses)

pathogenesis the development of a disease

pedicel (pedicle) a small stalk, part, or organ, especially one serving as a support; a process or projection that resembles a foot

P/E Tubes See ***tubes***

perforated ear drum "perf" an eardrum which has been pierced with one or several holes

peri- around

perilymph fluid that fills the bony labyrinth of the ear

perilymphatic pertaining to, or containing, perilymph

perilymph fistula abnormal drainage of perilymph (through a duct) from the cochlea

perilymph gusher

perioperative medicine the term used to describe the period before, during, and shortly after a patient's operation

periosteal pertaining to the periosteum

periosteum a tough fibrous connective tissue that covers the surface of bones; it is rich in sensory nerves and is responsible for healing fractures; the fibrous membrane covering the surfaces of bone; a specialized connective tissue covering cell bones of the body and possessing bone-forming potentialities; in adults, it consists of two layers that are not sharply defined, the external layer being a network of dense connective tissue containing blood vessels, and the deep layer composed of more loosely arranged collagenous bundles with the spindle-shaped connective tissue cells and a network of thin elastic fibers

PET scan *see* positron emission tomography

petrous resembling stone, rock; hard

PHp Platinum Headpiece

pia tender, soft

pinna (ear flap) a cartilage flap on the outside of the head that gathers in sounds

-plegia paralysis

pneumatized bone normal bone with an abundance of small air cells. Shows up on an MRI as pure white

pons bridge of tissue connecting two organs

positron emission tomography (PET scan) uses principles and radionuclide scanning and computed tomography to study cerebral structure and function

post after or behind

postauricular behind the ear

posterior located behind a part; towards the rear; in the back part of a structure

posterior tympanotomy also known as the facial recess approach

postlingual deafness deafness acquired after the development of speech

prednisone drug used in cases of facial paralysis—administered orally

prelingual deafness deafness acquired before the development of speech

presbycusis hair cell loss

p.r.n. as needed

pro- before, in front of

process 1. a prominence or projection, as of a bone. 2. a course of action

promontory a projecting eminence or process

prone lying face down

prophylactic an agent that wards off disease

prophylaxis precautions taken to prevent a disease; preventive treatment

protocol the plan for a medical or scientific experiment

proximal nearest; closer to the body or any point of reference. Opposite of distal

PSP Platinum Speech Processor

pt patient

PTA see Pure Tone Average

Pure Tone Average (PTA) The average threshold levels (in decibels) measured at 500, 1000, and 2000 Hz. The implant may be an option for patients with severe (71-89dB) and profound (90+dB) hearing loss, with each category representing decreasing auditory sensitivity.

pus the fluid product of inflammation composed of white blood cells, the debris of dead cells, and a thin fluid

radiogram a photographic image produced on a radiosensitive surface by radiation other than visible light (especially by x-rays or gamma rays)

receptor a peripheral nerve ending specialized for response to particular types of stimuli

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recess a small space or empty cavity

recessive in genetics, incapable of expression unless the responsible allele (alternative form of a gene that can occupy a particular chromosomal locus) is carried by both members of a pair of homologous (corresponding) chromosomes

reflex an involuntary, relatively invariable adaptive response to a stimulus

retinitis pigmentosa *any one of a large group of inherited disorders in which abnormalities of the photoreceptors (the rods and cones) in the retina lead to progressive visual loss. People with retinitis pigmentosa (RP) first experience defective dark adaptation ("night blindness"), then constriction of the visual field ("tunnel vision") and eventually loss of central vision. RP may be inherited in a number of different ways: as an autosomal dominant, autosomal recessive, or X-linked recessive trait or as a mitochondrial disorder. More than 30 different genes are known to cause RP. RP can occur alone or be part of a syndrome involving abnormalities outside the retina. For example, Usher syndrome (of RP and deafness) is a relatively common form of syndromic RP.*

rhin- nose

ridge an elevation or crest

Rongeur clipper aka carrison. Used to cut ("clip") and remove bone when creating the bone bed

rotate to turn about an axis

round window works in conjunction with the oval window

saccule smaller of two sacks within the membranous labyrinth of the vestibule in the inner ear (sacculus = small bag)

sagittal plane a longitudinal (lengthwise) plane that divides the body or any of its parts into right and left portions

saline salty, containing sodium chloride

saucerize to create a rounded, smooth excavation of a bony area

sclerotic bone hard, dense bone formed from the ossification of scar tissue. This type of bone may show up on an MRI is grayish—not pure white

-scopy to examine visually

scala a staircase structure; any of the three spirally arranged canals into which the bony canal of the cochlea is partitioned by the vestibular and basilar membranes and which comprise the scala media, scala tympani, and scala vestibula

scala media the spirally arranged canal in the bony canal of the cochlea that contains the organ of Corti, is triangular in cross section, and is bounded by the vestibular membrane above, by the periosteum-lined wall of the cochlea laterally, and by the basilar membrane below (a.k.a., the cochlear canal or cochlear duct)

scala tympani the lymph-filled spirally arranged canal in the bony canal of the cochlea that is separated from the scala media by the basilar membrane, communicates at its upper end with the scale vestibula, and abuts at its lower end upon the membrane that separates the round window from the middle ear

scala vestibula the lymph-filled spirally arranged canal in the canal of the cochlea that leads to the vestibule of the ear—an oval cavity in the middle of the bony labyrinth, communicating anteriorly with the cochlea and posteriorly with the semicircular canals

schwannoma a tumor of the peripheral nervous system that begins in the nerve sheath (protective covering). It is almost always benign, but rare malignant schwannomas have been reported

SCS Spinal Cord Stimulation

semicircular canals inner ear structures responsible for regulating balance; three canals within the inner ear that contain specialized receptor cells that monitor the position of the head as well as rotational movement

sensory nerve nerves through which impulses travel toward the central nervous system

sentinal cell a dark area encountered when drilling the facial recess which, as the bone is removed, reveals a passage into the middle ear

septum a partition separating two cavities

seroma bleeding

serrated notched on the edge, like a saw

sheath a tubular structure of connective tissue covering vessels, muscles, nerves, etc

short circuit an accidentally established low-resistance (the opposition to electric current characteristic of a medium, substance, or circute element) connection between two points in an electric circuit. Also called a "short"

shunt to turn or divert to another course

sigmoid shaped like the letter S

sigmoid sinus ***= lateral sinus*** a vein about the size of your thumb in the area of the mastoid. It drains blood coming from the brain to the heart. The sigmoid sinus becomes the jugular vein

sinodural angle the angle created in the mastoid cavity by the intersection of the dura (roof of the mastoid) and the sinus

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sinus one of several special air cavities within the skull that help make the skull lighter and warm incoming air (L. fold. curve)

skeletonize to expose the bony framework of a structure

SNR (audiology) Signal-to-Noise Ratio

soft surgery a surgical technique which emphasizes a minimally invasive a procedure in an effort to preserve the cochlear structures as well as any residual hearing

solution a homogenous mixture of two or more components

soft tissue **aka** ***periauricular soft tissue***

spiral ganglion a mass of bipolar cell bodies occurring in the *modiolus of the organ of Corti* and giving off axons which comprise the cochlear nerve

spiral lamina a twisting shelf of bone which projects from the modiolus into the canal of the cochlea as it coils around the modiolus and to which the inner margin of the basilar membrane is attached

spiral ligament the thick periosteum that forms on the outer wall of the scala media and that gives attachment to the outer edge of the basilar membrane

squama a thin plate of bone

squamous (1) platelike or scaly; (2) pertaining to flat, thin cells that form the free surface of some epithelial tissues

SSEP Steady State Evoked Potentials, used to decide ear implantation—especially in younger children

stapes the innermost ossicle of the middle ear, shaped somewhat like a stirrup (L. stirrup)

stasis (1) a decrease or stoppage of flow; (2) a state of noncharge

steno- narrowing, constriction

stenosis abnormal narrowing of a bodily canal or passageway

Stenvers (radiologic) position Some surgeons request an x-ray of CI candidates using the Stenvers position. (STENVER Oblique [slanted at an angle] view of the petrous temporal region. Ref: K. Clark, Positioning in Radiography, 11th Ed.) The Stenvers position gives a good picture of the cochlea and semicircular canals—when looking from behind the patient. In the Stenvers position, the patient is seated facing the x-ray film cassette. To x-ray the left temporal bone, the x-ray beam is pointed, on the left side, in back of the patient's head, (P-A Posterior to Anterior), toward the canthus (the angular junction of the eyelids at the corner of the left eye). Using this projection, a number of landmarks can be identified including the: tympanic cavity, mastoid cells, superior semicircular canal, horizontal semicircular canal, cochlea, and internal auditory canal. (Glasscock, 3rd Ed.)

stent a slender rod- or threadlike device used to support and/or maintain patency within a tubular structure. (Dorland's)

stimulus anything that produces functional or trophic reaction in a receptor or in an irritable tissue

stocastic random

-stomy to form an opening

stratum a layer

subcutaneous beneath the skin

sulcus a furrow or groove, especially on the surface of the brain

surgical approach

Surgicel absorbable gauze

superficial (external) located close to or on the body surface

superior refers to the head or upper body regions

supine lying on the back, face upward

suprameatal situated superior to a meatus, passage, canal

suture 1. the point or line of junction of two structures or parts in an immovable articulation. 2. the joining of the edges of a wound or incision by stitching

sympathetic

synapse the region of communication between neurons

syndrome a group of symptoms or characteristics that, taken together, identify a certain disease or disorder; syndromes may be dominant (one or both parents show signs of the syndrome) or recessive (neither parent shows signs, but one or both may be carriers), or may appear spontaneously

tectulum a little "roof" of bone, a bony overhang

tegmen a cover or roof

tegmen tympani a thin plate of bone which forms the roof or wall of the or middle ear. It separates the middle ear from the dura on the floor of the middle cranial fossa. The tegmen tympani also covers the mastoid antrum and separates it from the middle cranial fossa

temporal bone a compound bone of the side of the skull that has four principal parts including the squamous, petrous (the hard and dense bone that contains the internal auditory organs), and tympanic portions and the mastoid process

temporal/temporalis fascia a strong fibrous tissue sheet covering the temporal muscle; it has deep and superficial parts which attach inferiorly to the zygomatic arch

temporal fossa a broad fossa (an anatomical pit, groove, or depression) on the side of the skull behind the orbit (eye socket) by the zygomatic bone

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temporalis a large muscle in the temporal fossa that serves to raise the lower jaw (for chewing)

temporal line either of two nearly parallel ridges or lines on each side of the skull that begin as a single ridge on the temporal bone, run upward and backward from the zygomatic process above the temporal fossa, divide into upper and lower lines, and continue on the parietal bone. (The line is roughly in the area posterior to where eyeglasses would be worn.) (Frankfort line)

Tesla a unit used to measure the strength of the magnetic field produced by an MRI system (i.e., 1 Tesla = 10,000 gauss; 1.5 Tesla = 15,000 gauss)

threshold stimulus the weakest stimulus capable of producing a response in an irritable tissue

tests of inner ear function: 1) audiometery (hearing test), 2) Sinusoidal and Vestibular Autoratation Test (VAT), 3) Electronystagmography (ENG), 4) Posturography, 5) Electrococleargram, 6) Harmonic Accelleration, 7) Otoacoustic Emissions, 8) Auditory Brain Stem Response (ABR)

tinnitus a jingling; ringing or buzzing in the ear

tissue a colony of cells similar in structure and function;; primary tissue types are epithelial, connective, muscle, and nervous tissues

titer (see ***titration***) the highest dilution of a material that produces a reaction in an immunologic test system

titration The process of estimating the quantity of a substance in solution by adding to it a measured amount of standard test solution until a reaction of known proportion is reached (shown by a color change in a suitable indicator, the development of turbidity, or the change in electrical state) from this the unknown concentration of the substance is calculated

tomography obtaining pictures of the interior of the body; it is a method of diagnostic imaging to produce cross-sectional images of the body

-tomy incision into

trabecula a strand of connective tissue resembling a little beam or crossbar

trabeculated bone bone with connective/fibrous tissue; pneumatized (with air cells, normal) bone

tract 1. a bundle of nerve fibers having a common origin, function, and termination. 2. a series, group, or system of organs or parts having a common function

traebeculate bone with abundant air cells

tragus a small eminence in front of the external opening of the ear

Transcanal Approach ("Attical Approach") The transcanal approach was listed as an option on the surgical report during CLARION's early clinical trials. It depends on how well the surgeon can protect the electrode lead from causing skin irritation within the ear canal. The transcanal typically started from the recessed bed. At this point, imagine the surgeon lifting the skin-flap/ear forward to expose the edge of the ear canal. Now imagine the surgeon drilling a bony channel that goes over the corner (Spine of Henle) and down into the external ear canal, lifting the tissue away all the way down to the inner or middle ear—almost like laying the electrode between the fantail and the mastoid, except that this is a channel along the *ear canal*. The problem with this approach was noticed as the patients began to heal and the area was found to be irritated. Patients could feel the lead in the tissue of ear canal as the wound healed. It is generally felt that the technique ultimately caused irritation in the area of the ear canal and concerns surfaced about how the lead was secured in the canal so that it would not lift up and irritate the skin. One key question to ask when this approach is contemplated is "how is the electrode secured so that it does not irritate the skin?" With fibrin glue, perhaps? (SAH, 10/25/00)

transect cut

transverse plane a plane (section) that cuts the body or an organ across its narrowest dimension, i.e., splitting the body into top and bottom halves

trauma the process or event leading to an injury or wound

tube, ventilation a tube inserted after myringotomy (surgical removal of the tympanic membrane) in chronic cases of middle ear effusion, such as in otitis media; it provides ventilation and drainage for the middle ear during healing

tumor an abnormal new mass of tissue that serves no purpose; at the location cells in the body multiply at an increased rate; they can interfere with vital body functions and absorb nutrients needed elsewhere; they can be malignant (cancerous), which means they will grow rapidly and spread to other parts of the body or cause more tumors to form elsewhere, or be benigh, which means that they will generally grow much more slowly and stay put in one area

tympanic cavity See Glasscock, p. 595

tympanic membrane the eardrum, which vibrates as sound waves strike it—the membranous partition between the external ear canal and the tympanic cavity—middle ear. The *secondary* tympanic membrane is also called the membrane of the round window

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tympanogram (audiology) a test to verify that the ear drum is working properly

UCSF/Storz CI Device The forerunner of CLARION. University of California at San Francisco/A cochlear implant manufacturer. The UCSF/Storz multi-channel cochlear implant was developed ca. 1983. It had 16 electrodes, 8 channels, 4 stimulated (?)

USE Universal Strategy Encoder

Usher's Syndrome congenital deafness accompanied by retinitis pigmentosa, often ending in blindness; sometimes mental retardation and disturbances of gait (style of walking) also occur

utricle larger of two sacs within the membranous labyrinth of the vestibule in the inner ear (utter = leather bag)

vagus wandering

vas a duct; vessel

vascular pertaining to blood channels or vessels

VCV (audiology) Vowel-Consonant-Vowel. A test for the patient to identify specific consonant sounds between two vowels (i.e., A-K-A: "aka")

vein a vessel carrying blood away from the tissues toward the heart

ventilation the mechanical movement of air into and out of the lungs

ventral anterior or front

vertigo dizziness; an illusory sensation of movement

vessel a tube or duct conveying body fluid, especially blood or lymph

Vestibular Aqueduct Syndrome (VAS) characterized by an enlargement of the vestibular aqueduct with or without enlargement of the vestibule. VAS is the most commonly missed cause of congenital deafness. Clinically, these patients hear normally during the first few years of life, with progressive sensory neural hearing loss developing as late as the teenage years. VAS may be unilateral or bilateral and is associated with Mondini malformations.

vestibular canals act as organs of balance. Fluid-filled cavities sensitive to movement, speed, acceleration, and rotation

vestibular neuronitis vestibular neuronitis causes dizziness due to a viral infection of the vestibular nerve

vestibule middle part of the inner ear in front of the semilunar canals and behind the cochlea that contains the utricle and the saccule

viscera soft organs in the body cavities

viscosity the state of being sticky or thick

viz. (L. videlicit) namely

VRA (audiology) Visual Reinforcement Audiometry. In later infancy, up to about age two, children are able and willing to turn to the sound and are reinforced by a flashing light and/or moving toy whenever they respond

VT (audiology) Vibro Tactile

VU abbreviation for volume units

Waardenburg's Syndrome a congenital condition characterized by a wide bridge of the nose due to lateral displacement, pigmentary disturbances, including white forelock, white eyelashes, and sometimes cochlear deafness

X Left ear

x-ray high-energy radiation used in low doses to diagnose diseases and in high doses to treat cancer

zygomatic process any of several bony processes that articulate (unite by means of a joint) with the zygomatic bone as: (a) a long slender process of the temporal bone helping to form the zygomatic arch; (b) a narrow process of the frontal bone articulating with the zygomatic bone; (c) a rough triangular eminence of the maxilla of the upper jaw articulating with the zygomatic bone.

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Surgical Approach and Terminology

Overview of AB Surgical Products and CI Surgery

AB Surgical Lab in Valencia on the 2nd Floor

AB has a six drilling station Surgical Lab on the 2nd floor in Valencia

Surgeons from around the world come to learn about AB products here





Warning: There are some mildly, graphic images ahead.

Nothing too bad.

History of AB Implants

1986 – 2012 Legacy Devices (dates vary depending on global region)



2012 – 2021…



HiRes 90K Advantage



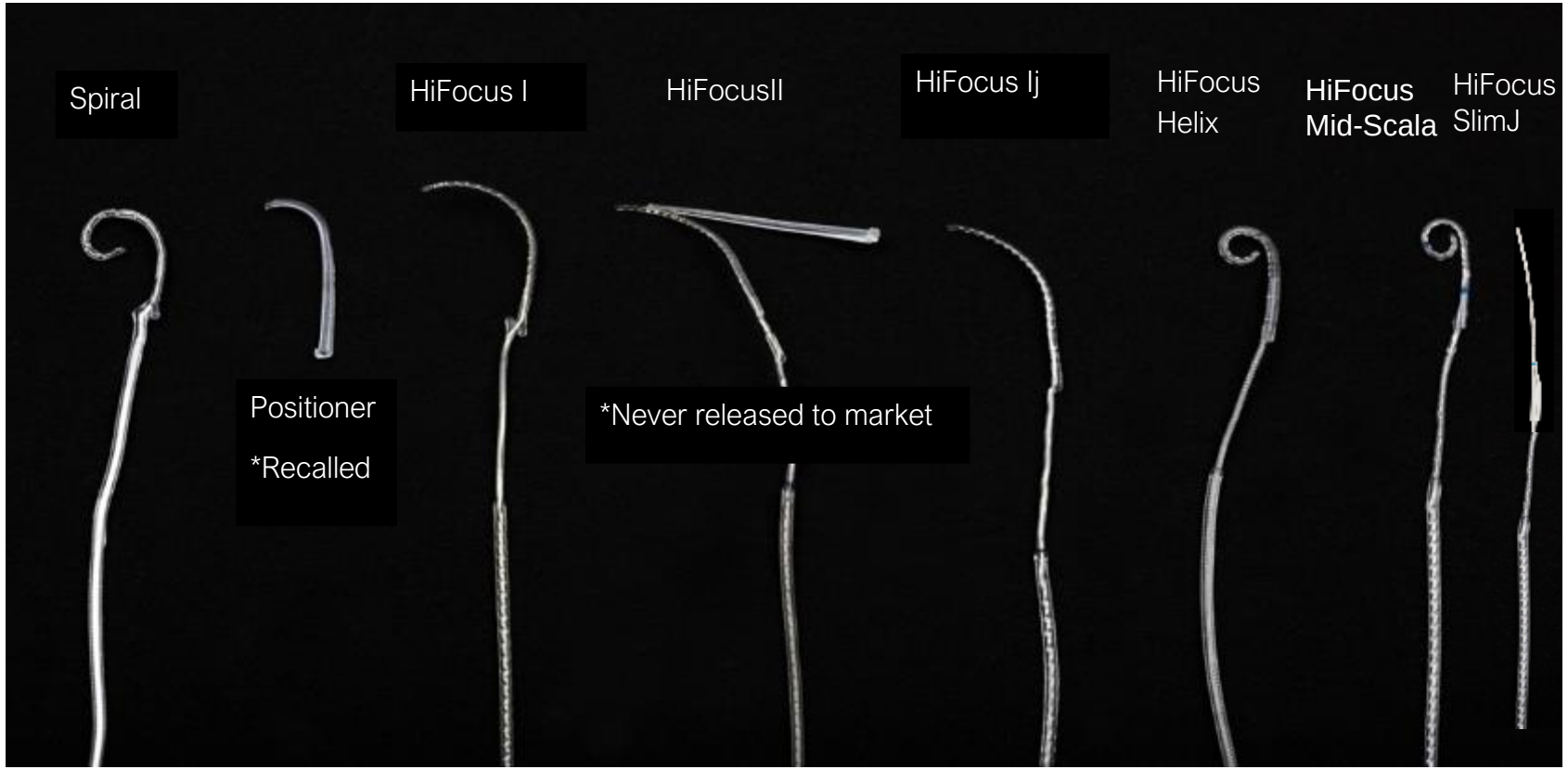
HiRes Ultra



HiRes Ultra 3D

1989 1990 1994 2001 2004 2012 2016 2018

AB History of Electrodes



1987 1999* 2000 2001* 2002 2003 2013 2018

Ceramic case arrays: Spiral, HF1 HFII; CII began *HiFocus* array platform. The Positioner may be found with Spiral, HFI, HFII



HiRes 90Karrays: HF1j, Helix 90K Adv: Added HFMS





HiRes Ultra/3D arrays: HFMS, SlimJ

AB Current Products



HiRes Ultra 3D Implant
MRI Compatible up to 3T
with the magnet still in



HiFocus™ SlimJ electrode

Lateral wall array



HiFocus™ Mid-Scala electrode

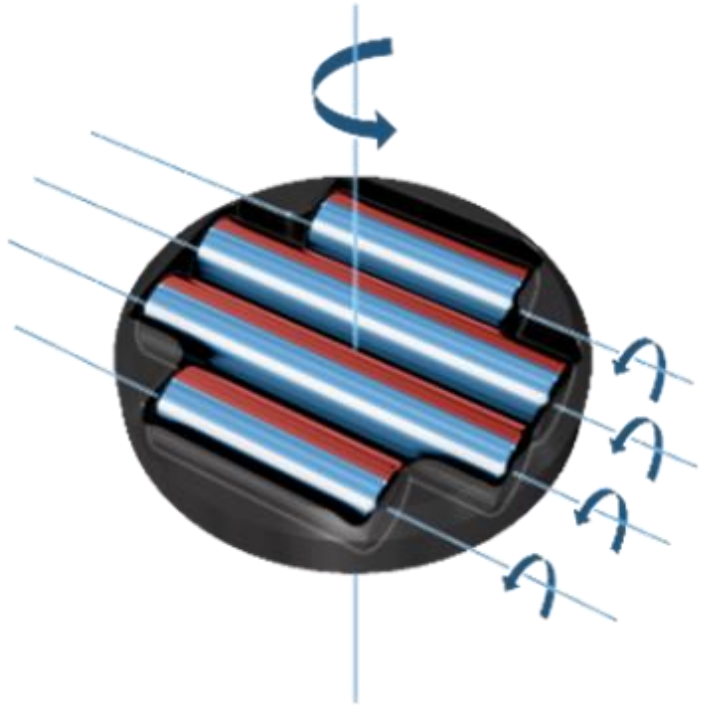
Pre-curved array

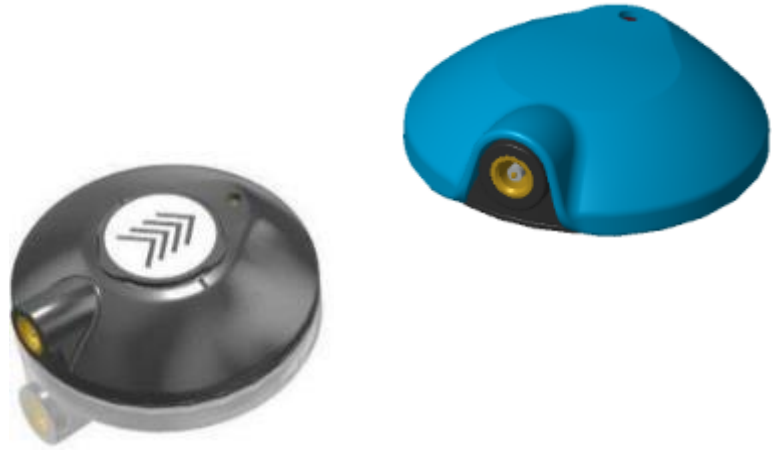
Ultra3D Headpiece Fitting

The unique nature of diametrically polarized magnets need careful headpiece fitting for optimal retention

- There is a ‘weak’ retention plane (lateral) compared to the normal force required to remove the headpiece

The implant/headpiece system is functional up to a skin flap thickness of 10 mm





MRI Guidelines across AB devices



C1.0- CII:
NO MRI: Ceramic cases contain the magnet inside and cannot be removed

90K:
0.3T & 1.5T with magnet removed

.

90K Advantage:
1.5T okay with magnet out** and head bandaging;
No 3.0T



Ultra:
1.5T with the magnet in with conditional bandaging protocol;
3.0T with the magnet removed



Ultra 3D:
1.5T and 3.0T okay with magnet in for both and no bandaging needed



** TUV Markets** NOT FDA U.S. Market
We are pleased to inform you that the European notified body, **TÜV**, has granted approval for recipients of the HiRes 90K™ or the HiRes 90K™ Advantage Implant with the
HiFocus Helix™, HiFocus™ 1J and HiFocus™ Mid-Scala electrodes to undergo MRI analysis without the need to surgically remove the internal CI magnet at the following magnetic flux densities/frequencies:
- 0.3T/12MHz
- 1.5T/64MHz

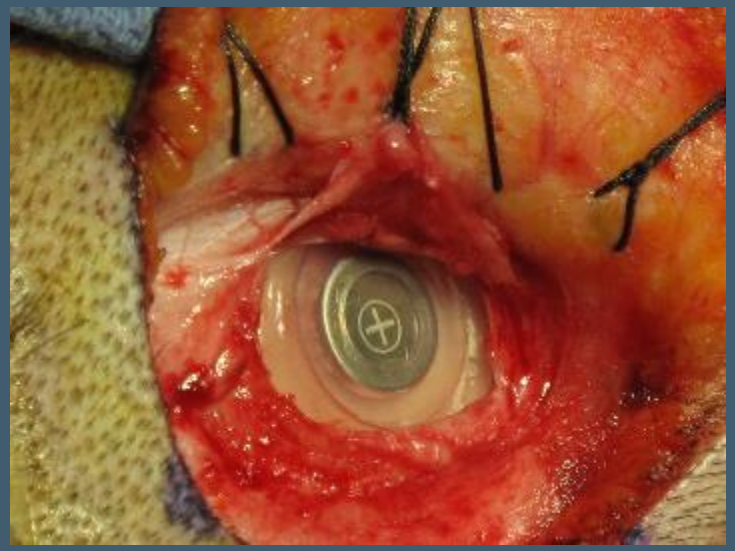
MRI Magnet Removal/Replace Procedure





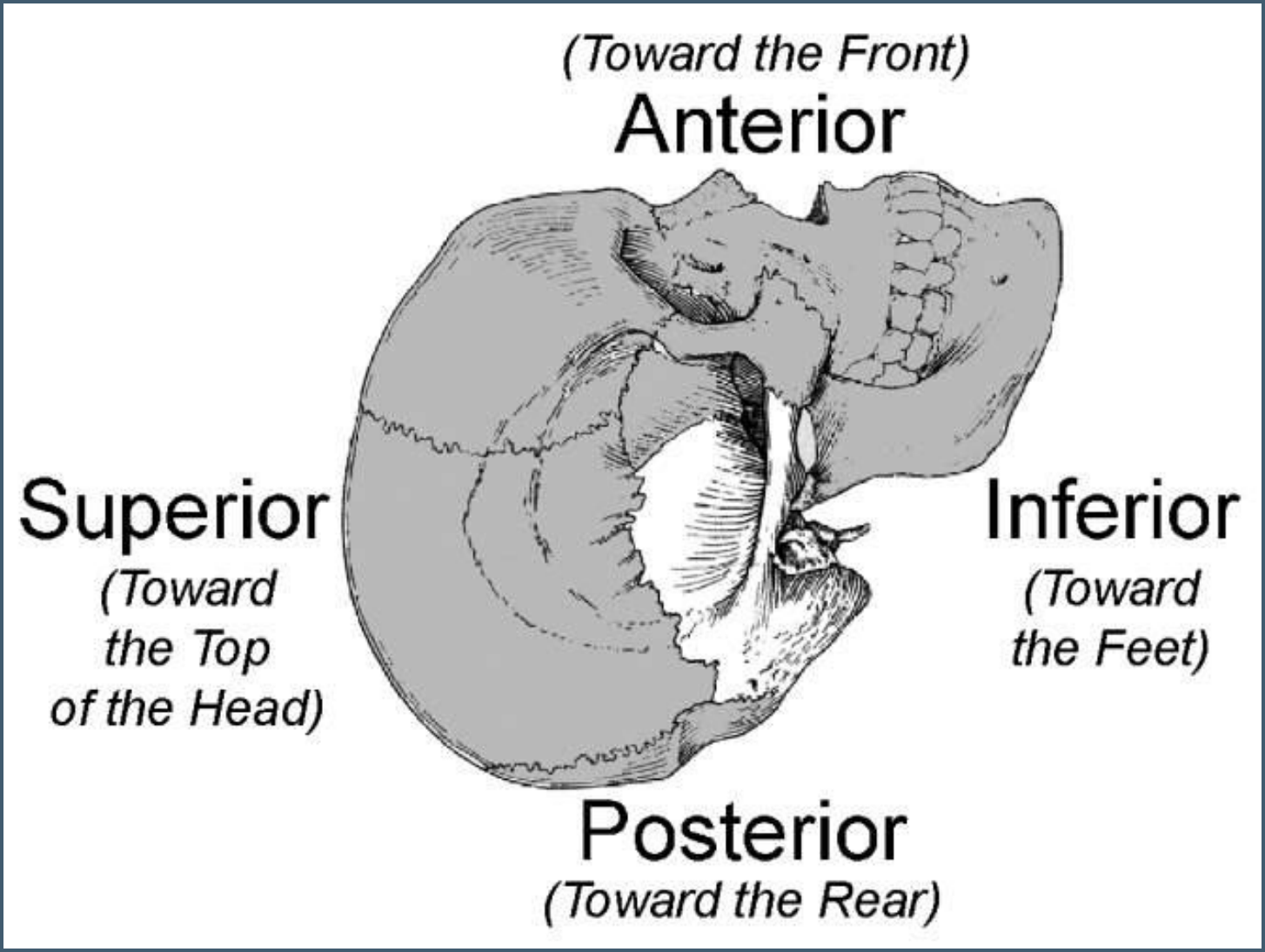








Anatomical Directions



During surgery you will frequently hear surgeons use the following terminology.

Know these well:

Superior = top of head

Posterior = back of head

Anterior = toward the face

Inferior = toward the feet

Medial = moving inward

Lateral = moving outward

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Important O.R. Terminology

Who is in the O.R.

- Patient
- Surgeon
  - Otolaryngologist
  - Neurotologist
  - Otologist
- Scrub nurse
- Circulating nurse
- Anesthesiologist
- Charge nurse
- Fellow/Resident/Med Student
- Audiologist
- Facial nerve monitor
- Company reps

- Aseptic
  - Free of disease causing microorganisms; prevention of infection

- Sterile
  - The state of being aseptic or free of all microorganisms
  - Sterilization – Processing/cleaning tooling

- Sterile Technique/Field
  - Back table
  - Microscope
  - Draping

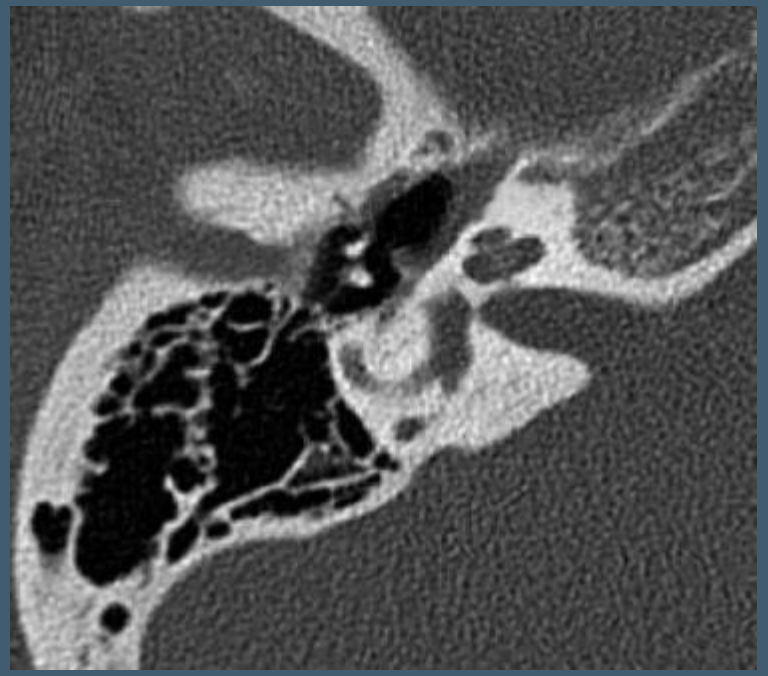
- Anesthesia
  - General
  - Local anesthetic
  - Conscious sedation/ “twilight”

- Contaminated
- Biohazardous Waste
- Communicable Diseases

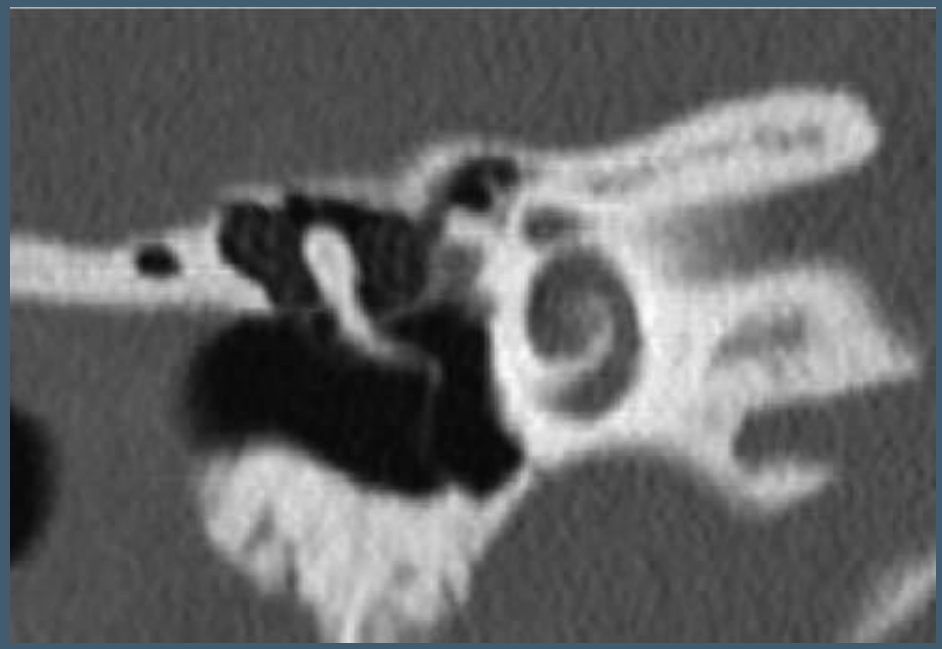
- OSHA – *Occupational Health & Safety Administration*. U.S. Dept of Labor overseeing safety measures in the workplace
- JCAHO – *Joint Commission of Accreditations of HC Organizations*. Private body overseeing healthcare standards

Pre-Op Imaging

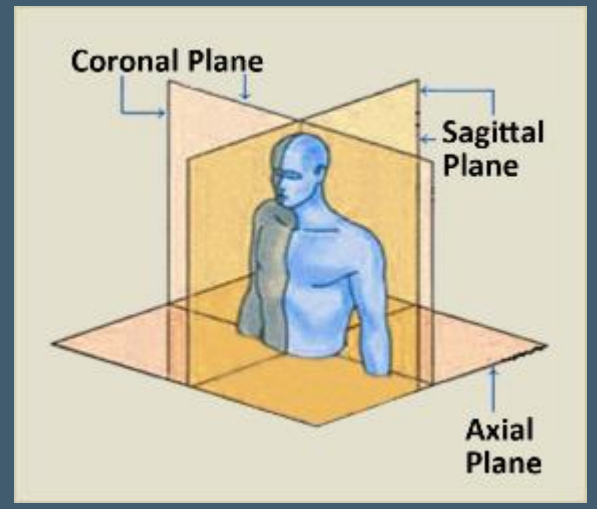
CT Scans; Normal Right Ear



Axial scan—Inferior to Superior



Coronal scan—Anterior to Posterior



Terminology for imaging slices

Coronal – front/back

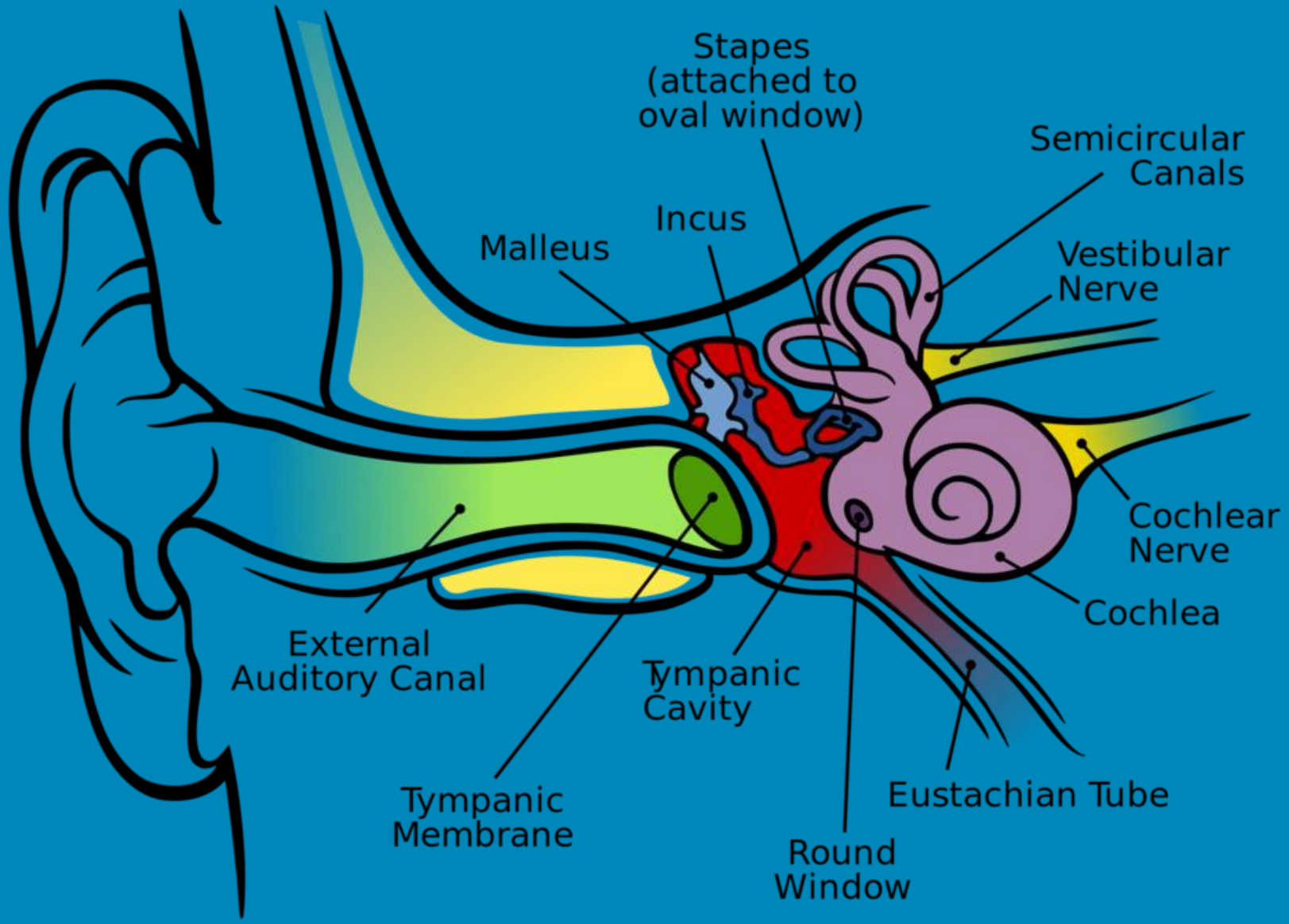
Sagittal – right/left

Axial – top/bottom

Note: No one that is not a doctor or radiologist is qualified to read a scan and give any recommendations. That is medical advice.



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Stapes
(attached to
oval window)
Semicircular
Canals
Incus
Malleus
Vestibular
Nerve
Cochlear
Nerve
Cochlea
External
Auditory Canal
Tympanic
Cavity
Tympanic
Membrane
Eustachian Tube
Round
Window



Facial Nerve Monitoring

Patient is under general anesthesia in a very deep sleep but not paralyzed.





Facial nerve stimulator is connected so if the nerve is irritated during drilling it will signal the surgeon

Electrocautery



Once the device is on the surgical field monopolar cautery should be turned off.

Bipolar cautery is preferred for all procedures in the region of the head and neck to reduce risk of current flowing to electrode contacts inside cochlea.





Bipolar cautery bayonet – tips ground to each other so current is not moving through the body

Note: This is important to remind surgeons to use bipolar cautery only during bilateral, magnet removal and revision surgeries or any surgery in head or neck region



FOR INTERNAL USE ONLY

HiRes Ultra Reusable Surgical Tool Kit (CI-4509)



Contains two of each template





Ultra BTE Templates
CI-4421



Ultra Coil Gauges
CI-4341



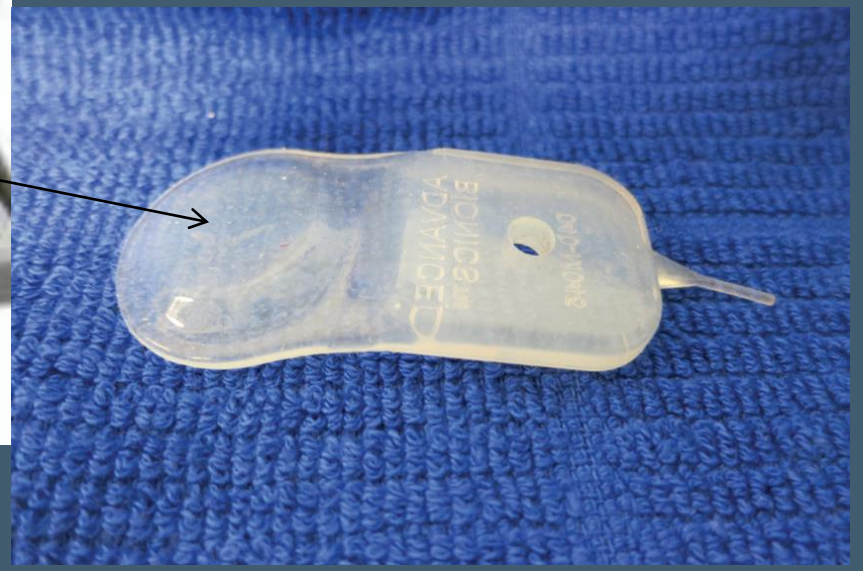
Ultra Recess Gauges
CI-4331

HiRes Ultra Silicone Mock-up, CI-4426

HiRes™ Ultra Mock-up, CI-4426, is provided with the HiRes Ultra Implant, in a separate pre-sterilized peel pack inside the implant box







Holes in templates are used for option of Methylene Blue die to scratch surface of the skull with a needle

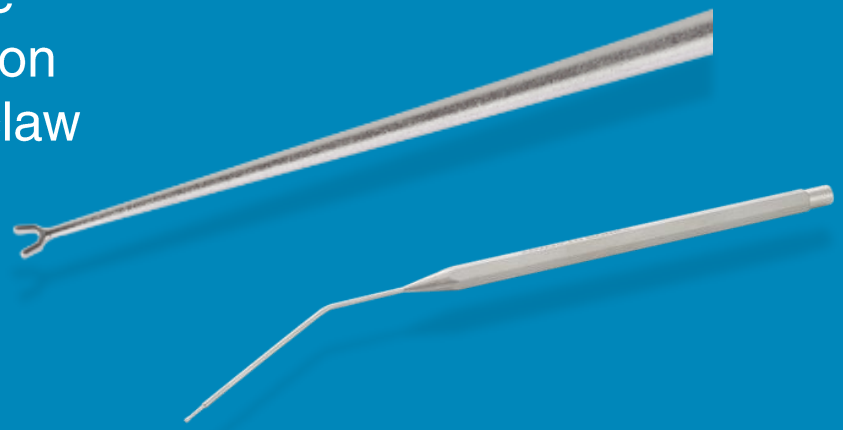
HiFocus ™ Mid-Scala Instrument Kit (CI-4508)

Tool designs determined by temporal bones studies with surgeons



Claw Tool

- One-piece construction
- Tapered claw



HiFocus™ Mid-Scala Electrode Sizing Gauge

- 0.8mm diameter
- “Waisted” to help with visibility to the cochleostomy

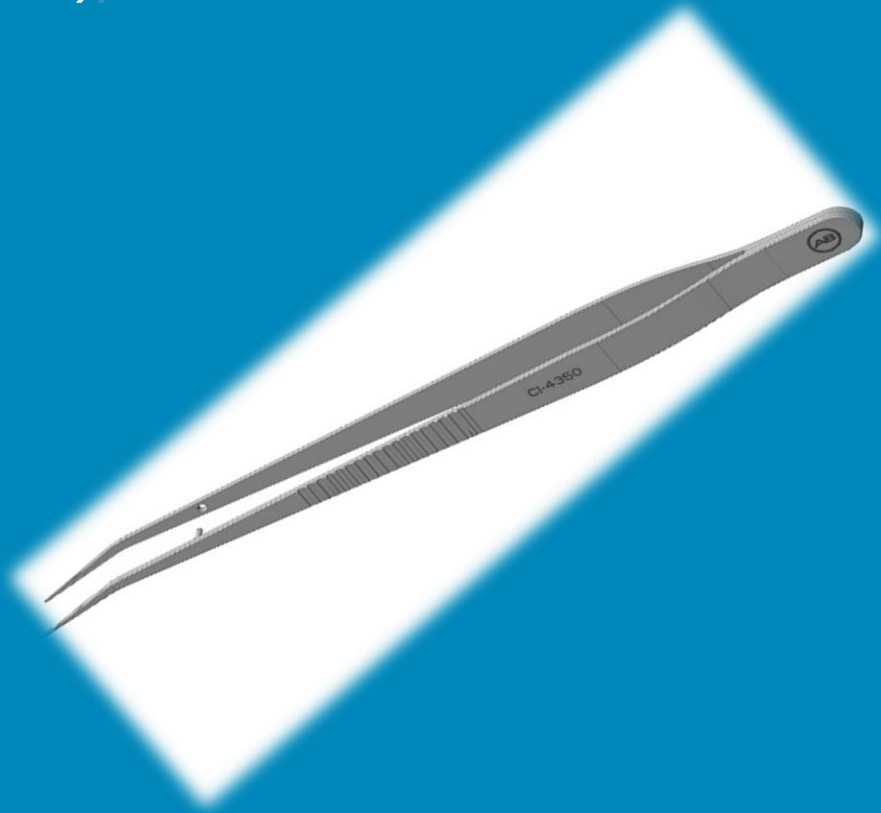
- ***Both HiFocus™ SlimJ and Mid-Scala require a minimum of 0.8mm opening into the cochlea***

FOR INTERNAL USE ONLY

HiFocus ™ Electrode Forceps (CI-4350)

Contains 2 HiFocus™ Electrode Forceps, CI-4350-02





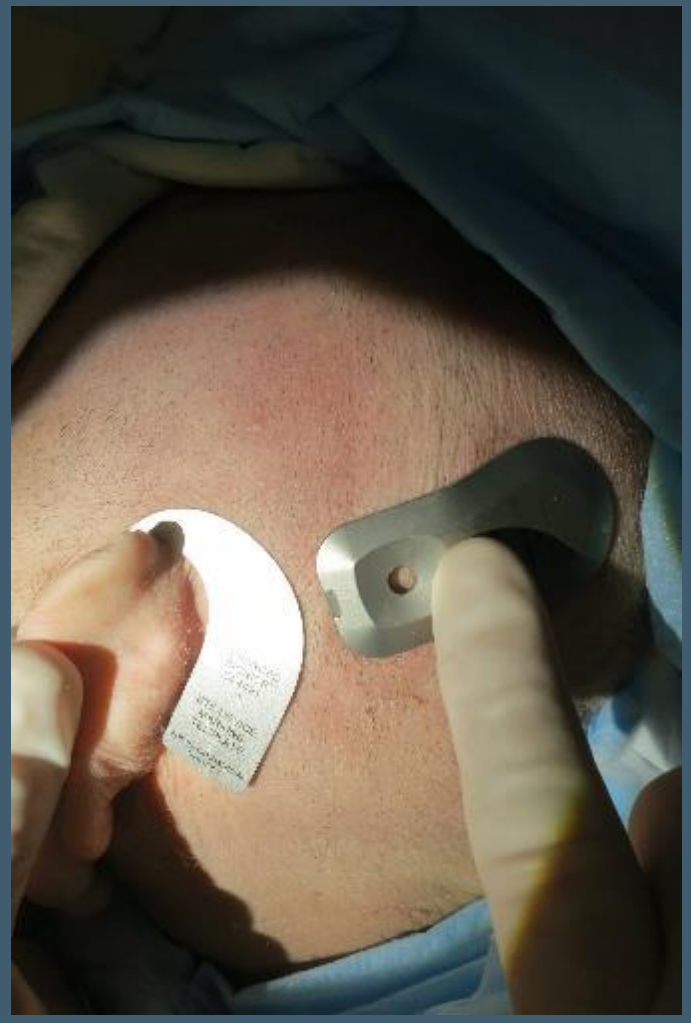
Note: AB Electrode Forceps designed for use with HiFocus™ SlimJ electrode. They should not be used for the HiFocus ™ Mid-Scala array to grab the stylet because the tips open. They are slippery if using to try to push array off stylet.

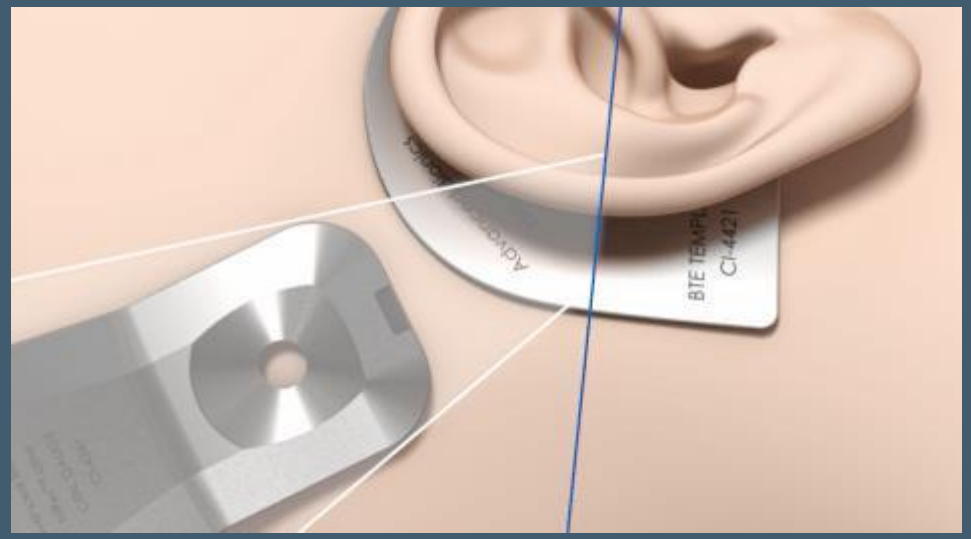
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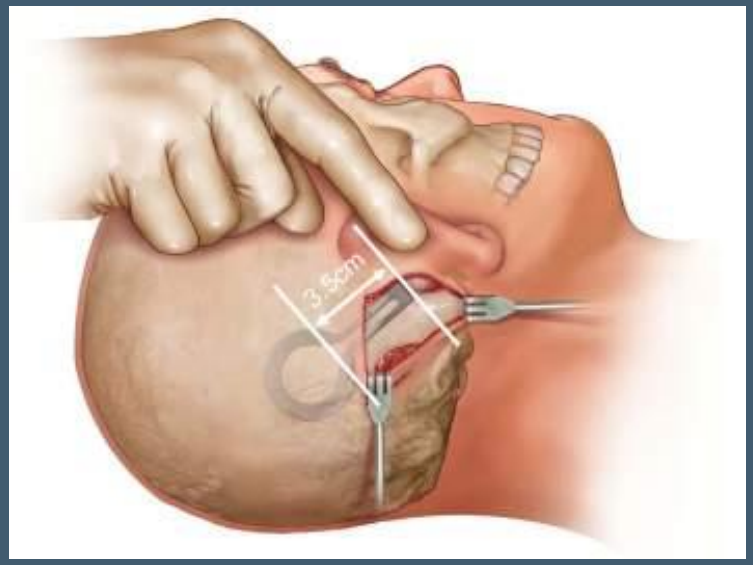
Implant placement options

Implant placement angle varies among surgeons. Typically 45º-60º degrees of the temporal line.

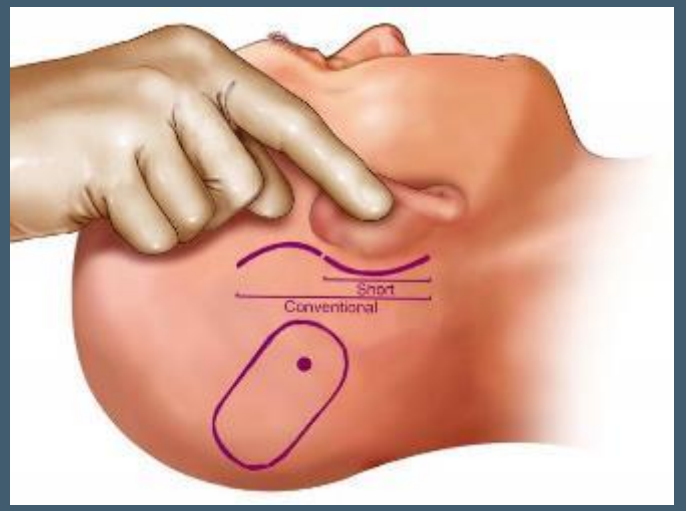
A distance of 3.5cm is recommended from the posterior canal wall to the anterior edge of the titanium case of the implant to avoid BTE rubbing the implant under the skin and causing skin flap issues.





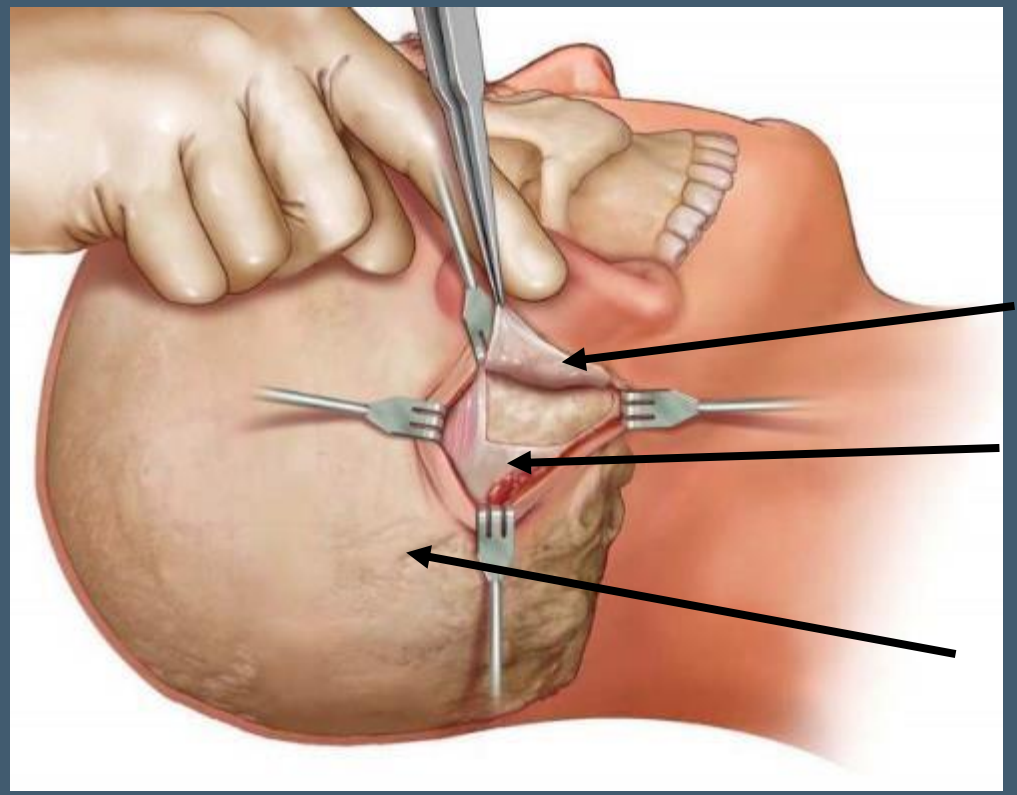


Incision and develop skin flap and periosteal pocket



Separate the periosteum from the skin-temporalis.

- Create an anteriorly-based periosteal flap over the mastoid.
- Use electrocautery to cut the periosteum and elevate the flap.
- A 5-7 mm skin flap is recommended. However, the system functionality of the implant/headpiece has been confirmed up to a 10 mm range. Modification of the skin flap is at the discretion of the surgeon.



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Incision and pocket/flap design—Periosteal pocket



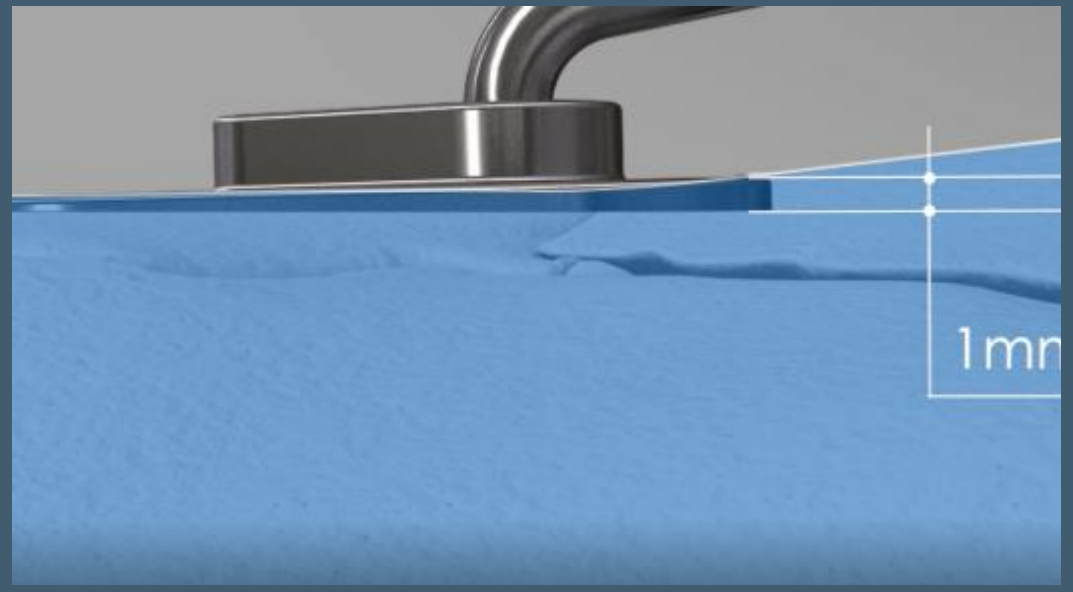
90K template under periosteal tissue

Drill the Ultra Recessed Ramp

Use the recess gauge to check the size of the recessed ramp: 1.0mm deep anterior edge ramp.

The gauge should fit loosely into the ramp.



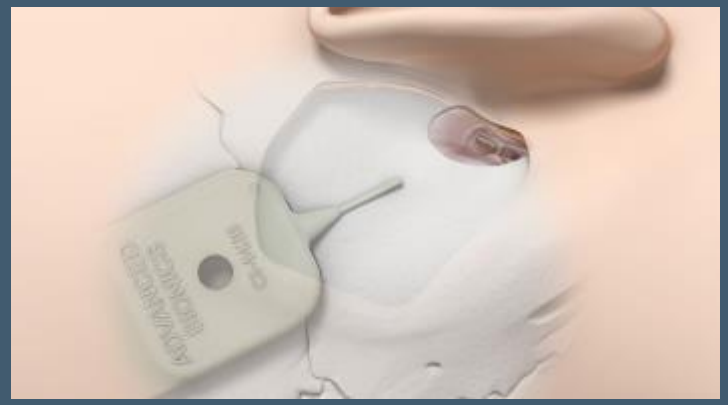




Drill a channel for the electrode lead







Drill a channel for the fantail and electrode lead from the recessed ramp to the mastoid. Having the lead below the skull surface protects the lead wires from external rubbing and damage.

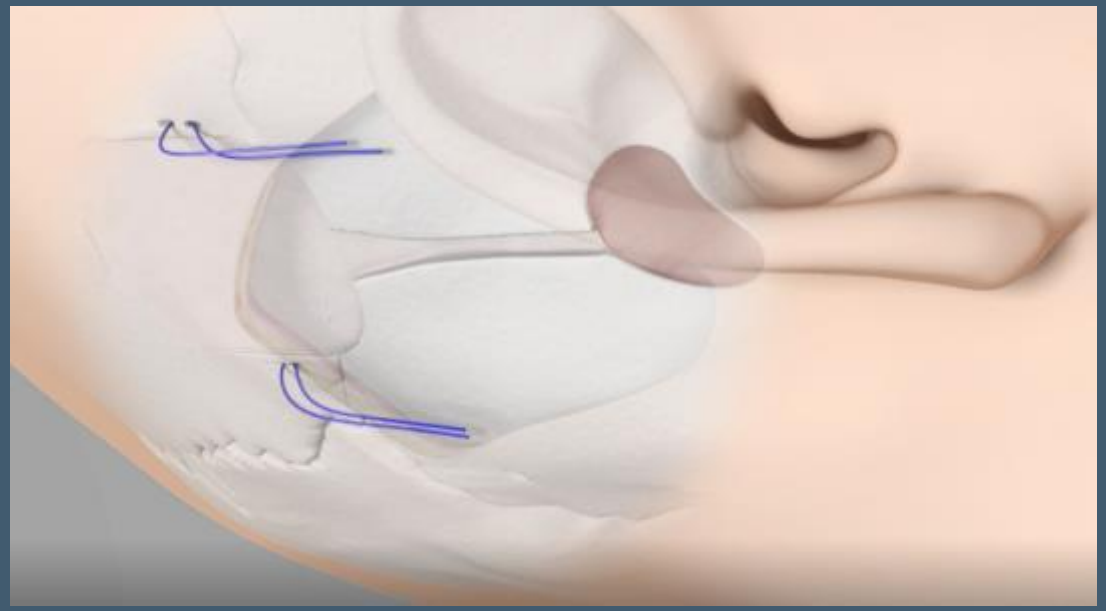
Use the HiRes Ultra surgical templates to locate fantail position. The silicone mock-up should fit loosely into the recessed well and channel.



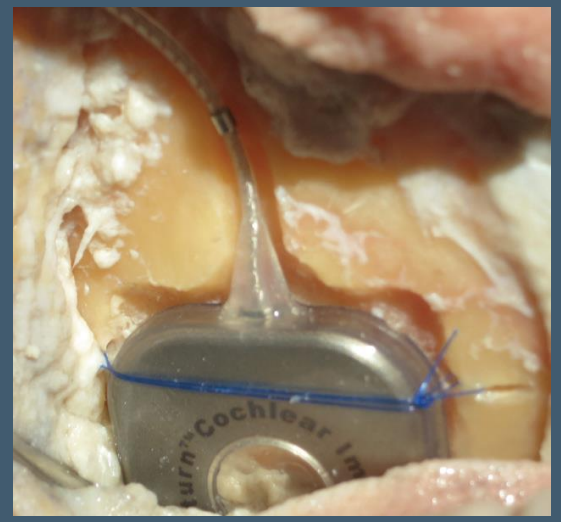
Place sutures (optional)

Place non-absorbable sutures into the tie-down holes.

The integrated ground contact should rest within the lead channel. The ring needs to touch tissue or blood for a conductive pathway during intra-op testing



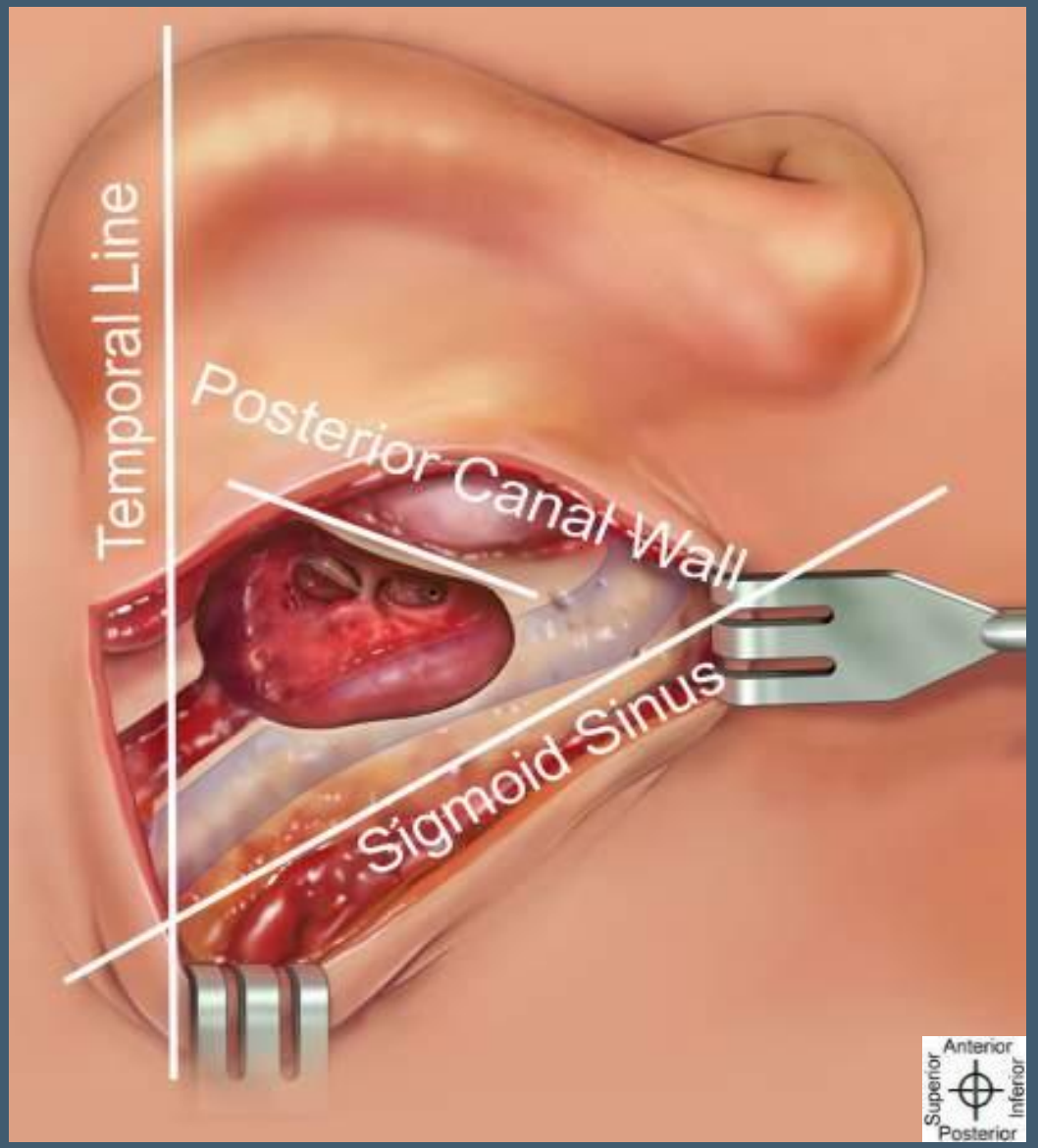




Ensure suture knot is tied off to side so to not to irritate under side of the skin flap

Surgical Borders





Three borders of surgical area:

- *Anterior-* Posterior Ear Canal Wall
- *Superior-* Temporal Line/ Tegmen/Dura (brain)
- *Posterior-* Sigmoid Sinus

Don't put a hole in the borders!!

- Hole in the ***Ear Canal*** = leaves an opening for the outside world to enter the inner ear space and bacteria to travel in.
- Hole in the ***Dura***/outer layer of brain = tear the dura and CSF leak can lead to meningitis
- Hole in ***Sigmoid Sinus =*** big bloody mess to stop bleeding and repair.

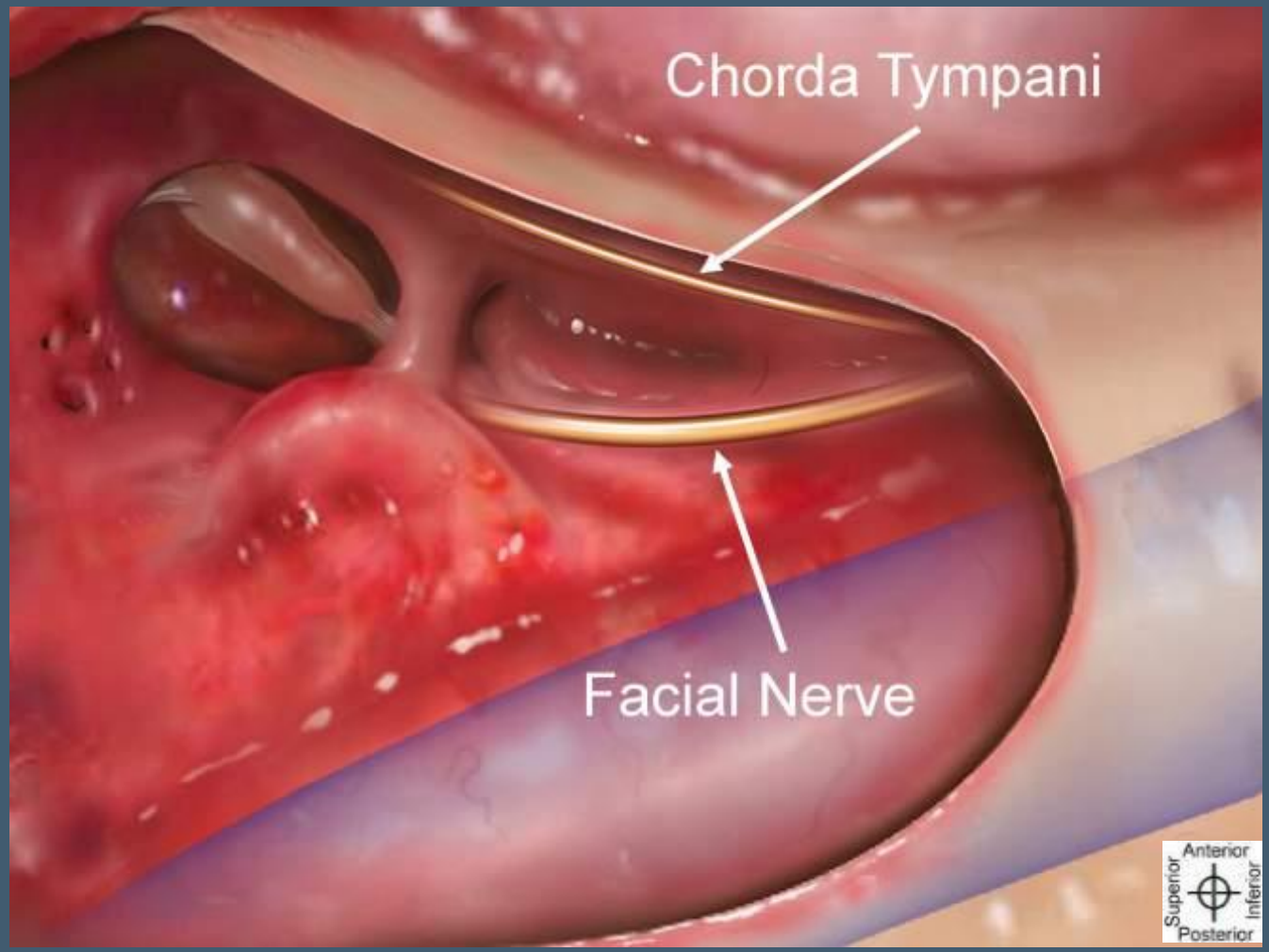
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Facial Recess Approach

- If Chorda Tympani nerve is cut the patient will have taste disturbance (temporary)

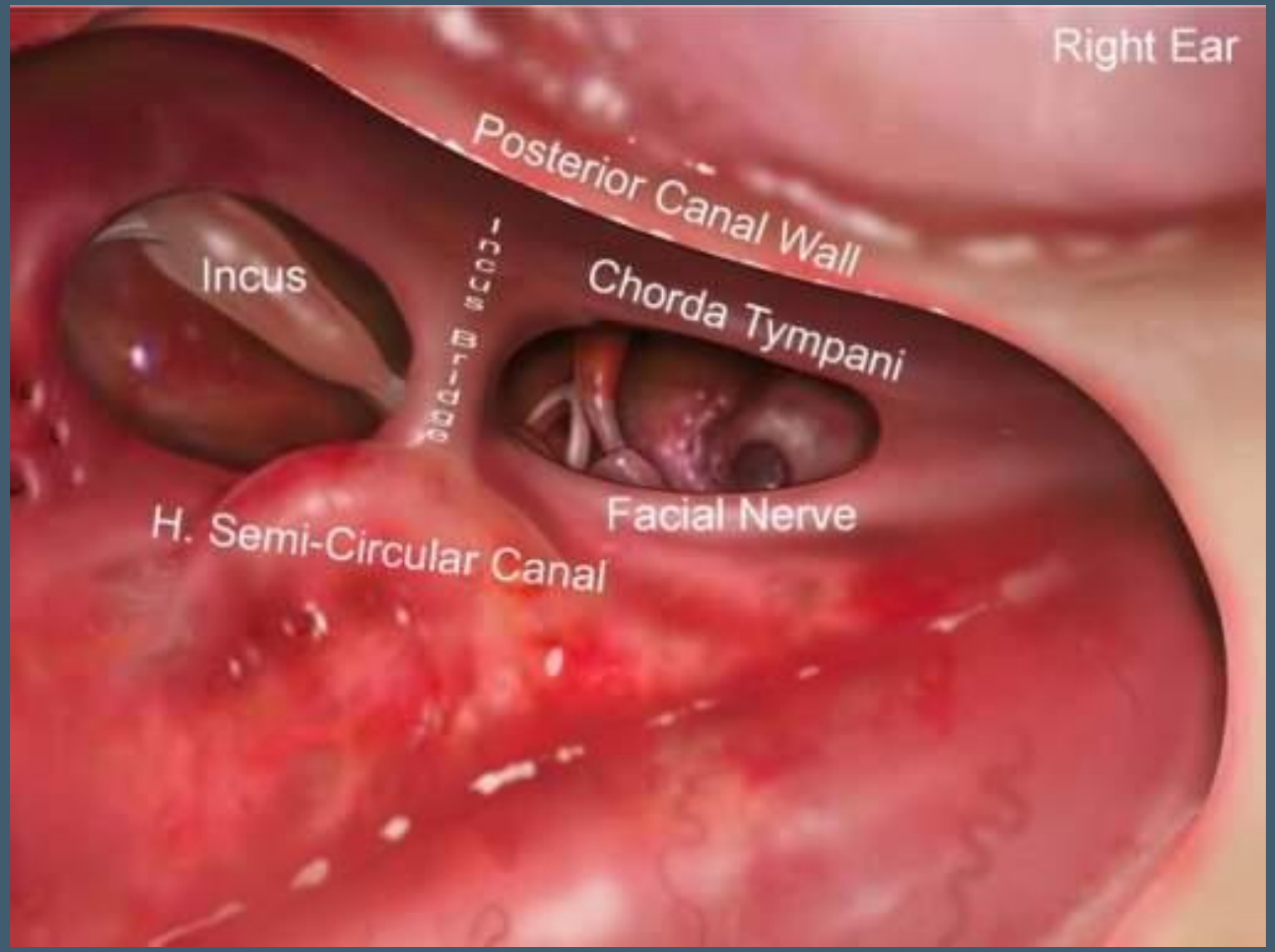
- If the facial nerve is cut the patient will have paralysis on that side of the face (permanent)

- Approximately 2.0mm between the two nerves

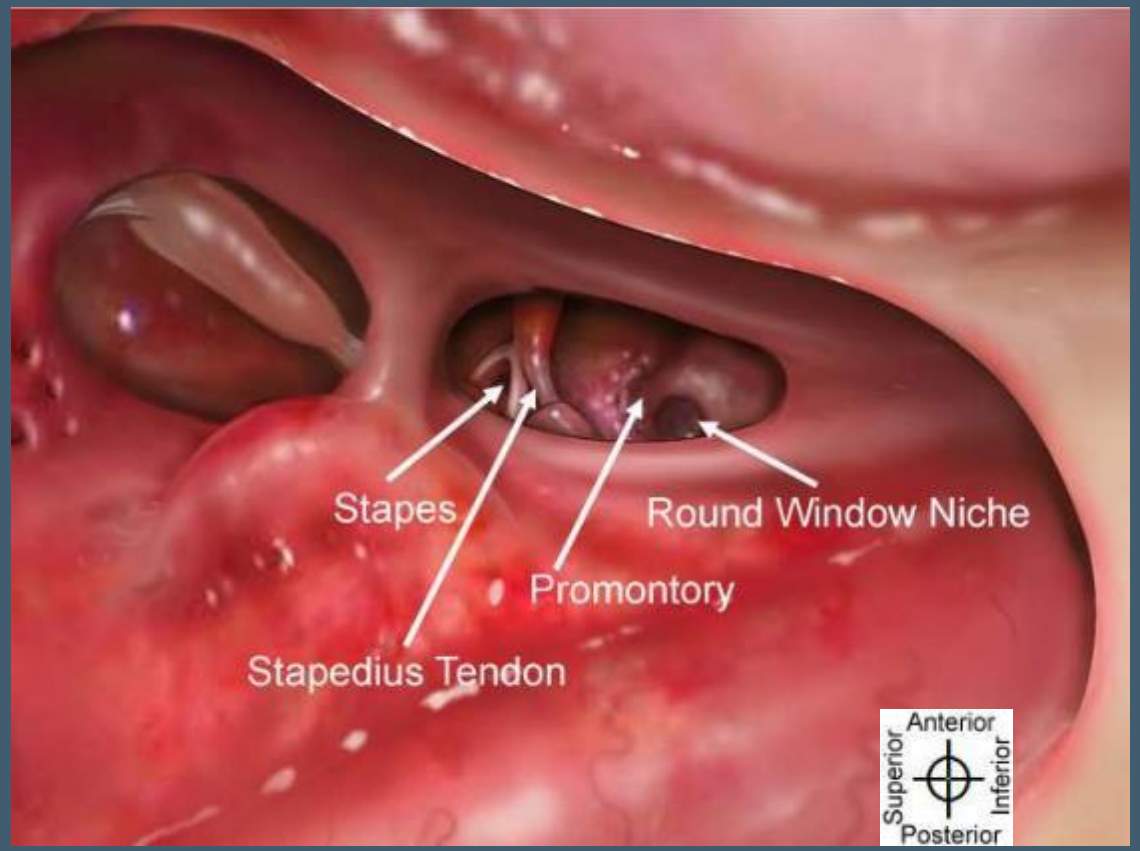


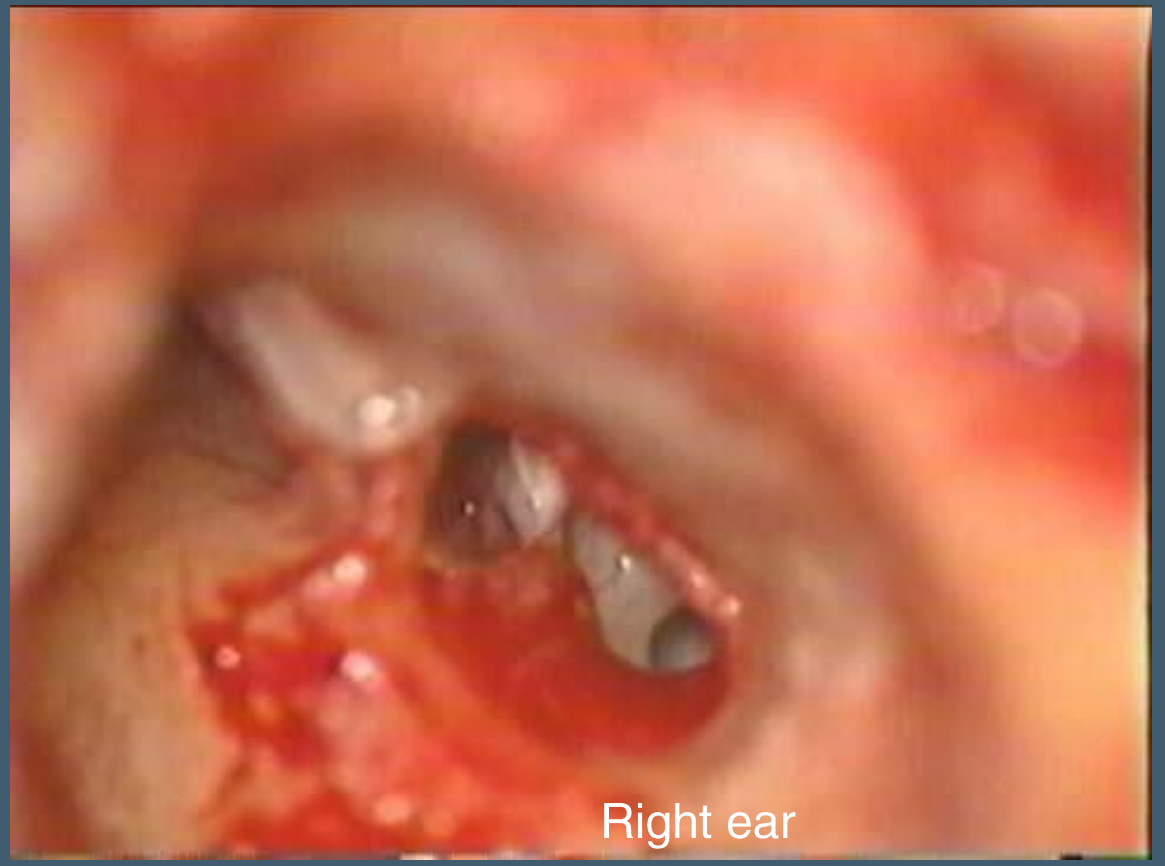
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Completed surgical approach to Round Window



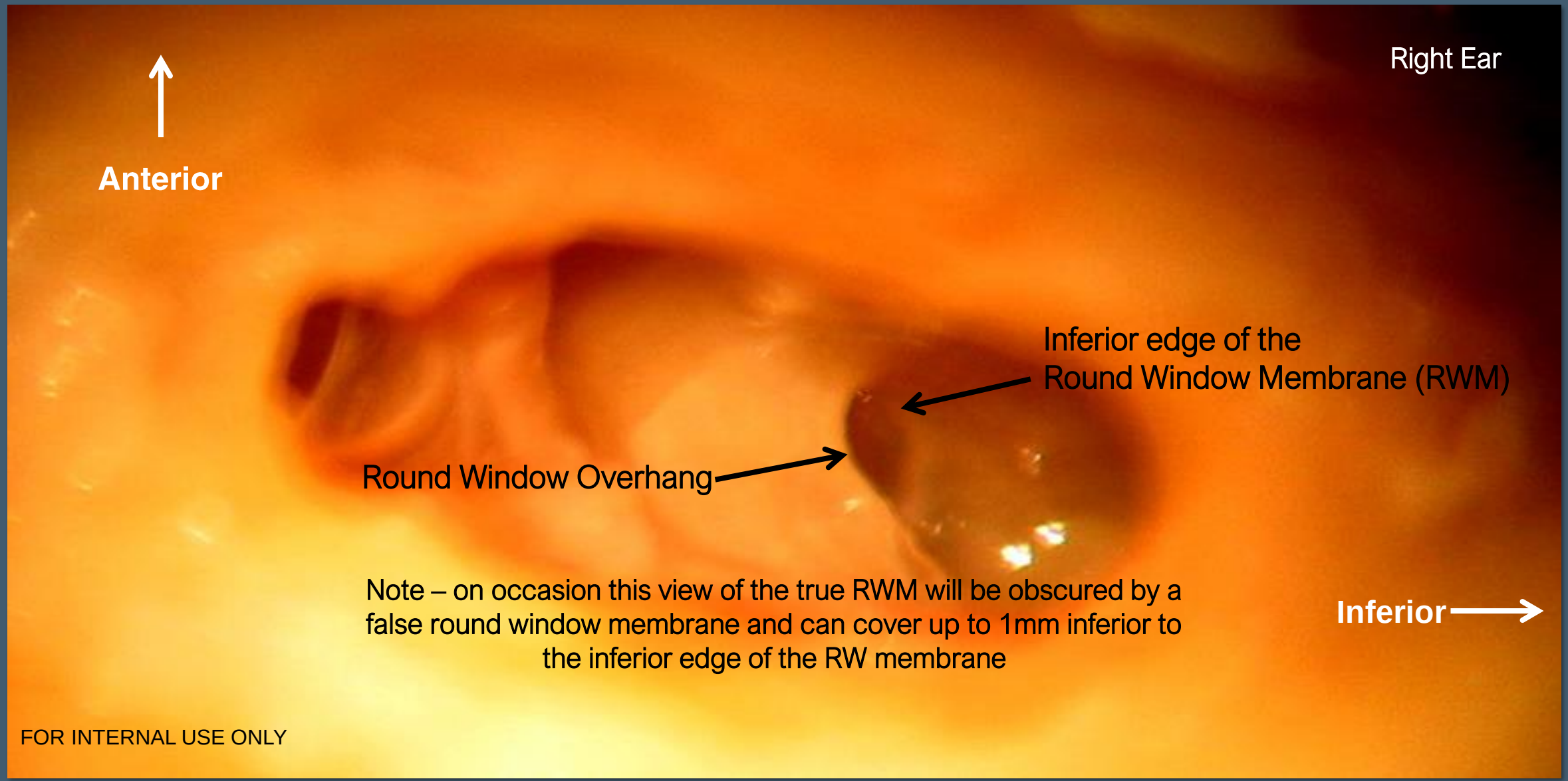
The middle ear seen through the facial recess (right ear)





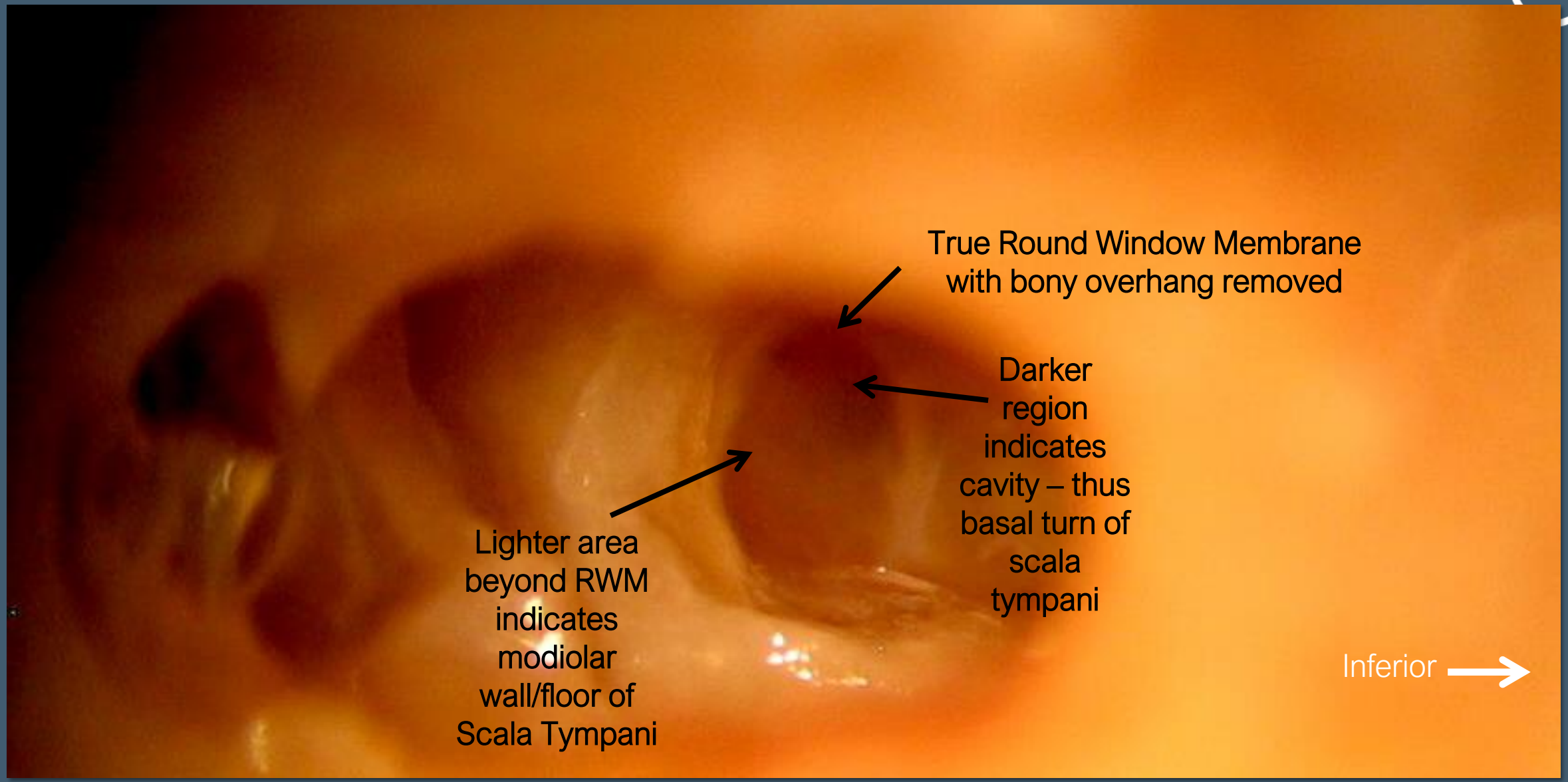
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Bony Overhang *Intact* Over Round Window Membrane (RWM) - Right Ear



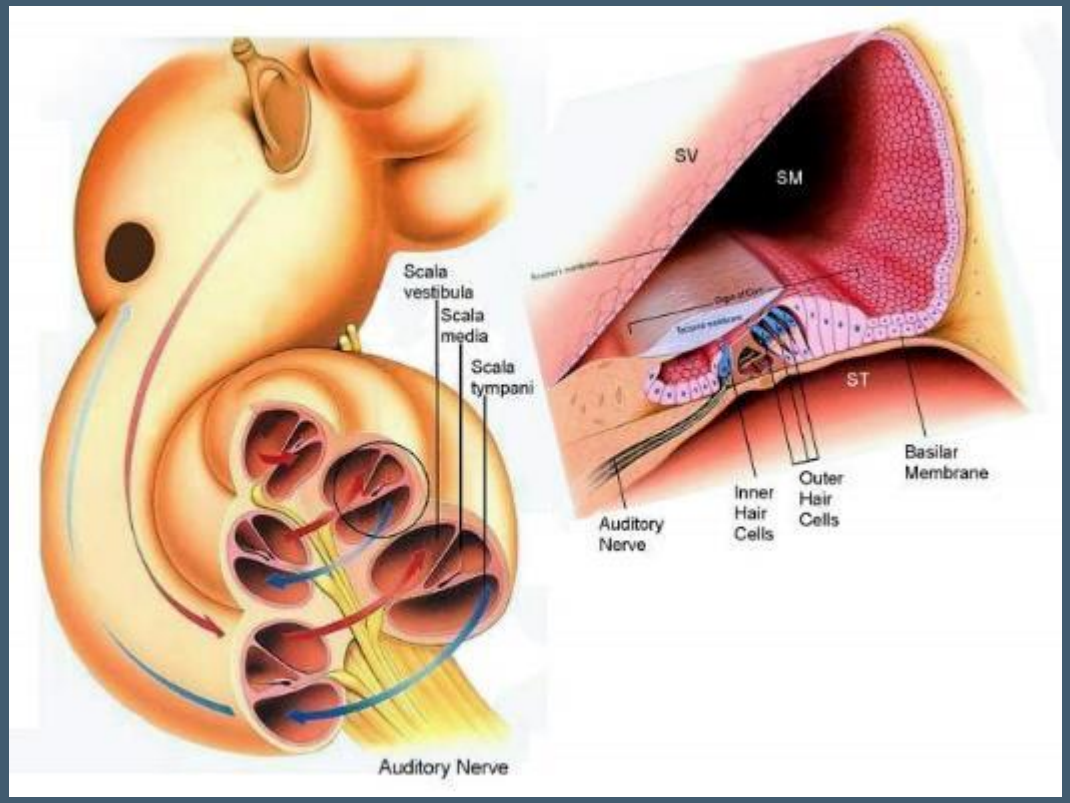
FOR INTERNAL USE ONLY

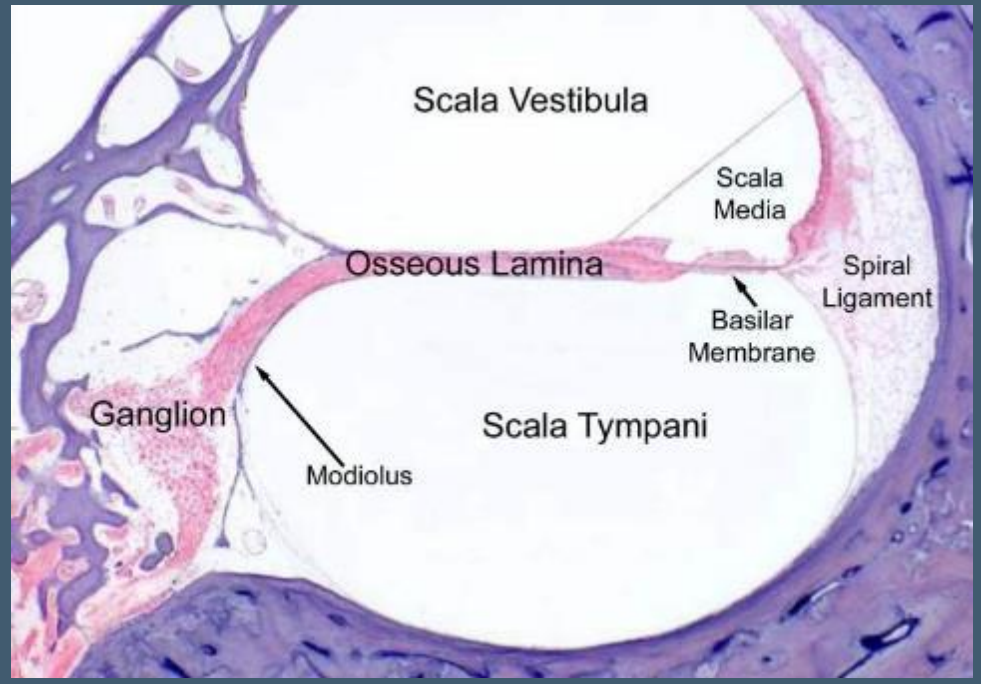
Bony Overhang *Removed* Over Round Window Membrane (RWM) - Right Ear



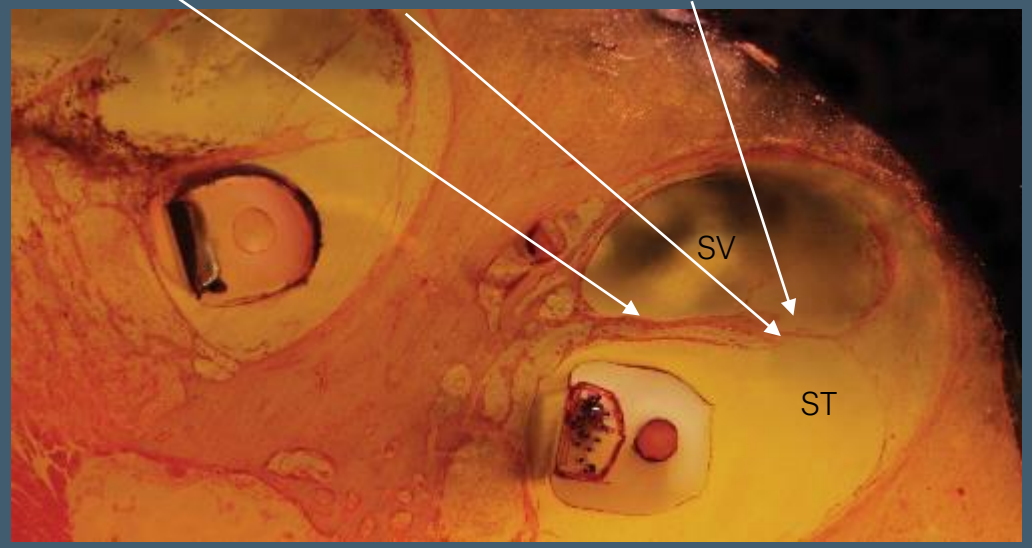
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The cochlea, hair cells and auditory nerve

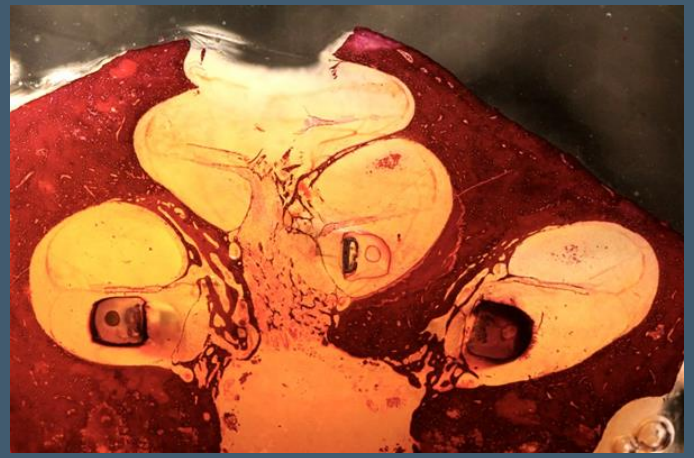




(OSL) Osseous Spiral Lamina – Basilar Membrane – Organ of Corti /Hair Cells

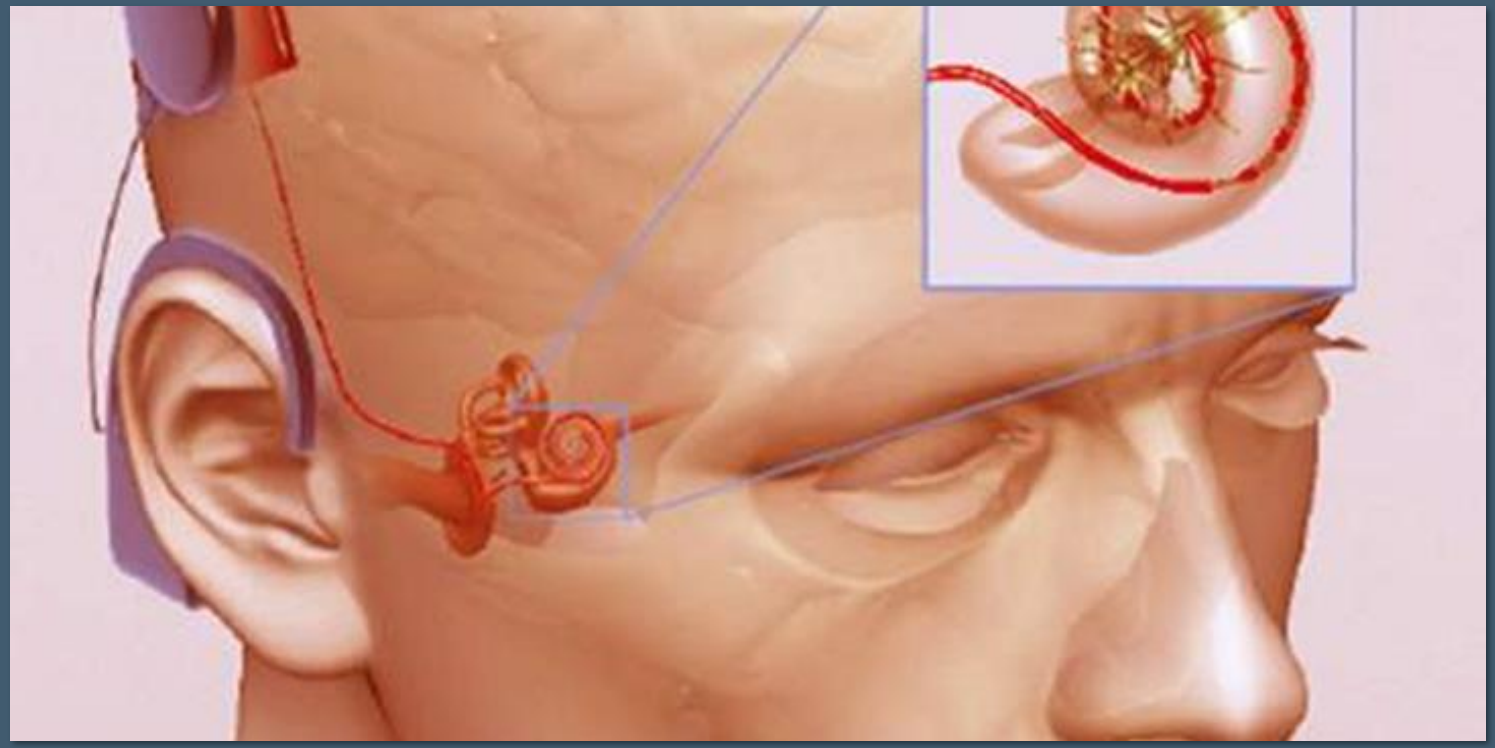


Right Ear



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Anatomical and Surgical Positions—Right Ear





Implant and Tooling Packaging In the O.R.

4 Layers of packaging the implant =



1. Outer box sleeve



2. Inner box contains sterile tray



3. Outer tray



4. Sterile tray



HiRes™ Ultra Primary implant plus back up device for “MS” or “SJ”

HiFocus™ **Mid-Scala** Only Tooling ***Options***



HiFocus™ Mid-Scala back up, pre-sterile “Insertion TOOL KIT”

HiFocus™ Mid-Scala “Insertion TOOL” (*optional)*

Opening the implant box and tray



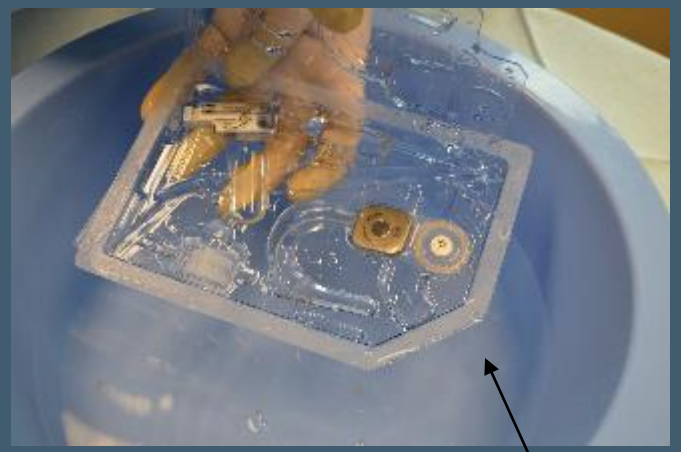
Circulating/Scrub nurses steps to opening the implant tray:

There are four layers of packaging:

1. Outer implant box (circulating nurse)
2. Outer tray; peel paper back (circulating nurse)
3. Remove the sterile tray from outer tray and submerge sterile tray and peel back paper or squirt saline into inner sterile tray (scrub nurse or surgeon) and lift plastic lid
4. Hand off to surgeon for implantation (scrub nurse or surgeon)





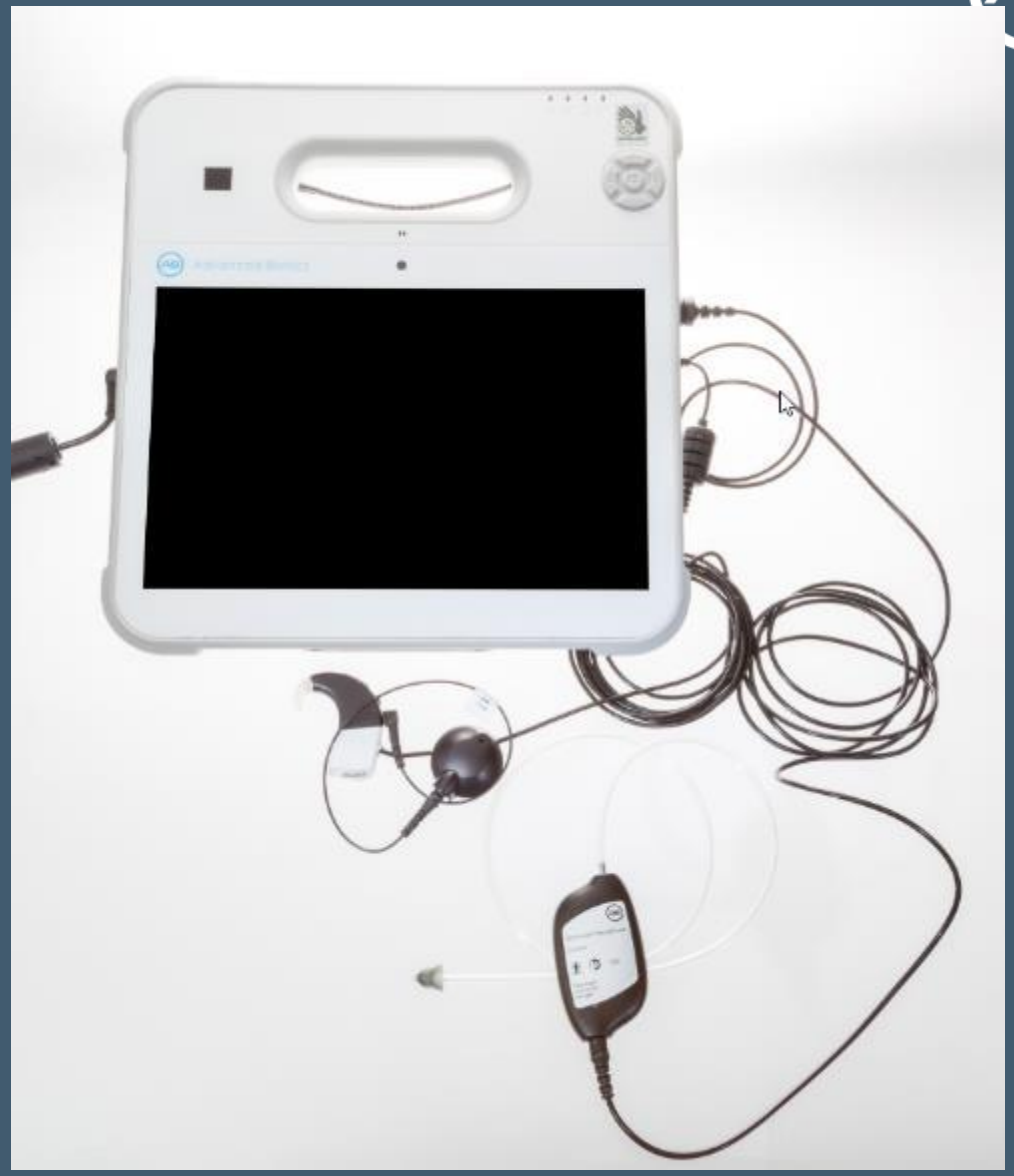




Opening the implant tray under saline or squirting in saline before pulling back the paper top reduces the risk of ESD (static) shocking and disabling the implant. Historically an issue with the older, ceramic casing where static could pass through the ceramic. Today with the titanium casing the static less likely to pass through but it is still good handling practice to moisten the implant and electrode before insertion.

FOR INTERNAL USE ONLY

AIM™ System – Active Insertion Monitoring



It is at this time the AIM™ would be connected if being used in surgery

NOTE: See the series of on-line AIM™ training modules for more on this AB product.

The AIM ™ system uses the implant to measure electrocochleography, or ECochG, potentials generated by the inner ear and the auditory nerve in response to acoustic stimuli.

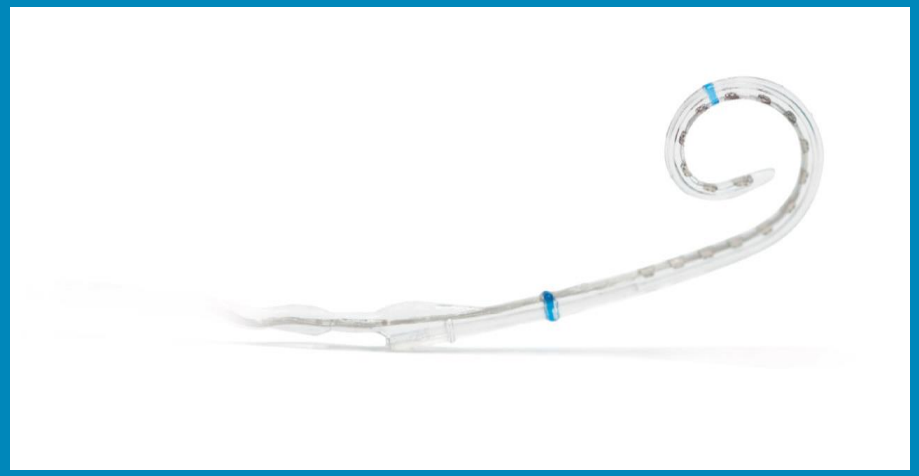
This continuous and real-time measurement during electrode insertion provides invaluable feedback to the surgeon.

OM Suite:

- ECochG
- NRI
- ESRT
- Impedance measurements
- Objective audiometry

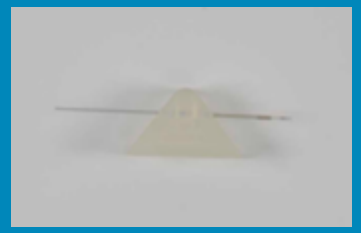
FOR INTERNAL USE ONLY

HiFocus ™ Mid-Scala (HFMS) Electrode Insertion



Reloading Tool allows for up to 2x reloading = 3 insertion attempts before going to the backup implant





Reloading Tool and extra style in the sterile tray with every implant

Freehand/Off-Stylet Technique





Insertion Tool Technique





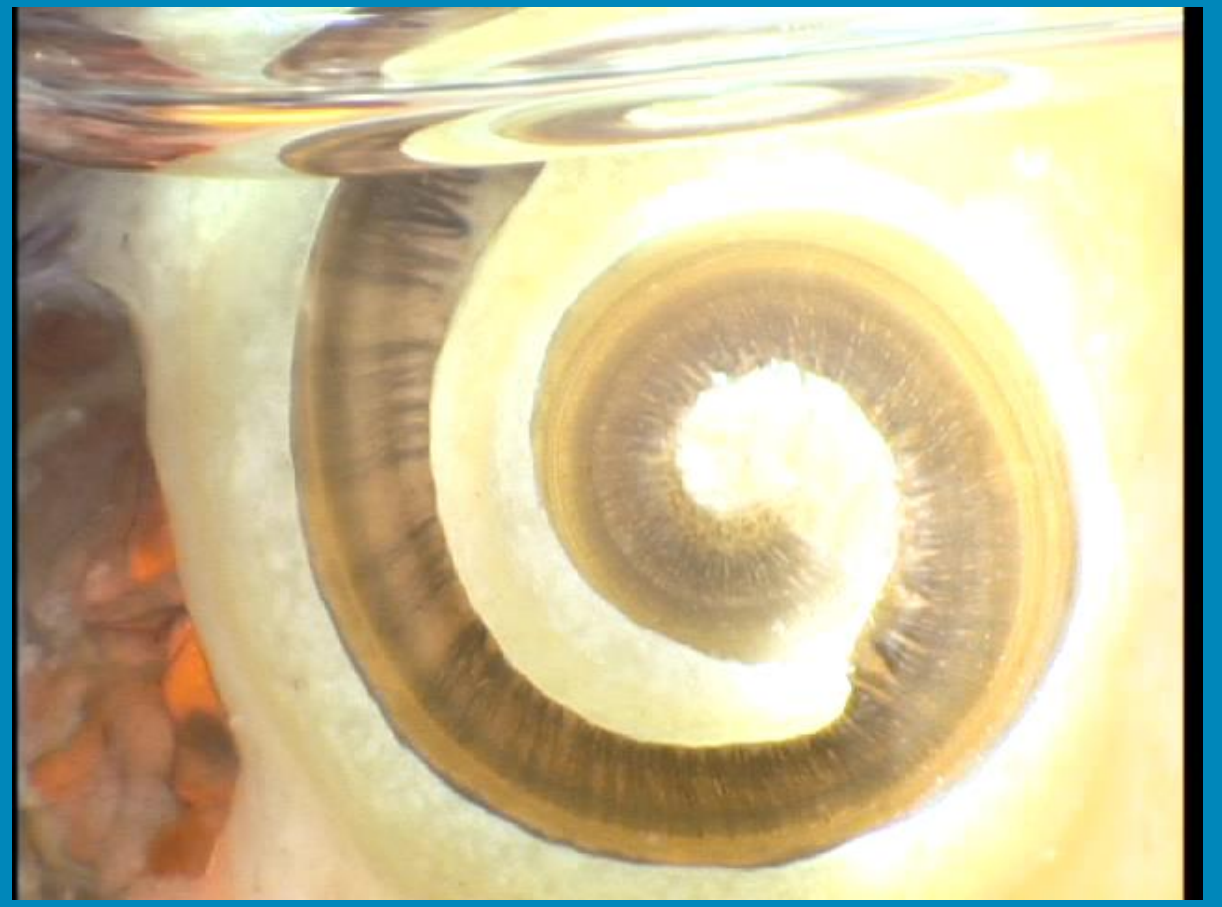
FOR INTERNAL USE ONLY

HiFocus Mid-Scala Electrode Insertions – demonstrating importance of stylet depth and apical blue marker

Good insertion



Bad insertion



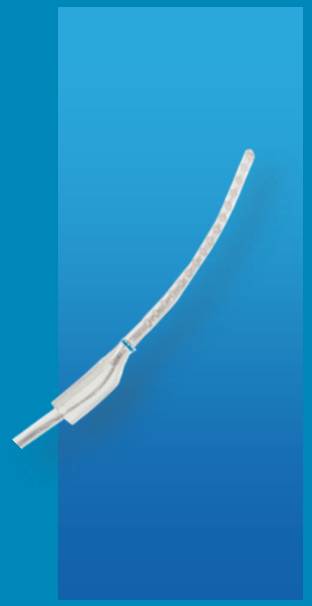
HiFocus ™ SlimJ Electrode – Free Hand Technique with Forceps



HiFocus™ SlimJ electrode

- Use the HiFocus™ Electrode Forceps*
- Hold the HiFocus™ SlimJ Electrode array at the wing
- Ensure that planar electrode contacts face superiorly towards the modiolus
- The wing should be positioned inferiorly (electrode contacts facing superiorly towards the modiolus)

* Or standard surgical forceps or a similar tool





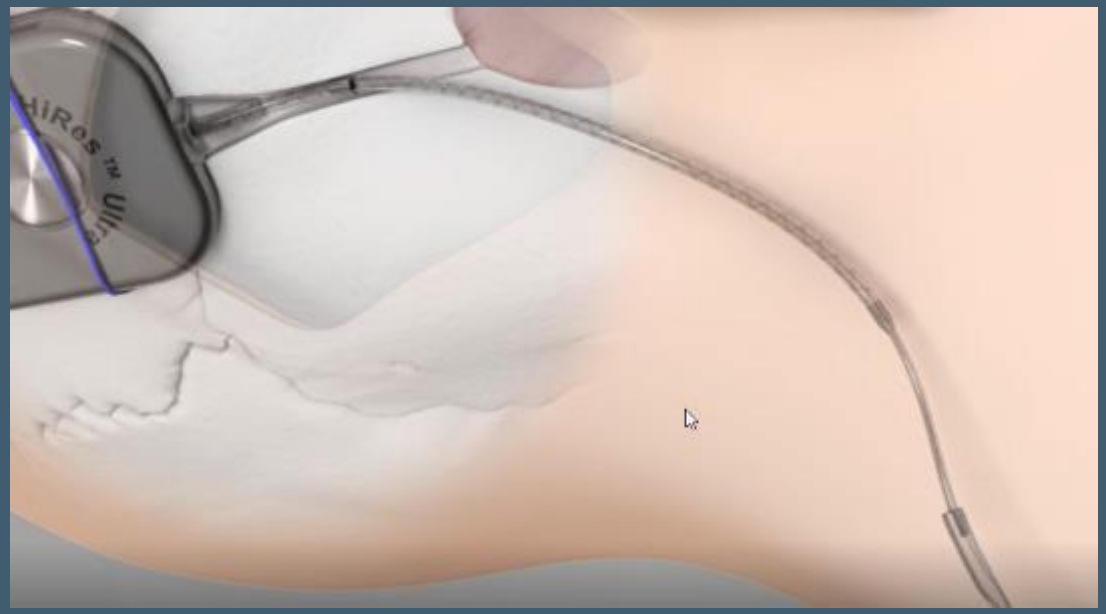
HiFocus™ SlimJ Electrode Depth Gauge
CI-1605 (optional for difficult anatomy cases)

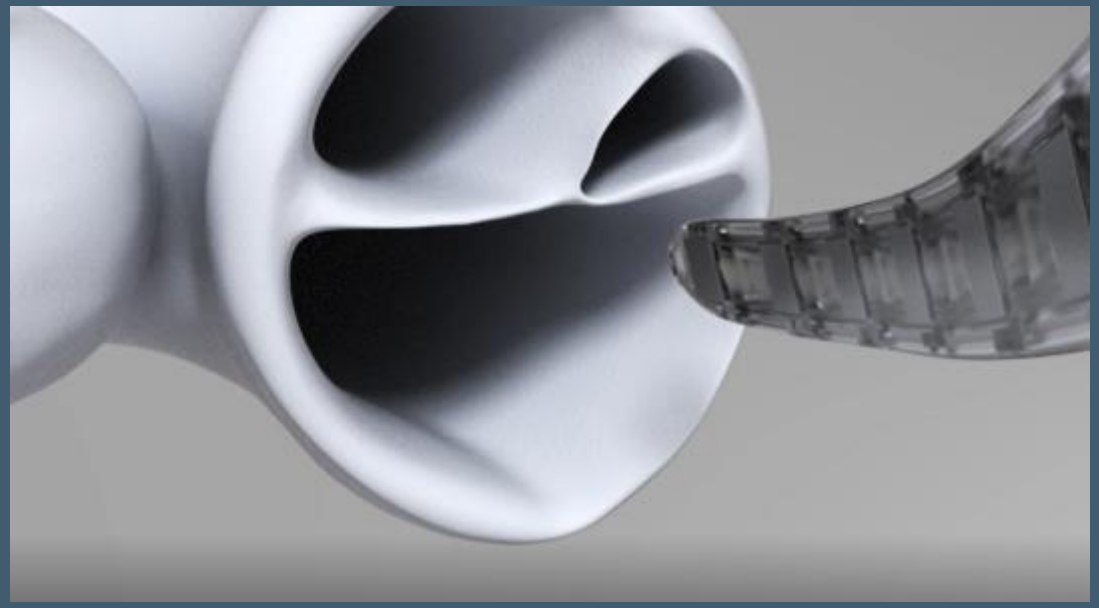
FOR INTERNAL USE ONLY

HiFocus SlimJ Insertion –



Place the implant in pocket and recessed ramp – insert the electrode



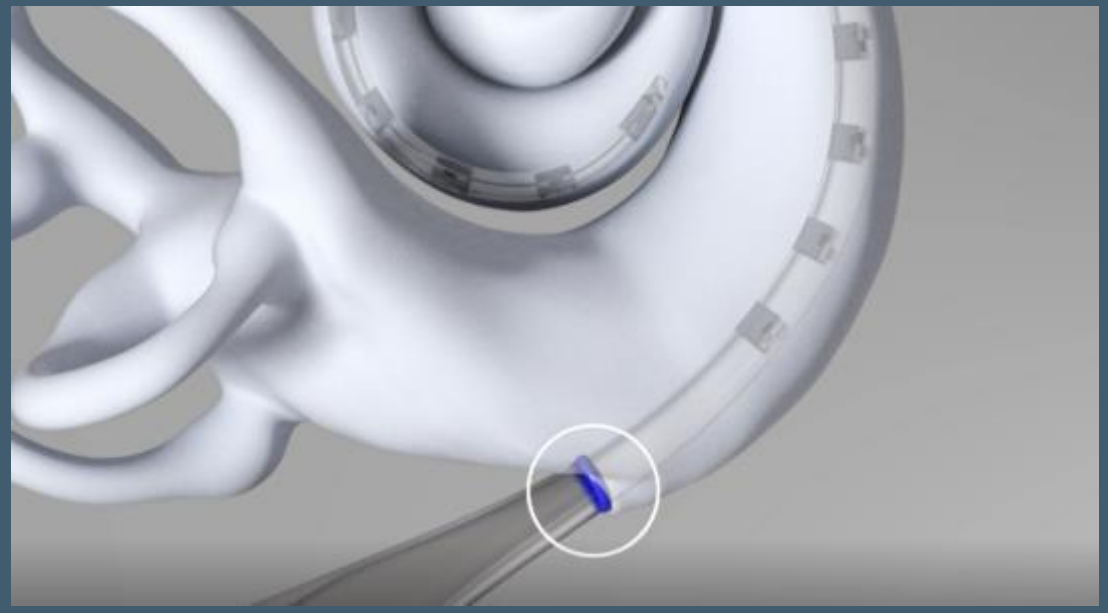


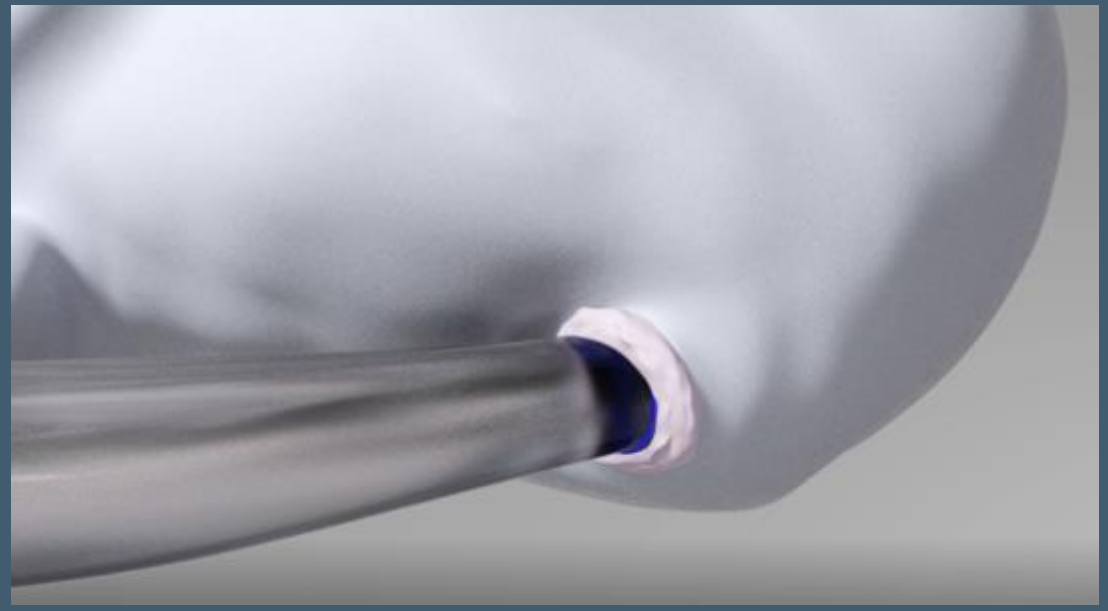
FOR INTERNAL USE ONLY

Pack around the Round Window

Pack the RW/cochleostomy site with fascia or muscle taken from the skin flap.

This helps keep the array in place and encourages fibrosis to form around the RW, blocking bacteria from entering the cochlea (meningitis) and perilymph fluid from leaking out.



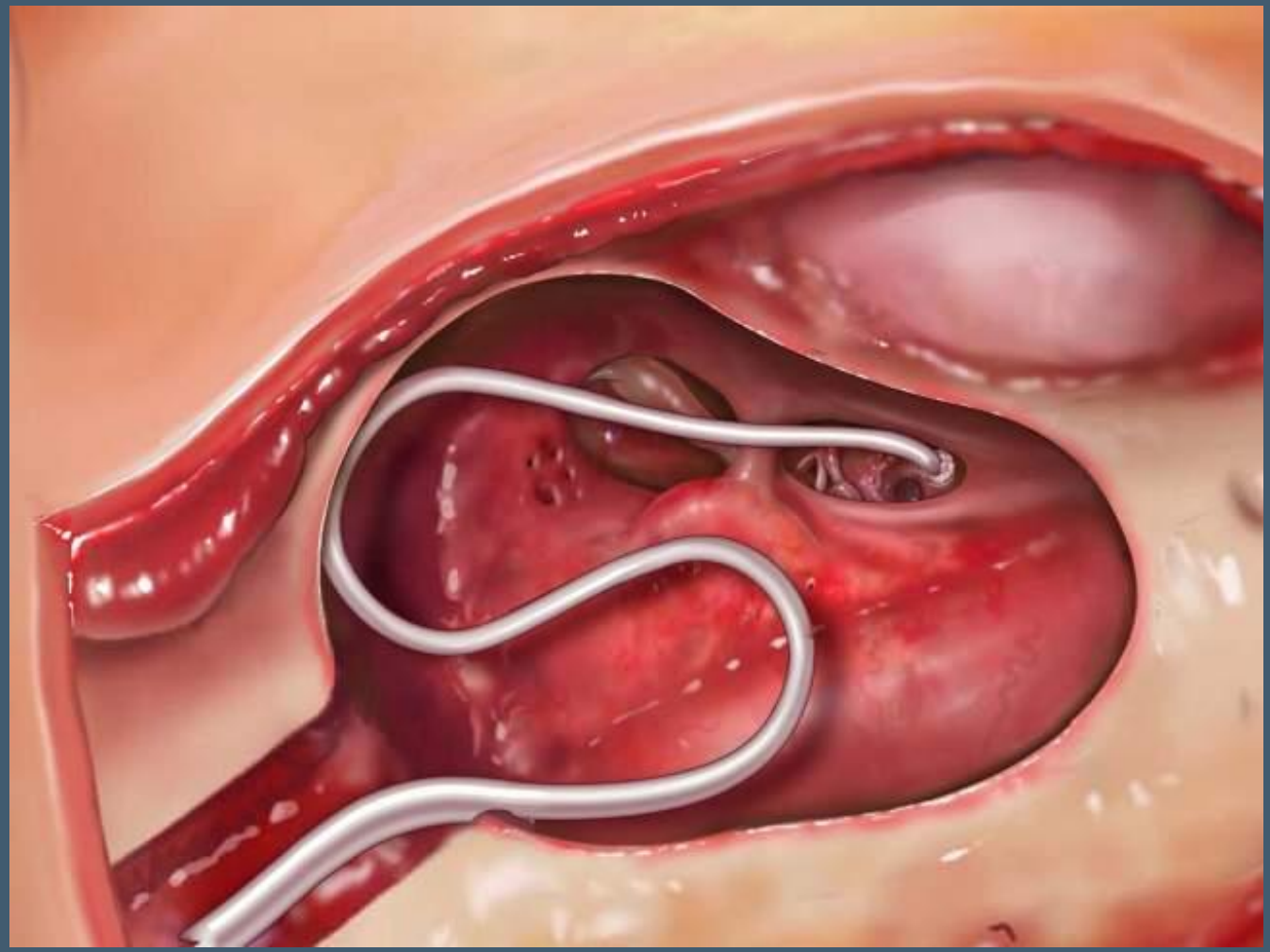


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Coil the lead within the mastoid cavity under bony overhangs

This step is critical to help avoid the electrode array from migrating back out of the cochlea. The mechanics of the lead should be pressing medially (inward) and not wanting to spring back out.

Catch the lead wire under bony overhangs within and around the mastoid cavity



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Photos from a live surgery

One surgeon’s approach to cochlear implant surgery…



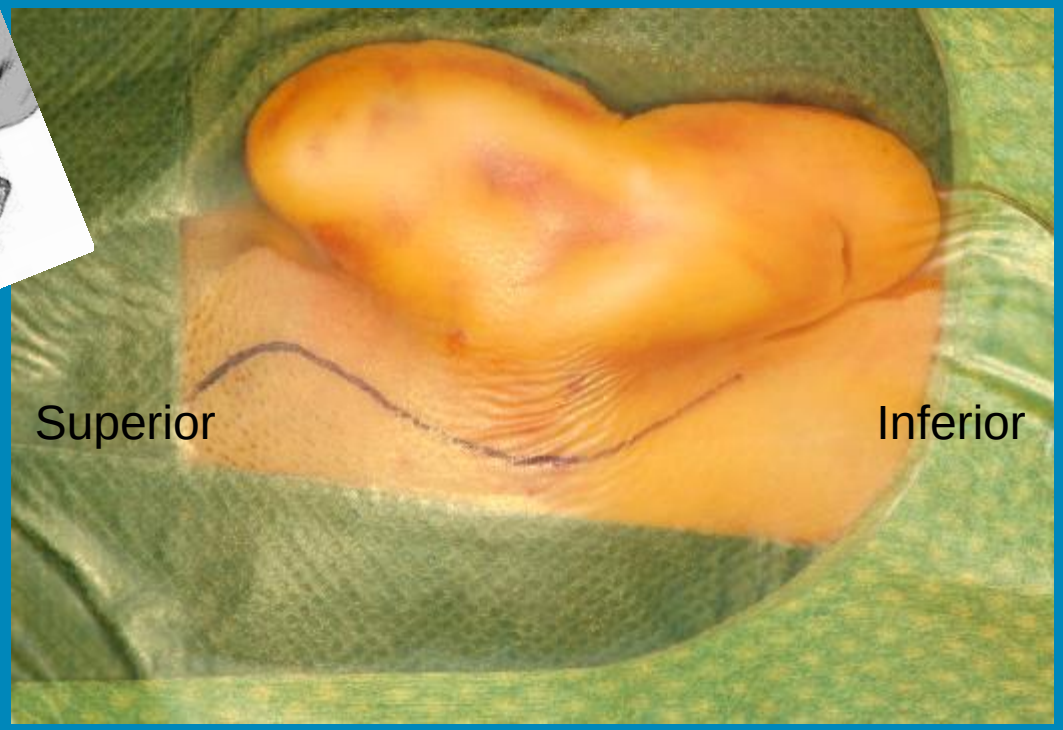


Draped right ear



Sterile field is created with towels down and *Ioban* drape over the site with ear pulled forward; incision created behind the pinna (right ear)







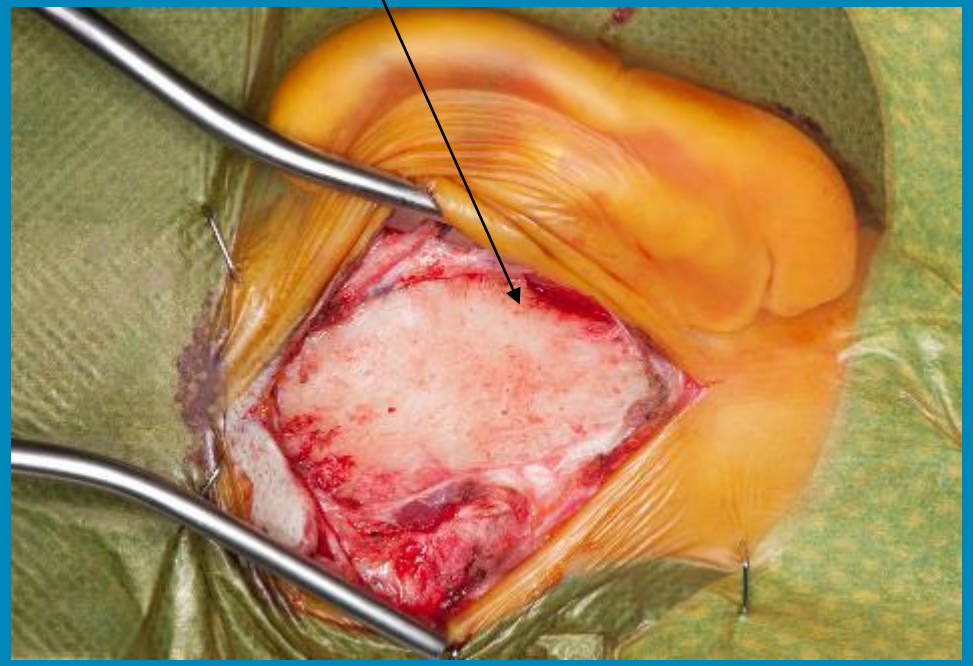
Periosteal Layer



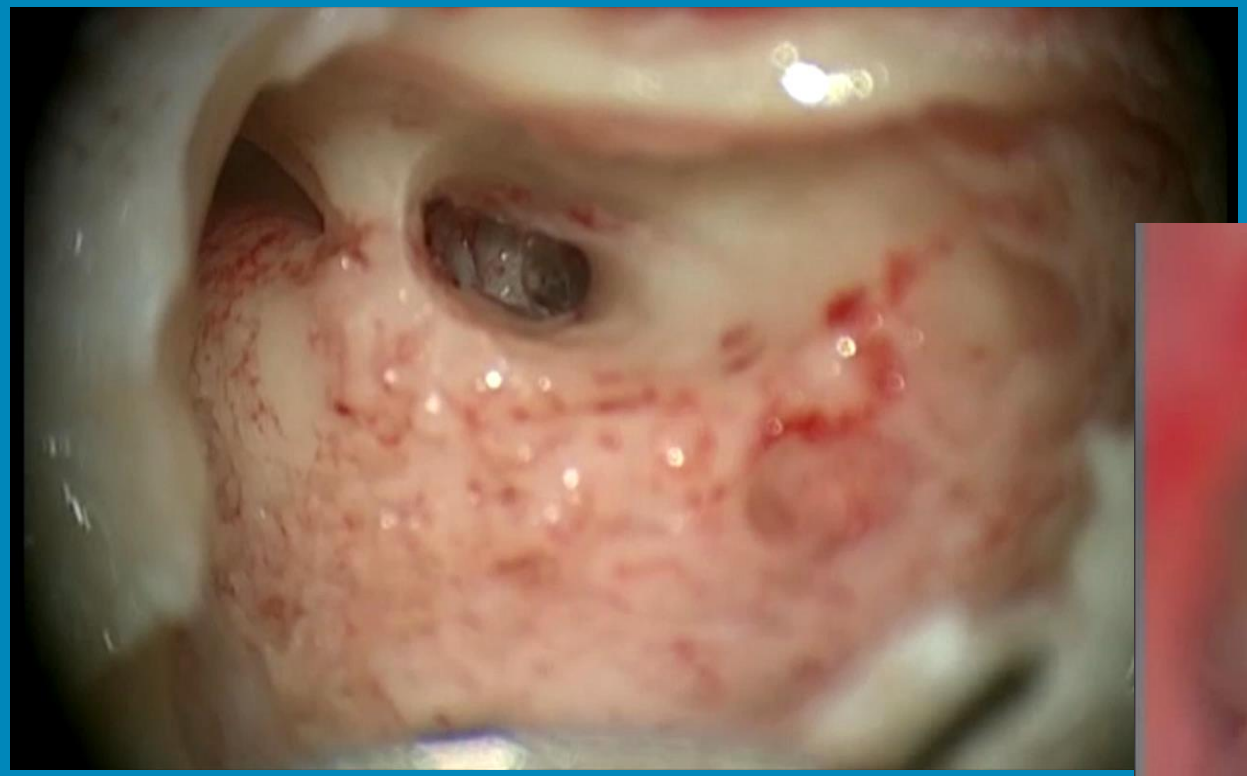


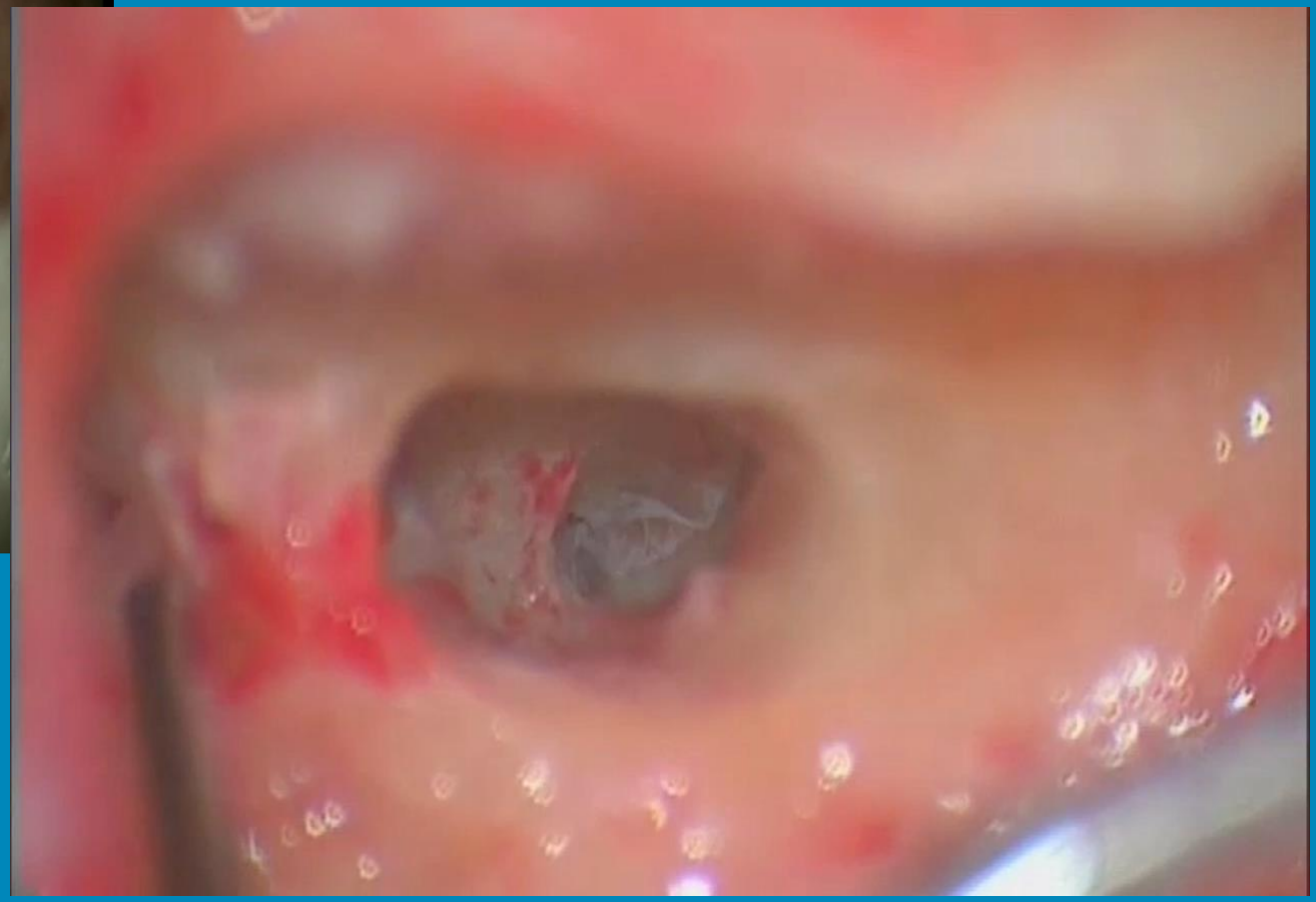
Separating skin/muscle flap and periosteal layers of tissue; retractors to open surgical site

Exposed down to level of the skull and identify the posterior canal wall



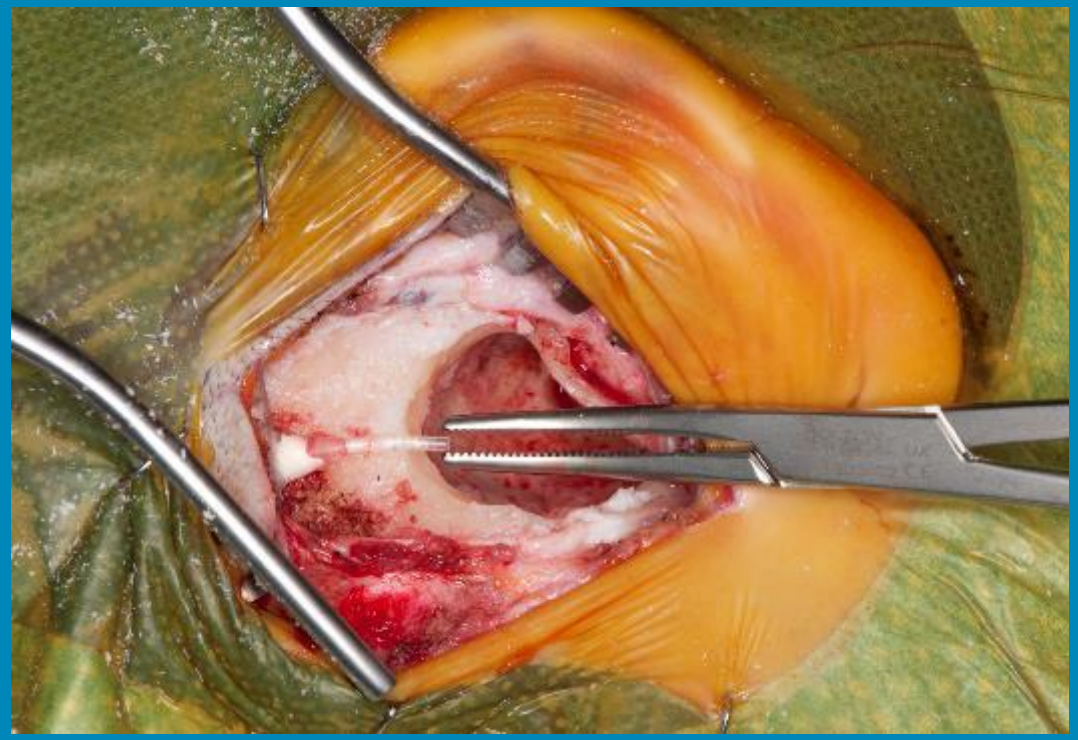
Open RW and insert SlimJ Array

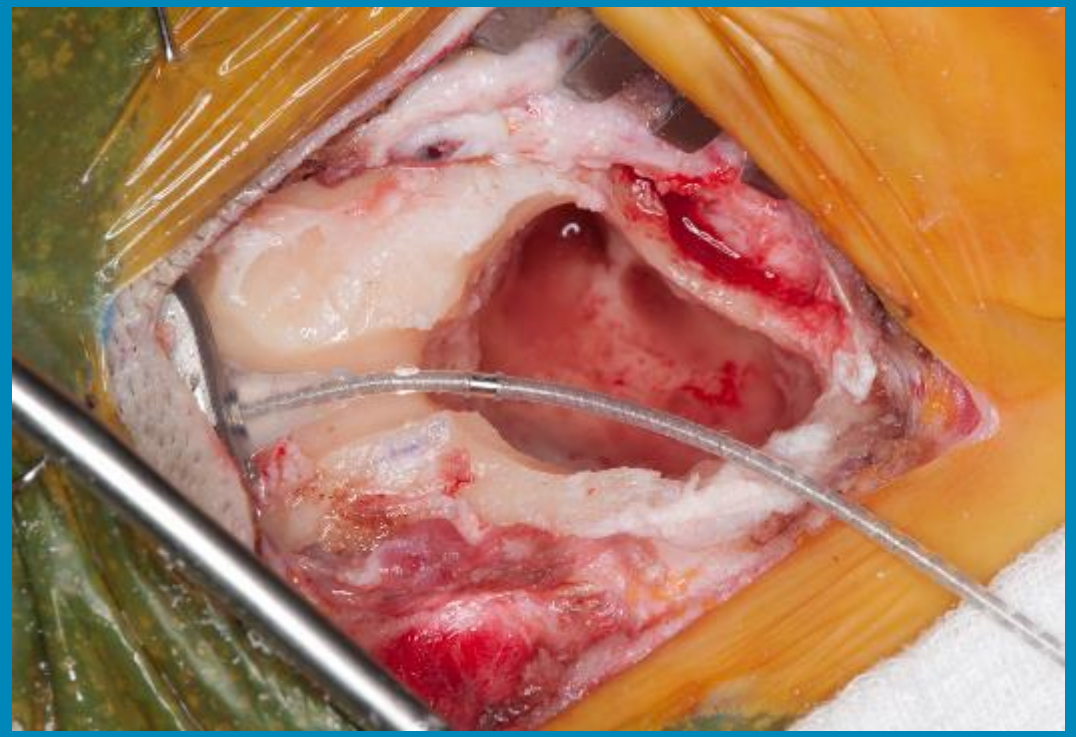




Test pocket with Silicone Mockup before seating implant

Once down to the RW and confident there will be no issue with electrode insertion, a recessed ramp and lead channel are drilled to prepare for implant placement. Using Ultra silicone mock-up to test pocket and ramp before inserting implant.





Close tissue layers

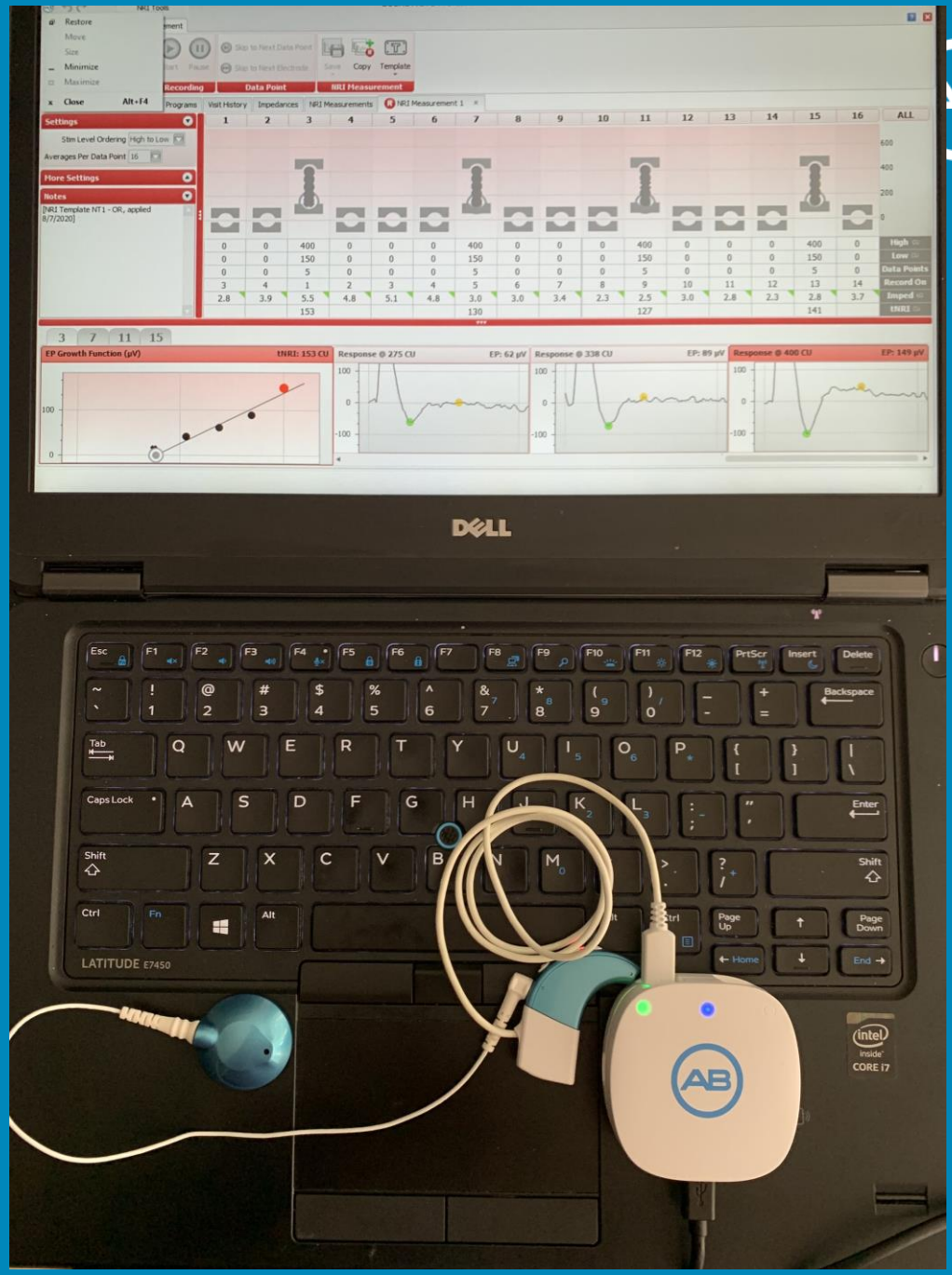




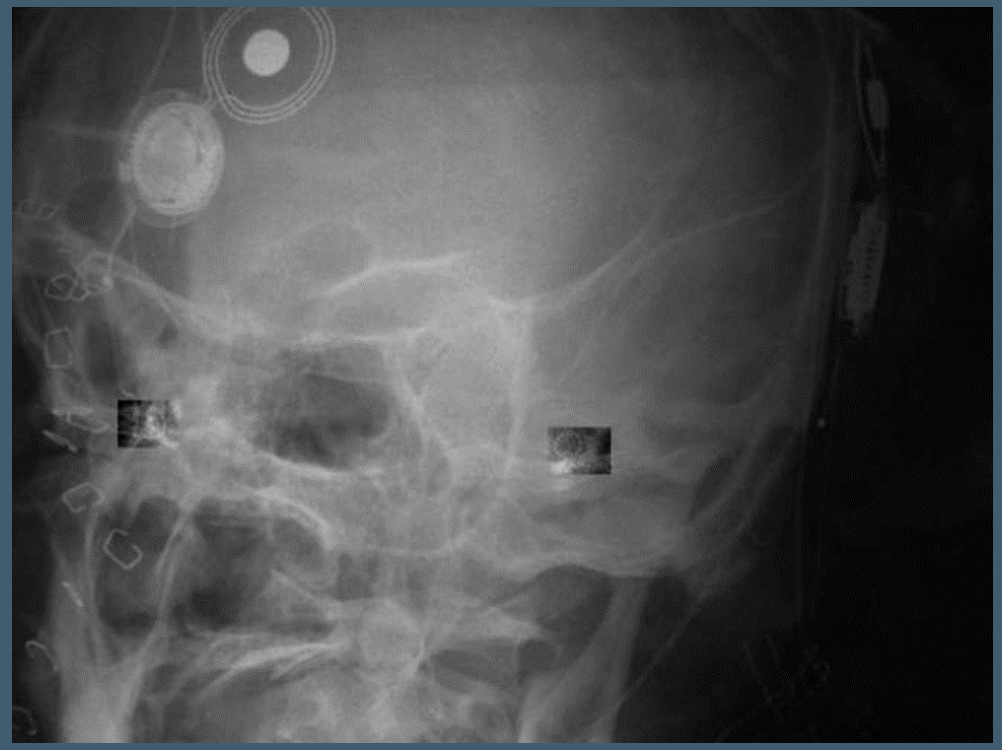
Device Testing Equipment Setup:

- ❑ Laptop with current software
- ❑ CPI 3 with USB cable
- ❑ Speech Processor: Naida BTE, Neptune or PSP (with cable lock)
- ❑ Longest cable configuration possible
- ❑ Auxiliary HP cable for added length
- ❑ UHP/ UHP3D headpieces with strongest magnet available

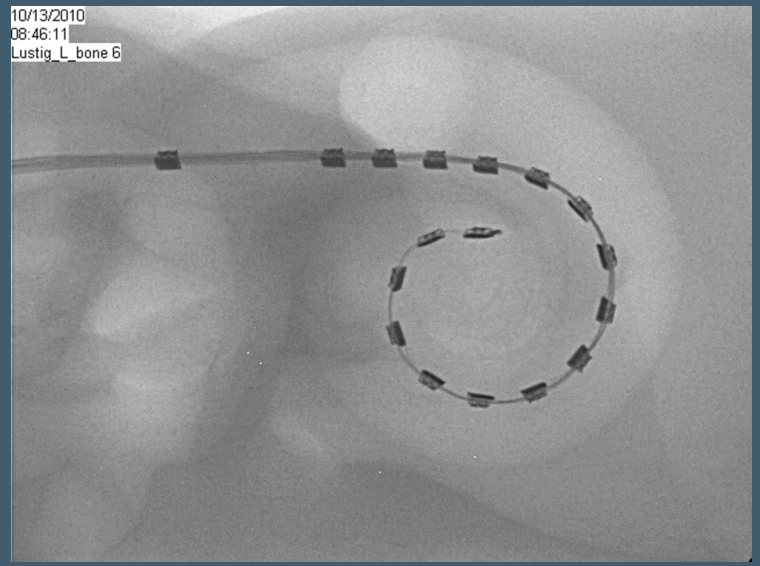








Set up an A-P (Anterior-Posterior), Transoribital view with “high penetration” (overexposure) of the x-ray.



HiFocus™ Mid-Scala X-Ray from bone study

Note: pre-curved arrays will look curled even if not in cochlea.

FOR INTERNAL USE ONLY

Surgery is complete

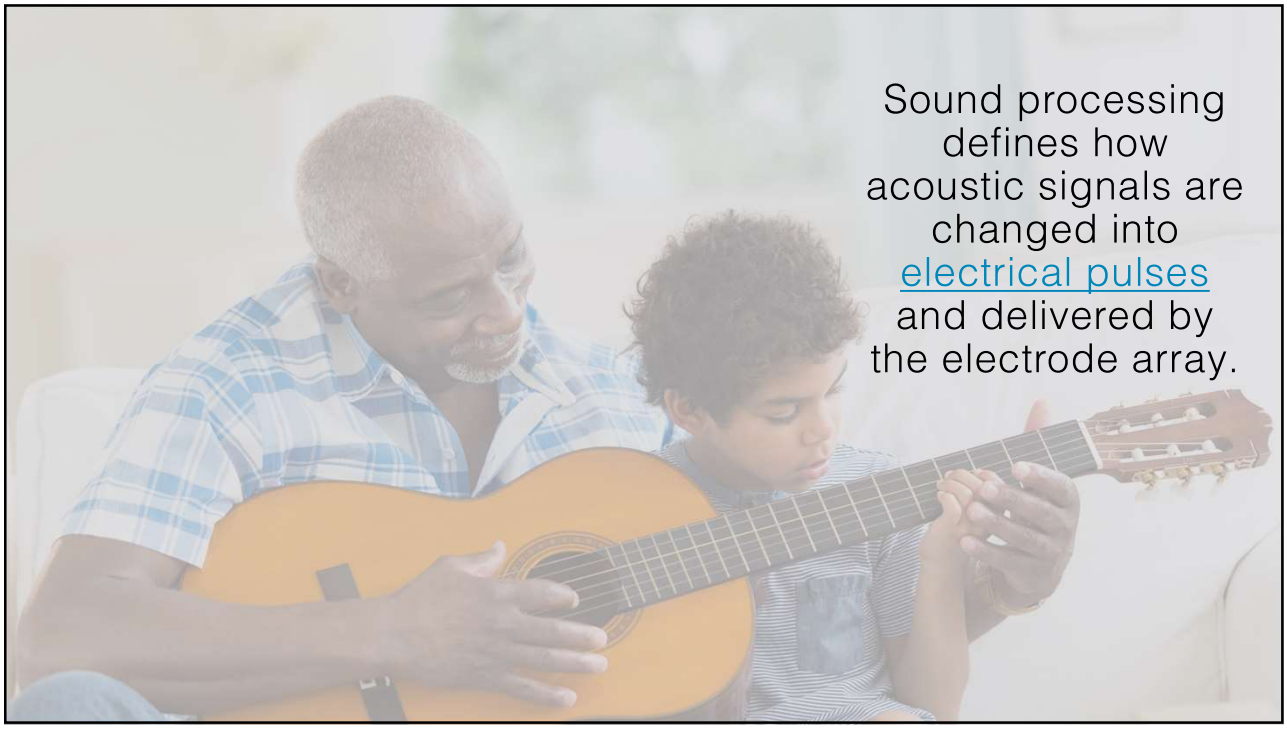
Typically 2 weeks post-op, once the healing and swelling reduces, the patient will go to the audiologist to have the external equipment hooked up and hear for the first time with their new implant.





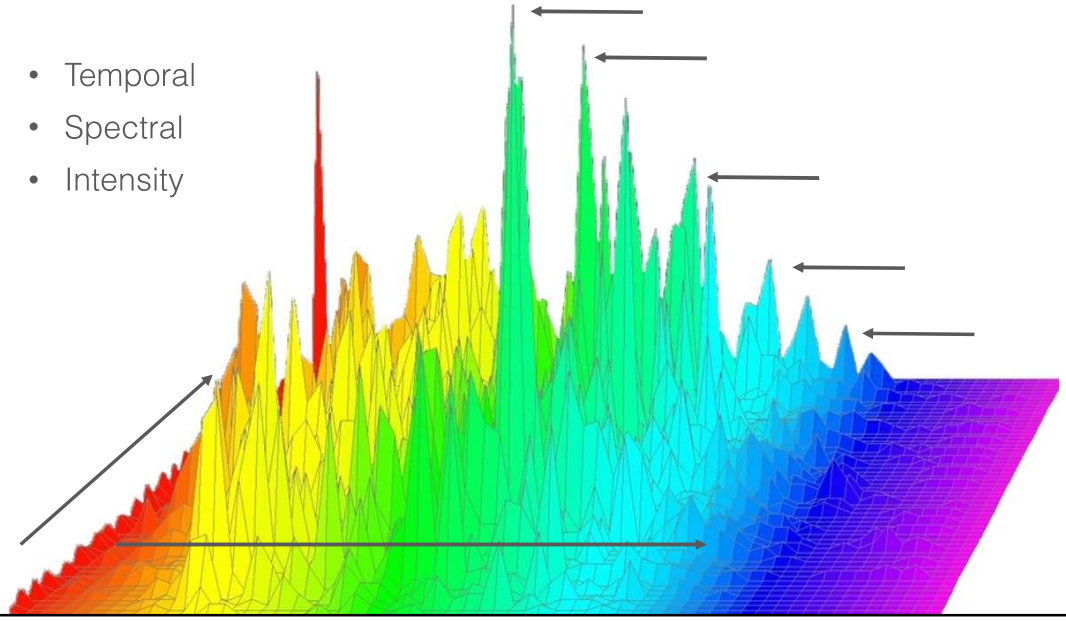
Everyone deserves to connect to a full life of sound.

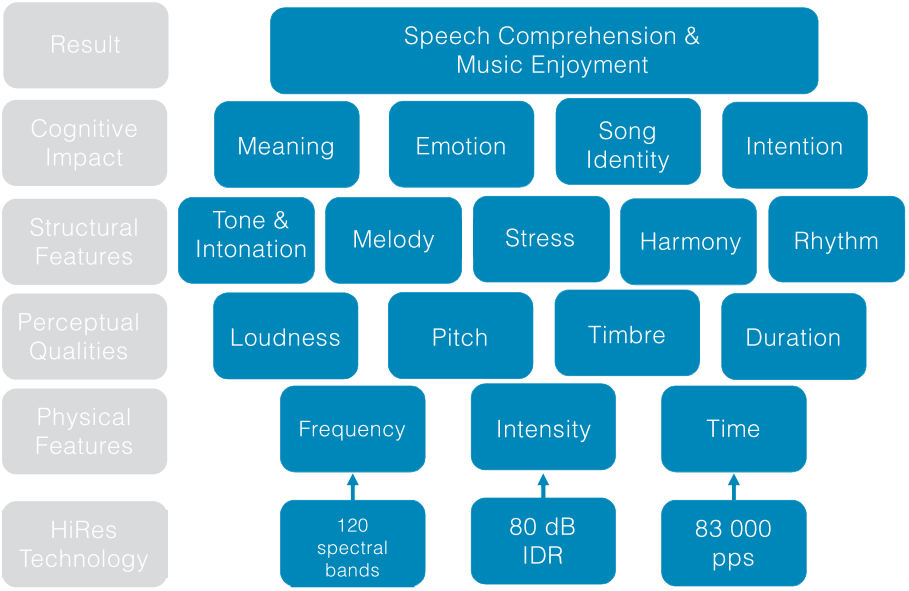

ADVANCED
BIONICS
POWERFUL CONNECTIONS
Advanced Sound Processing
A Sonova brand


Sound processing defines how acoustic signals are changed into electrical pulses and delivered by the electrode array.

Sound Parameters

- Temporal
- Spectral
- Intensity

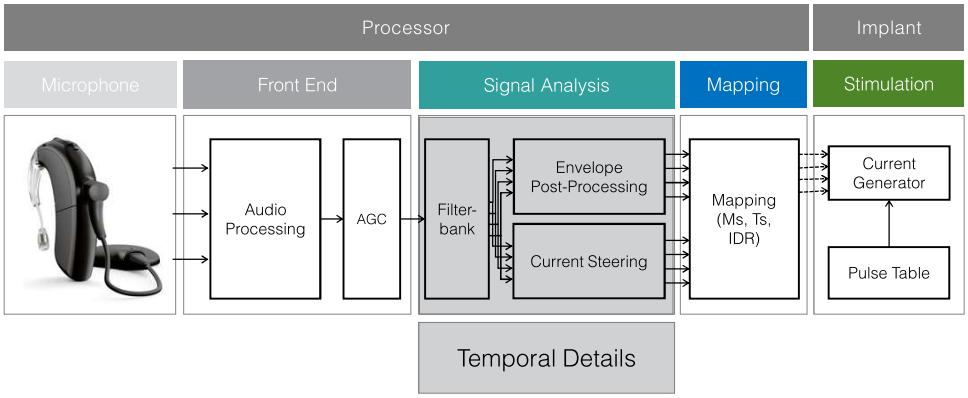




Sound Processing Strategies

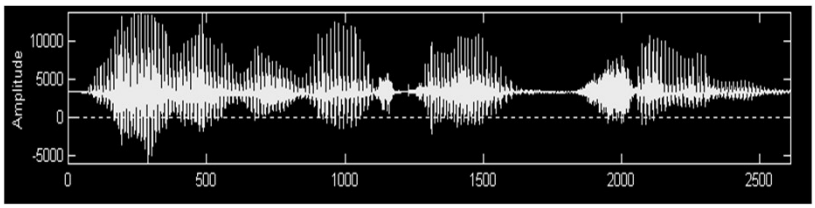
HiResolution Fidelity 120™ HiRes™ Optima	Significant improvement in coding **spectral** information through current steering
HiResolution™ Sound	Significant improvement in coding **temporal** information in all channels
CIS	**Foundation** for all modern sound processing strategies

Sound Processing Pathway



Temporal Characteristics of Speech

Sentence: *Where were you last year, Sam?*



Temporal details provide information on:

- Word and syllabic structure
- Prosody/Stress
- Manner of articulation
- Stops
- Voicing (duration)
- Frication (and strength)
- Nasality

Temporal Characteristics of Speech

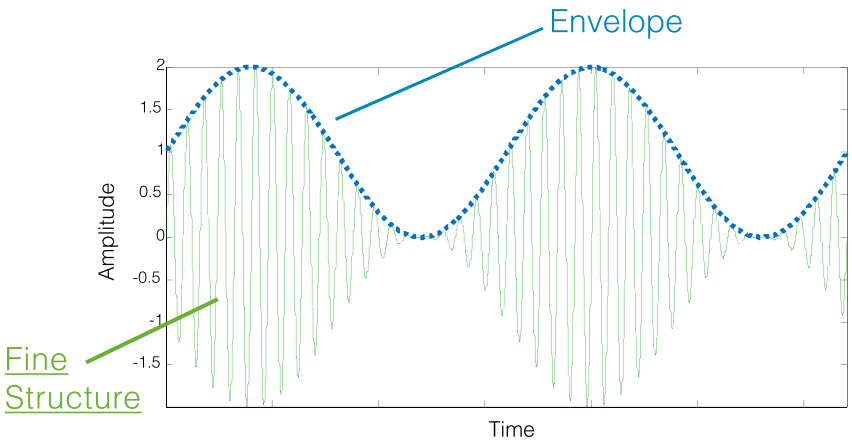
For a vocabulary of 126,000 words, temporal information alone can narrow the options down to

2.4 possible words

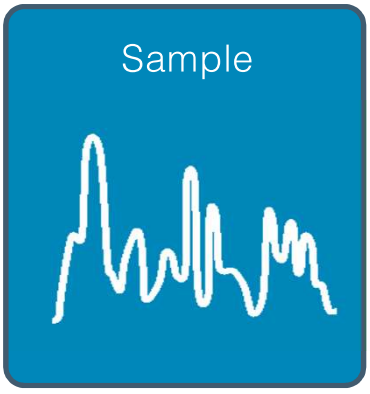


Kiefer 1985

Temporal Characteristics of Speech



Temporal Details



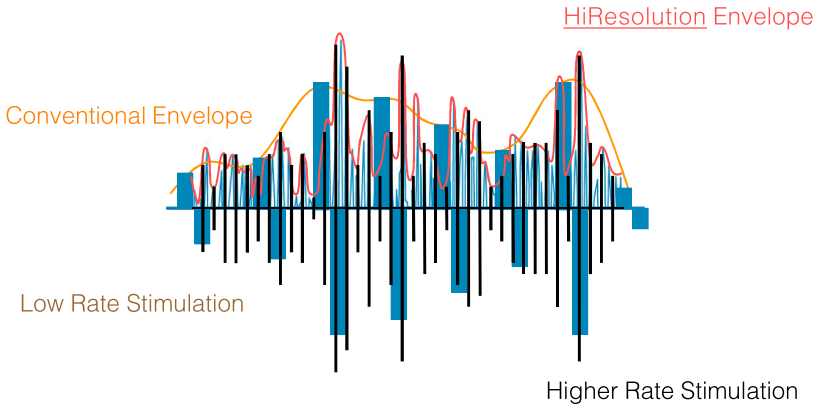


Sampling Rates



22.05k Hz

Temporal Details



Temporal Details

Faster rates of stimulation elicit stochastic firing of the auditory nerve and provide additional temporal details that:

Deliver increased fine structure information

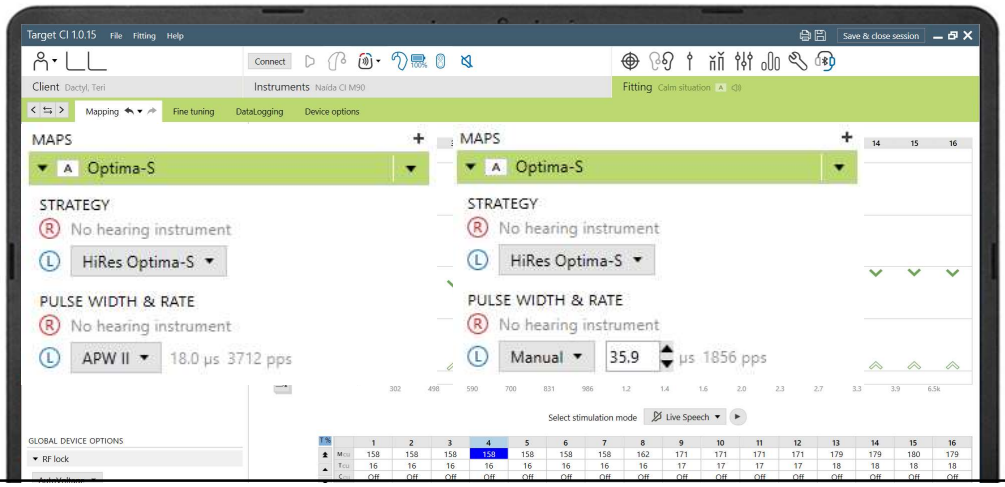


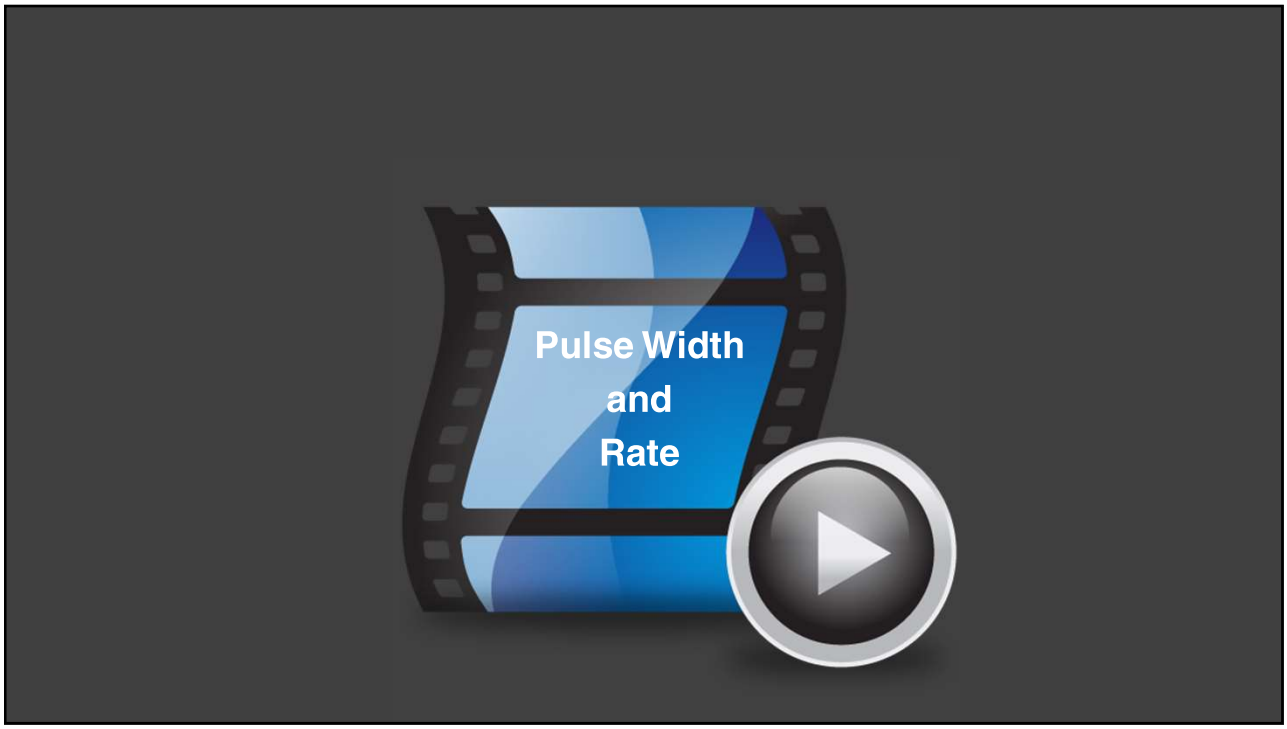
Provide additional rate pitch percepts



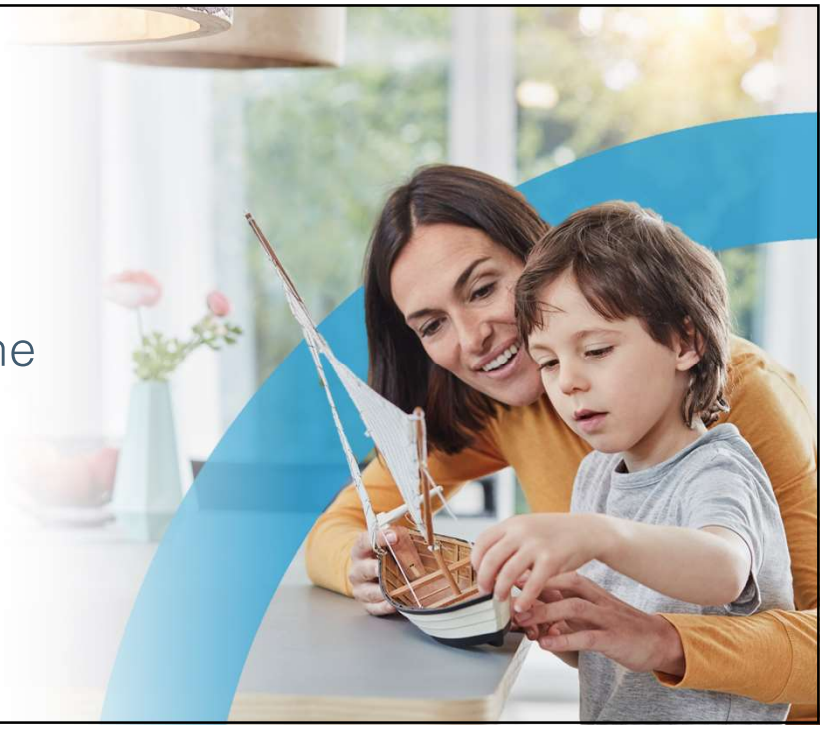
Temporal Details

AB's fitting software provides the flexibility to adjust rate of stimulation by adjusting the **pulse width**. Wider Pulse Width = Slower Rate

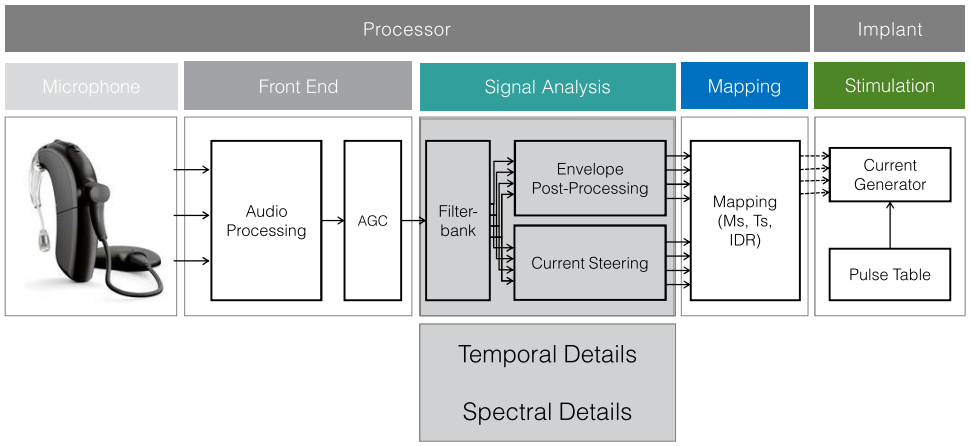




Temporal details provide a more accurate representation of the acoustic signal, resulting in better hearing performance.

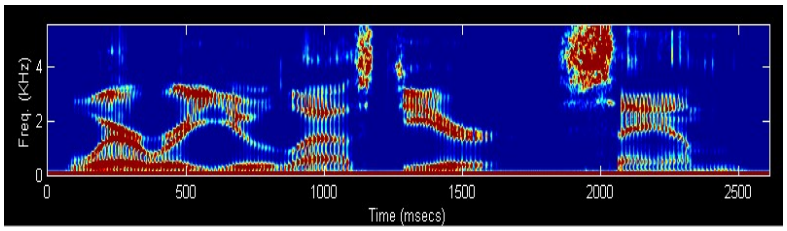


Sound Processing Pathway



Spectral Characteristics of Speech

Sentence: *Where were you last year, Sam?*



Spectral details provide information on:

- Vowel identification
- Vowel pitch
- Intonation
- Consonant place of articulation
- Depth
- Naturalness

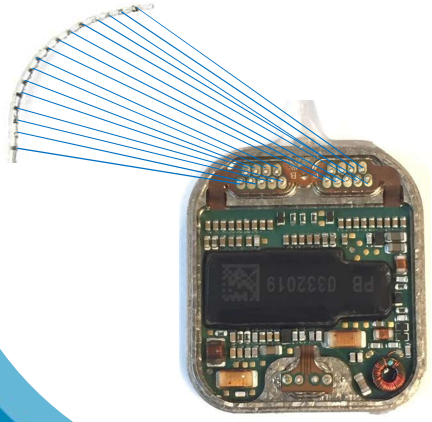


How can we provide additional spectral details?

ADVANCED BIONICS
POWERFUL CONNECTIONS

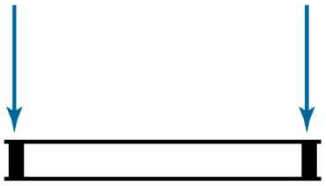
Current Steering

16 independent current sources provide the ability to steer current between electrode contacts.



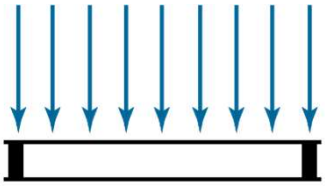
Current Steering

Conventional



Stimulation occurs at the location of the electrode

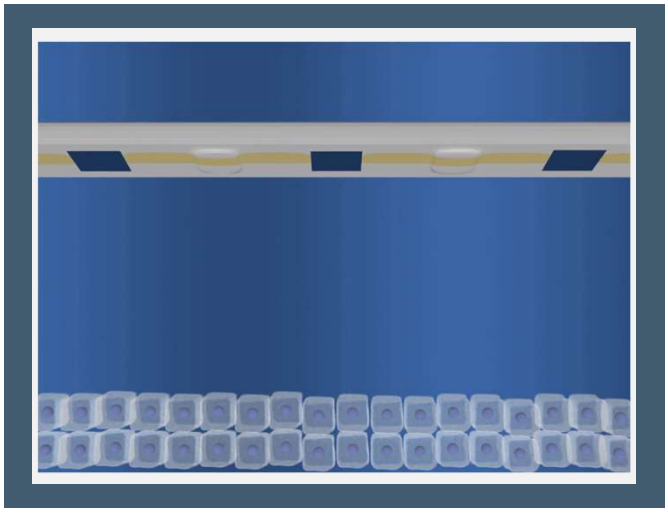
HiRes Fidelity 120



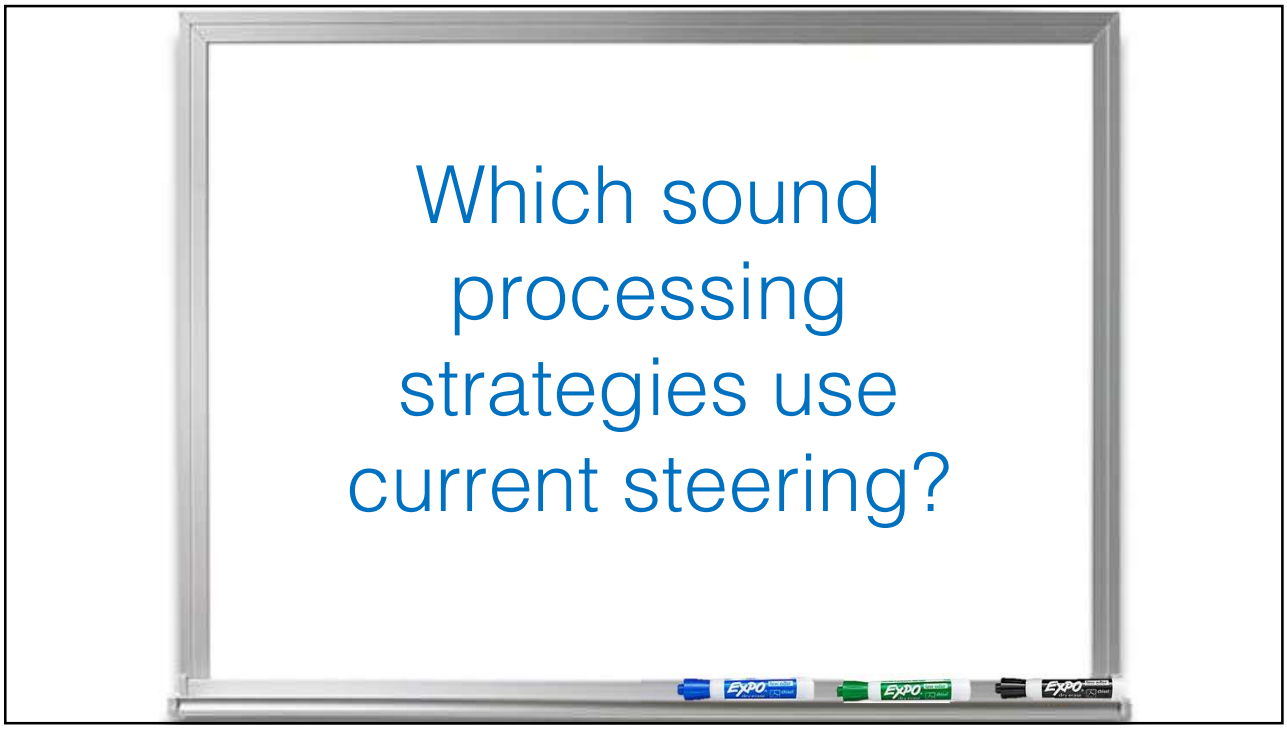
Provides additional points of stimulation

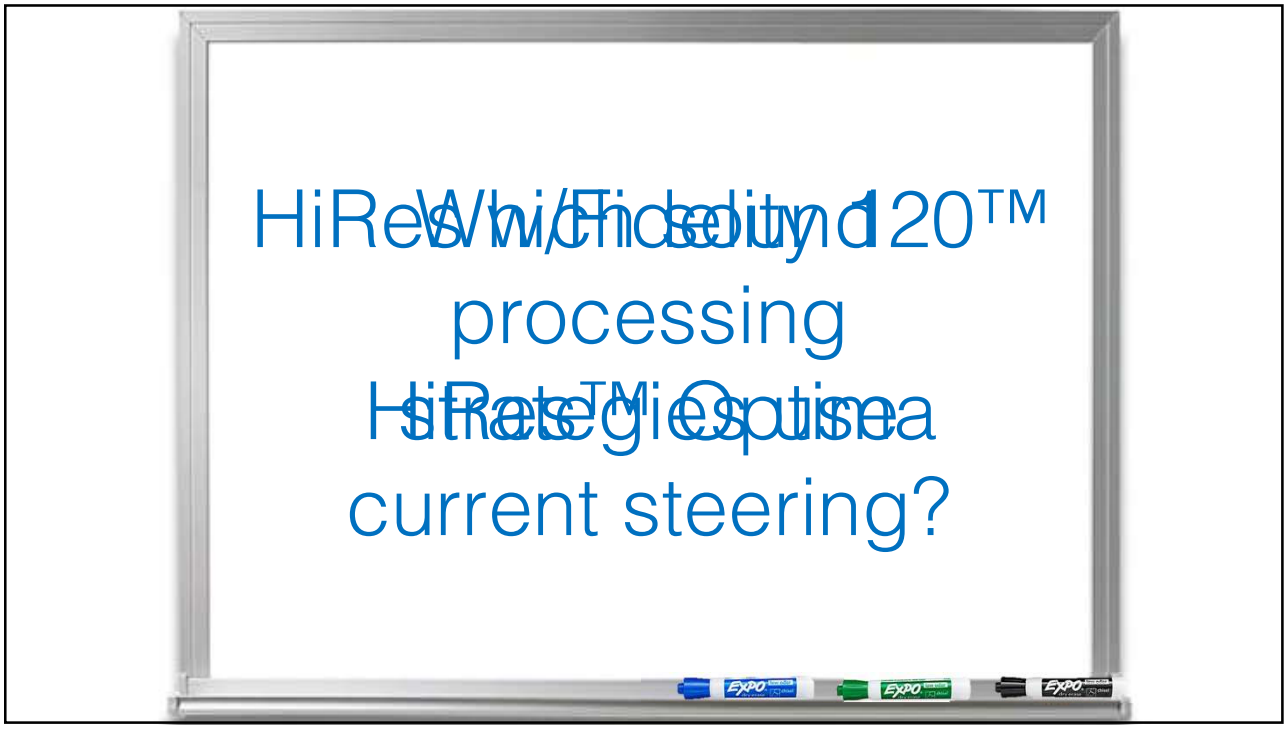
Note: This figure represents stimulation at one site

Sound Processing

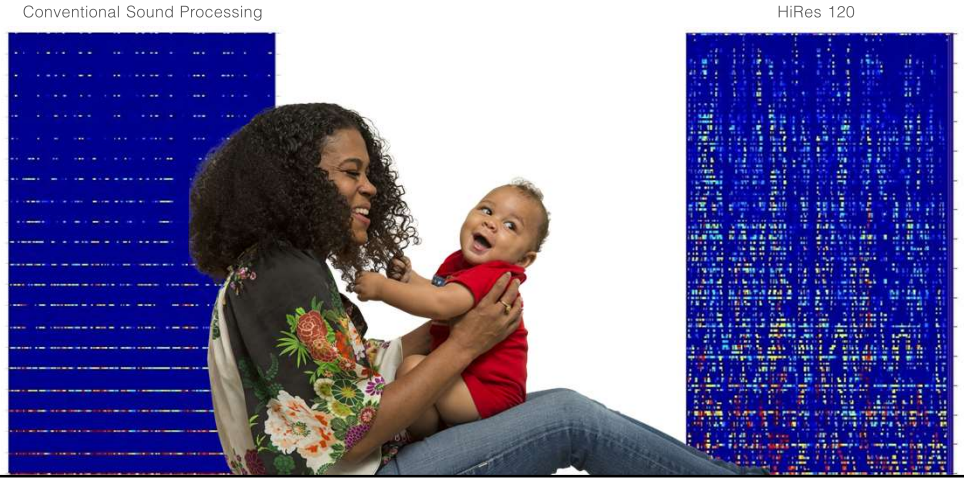


AB's Current Steering

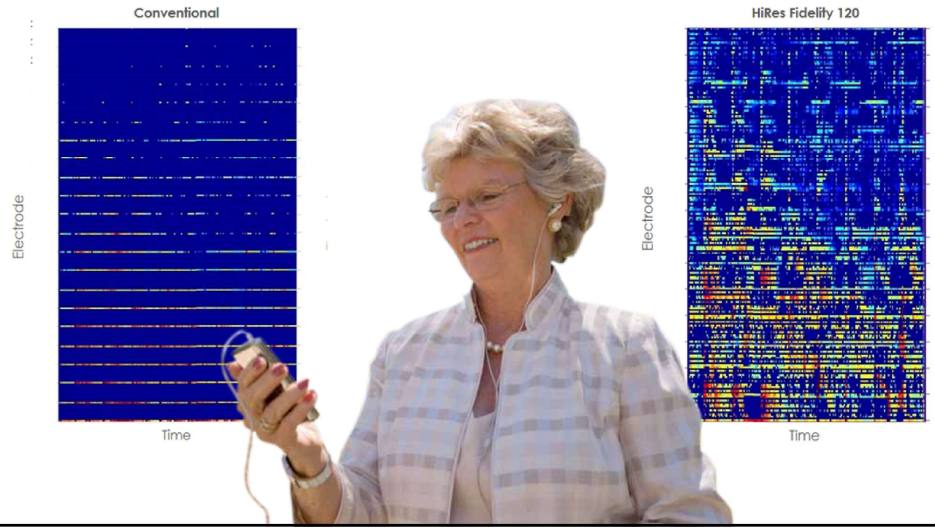

Which sound processing strategies use current steering?


HiRes Fidelity 120™ processing strategies use current steering?

Hear the difference for real world listening…

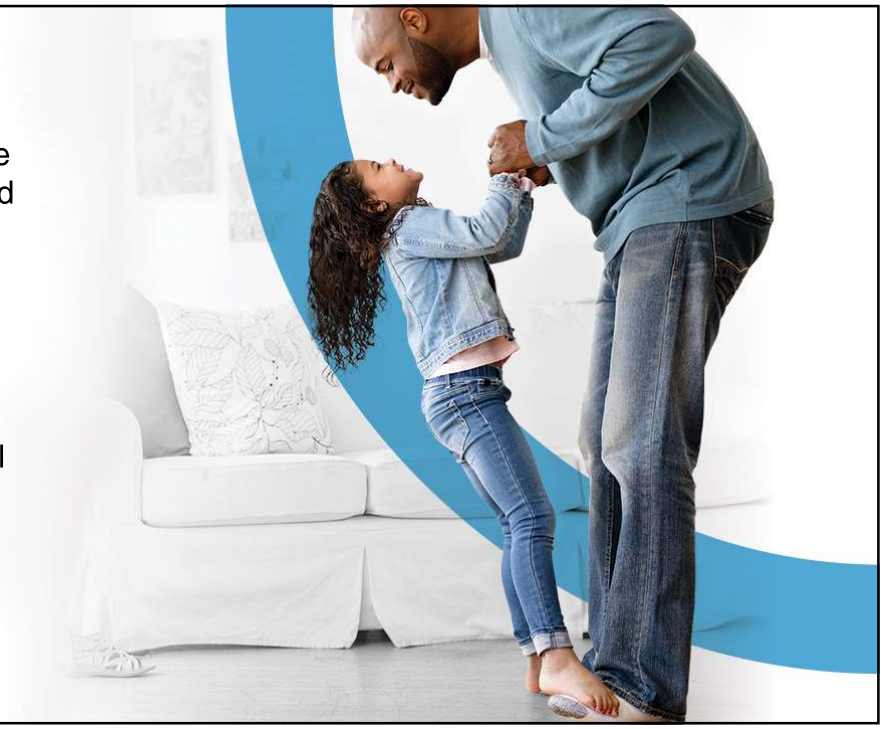


Hear the difference for listening to music.

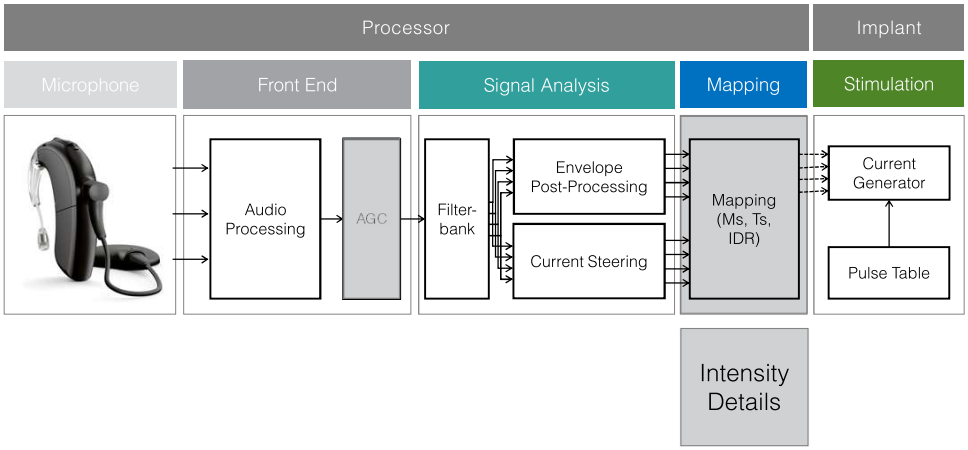


Spectral details contribute to speech intelligibility and sound quality, helping recipients:

- Hear in noise
- Appreciate music
- Hear environmental sounds
- Understand tonal languages



Sound Processing Pathway



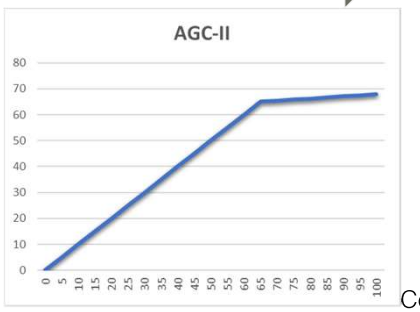
AGC-II

Slow 1:1 dB ratio

> 55-65 dB SPL

Fast 12:1 dB Ratio







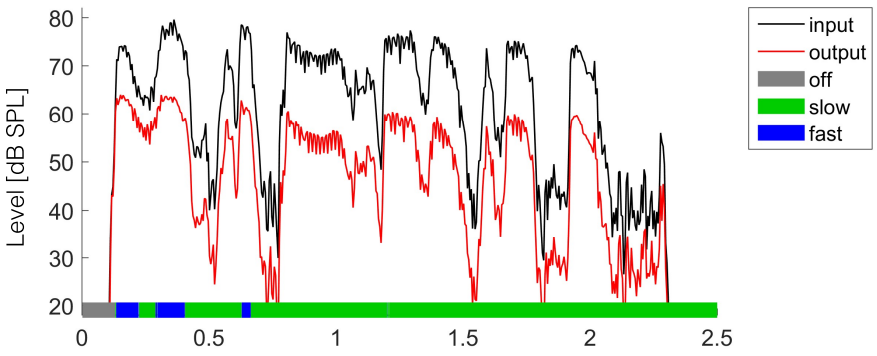
Speech Understanding

Comfort/Sound Quality

AGC-II optimizes gain and compression based on the listening environment

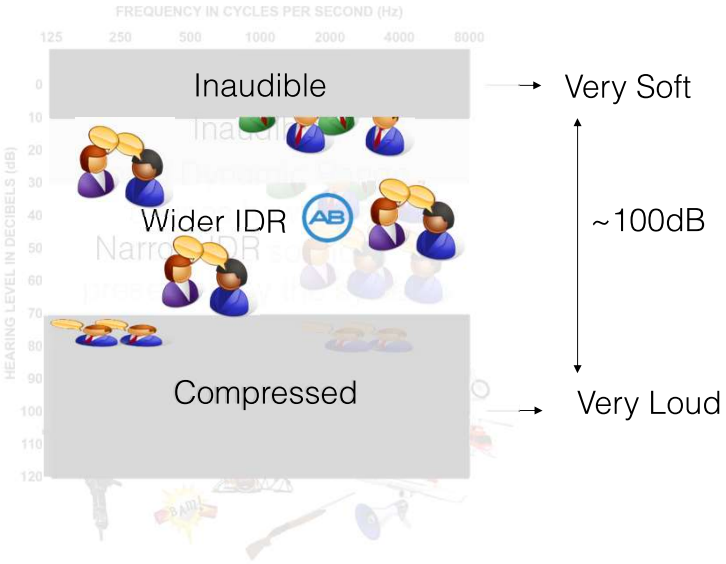
The kneepoint (55-65 dB SPL) is based on average input level and frequency

AGC-II acting on a 70 dB signal average

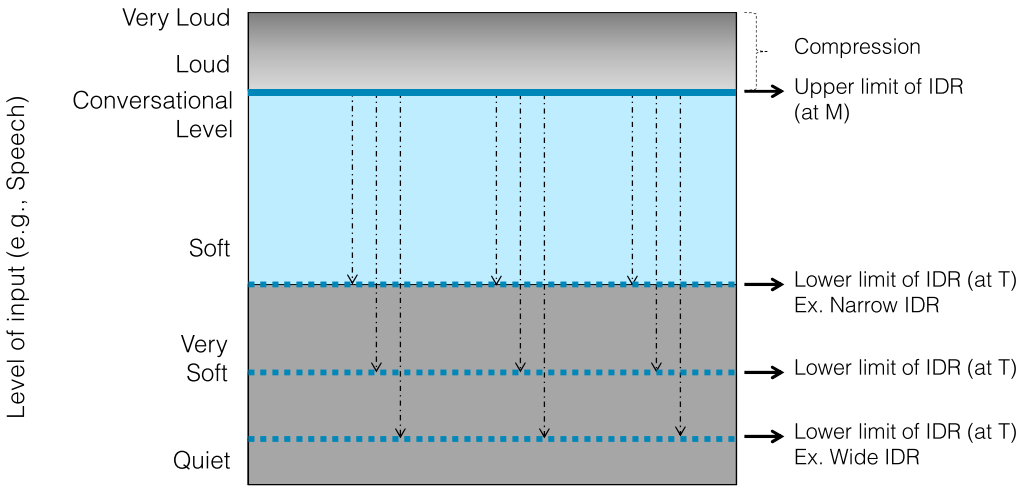


Attack and Recovery Times of AGC allow optimal switching between FAST & SLOW

IDR


Inaudible
Very Soft
Wider IDR
~100dB
Compressed
Very Loud

IDR


Level of input (e.g., Speech)
Very Loud
Loud
Conversational Level
Soft
Very Soft
Quiet
Compression
Upper limit of IDR (at M)
Lower limit of IDR (at T) Ex. Narrow IDR
Lower limit of IDR (at T)
Lower limit of IDR (at T) Ex. Wide IDR



With a wide IDR, soft sounds are more audible, improving perception of important speech sounds.



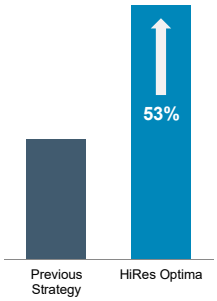
HiRes Optima

- Enables recipients to have similar battery life with smaller processors and batteries
- Takes advantage of unique current steering technology from AB
- Allows AB to miniaturize without compromising performance!



HiRes Optima Clinical Study

Recipients noticed improved battery life with HiRes Optima.



HiRes Optima

The HiRes Optima study had an average battery life improvement of 53% for existing recipients.



HiRes Optima

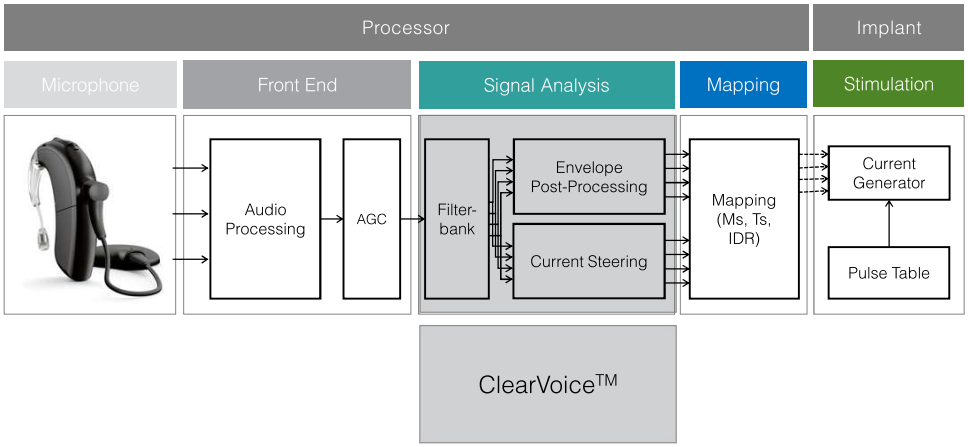
100% of recipients reported that HiRes Optima was acceptable for daily use!

ADVANCED BIONICS
POWERFUL CONNECTIONS

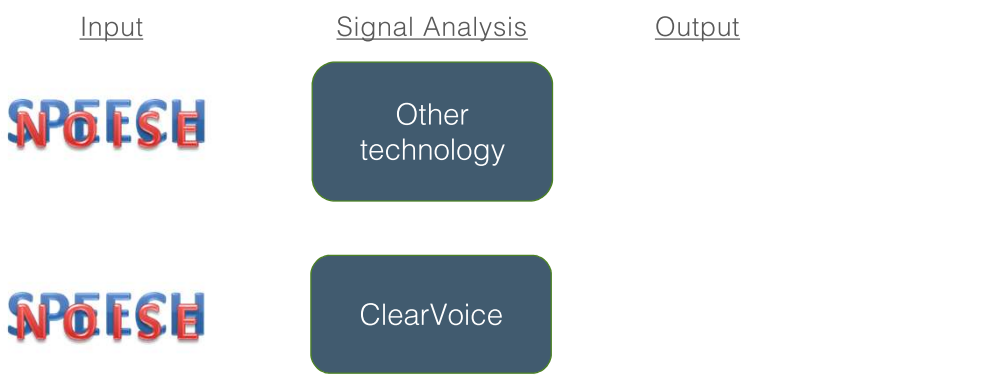
Same great performance and battery life with new strategies and **smaller** devices!



Sound Processing Pathway



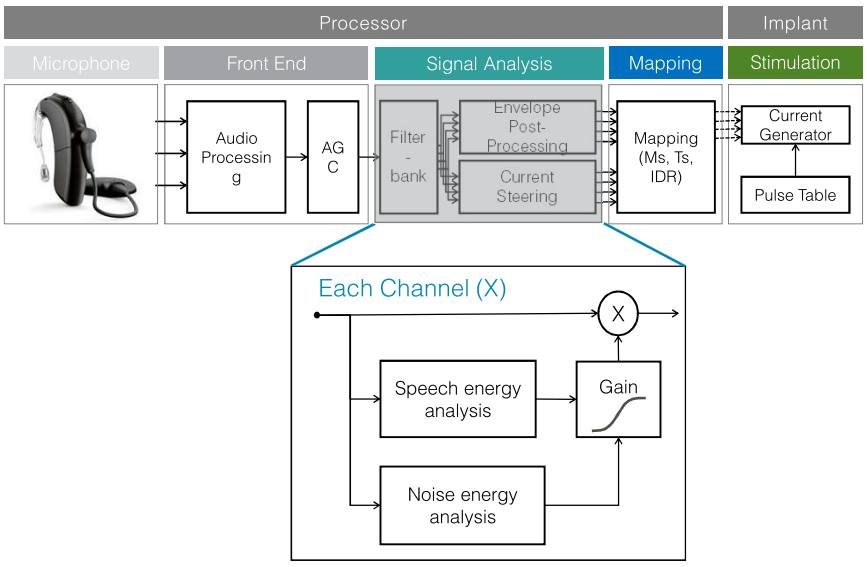
ClearVoice



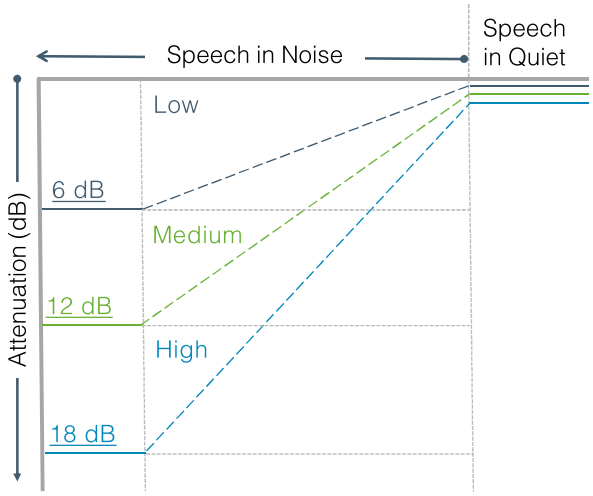
ClearVoice improves the signal-to-noise ratio.

**In the United States, ClearVoice is approved for pediatric use in children 6 years and above who are: able to complete objective speech perception testing in order to determine speech performance; and 2) able to report a preference for different coding strategies or features.*

ClearVoice Analysis

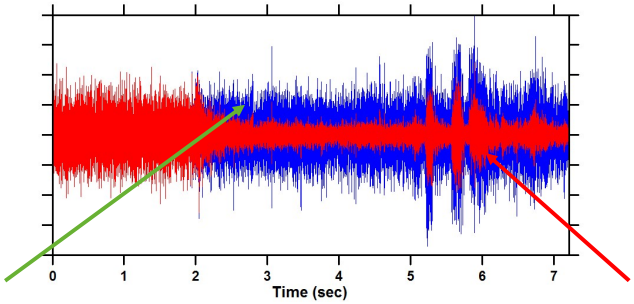


ClearVoice



ADVANCED BIONICS
POWERFUL CONNECTIONS

Hear the ClearVoice Difference



Without ClearVoice

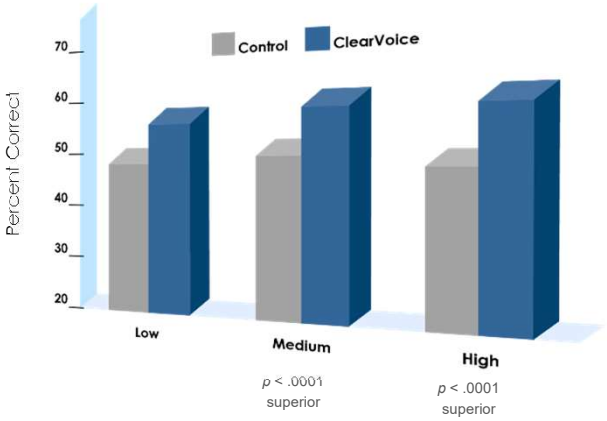
With ClearVoice

ClearVoice Clinical Study

- AzBio sentence recognition was compared in quiet and in noise for HiRes Fidelity 120 with and without ClearVoice.
- The SNR was adjusted for each subject to yield approximately 50% of score in quiet using HiRes Fidelity 120 without ClearVoice.

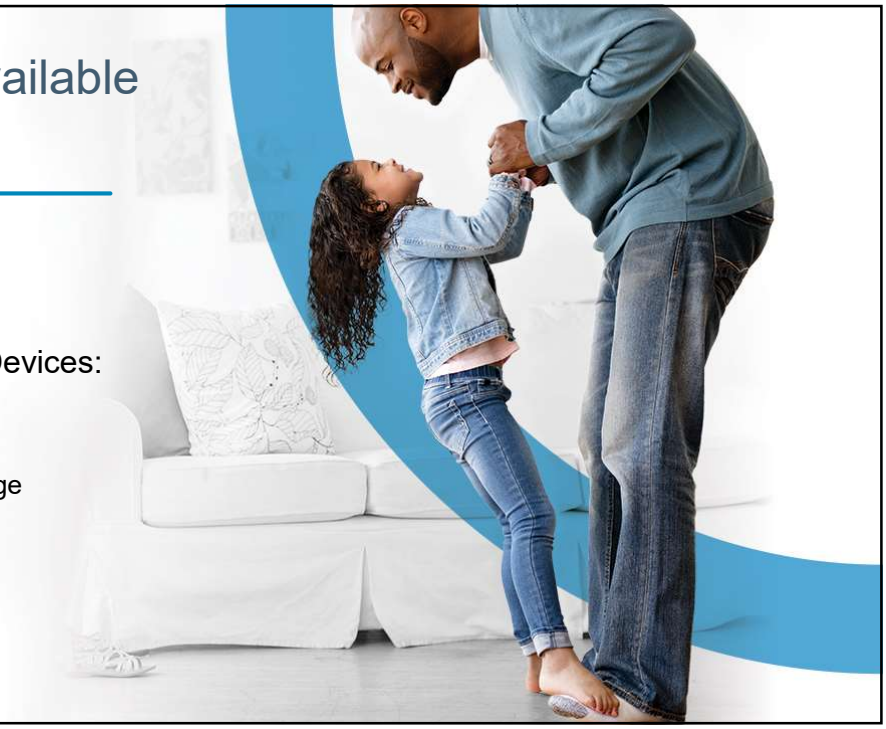


ClearVoice improves speech understanding in steady-state noise

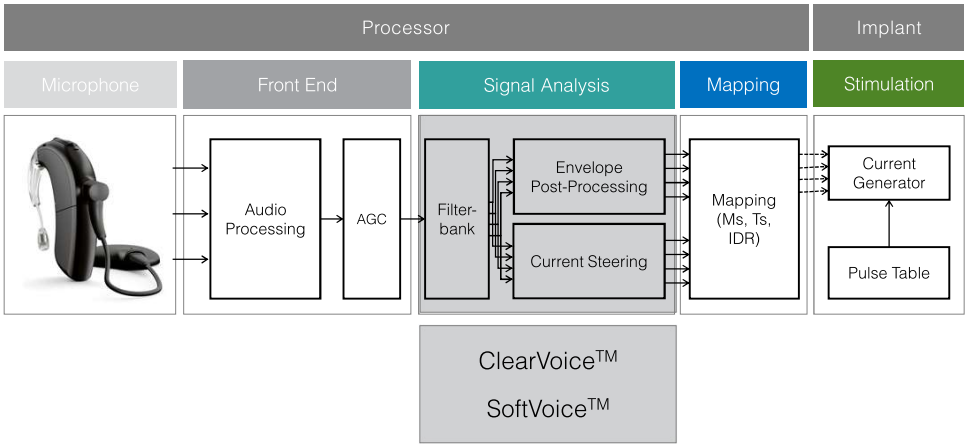


ClearVoice is available for:

- Fidelity 120™ based strategies
- Compatible Internal Devices:
  - HiRes Ultra™ 3D
  - HiRes Ultra™
  - HiRes 90K™ Advantage
  - HiRes 90K™
  - CII



Sound Processing Pathway



What is SoftVoice?

- An AB innovation designed to enhance audibility in quiet.
- A premium **enhancement** to the AutoSound OS automatic processing environment.
- A sound cleaning feature designed to remove unwanted noise from low intensity input.

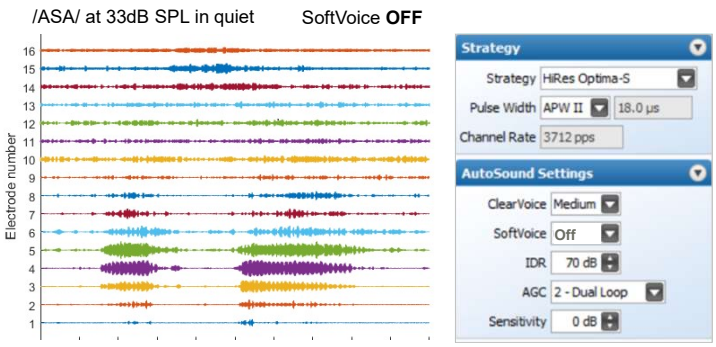
What are the benefits of SoftVoice?

- Improved signal-to-noise ratio for soft sounds
- Greater opportunity to hear **meaningful sounds** and soft speech
- Provides an optimal signal-to-noise ratio for the best all-day hearing, when combined with other technologies



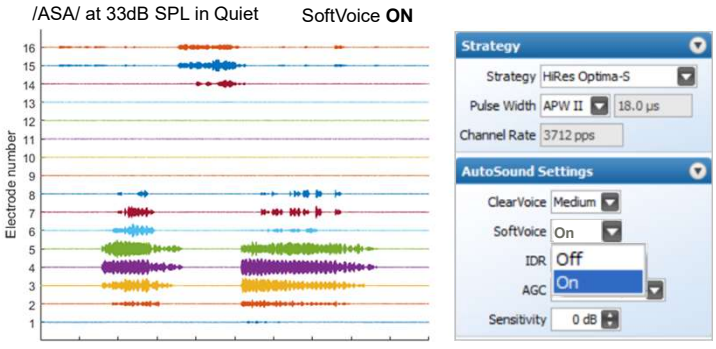
Why is SoftVoice needed?

- The world is noisy!
- Noise is always present, even in a quiet environment, which results in a less favorable signal-to-noise ratio.
- More listening effort is required to discriminate speech in noise.

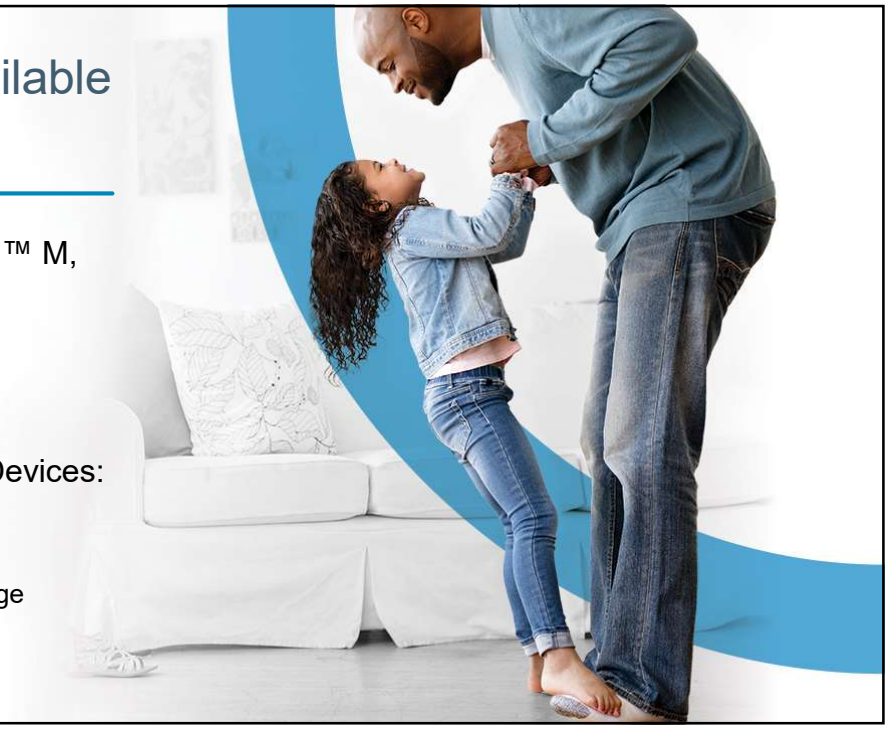


How does SoftVoice work?

- Within each channel, SoftVoice removes low level noise, making it easier to detect soft sounds.
- SoftVoice provides recipients with a greater opportunity to hear meaningful sounds and soft speech.

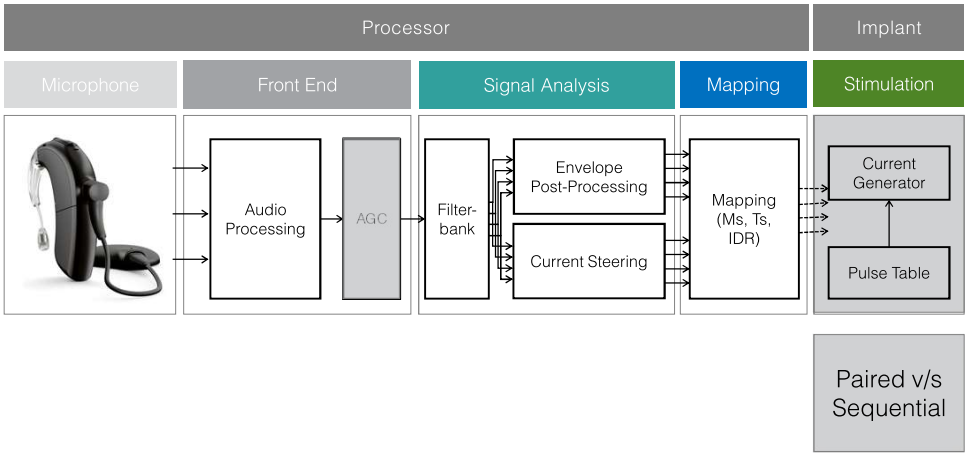


SoftVoice is available for:



- Naída™ CI M, Sky CI™ M, and Naída™ CI Q90
- Fidelity 120™ based strategies
- Compatible Internal Devices:
  - HiRes Ultra™ 3D
  - HiRes Ultra™
  - HiRes 90K™ Advantage
  - HiRes 90K™
  - CII

Sound Processing Pathway



Sequential and Paired Stimulation Strategies

- AB is the only company that offers both a paired and a sequential strategy.
- Both offer unique benefits to recipients.
- Recipients may have a preference.



Sequential Stimulation

- Sends an electrical pulse to one electrode at a time
- Pitch specific stimulation



ADVANCED BIONICS
POWERFUL CONNECTIONS

Paired Stimulation

- Stimulates a pair of electrodes at the same time
- Increases the total pulses per second



Sequential stimulation

- HiRes™ Optima-S*
- HiRes -S with Fidelity 120™*
- HiRes™-S
- Continuous Interleaved Sampler (CIS)



HiFocus™ SlimJ

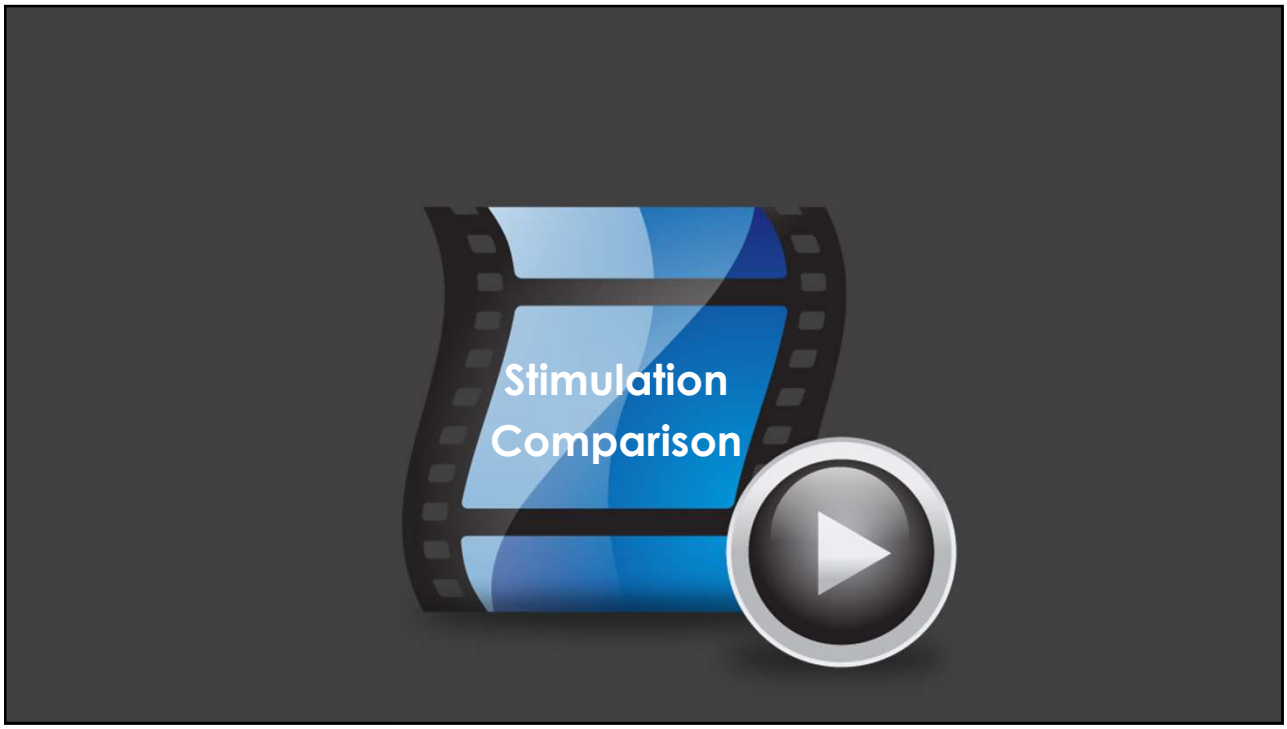
Paired stimulation

- HiRes™ Optima-P*
- HiRes -P with Fidelity 120™*
- HiRes™-P
- Multiple Pulsatile Sampler (MPS)

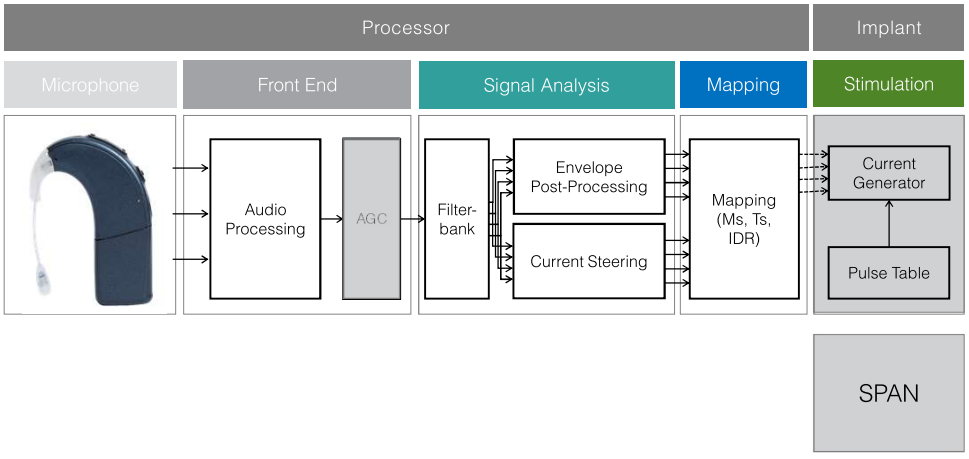


HiFocus™ Mid Scala

*HiRes Fidelity 120 and HiRes Optima are approved for use in adults and in children over the age of 12 months

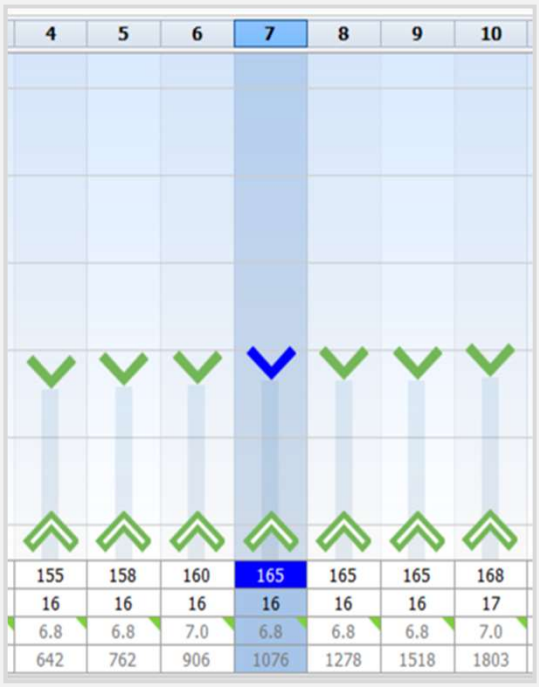


Sound Processing Pathway



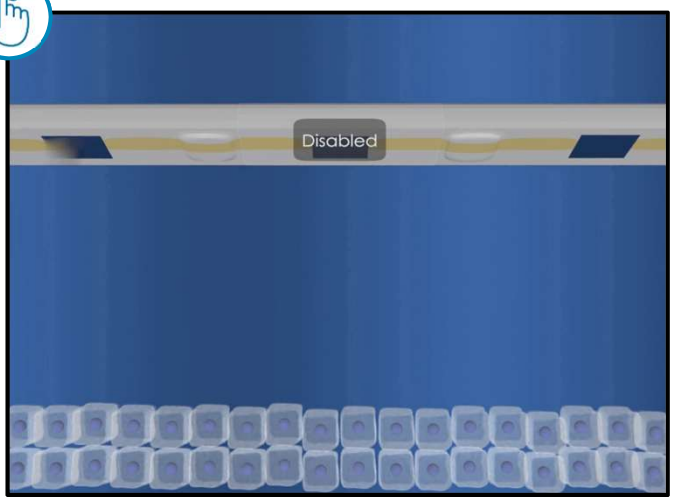
What is Span?

- Span is an electrode management tool that allows a recipient to maintain the full complement of channels, even when electrodes may be disabled.
- AB's current steering technology allows stimulation to occur across a disabled electrode by providing stimulation at virtual locations.



What happens when an electrode is disabled?

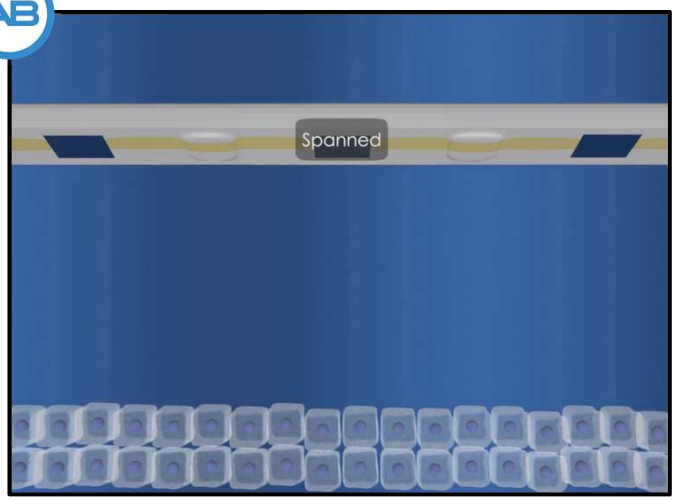
- When an electrode is disabled, a gap in neural coverage is created.
- Incoming frequencies reallocate to adjacent electrodes.
- This often results in a change in sound quality for CI recipients.



How does Span work?

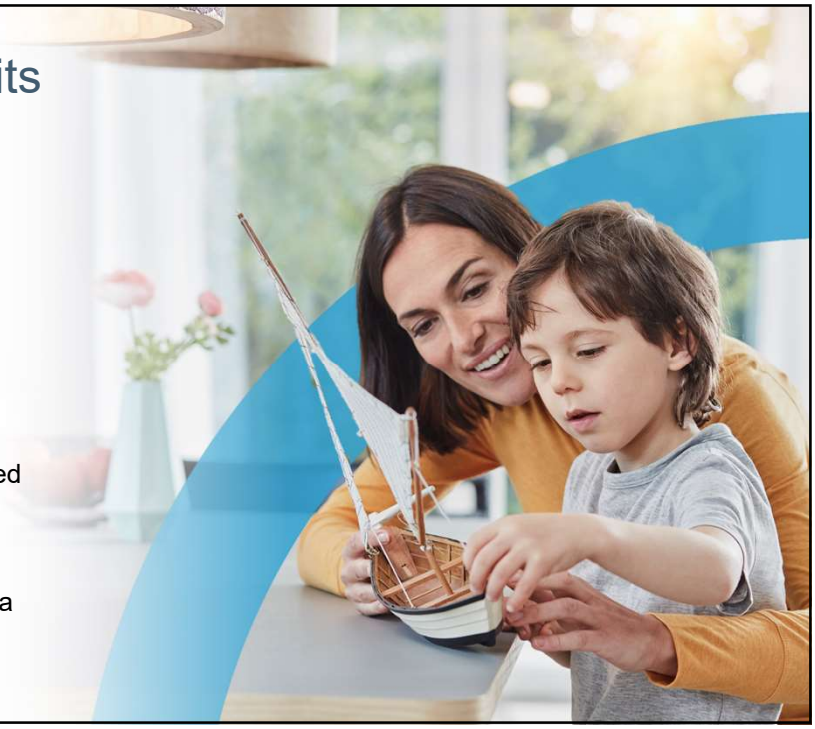
Span uses current steering technology.

- AB innovation can be leveraged to ensure there are no gaps in cochlear coverage.
- Now choose to **Span** (instead of disable) atypical electrodes.
- Span restores the frequency-to-neural interface relationship (pitch)
- Span provides complete spectral resolution, even when an electrode contact is disabled



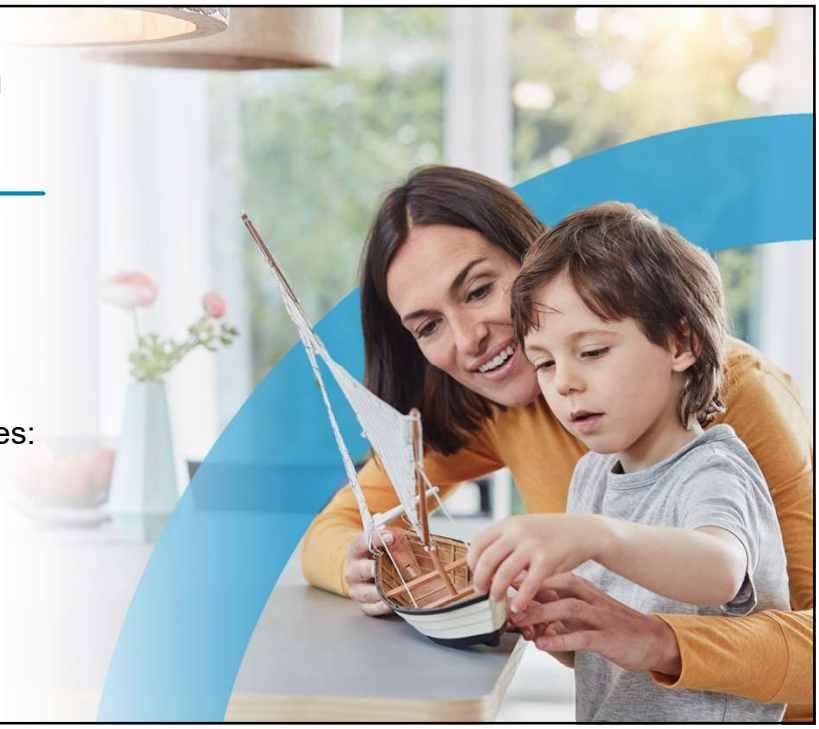
What are the benefits of Span?

- Provides an **easy** option for managing complex cases
- No frequency reallocation; **Maintains** sound quality from electrode enabled to Span
- Simple to enable with interpolated M- and T-Level values
- Two adjacent electrodes can be SPANed. Six electrodes total in a map can be SPANed.



Span is available in for:

- Marvel CI and Naída™ CI
- Fidelity 120™ based strategies
- Compatible Internal Devices:
  - HiRes Ultra™ 3D
  - HiRes Ultra™
  - HiRes 90K™ Advantage
  - HiRes 90K™
  - CII







Knowledge Check

Marvel CI

Review from pre-learning:

Which features of Marvel CI were you most excited to learn about?

What questions do you have about Marvel CI?



Marvel CI

Compatibility

Compatible with all implants available since 2000/2001*

- HiRes™ Ultra 3D
- HiRes™ Ultra
- HiRes™ 90K Advantage
- HiRes™ 90K
- CII Bionic Ear™



* Based on market availability.

Knowledge Check

What is the warranty of new Marvel CI systems in the US?

1 year

3 years

5 years

10 years



Krista Heavner, M.S.

Advanced Bionics



How to

ADVANCED BIONICS
POWERFUL CONNECTIONS

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Marvel CI Multi-function Button

Button behavior summary chart

	Long Press (≥ 2 secs.)	Short Press
Standard CI Use		
Streaming		
Phone Calls		

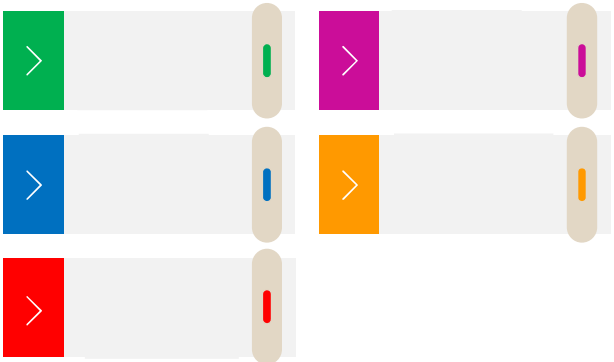


Marvel CI

Processor LED

Processor LED is located on the multi-function button.

Marvel CI LEDs:





Marvel CI

Processor LED

Color	Behavior	Programmable	Indication
Green	AutoSense: 1 long blink Program 1: 1 green blink Program 2: 2 green blinks Program 3: 3 green blinks Program 4: 4 green blinks	Yes	Program Change
	Blinks during use in response to loud input	Yes	Microphones are responding to loud sound (AGC)
	3 green blinks upon command by fitting software or mobile app	No	Detect sound processor
Purple	1 purple blink	Yes	Progressive level change
Blue	Blinks while streaming audio	Yes	Receiving streaming information (AGC)

Marvel CI

Processor LED (cont.)

Color	Behavior	Programmable	Indication
Orange	One long blink at start-up after battery and program status	No	Flight mode
	1 orange blink < 20% 2 orange blinks 20-49% 3 orange blinks 50-84% 4 orange blinks 85%+	No	Battery status at start-up
	Continuous orange blinks	Yes	Low battery
Red	Solid red	No	Start-up issue/error
	Blinking red, faster than once per second	No	Wrong implant detected
	Blinking red, once per second after start-up	Yes	No lock to implant

Marvel CI

Internal alarms

Indication	Behavior	Programmable
Low battery	2 beeps	No
Program change	• Jingle = AutoSense program • 1 beep = program 1 • 2 beeps = program 2 • 3 beeps = program 3 • 4 beeps = program 4	Yes
Volume change	• Long beep at end of range • 2 short beeps at middle of range • 1 short beep at intermediate steps	Yes
Pairing successful	Ascending beeps	Yes
TV Connector available	Ascending beeps	Yes
Phone ring tones	Ringing beeps	No

Marvel CI

Progressive levels

Progressive levels allow recipients to gradually increase stimulation levels.

- Progressive levels are used by recipients following initial stimulation
- Level of change (5 or 10 CU) is set in Target CI
- Marvel CI maintains recipient's selected progressive level even when power cycled!



AB Advantage:
Recipients can use Marvel CI with confidence knowing it will always start up at their preferred level!

Marvel CI

Flight mode

Power saving condition that disables the 2.4 GHz and wireless communication, as required by some airlines.



To enable:

- Hold down the multi-function button while attaching the battery until solid orange LED is visible (around 10 sec)

To disable:

- Remove and reattach the battery to take the processor out of flight mode

Hands-On

Batteries



How to

ADVANCED BIONICS
POWERFUL CONNECTIONS

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Marvel CI Batteries

Battery life ranges

	 M Battery Small	 M Battery Medium	 M Battery Large	 M Zinc Air Battery Pack	 M Standard Battery
Capacity (milliAmp hours)	90 mAh	150 mAh	220 mAh	N/A	170 mAh
Typical Expected Battery Life*	≥9 hrs	≥16 hrs	≥16 hrs	≥16 hrs	≥16 hrs

*using HiRes Optima processing strategy



M Battery Charger

Charger LEDs

	Charging
	Fully Charged
	Charging fault



Marvel CI

Earhook options

M Earhook

- Available in 2 sizes
- With and without earmold retention grip



M T-Mic™

- Available 3 sizes
- T-Mic Detect New



M Acoustic Earhook

- Available in 5 sizes, for right and left
- Uses Phonak's SDS 4.0 and Phonak's P Receiver





M T-Mic™

Marvel CI

M T-Mic

The M T-Mic is an AB-exclusive technology that takes advantage of the ear's natural resonance to focus sound towards the microphone.

This strategic placement utilizes the outer ear's natural sound-gathering capabilities, just like normal-hearing ears.

The result is better, more effortless hearing in noise.



Marvel CI

M T-Mic size options

Small	Medium	Large
		

Marvel CI

M T-Mic

Hardware Enhancements:

- Additional Kevlar coating around the M T-Mic wire to improve durability
- Better retention with the curve of the M T-Mic
- The curve of M T-Mic is different, but microphone placement is similar to Naída CI Q90.

Pro Tip: Battery size may alter M T-Mic placement.

Naída CI M90 with M T-Mic





Knowledge Check

T-Mic Detect and Real Ear Sound

Review from pre-learning:
Explain T-Mic Detect and Real Ear Sound to a professional or recipient.

How may this technology provide benefit?



Knowledge Check

Phone Detect

Review from pre-learning:
Explain Phone Detect to a professional or recipient.

How may this technology provide benefit?



Marvel CI

Phone Detect Scenario

Max Athlete is a unilateral recipient with Naída CI M90 who uses AutoSense OS 3.0 as his primary program.

If he is in a restaurant with his swim team buddies, AutoSense will automatically adapt to the noisy environment and change to the Speech in Noise program which uses beamforming technology.

If Max's girlfriend calls him when he is in the restaurant, Max can place his phone up to his T-Mic. The **Phone Detect** feature will recognize that the T-Mic is covered and switch Max's microphone mode to T-Mic while the phone is up to his ear.

When Max moves the phone away from the T-Mic, Marvel CI will switch back to the beamformer.



Slim HP

Slim and sleek

New and improved design

- Thin and streamlined
- Easy to use
- Integrated cable
- Available with and without integrated microphone



Internal compatibility:
CII, HiRes™ 90K, HiRes™ 90K Advantage, HiRes™ Ultra, HiRes™ Ultra 3D

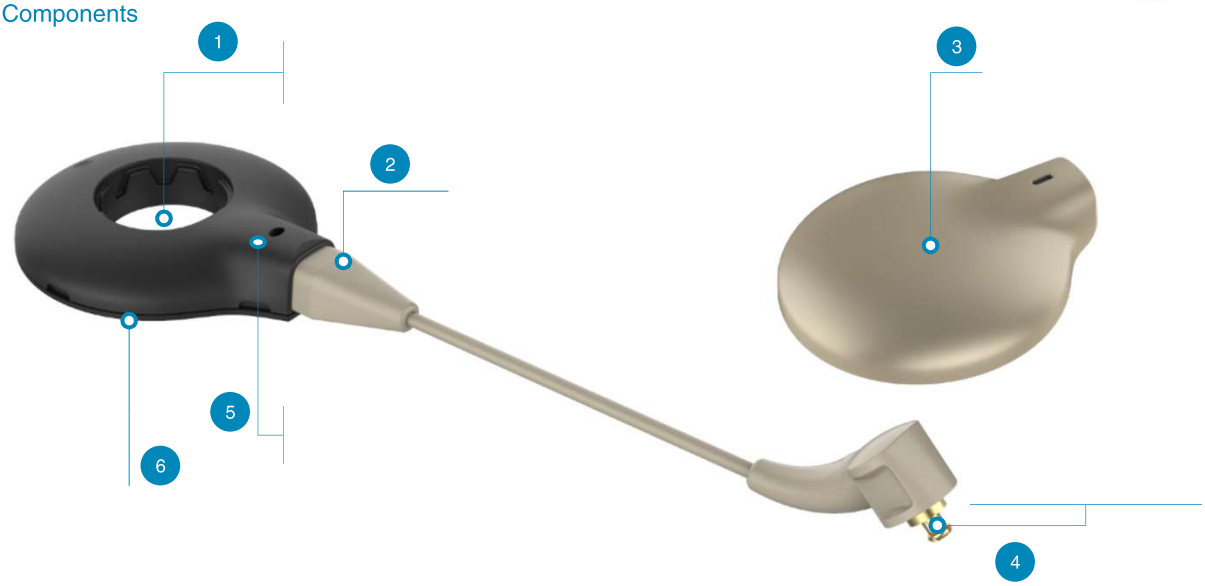
Slim HP

Three options available

1	2	3
Slim HP	Slim HP Mic	Slim HP AquaMic™
Designed for on-ear use with Naída CI	Designed for off-ear use with Naída CI	Designed for use with M Waterproof Battery
No microphone	Integrated microphone	Waterproof microphone
Integrated cable	Integrated cable	Integrated cable

Slim HP

Components



Hands-On

Slim HP





How to

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POWERFUL CONNECTIONS

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Slim HP

Color Cap removal

- Color cap removal is easy!
- Redesigned for improved usability
- Arrow on bottom of headpiece indicates inlet where the color cap removal tool should be inserted
- Improves durability, as removal no longer occurs where the cable connects



*There is a water droplet icon on the bottom of the Slim Headpiece AquaMic.

Slim HP

Color Cap options



Small/Standard Color Cap



Large Color Cap

Required for strongest magnet strengths

- Standard Magnet sizes 6+ and 7+
- 3D Magnet sizes 5+, 6+ and 7+
- Not recommended for children ages 3 yrs. and younger, as this color cap and the Slim HP magnet may become displaced upon dropping.

Color	Small/Standard	Large
Velvet black	●	●
Alpine white	○	○
Sand beige	●	●
Chestnut	●	●
Silver grey	●	●
Caribbean pirate	●	
Blue ocean	●	
Majesty purple	●	
Lava red	●	
Precious pink	●	

Slim HP

Features

- No headpiece microphone
- IP57 Rating (water resistant)
- Integrated cable
- Headpiece color: Black
- Cable colors: Beige, black, brown, gray, white
- Cable lengths:
  - 3.5” / 8.89 cm (all colors)
  - 4.25” / 10.79 cm (all colors)
  - 5.5” / 13.9 cm (beige and black)



Slim Headpiece

Designed For:

- On-ear use (Marvel CI, Naída CI Q)

Slim HP Mic

Features

- Headpiece microphone
- IP57 Rating (water resistant)
- Integrated cable
- Headpiece color: black
- Cable length: 12” / 30.48 cm
- Cable color: Black



Slim HP Mic

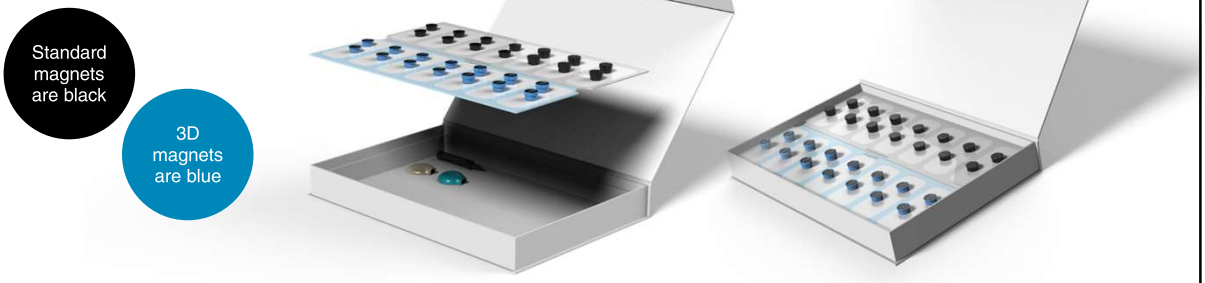
Designed For:

- Off-Ear Use (Marvel CI, Naida CI Q)

Slim HP

Magnet management

- One headpiece, two sets of magnets
- Easy-to-use magnet kit



Slim HP

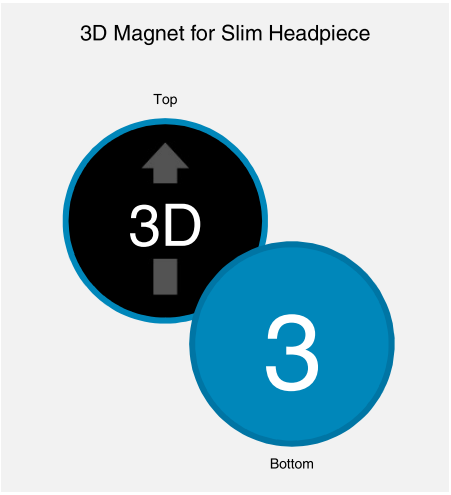
Magnet management

Compatible with both standard and 3D magnets!

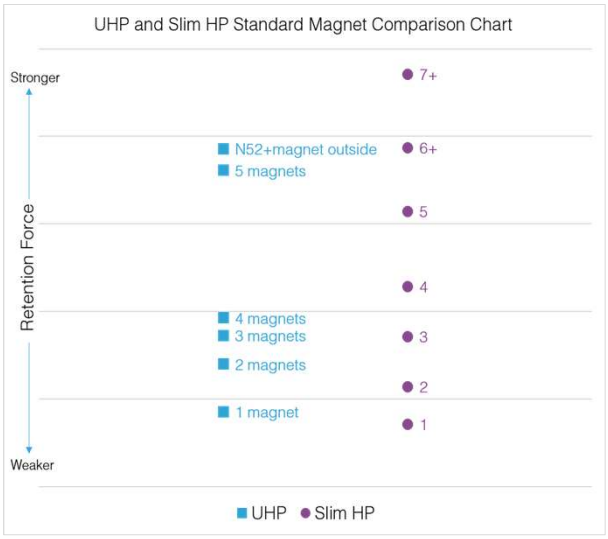
Identifying magnets strengths and types:

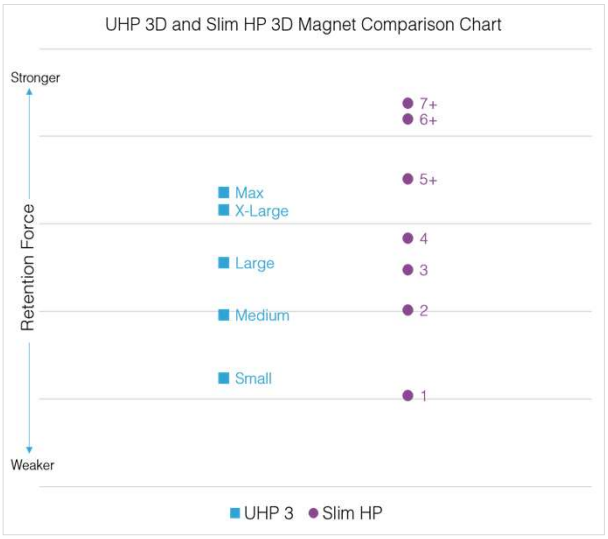
- All magnets are labeled with numbers (1-7) corresponding to magnet strength
- 3D magnets are labeled on top with an arrow indicating direction for alignment





Slim HP comparison to Previous Generation Headpieces





Slim HP

Three options available

Feature	Slim HP	Slim HP Mic	Slim HP AquaMic
Designed for on-ear wearing	Yes	No	No
Designed for off-ear wearing	No	Yes	Yes
Microphone	No	Yes	Yes
Waterproof	No	No	Yes
3.5”, 4.25”, 5.5” Cables	Yes	No	No
12” Cables	No	Yes	Yes
18”, 24”, 42” Cables	No	No	Yes

Marvel CI Waterproof Solutions

M Waterproof Battery and Clip



M Waterproof Battery



M Waterproof Battery Clip

Slim HP AquaMic



Slim HP AquaMic

M Waterproof Battery

IP Rating

M Waterproof Battery has an IP (Ingress Protection) Rating of 68.

IP 68 means it is dust-tight and functional after immersion in 1 meter of water for 30 minutes.

AB has tested the M Waterproof Battery beyond these minimum requirements by immersing it in 3 meters of water and by using various types of water.



How to

ADVANCED BIONICS
POWERFUL CONNECTIONS

A Sonova Brand



Ilana Cellum, Au.D.

Columbia University Medical Center

Hands-On

Listening Check



Marvel CI

M Listening Check

Allows a listener to easily check all of the system's input sources for each program on the processor

- Optimized gain for better sound quality
- Portable and easy to use
- Listen to sound sources on a program-by-program basis
- Easily connects to a keychain or lanyard



Pro Tip: M Listening Check can be used with all battery sizes and types.

Marvel CI

M Listening Check

Sound sources that can be verified by M Listening Check

1

Processor Mic and Internal Alarms



2



3

Headpiece Mic



4

Auxiliary Inputs

Roger streaming signal

Bluetooth audio streaming signal

Phonak AirStream accessories





Marvel CI

New system order forms


Order Form for Advanced Bionics Cochlear Implant System – Naida CI M90


Order Form for Advanced Bionics Cochlear Implant System – Sky CI M90

Order Form for Advanced Bionics Cochlear Implant System – Naída CI M90

ADVANCED BIONICS
POWERFUL CONNECTIONS

RECIPIENT INFORMATION

Ear: ◯ Left ◯ Right

Name: _____

Guardian (if under 18): _____

DOB: _____ Phone: _____

Address: _____ Email: _____

Clinic Name: _____

Clinic Phone: _____

IMPLANT SELECTION AND DETAILS

Surgeon: _____ Surgery Date: _____

Implant Ship Address: _____

◯ HiRes™ Ultra 3D Implant with HiFocus™ SlimJ Electrode (CI-1601-05)
◯ HiRes Ultra 3D Implant with HiFocus™ Mid-Scala Electrode (CI-1601-04)

AIM Sterile Inserts (CI-6120)** ◯ YES ◯ NO

Backup Kit*:
Do you need a Backup Kit for this surgery?
◯ YES ◯ NO

Electrode Array type:
◯ HiFocus SlimJ Electrode
◯ HiFocus Mid-Scala Electrode

* A 10% restocking fee will be charged for any returns. The back-up implant unit must be returned within 30 days or there will be a 10% restocking charge. If back-up implant is opened or not returned after 90 days from date of shipment, the original purchase order price will be charged.

OPTIONAL SURGICAL TOOLING

◯ HiFocus SlimJ Electrode Depth Gauge (CI-1605)**
◯ HiFocus Mid-Scala Insertion Tool (CI-4207)**
**At additional charge. Pricing dependent on hospital contract.

PROCESSOR SELECTION AND DETAILS

Audiologist: _____ Estimated Activation Date: _____

Processor Ship Address: _____

◯ Single Naída CI M90 (303-M449) ◯ Dual Naída CI M90 (303-M450)

Sky CI M

Introducing Sky CI M

CONNECT RECIPIENTS WITH THE MOMENTS THEY LOVE



Designed with kids in mind



Sky CI M, the world's first sound processor designed specifically for children.

Offering exceptional hearing performance and built for your child's evolving needs – from understanding language to developing social skills – Sky CI M will ensure that your child connects to all of what life has to offer.

Sky™ CI M

ADVANCED BIONICS
POWERFUL CONNECTIONS

A Sonova Brand

Sky CI M

Additional pediatric colors*



Precious Pink | Caribbean Pirate | Blue Ocean | Majesty Purple | Lava Red

*Blending colors are available. Resin beige is available for special order.

POWERFUL HEARING EXPERIENCE



AutoSense Sky OS 3.0

BENEFITS

- Designed for children's listening needs
- AutoSense Sky OS 3.0 provides a powerful hearing experience with automatic access to a variety of features that customize sound based on the child's environment



Phonak Marvel

BENEFITS

- Leveraging the established Phonak Marvel platform
- Sky CI M delivers excellent sound quality and consistent access to the sound throughout the day
- Provides peace-of-mind with great parent solutions, like the M Listening Check

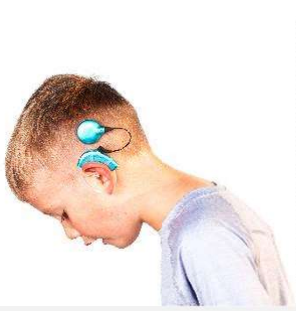


RogerDirect™ & Bluetooth®

BENEFITS

- Sky CI M directly streams calls and audio from virtually every smartphone and Bluetooth®-enabled device
- The built-in RogerDirect feature delivers clear speech right to the child's ears without extra devices attached to the processor

FLEXIBILITY FOR YOUR GROWING CHILD'S ADVENTURES







Sky CI M features a variety of wearing options that can be customized to the changing needs of your child:

M Snuggie

M Retention Cuff

M Wearing Clip

ULTIMATE EASE OF USE

- AutoSense Sky OS 3.0 seamlessly adapts to sound wherever your child goes without the need for manual adjustments
- Connect wirelessly with your child's favorite devices for video calls with family and friends, and educational apps
- Convenient control and management of your child's hearing devices with the AB Remote app



Marvel CI

Compatibility

The platform (Naída or Sky) and tiers (90 or 30) must match in order to ensure compatibility and full access to bilateral/bimodal features.

	Naída CI M	Sky CI M
Bilateral		
Bimodal		



HL45
HL46

Partnering for Hearing Success



Slide 63

HL45 In Intro to AB
Hambrick, Lori, 2/3/2021

HL46 Add text from Sky CI talk track
Hambrick, Lori, 2/3/2021

Knowledge Check

Knowledge Check

Match the feature to the use case



Debbie is a business manager responsible for a team of four.

At work, she has regular meetings on the phone and frequent conference calls. She struggles to hear in this environment.

Which Marvel CI feature would you highlight to help Debbie in this situation?

- M Batteries
- SWORD chip
- M Phone Detect
- Internal Alarms
- M Listening Check

Knowledge Check

Match the feature to the use case



Angie is the parent of a child with a profound HL. Her child needs a CI. Angie wants to choose a device that is pediatric friendly. She is concerned about how she will know when the device is working.

Which feature would you highlight to help Angie feel confident with managing care of a CI?

- M Batteries
- SWORD chip
- M Phone Detect
- Internal Alarms
- M Listening Check

Knowledge Check

Match the feature to the use case



Paul is a new CI candidate. He is a busy college student who is constantly on the go.

He wants a CI that is easy to manage. Paul expressed concerns about his CI stopping in the middle of class without warning.

Which feature would you highlight to give Paul assurance?

- M Batteries
- SWORD chip
- M Phone Detect
- Internal Alarms
- M Listening Check

Knowledge Check

Match the feature to the use case



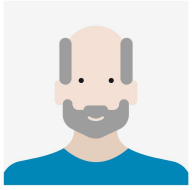
Catherine is a new CI candidate. She works as an engineer and wants to get the best technology available. She mentions that bilateral streaming is also important to her.

Which feature would you highlight to give Catherine confidence that Marvel CI is the best choice?

- M Batteries
- SWORD chip
- M Phone Detect
- Internal Alarms
- M Listening Check

Knowledge Check

Match the feature to the use case



Patrick is a retired teacher who enjoys spending time with his family. He is a candidate for a CI. Patrick is on a fixed income and expressed concerns about paying for CI supplies, as his HA batteries were costly.

Which feature would you highlight to give Patrick peace of mind about the CI?

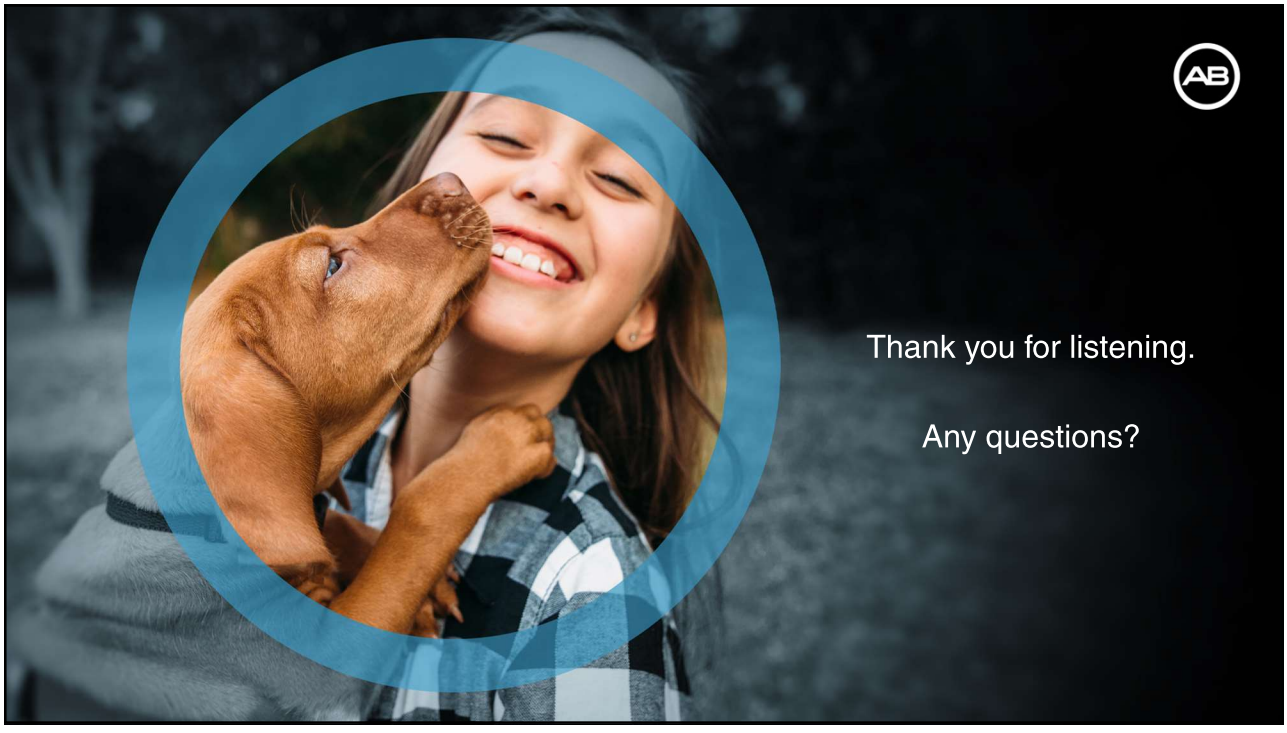
- M Batteries
- SWORD chip
- M Phone Detect
- Internal Alarms
- M Listening Check

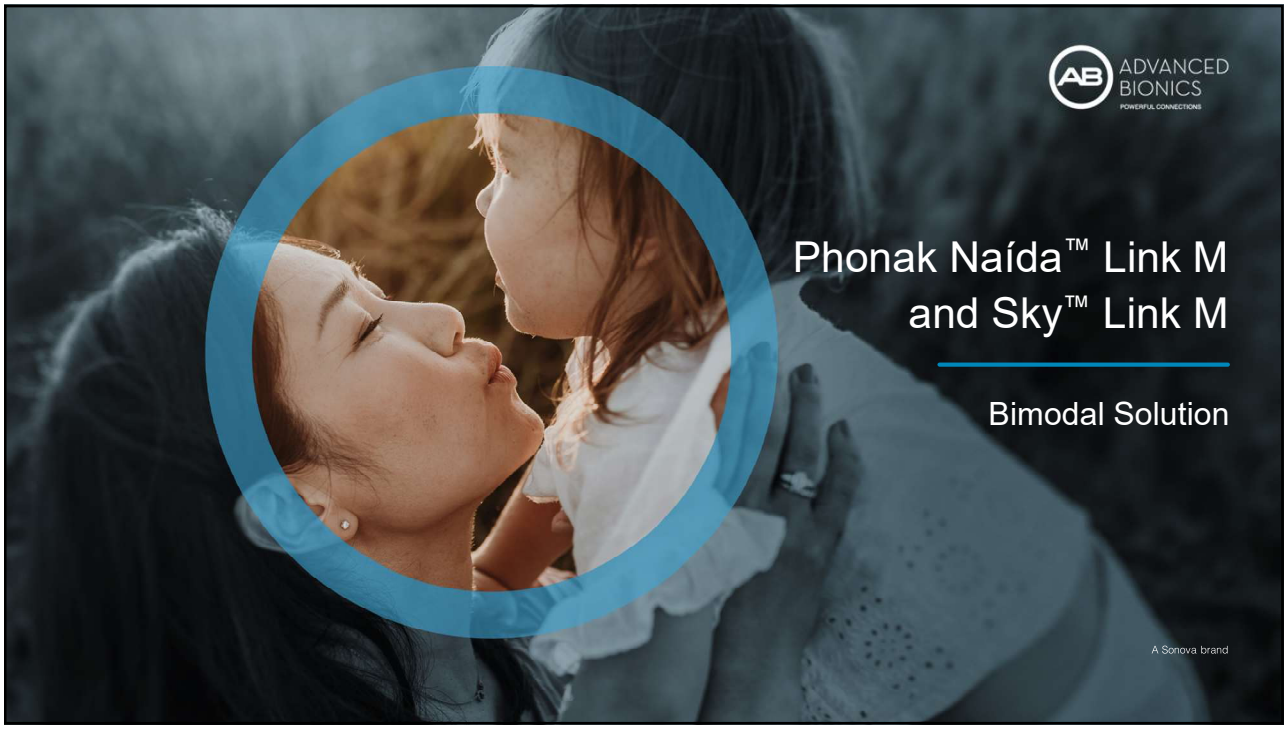
Skill Practice

Marvel CI Elevator Pitch

"I'm looking forward to our upcoming meeting to learn more about AB's new sound processor. Can you give me some basic information about the new offerings before you have to leave for your next appointment?"







The Power of Two Working Together as One

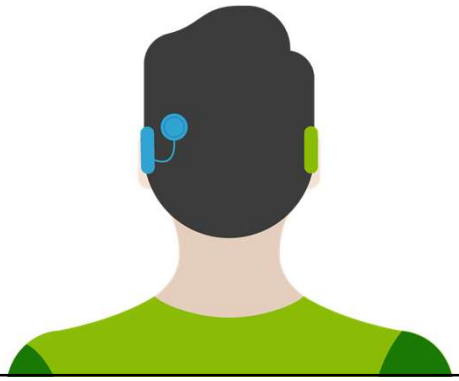
PHONAK + AB

Unilateral CI benefit can be enhanced by adding a hearing aid to the contralateral ear, referred to as bimodal hearing.

This is why Phonak and Advanced Bionics developed the Naída Link M and Sky Link M - **hearing aids specifically designed to work with the cochlear implant and sound processor.**



What are the benefits of bimodal hearing?



1

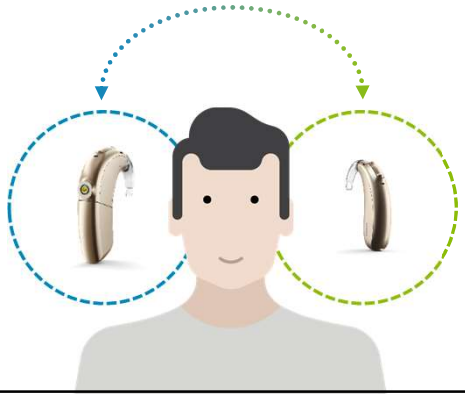
2

3

4

Compatibility

- Naída Link M is dedicated for **adults**; Sky Link M is dedicated for **pediatrics**
- Naída Link M is compatible with the Naída CI M90 sound processor
- Sky Link M is compatible with the Sky CI M sound processor



Naída CI M90 / Sky CI M
sound processor

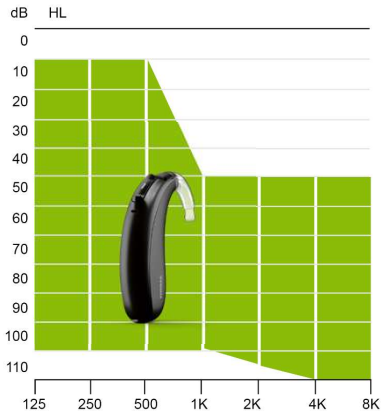
Naída Link M / Sky Link M
hearing aid (HA)

Fitting Range

Fits moderate to profound hearing loss.

All audiometric configurations.

HE11 680 2 cc coupler data	
Maximum Power Output (dB SPL)	133 dB SPL
Maximum Acoustic Gain (dB)	75 dB



Components



1

2

3

4

Components



1 Multi-function button with **LED** indicator light

The multi-function **button** functions as a volume control and/or a program change depending on the hearing aid programming.

LED Indicator Light

The LED indicator light is **green** and provides status information showing that the hearing aid is receiving input, as well as program changes, volume changes and low battery information.

The LED indicator light is off by default, but can be activated in the fitting software as desired.

Hearing Aid Status	Indicator Behavior*	
Hearing aid is powered on	Repeating single blink	
Hearing aid is powered on and Roger is accessible	Repeating double blink	
Low battery	Continuous blinking	
Volume level change (either initiated by a remote control or by the multi-function button)	Single blink per volume change	
Program change (either initiated by a remote control or by the multi-function button)	Single blink per program change	

Components



2 Microphone openings

There are **three microphone openings**. One microphone opening is below the multi-function button. The other two microphone openings are located above the button.

The proven Phonak microphone inlet design helps to reduce wind and hair noise.

No filter covers are required.

Components



3 Battery Door

The battery door also serves as the on/off switch.

Closed battery door = On
Open battery door = Off

A tamperproof battery door option is also available.

Components



4 Earpiece

There are earpiece options for standard tubing and SlimTube 4.0.

A tamperproof earhook is also available.

Acoustic Coupling

Earpiece options for standard tubing



Earmold



Universal eartip



Acoustic Coupling

Earpiece options* for SlimTube 4.0



Earmold



Power dome



Custom SlimTip in acrylic and titanium



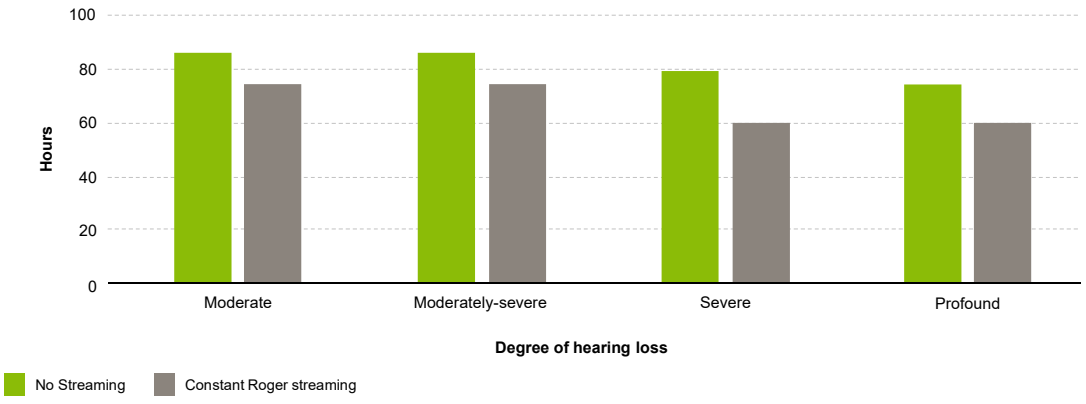


*Note: All Sound Delivery System 4.0 acoustic options are mechanically compatible with the SlimTube 4.0 when used with Naída Link M and are supported in Target CI.

Battery Life

Battery:
Zinc-air size 13

Battery life by hearing loss with and without Roger use[6]



How can you identify Naída Link M?



1

Naída Link M has a LED indicator light



2

Marked Naída on the outside housing



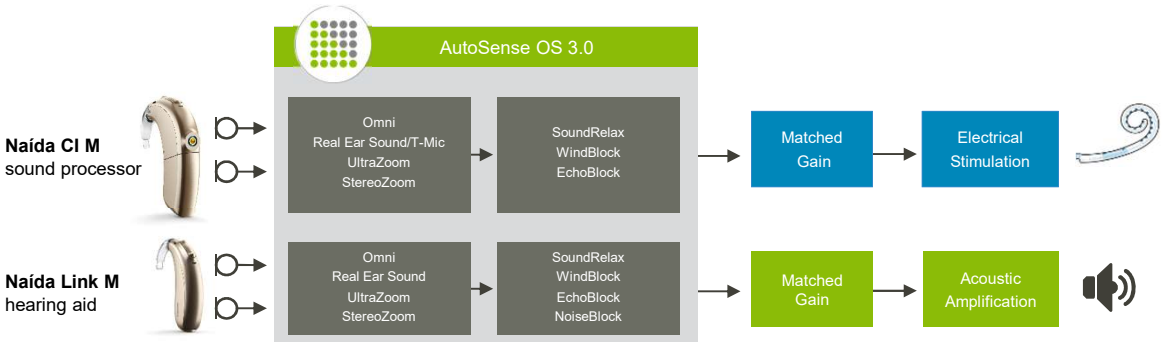
3

Marked Link M on the serial number plate inside the battery door

Matched Signal Processing

Synchronizing the dynamic behavior between the two devices

The matched signal processing combines the established Phonak Marvel platform with AB sound processing. Both devices react and adjust at the same time to the changing listening situations using the matched signal processing and gain behavior.



Knowledge Check

Binaural VoiceStream Technology

Review from pre-learning:

How would Binaural VoiceStream Technology work with bimodal fittings?

Which features would be available?



Matched Technologies for a Dynamic Bimodal Solution

	Naída CI M90 and Sky CI M sound processors	Naída Link M and Sky Link hearing aids
Built on the Marvel platform	●	●
AutoSense OS 3.0	●	●
Aligned signal processing and gain behavior	●	●
Binaural VoiceStream Technology	●	●
Integrated Bluetooth Classic, Bluetooth LE and AirStream	●	●
RogerDirect for direct streaming	●	●
Aligned controls and alerts	●	●
Compatible with AB Remote mobile app and wireless solutions	●	●
Programmed in Target CI fitting software	●	●

Marvel CI Internal Alarms


Low battery



AutoSense



Program 2



Program 4

Link M Internal Alarms


Low battery



AutoSense



Program 2



Program 4

Designed for Children

PHONAK AB

Tamperproof battery door and tamperproof earhook - keeps small batteries and parts out of small hands and mouths

Retention and wearing options

Indicator LED light for fast visual check

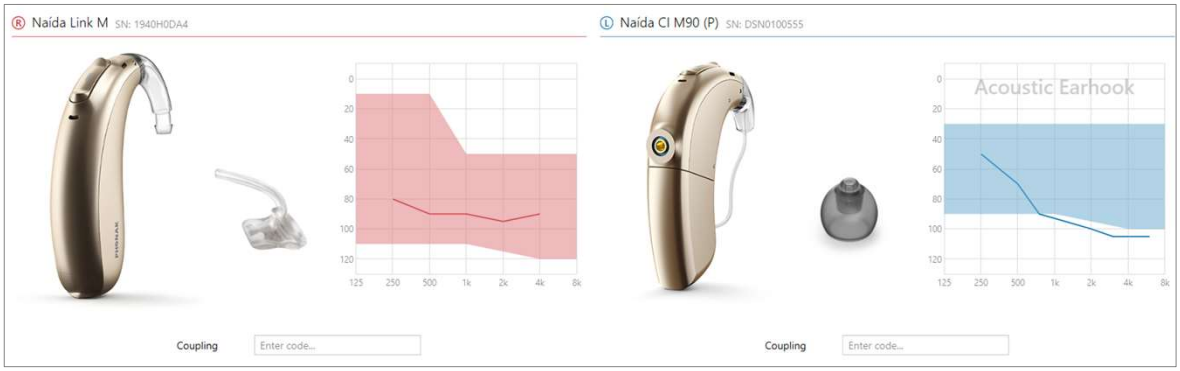
AB Remote mobile app - checks the status of both devices for peace of mind

Robust IP68 housing for all day wear as water and dust resistant



With RogerDirect there is no need to attach any external receivers

Combined Fitting of Both Devices



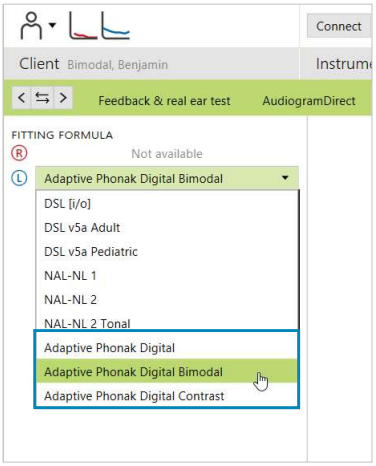
Save valuable clinical time and effort by fitting both devices in the same fitting session using Target CI.

Unique Adaptive Phonak Digital Bimodal Fitting Formula

- Adaptive Phonak Digital Bimodal Fitting Formula is easy and efficient to program; saving valuable clinical time and effort
- Aligns the acoustic and electric signal processing
- Exclusive to Naída Link M, Sky Link and Naída Link Q hearing aids

Default:

- **Adults:** Adaptive Phonak Digital Bimodal
- **Pediatrics:** Junior Mode settings determine fitting formula

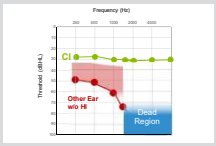


Unique Adaptive Phonak Digital Bimodal Fitting Formula

Automatic calculation procedure for effortless fitting of the Naída Link M and Sky Link M within minutes using the bimodal fitting formula.

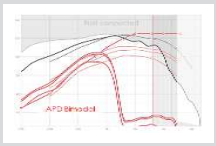
Alignment of frequency response

- Optimizes bandwidth
- Reduces gain in dead regions



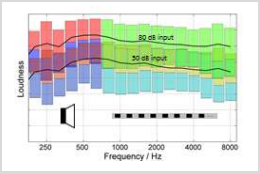
- Optimizes low frequency gain
- Maximizes effective audibility*

*based on Ching et al, 1998, Keidser et al, 2011.



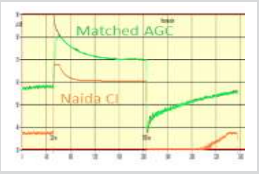
Alignment of loudness growth

- Matches I/O curves



Alignment of dynamic behavior

- Matches dynamic compression characteristics
- Same dual-loop AGC

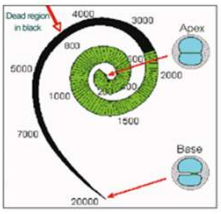


Unique Adaptive Phonak Digital Bimodal Fitting Formula

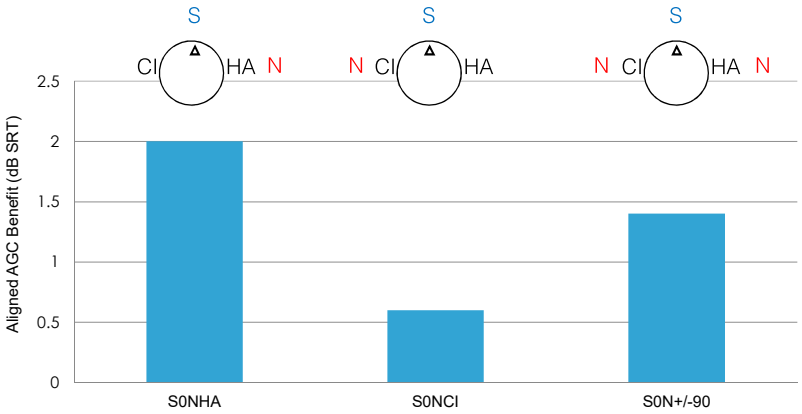
What is a cochlear dead region?

A dead region of the cochlea is caused by **non-functioning** inner hair cells and/or neurons corresponding to a range of frequencies.

If someone has a dead region, a hearing aid may provide little or no benefit within that region and may actually decrease speech intelligibility if too much gain is applied to that region.



Proven Benefit for the Adaptive Phonak Digital Bimodal Fitting Formula[8]



Aligned AGC improves speech understanding in noise by up to 2 dB over the standard Phonak AGC

Adaptive Phonak Digital Bimodal Fitting Formula (APD BFF) Benefits



Bimodal benefit for improved speech understanding in quiet when using APD BFF[9]

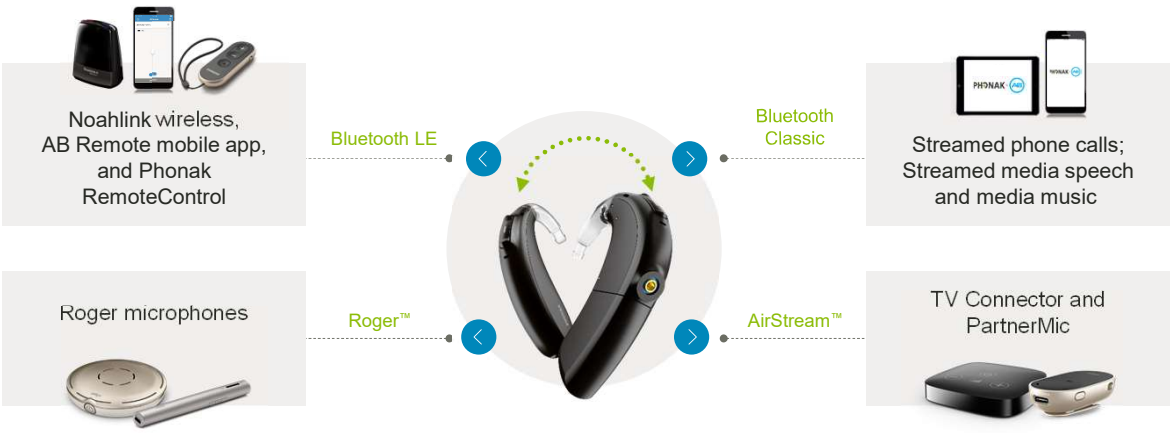


Bimodal benefit for improved speech understanding in noise when using APD BFF[9, 10]



Subjective preference towards bimodal system with APD BFF [10]

Bimodal Wireless Connectivity Options





Together, Phonak and Advanced Bionics offer a solution designed to provide an enhanced listening experience for bimodal users, helping them to connect to the moments they love.

It is faster and easier for audiologists to fit the bimodal solution with one fitting software using an efficient workflow.

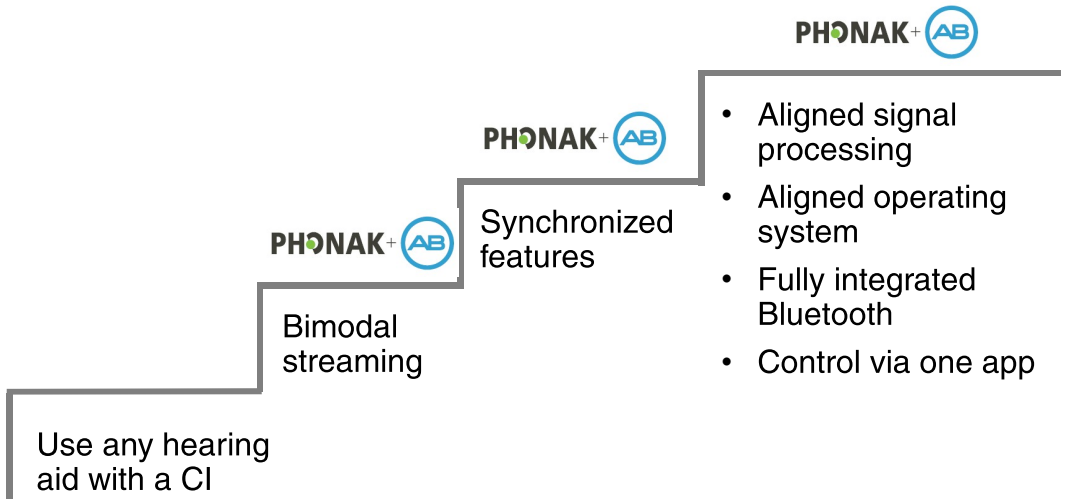
Skill Practice

Naída Link M and Sky Link M

"Can't any hearing aid be a bimodal hearing aid? What is unique about AB's bimodal solution?"



Bimodal Options



Knowledge Check

In which of the following scenarios can Naída Link M / Sky Link be fit?

A. Fit as standard superpower hearing aid
B. Fit during the hearing aid trial phase in CI assessments
C. Fit to the non-implanted ear of a Marvel CI user
D. All of the above



Knowledge Check

The Link M Bimodal Solution is designed to help users enjoy an enhanced listening experience with

A. Shared signal processing and automation
B. Full audio bandwidth streaming to both ears
C. A distinctive bimodal fitting formula
D. Shared controls
E. All of the above



Knowledge Check

True or false.

A recipient with the Link M Bimodal Solution can stream phone calls directly to both the Naída CI M90 and Naída Link M at the same time.

A. True
B. False



Continuum of Hearing Care:

Phonak and AB supporting customers for life



1	2	3	4
Phonak Link M fit as standard HAs binaurally Stable severe to profound SNHL bilaterally.	**Phonak Link M fit pre-implant** If hearing loss progresses further, fit or fine tune HAs binaurally.	**Phonak Link M fit with Marvel CI** Continue with HA fit to non-implanted ear for bimodal benefit.	**Marvel CI bilaterally** Fit Marvel CI for bilateral benefit.

Fit Phonak Link M as a standard super power hearing aid

Ideally suited for being fit as a standard hearing aid binaurally, especially during the HA trial phase of CI assessments.

References

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2. Advanced Bionics (2016) Bimodal StereoZoom Feature: Enhancing Conversation in Extreme Noise for Unilateral AB Implant Recipients White Paper.
3. Morera C., Manrique M., Ramos A., Garcia-Ibanez L., Cavalle L., Huarte A., Castillo C., and Estrada E. (2005). " Advantages of binaural hearing provided through bimodal stimulation via a cochlear implant and a conventional hearing aid: A 6-month comparative study," Acta Oto-Laryngol. 125, 596–606.10.1080/00016480510027493
4. Flynn MC, Schmidtke T. Benefits of bimodal stimulation for adults with a cochlear implant. International Congress Series. 2004;1273:227–230
5. Sucher, C. M., & McDermott, H. J. (2009). Bimodal stimulation: Benefits for music perception and sound quality. Cochlear Implants Int, 10 (1 Suppl), 96–99
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7. Ching TY, Dillon H, Katsch R, Byrne D. (2001) Maximizing effective audibility in hearing aid fitting. Ear and Hearing 22(3): 212-224.
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References

9. Holtmann, L. C., Janosi, A., Bagus, H., Scholz, T., Lang, S., Arweiler-Harbeck, D., & Hans, S. (2020). Aligning Hearing Aid and Cochlear Implant Improves Hearing Outcome in Bimodal Cochlear Implant Users. Otology & Neurotology, 41(10), 1350–1356. https://doi.org/10.1097/mao.0000000000002796

10. Auletta, G.; Franzè, A.; Laria, C.; Piccolo, C.; Papa, C.; Riccardi, P.; Pisani, D.; Sarnelli, A.; Del Vecchio, V.; Malesci, R.; et al. Integrated Bimodal Fitting for Unilateral CI Users with Residual Contralateral Hearing. Audiol. Res. 2021, 11, 200–6. https://doi.org/10.3390/audiolres11020018



Knowledge Check

M Acoustic Earhook

Review from pre-learning:

What is the M Acoustic Earhook?

Who can benefit from it?



Marvel CI with M Acoustic Earhook



Marvel CI integrates acoustic and electric sound processing within a single device. The M Acoustic Earhook is designed for individuals with aidable low frequency hearing following cochlear implantation.

M Acoustic Earhook

The **Phonak P receiver** technology has been adapted for use with Marvel CI.



Amplifies up to 10,000 Hz

Provides up to 55 dB gain

Marvel CI with M Acoustic Earhook

Receiver available in right or left side

Available in five lengths: 00, 0, 1, 2, or 3



Modular attachment for easy placement and removal of the M Acoustic Earhook

Compatible with Naída CI M90 & Sky CI M



Use the measurement tool to determine appropriate length

Marvel CI for Electric-only Use



Electrical only

Acoustic mode

In the unfortunate event that the recipient's hearing levels deteriorate over time, simply configure the Naída CI M90 for electric-only use with a quick programming change.

The recipient can benefit from the T-Mic by simply changing the hardware using the Pin Removal Tool.



Pin Removal Tool*

*The Pin Removal Tool for M Acoustic earhook is blue.

Hands-On

M Acoustic Earhook



Compatible with Phonak Sound Delivery System (SDS) 4.0 Accessories

New



New P receiver integrated in the M Acoustic Earhook



New domes



New RIC Secure Fit



New CeruShield™ Disk

Re-designed retention

M Acoustic Earhook Earpiece Options



Vented Dome

- New balloon shape for comfort
- For mild-to-moderate hearing loss
- Helpful if occlusion is an issue



Power Dome

- Redesigned for better retention & comfort
- For moderate-to-severe hearing loss
- Provides a tighter fit than the vented dome



SlimTip

- Custom ordered through Phonak
- Available in standard acrylic
- Available with a variety of vent sizes
- Also available: RIC Secure Fit in silicone

M Acoustic Earhook Earpiece Options

Vented Dome



Large



Medium



Small

Power Dome



Large



Medium



Small

SlimTip*



Custom made

*Availability varies by region.

Pro Tip: Phonak SDS 4.0 dome options include Cap, Open, Vented and Power styles. Domes compatible with M Acoustic Earhook include Vented and Power domes.

Assembling the M Acoustic Earhook



1. Visually check and confirm the CeruShield™ wax filter is present.
2. Attach the appropriate earpiece/dome.
3. Connect the M Acoustic Earhook to the Marvel CI sound processor.

Pro Tip: When mounting a 4.0 dome onto a 4.0 receiver, you will feel the dome click into place.

CeruShield Disk

- CeruShield filters protect the receiver from wax-related problems and offer recipients longer wearing time between filter changes.
- The receiver is shipped with a wax filter already inserted.
- CeruShield Disk is an easy-to-use wax filter dispenser.

The CeruShield Disk consists of:

- 8 replacement CeruShield filters
- 8 positions for disposal of used filters



Pro Tip: The wax filter should be replaced every four to eight weeks.

How to

ADVANCED BIONICS
POWERFUL CONNECTIONS

A Sonova Brand

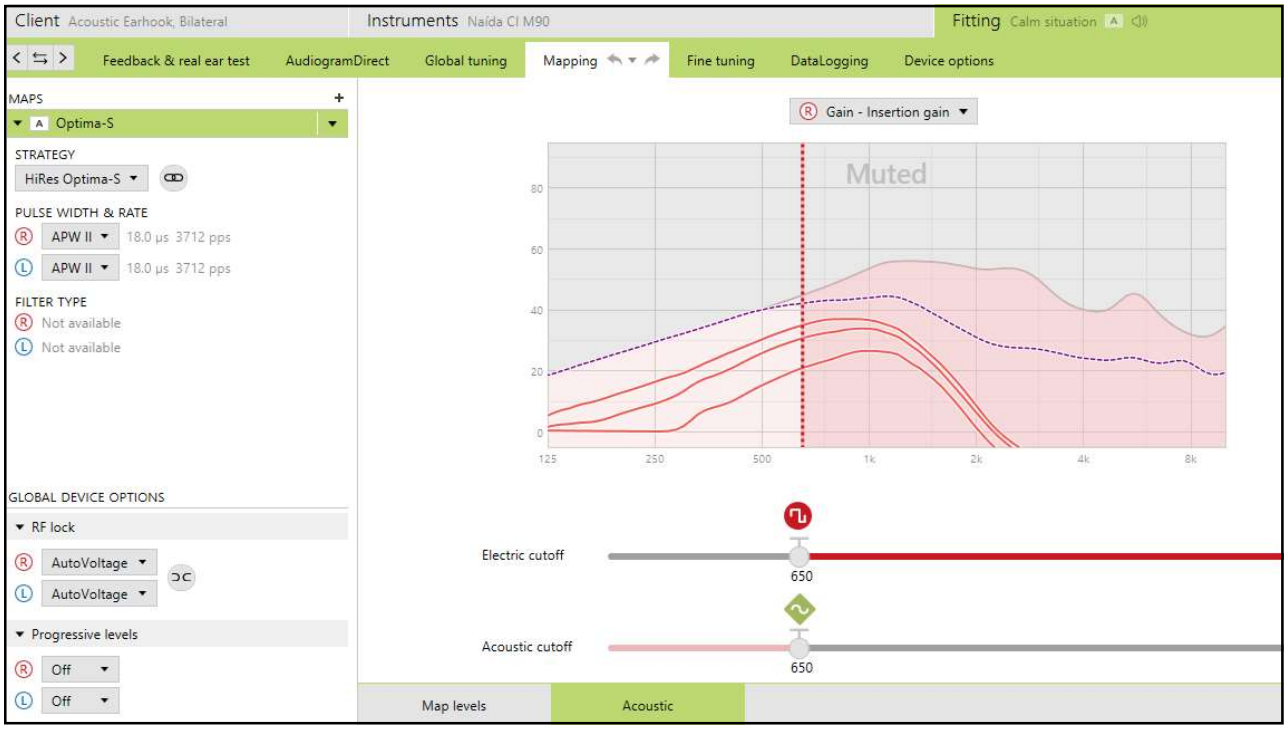
Fitting Formula



The Adaptive Phonak Digital Bimodal Fitting Formula is available for use with the M Acoustic Earhook and is the default setting in the Target CI fitting software.

Other fitting formulas are also available, if desired.

Pro Tip: If the recipient is a Naida Link M user, consider matching fitting formulas between the M Acoustic Earhook and contralateral hearing aid.



Additional Considerations

Acoustic stimulation begins as soon as Naída CI M is powered on.

New

Naída CI M volume control adjusts both acoustic and electric volume simultaneously.

New

Naída CI M / Sky CI M has an IP54 rating when the M Acoustic Earhook is attached.



Audible alerts are transmitted on both the acoustic and the electric path to ensure audibility.

New

Waterproof Solution Compatibility



Recipients with the M Acoustic Earhook will be able to take advantage of the new waterproof solution: M Waterproof Battery. Simply remove the M Acoustic Earhook and select the Off-Ear-Program.

Pro Tip: The clinician is required to issue an additional electric-only map for off-the-ear use.



Compatibility with Binaural VoiceStream Technology™ (BVST)

New BVST features are available for bimodal and bilateral recipients with M Acoustic Earhook.



Ensure the devices are aligned for full access to the BVST features e.g. fit Naída CI M90 devices on both sides, or Sky CI M devices on both sides.

BVST now uses a 2.4 GHz protocol instead of HIBAN, so recipients with the M Acoustic Earhook are able to benefit from BVST in more complex listening situations like noise and over the telephone.

Knowledge Check

True or false.

Binaural VoiceStream Technology features are available with M Acoustic Earhook.

A. True
B. False



Knowledge Check

The M Acoustic Earhook is compatible with the Naída™ CI M90 and Sky CI™ M sound processors.

A. True
B. False



Knowledge Check

The M Acoustic Earhook is designed for individuals with aidable _____hearing following cochlear implantation.

A. Low Frequency
B. Mid Frequency
C. High Frequency

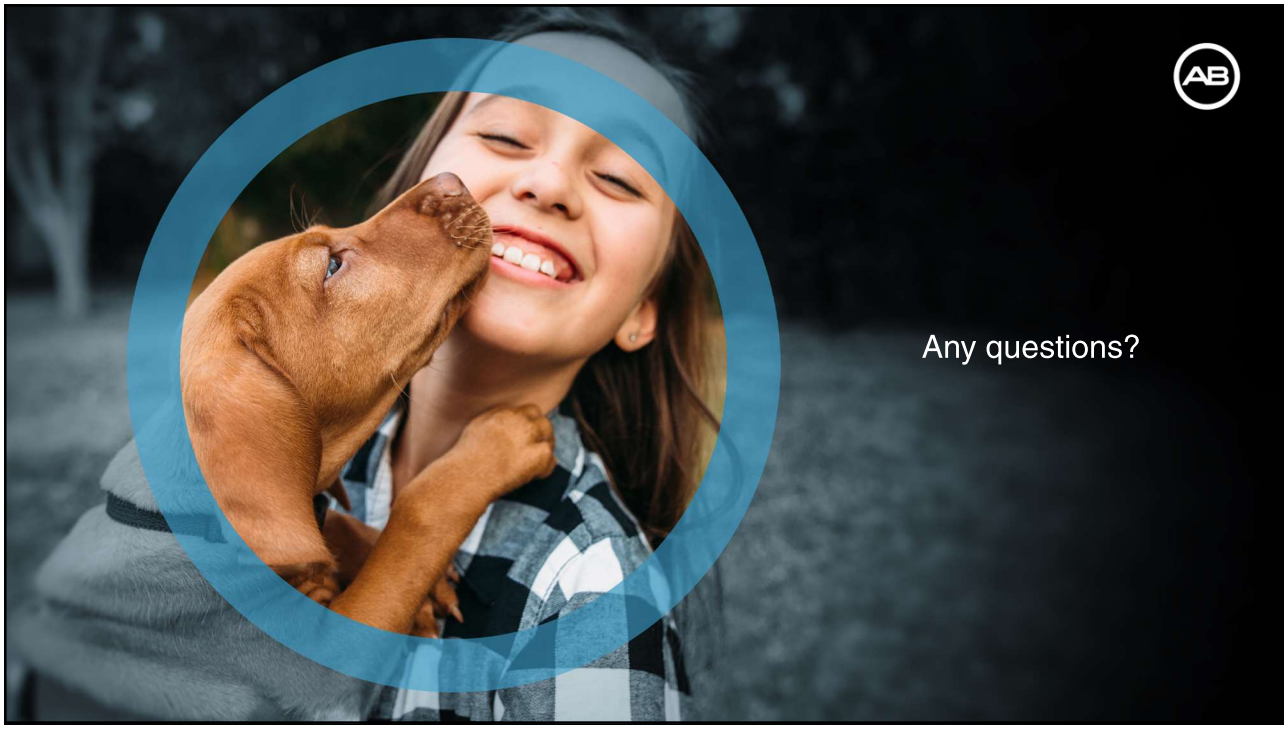


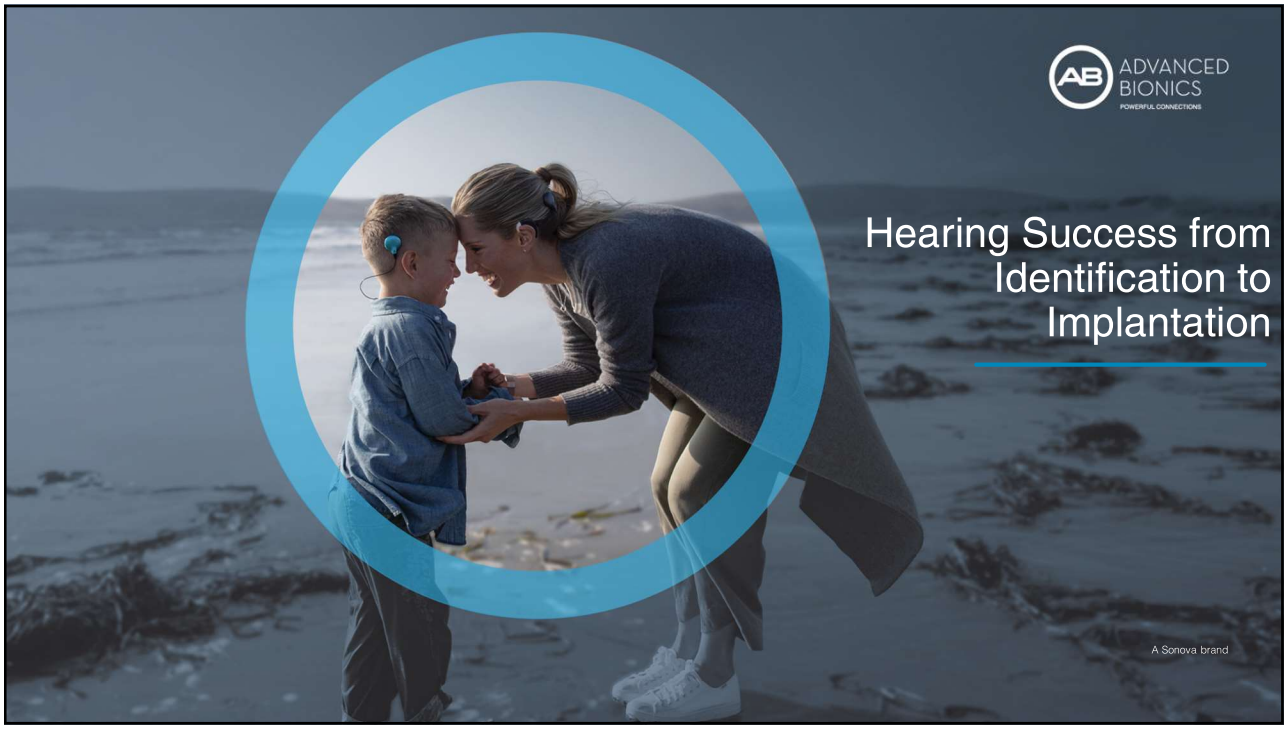


Homework

- Marvel CI Elevator Pitch
- Target CI Hands-On (Programming Staff Only):
  - Initial Stimulation
  - Creating Additional Programs
  - Creating Additional Maps
  - Bilateral Fitting with Acoustic Earhook



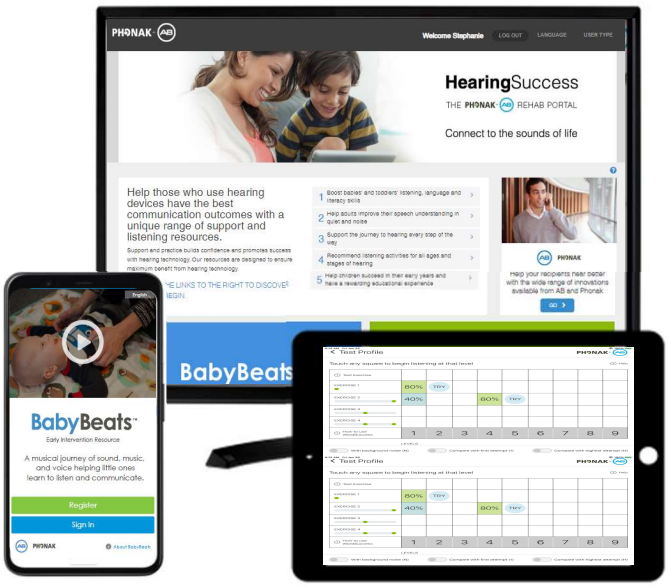




HearingSuccess.com

Supporting the whole hearing journey in their native language

The place to find all digital rehab resources to support the journey to better hearing in your language



Knowledge Check

RehAB

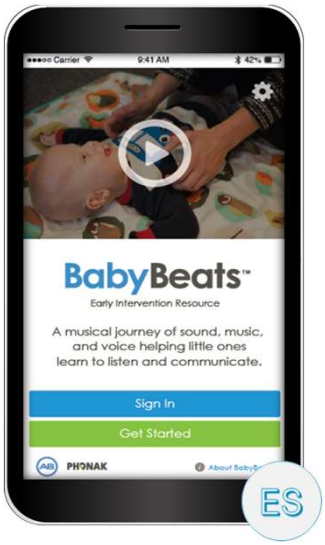
Review from pre-learning:

What is the name of the AB resource that is designed to introduce music and rhythm to young candidates and recipients?



BabyBeats

Early intervention resource



Bond, Play, Learn.

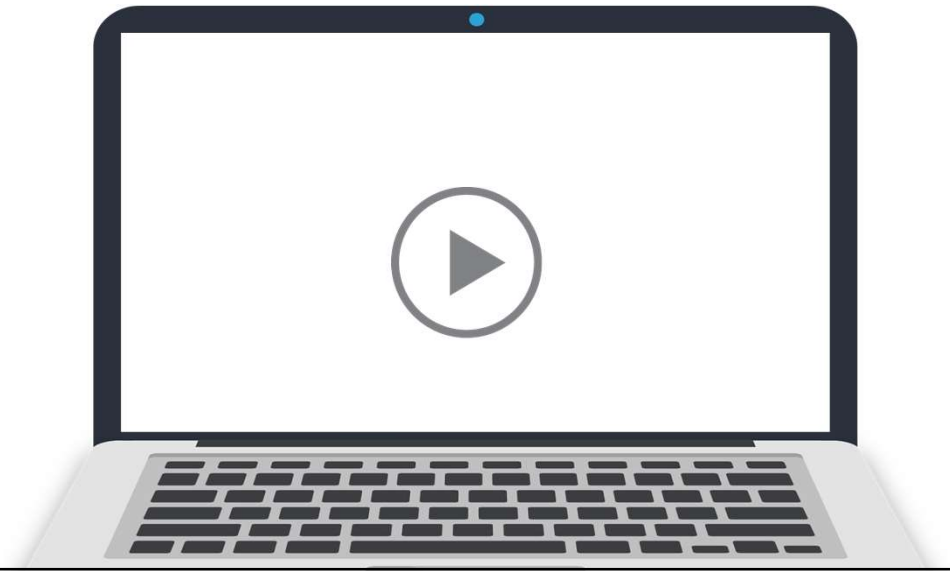
Assists with developing the hearing centers in the brain responsible for language and learning.

Available in English and Spanish.



BabyBeats

Early intervention resource



Knowledge Check

RehAB

Review from pre-learning:

What is the name of the resource that contains hundreds of activities for all ages and stages to support the development of listening and spoken language?



The Listening Room



Hundreds of activities to support the development of listening and spoken language.

- Parent education articles
- Fosters language-rich interactions
- At-home activities

Available in English and Spanish.
A bilingual resource.

ES

Knowledge Check

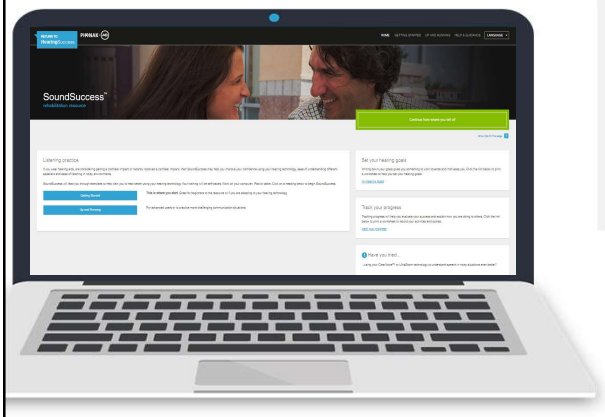
RehAB

Review from pre-learning:

What is the name of the rehab resource that trains the brain to hear by allowing users to practice listening to speakers with and without speech-reading cues, different accents, and genders?



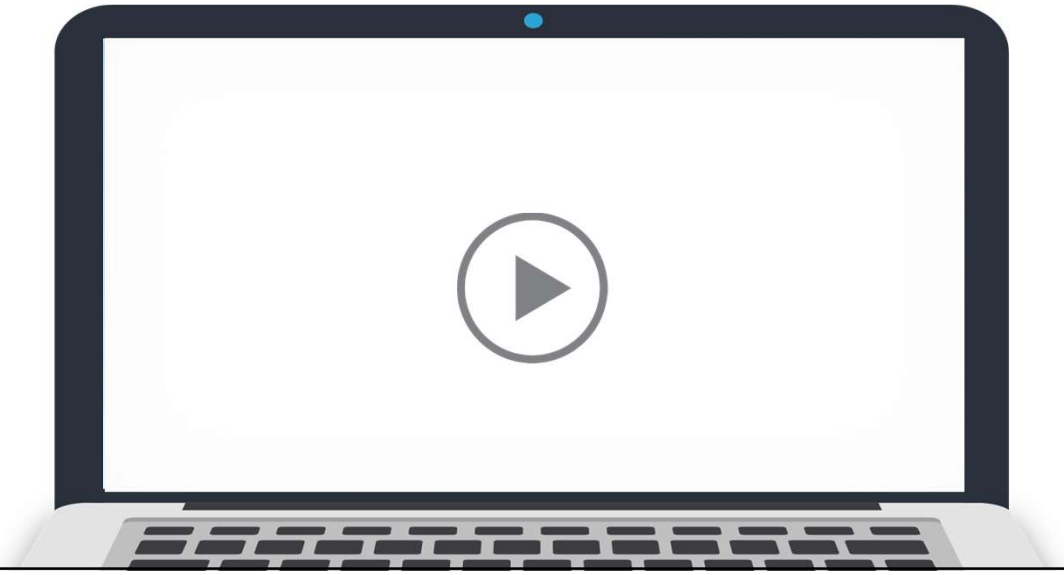
SoundSuccess



Communicate with confidence.

Interactive, online functional listening rehabilitation program.

SoundSuccess



Knowledge Check

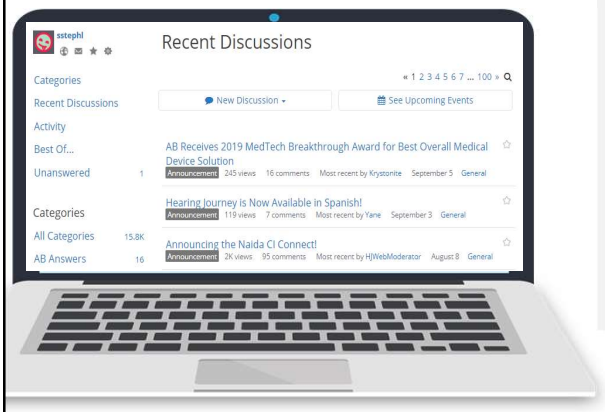
RehAB

Review from pre-learning:

What is the name of AB's online forum for our recipients/candidates?

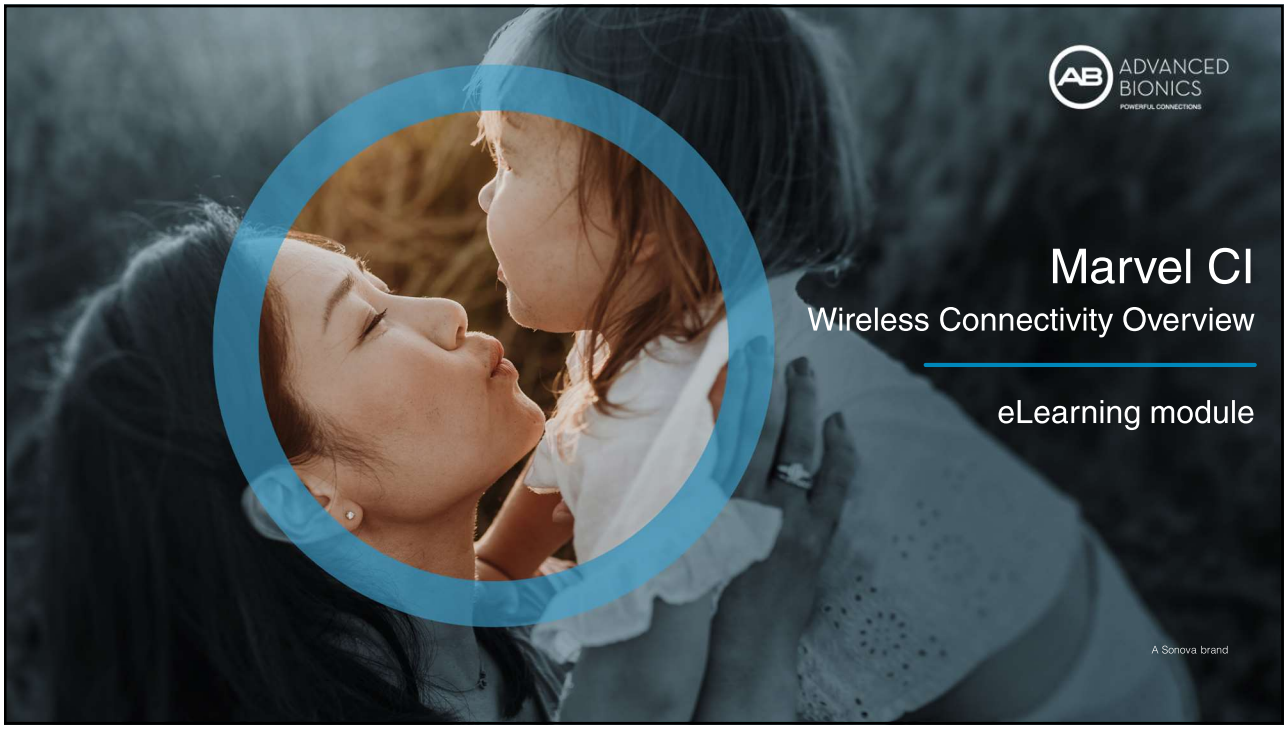


HearingJourney



The HearingJourney™ online forum is the premier place to chat, laugh, learn, and share stories about cochlear implants and hearing loss.

Available in English and Spanish.
www.caminoaudicion.com


ADVANCED BIONICS
POWERFUL CONNECTIONS
Marvel CI
Wireless Connectivity Overview
eLearning module
A Sonova brand

9

Wireless connectivity

The following wireless protocols are supported by Marvel CI.



3



Knowledge Check

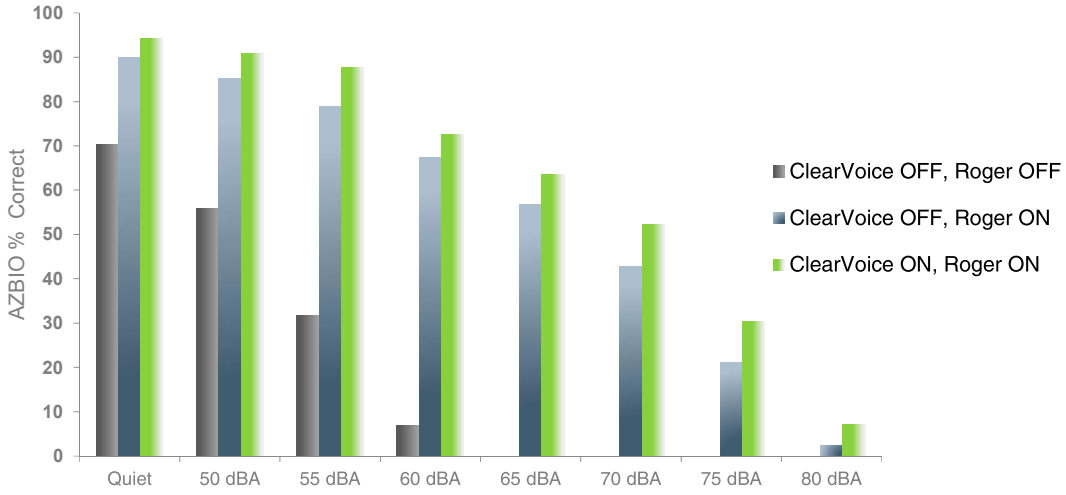
Roger

Review from pre-learning:
What is Roger?

How does it provide benefit to recipients?



Roger Performance



See Reference 30

Roger Select

The Roger Select microphone uses **MultiBeam Technology**.

MultiBeam Technology provides improved hearing in noisy environments or business meetings by using six beams spread out over 360º.

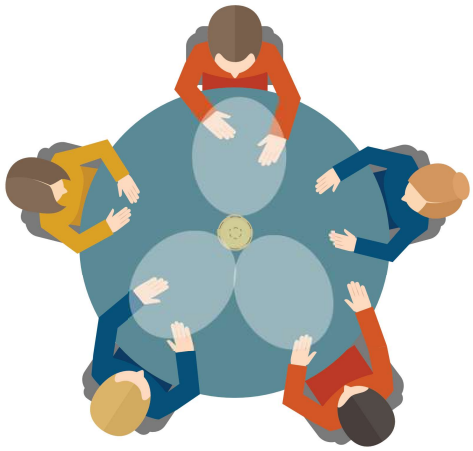
Beams are created using three omnidirectional microphones in an equilateral triangle. Each microphone can act as a rear or front microphone for either of the other microphones.



The beam with the best signal-to-noise ratio is automatically selected. When one speaker is talking, that microphone is activated and the others are muted.

It seamlessly switches from one talker to another.

When multiple conversations are taking place, the user can choose which conversation to focus on by manually selecting the segment to activate on the microphone.



The lapel mode uses an accelerometer to determine the orientation, and automatically enters Lapel Mode when positioned vertically. It will focus a narrow beam towards the mouth of the talker.

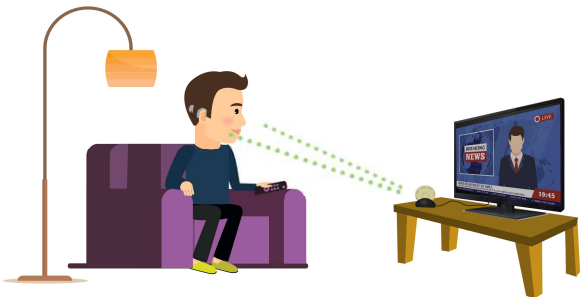
The talker should be within 10 meters/30 feet of the user.

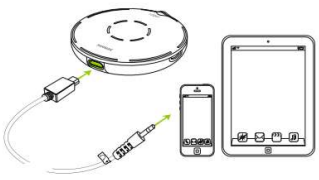


Roger Select can be used for streaming TV and multimedia.

When placed in the docking station, it will automatically turn off. The user can turn on the TV (or other multimedia device) to begin streaming.

To listen to portable audio device, like iPhones, MP3 players, and tablets, the user can plug the audio cable into the Roger Select and the audio device.

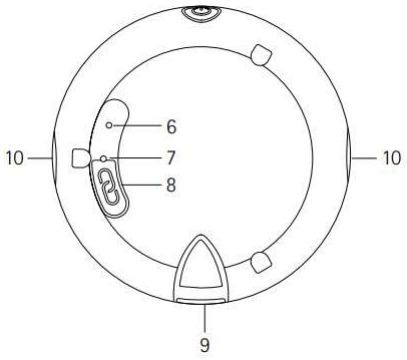




Roger Select Setup

Connecting a receiver:

With Roger Select and receiver on, hold within 10cm/4in from each other. Press the Connect button on the Roger Select. The back indicator light will turn green for two seconds to confirm a successful connection.



9

Using Roger Select

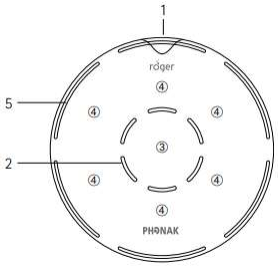
Table:

Automatically adapts its microphone settings depending on the signal-to-noise ratio.

Tap on a segment (or segments) to manually select which conversation to focus on.

- Tap the segment again to deactivate.
- Tap the center key to activate all microphones.

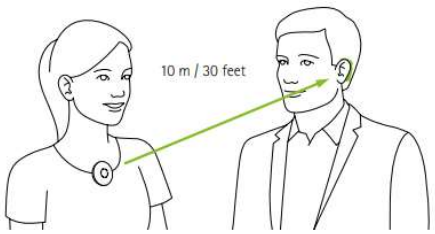




Using Roger Select

Lapel:

Roger Select uses an accelerometer to determine that it is in lapel mode and focuses a narrow beam towards the speaker's mouth.



RogerDirect™

Knowledge Check

RogerDirect

Review from pre-learning:
What is RogerDirect?

How does it provide benefit to recipients and professionals?





Only **Phonak** and **Advanced Bionics** can provide RogerDirect to cochlear implant recipients.

Roger Installation

Roger Installation

RogerDirect is activated after simply installing the receiver into Marvel CI and Naída Link M / Sky Link M.

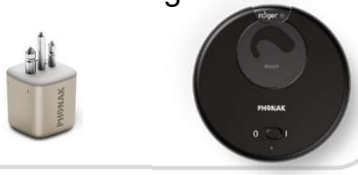
There are two options to install the Roger receiver into the sound processor.

Let's view the two options.

Via a Roger iN microphone using the Pin Tool



Via the Roger Installer and Roger X



Installation via a Roger iN Microphone and Pin Tool

Roger iN microphone	Pin Tool	Marvel CI or Phonak Link M
		

Roger iN microphones contain **two** Roger receivers that can be installed into a pair of Marvel devices.

Pro Tip: Roger iN microphones create an opportunity for providers to grow out-of-pocket sales for their practices.

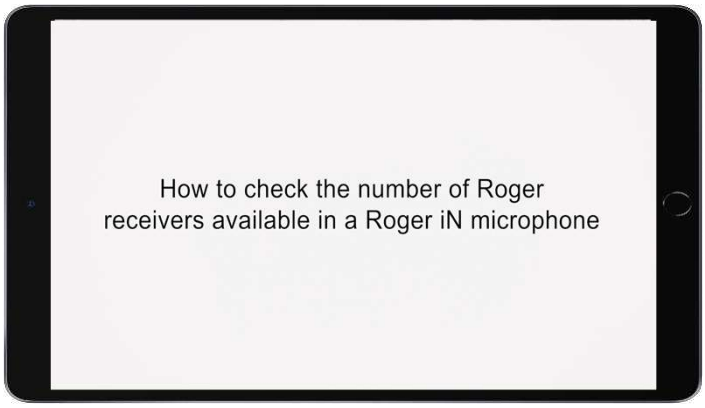
How to install a Roger receiver into a hearing aid using the Roger iN microphone

Installation via a Roger iN Microphone and Pin Tool

Number of available Roger receivers

To check the number of Roger receivers available in a Roger iN microphone:

- Turn on the Roger iN microphone.
- Use the Pin Tool to press the install button.
- The indicator light will blink to indicate the number of receivers installed. (The Roger Select iN* example in this video, this has two receivers available.)



Press play on the iPad screen.

*Available in select markets.

Installation via a Roger iN Microphone and Pin Tool

Let's view the number of available Roger receivers

Let's view the Roger Select™ iN indicator lights.



Two Roger receivers in Roger Select

One Roger receiver in Roger Select

No Roger receivers in Roger Select

Pro Tip: Roger iN microphones are also compatible with previous-generation Roger receivers, such as the Roger 17 for Naída CI Q.

Installation via the Roger Installer and Roger X

Installation via the Roger Installer and Roger X

Roger X



Roger Installer



Marvel CI or Phonak Naída Link M



The Roger Installer is designed for Hearing Care Professional and School Audiologist use. This option is focused on the adult and education reimbursement markets since a hardware solution is needed to meet reimbursement requirements.

Pro Tip: Use the Roger Installer and Roger X option with recipients who already have a Roger microphone.

Installation via the Roger Installer and Roger X

Roger X



To determine whether the Roger X will support installation:

- Ensure that the Roger X is champagne-colored. A silver-colored Roger X will not support installation via the Roger Installer.
- Ensure that the serial number on the Roger X begins with the numbers “1744xxxxxx” or higher. A serial number below “1744xxxxxx” will not support installation via the Roger Installer.

How to use Roger X to install a Roger receiver into a hearing aid

Installation via the Roger X and Roger Installer

Number of Roger receivers in the Roger X

The indicator light on top of the Roger Installer will indicate whether a Roger X is empty or full.

Let's view the Roger Installer indicator lights



- Roger receiver is inside the Roger X
- Roger receiver is not inside the Roger X (no light)

Roger Installation

Once the Roger receiver has been installed into each of the hearing instruments (for a bilateral recipient), the Roger microphone can be connected using the Connect button.

Clicking on the Connect button on the Roger Select iN connects the Roger microphone to the sound processors.



The Roger microphone only requires connection to one sound processor, as the connection information is automatically forwarded to the other hearing instrument.

Knowledge Check

Which is the 1st step for Roger installation via the Roger iN microphone and Pin Tool?

A. Power on one sound processor (keep the 2nd sound process off, if applicable) and place it close to Roger iN microphone (within 4 in/10cm)

B. Installation is complete when the indicator light on Roger iN microphone turns solid green. Repeat steps with 2nd sound processor, if applicable

C. Turn on Roger iN microphone. Press install button with Pin Tool for 2 seconds until the indictor light starts to blink green



Receiver Types

Installing multiple Roger receivers

PHONAK AB

Roger (02)



Compatible with all Roger solutions (educational, home, and office)

Roger (03)



Compatible with Roger home and office solutions

Roger Installation

Installing multiple Roger receivers

- With RogerDirect, it is possible to install both Roger (02) and (03) receivers into the same sound processor.
- When both receivers are installed, recipients can seamlessly switch from using a Roger for Education microphone at school to using their personal microphone (like the Roger Select) at home without having to reconnect every time.



Roger Installation

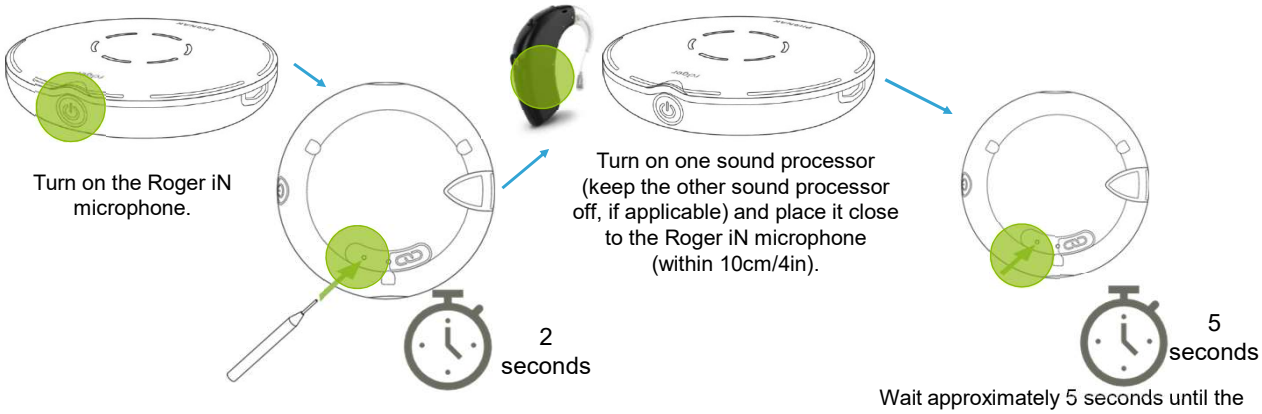
- Roger Select iN, Roger Table Mic iN, and Roger Pen iN are compatible with Roger (03) receivers.
- All previous Roger adult/teen/social microphones (Roger Select, Roger Table Mic II, Roger Pen, Roger Clip-On Mic) are compatible with Naída CI M and Sky CI M once the Roger receiver has been installed.



Roger Uninstallation

Uninstallation via a Roger iN Microphone and Pin Tool

Let's view the steps for uninstalling the Roger receiver from Naída CI M / Sky CI M back into a Roger iN microphone.



Turn on the Roger iN microphone.

Press and hold the install button for 2 seconds until the indicator light starts to blink green.

2 seconds

Turn on one sound processor (keep the other sound processor off, if applicable) and place it close to the Roger iN microphone (within 10cm/4in).

Wait approximately 5 seconds until the indicator light on the Roger iN microphone turns solid green. Repeat steps with second sound processor, if applicable.

5 seconds

Uninstallation via the Roger Installer and Roger X

Let's view the steps for uninstalling the Roger receiver from Naída CI M / Sky CI M back into the Roger X.



Plug the empty Roger X into the Roger Installer and turn on the Roger Installer.



When the indicator light on the Roger Installer is not illuminated (not green), Roger X is ready to receive a receiver from a hearing instrument.



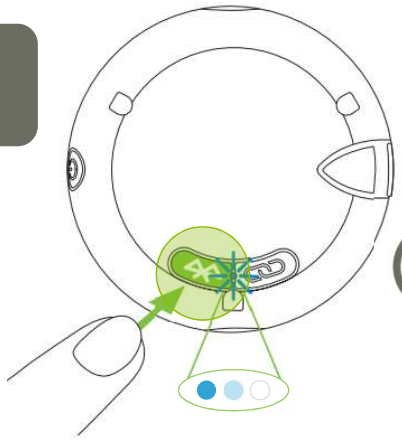
Turn on one sound processor (keep the other sound processor off, if applicable) and place it on the Roger Installer. The light on the Roger Installer will begin blinking green.



The uninstallation process is complete when the indicator light on the Roger Installer is solid green.
Repeat steps with second sound processor, if applicable.

Pro Tip: If a Naída CI M or Sky CI M recipient is using a Roger microphone (not a Roger iN microphone), Bluetooth must be disabled in the Roger microphone because the sound processor already features integrated Bluetooth. If Bluetooth is not disabled, it will result in a connectivity error and the recipient will hear a repeating chime sound.

Let's view how to disable Bluetooth.



Press and hold the Bluetooth button for two seconds until the blue back indicator light fades off.

2 seconds

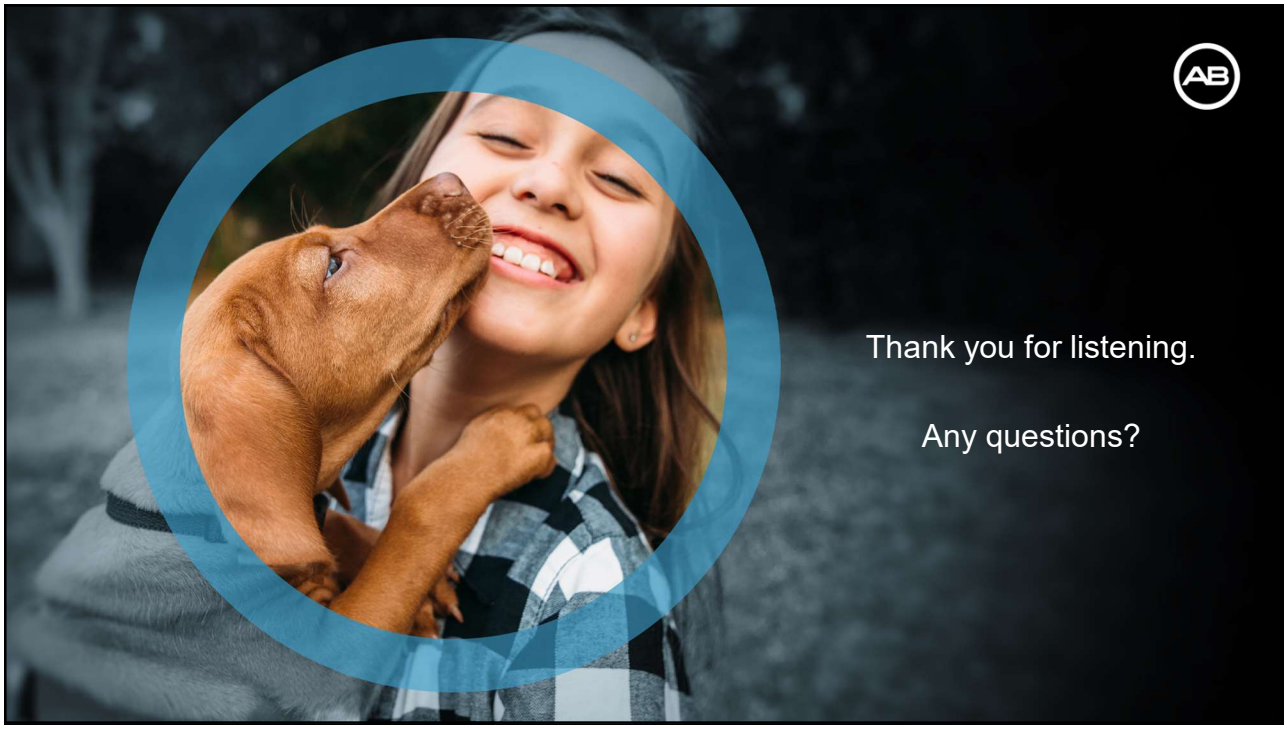
Skill Practice

Marvel CI

You are meeting with a customer about Marvel CI. During a discussion about the connectivity options that are available with Marvel CI, your customer says: “I don’t know what the big deal is about connectivity with your new product. All CI companies offer Roger.”

How will you respond to this customer?





References

1. Thibodeau, L. (2014). Comparison of speech recognition with adaptive digital and FM wireless technology by listeners who use hearing aids. American Journal of Audiology, 23(2), 201-210. (based on studies with moderate to severe hearing loss)

2. Wolfe, et al. Evaluation of Speech Recognition of Cochlear Implant Recipients using Adaptive, Digital Remote Microphone Technology and a Speech Enhancement Sound Processing Algorithm. Journal of the American Academy of Audiology, 26:502–508.



Bluetooth LE

Bluetooth LE

How does it work?

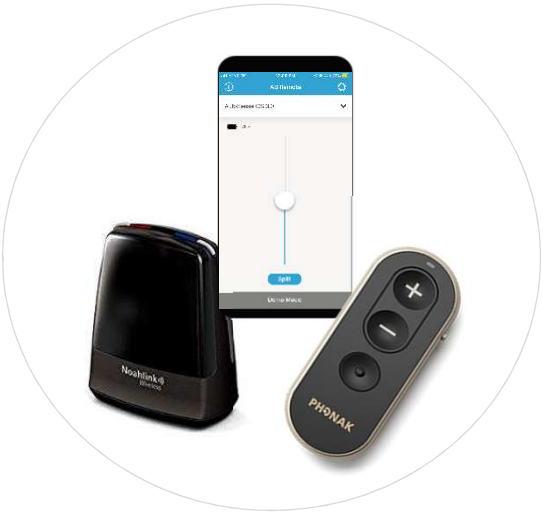
Bluetooth LE uses frequency hopping wireless technology in the 2.4 GHz unlicensed radio band to connect to nearby devices.

Bluetooth LE is slower than Bluetooth Classic (about one third of the speed) and only uses half of the power.

Bluetooth LE is also known as Bluetooth Smart.

Bluetooth® SMART

Bluetooth LE with Marvel CI



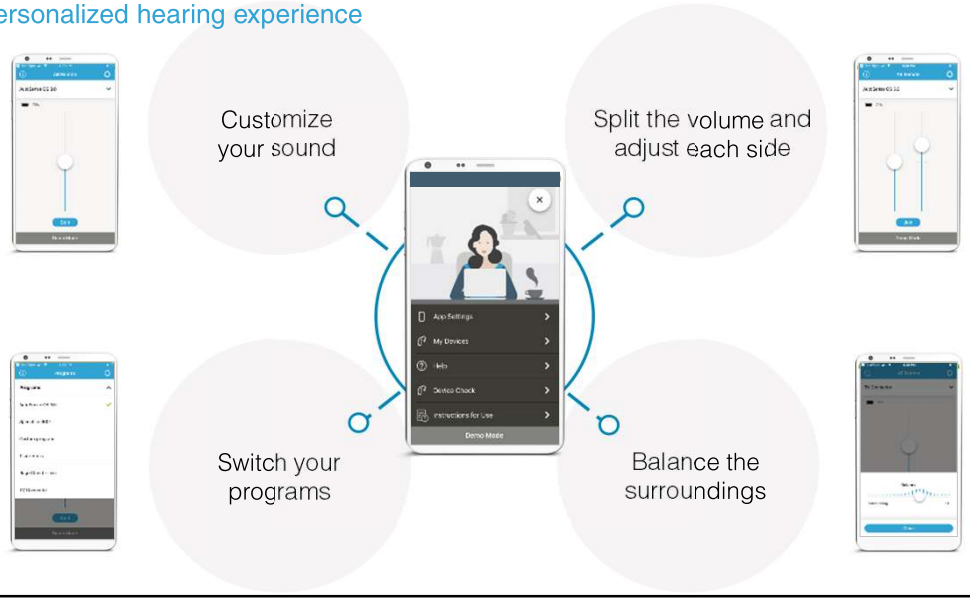
Marvel CI uses Bluetooth LE to connect to:

- AB Remote mobile app
- Phonak RemoteControl
- Noahlink Wireless

Bluetooth LE is ideal for applications that do not require continuous connection and depend on long battery life.

AB Remote Mobile Application

More personalized hearing experience

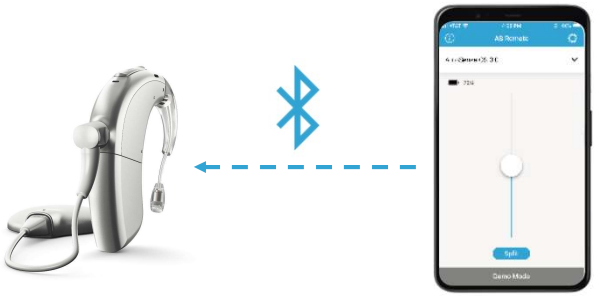


Bluetooth Low Energy (LE)

Connectivity

Commands are always sent in one direction: from the Bluetooth device to the hearing instrument.

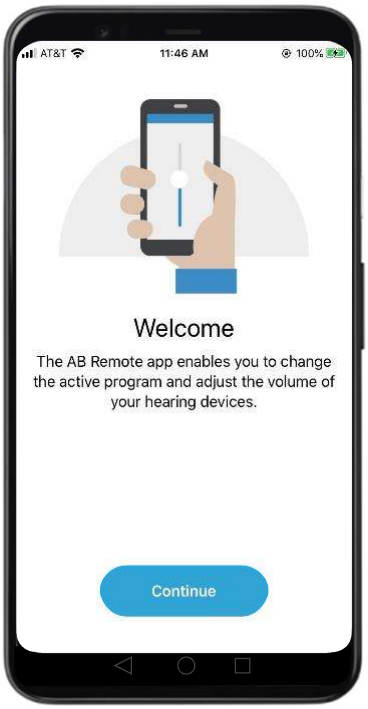
Each time a recipient reopens the AB Remote mobile application, the application connects with Marvel CI and or Naída Link M / Sky Link M.



Pro Tip: The AB Remote mobile application is available for phones only. It is not available for tablets.

Pairing to the AB Remote Mobile Application

1. Download the AB Remote mobile application (from the iPhone App store or Google Play Store) by searching *AB Remote* or *Advanced Bionics*.
2. Enable Bluetooth on the smartphone (Bluetooth Menu in Settings).
3. Open the AB Remote mobile application. The first time the app opens, the recipient will be guided through the pairing process.

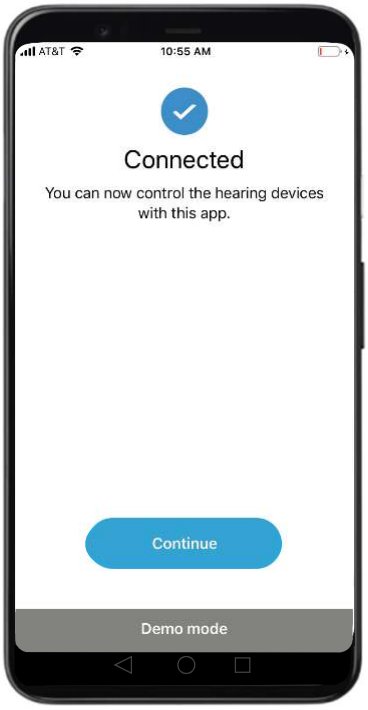


Pairing to the AB Remote Mobile Application

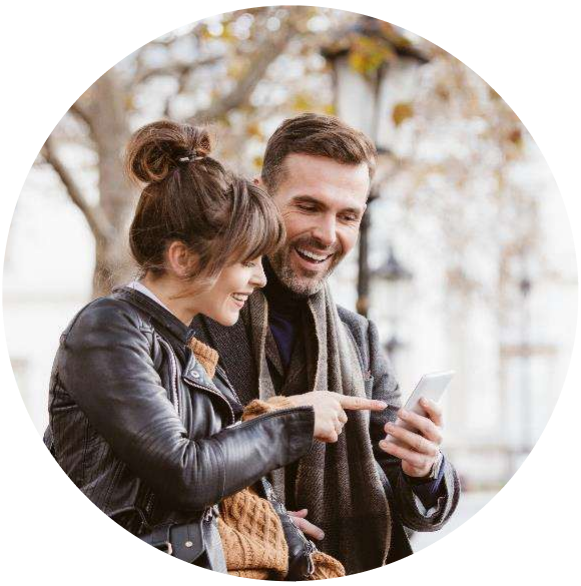
4. Enable pairing mode by restarting the hearing instrument(s). Remove and reattach the battery.

Pro Tip: The pairing window is open for 3 minutes after restarting the hearing instrument(s). Keep hearing instrument(s) within 3 feet or 1 meter of the phone.

5. Select ***Connect*** next to the names of the instrument(s) to begin using the AB Remote mobile app. Bilateral and bimodal instruments are paired together in one step.



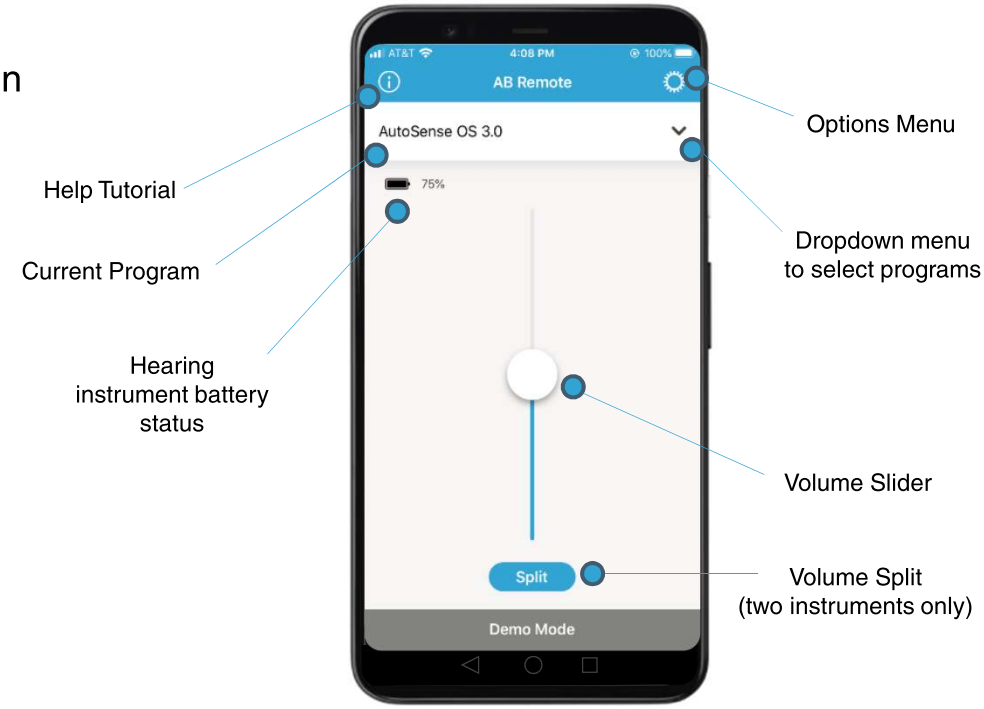
Using the AB Remote Mobile Application on Multiple Devices



Hearing instrument(s) can only be connected to the AB Remote mobile application on one Bluetooth-enabled smartphone at a time.

Hearing instrument(s) can remember pairings to two Bluetooth-enabled smartphones at a time. A third pairing will overwrite the pairing that was established longest ago.

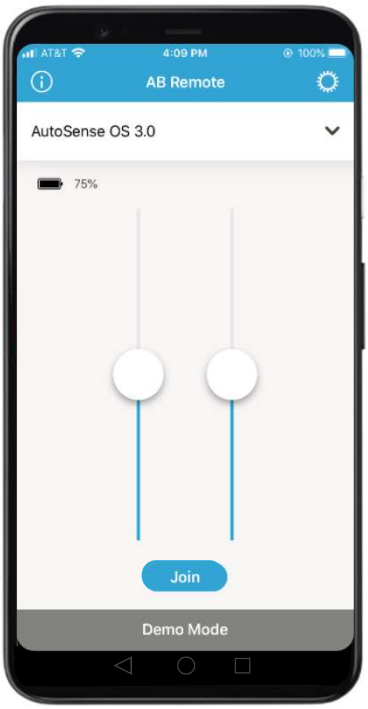
Home Screen



Independent Volume

Use the button below the slider labeled ***Split*** to split the control of the volume of each hearing instrument individually.

Pro Tip: With the M Acoustic Earhook, volume changes will control both acoustic and electric stimulation together.

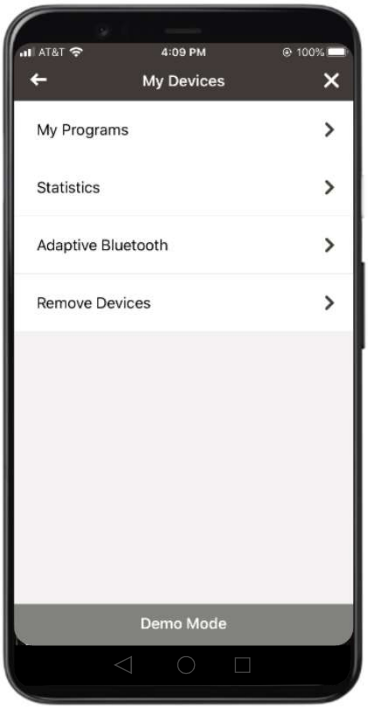


My Devices

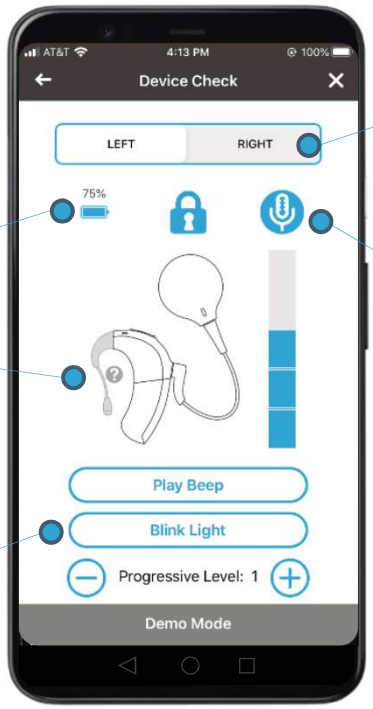
From the ***My Devices*** screen, recipients can access:

- My Programs: View all available programs and edit the names of programs
- Statistics: View hearing instrument battery levels and average wearing time per day
- Adaptive Bluetooth
- Remove Devices: When troubleshooting connectivity, select ***Forget Devices*** to forget the connected devices and pair again

Pro Tip: If you want to connect a different pair of hearing devices, you must first forget the current connected hearing devices. Afterward, you will be able to pair to the new devices.



Device Check



Select the side for the Device Check

View battery status

Conduct microphone check

Blue bars indicate that the microphones are receiving sound.

View T-Mic status

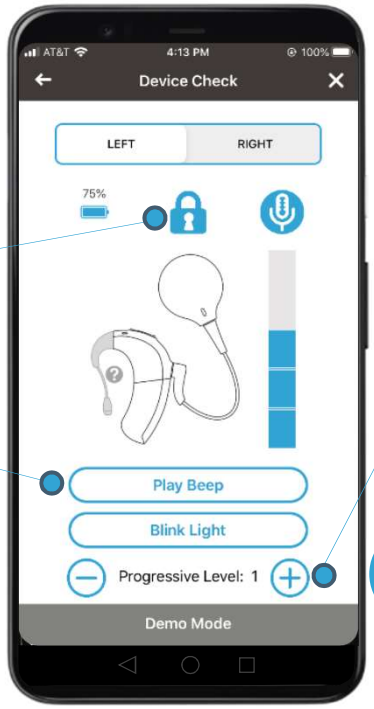
? suggests that T-Mic is not attached or is not functioning properly.

Blink LEDs verify right and left processors

Three green blinks will be visible on the selected processor.

Click here to move on.

Device Check



Click here to move on.

View lock status

Icon is blue when the CI is locked to the internal device..

Play Beep to verify right and left instruments

Recipient will hear an audible alert from the selected instrument.

Change Progressive Levels

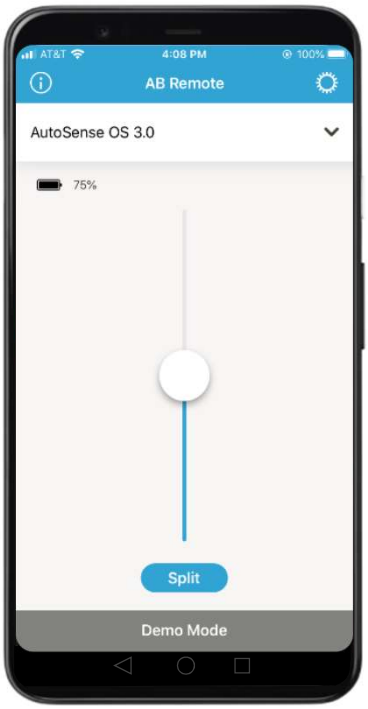
Available only if the programming clinician has enabled Progressive Levels.

Pro Tip: Progressive Levels are applied across all programs on the cochlear implant.

Knowledge Check

The Split option allows the recipient to change _____ independently?

A. Volume
B. Programs
C. Environmental Balance
D. All of the above

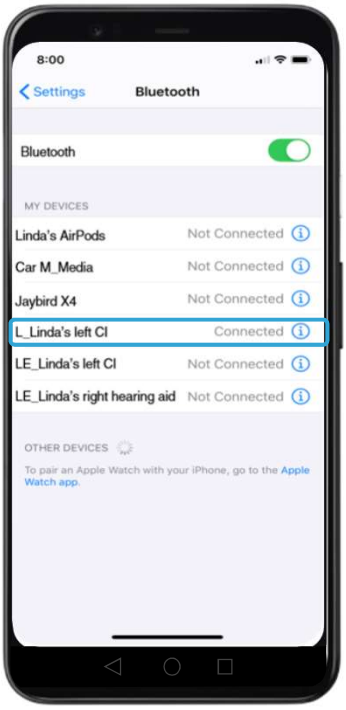


Pairing to the Bluetooth Phone

If the recipient will also be using their phone for streaming phone calls or media via Bluetooth, pair the hearing instrument(s) to the phone.

AB Marvel devices can receive Bluetooth Classic signals **bilaterally**. One hearing instrument is paired and connected to the smartphone. It receives audio from the phone and picks up the voice of the user, while the contralateral hearing instrument receives the phone's audio.

Bluetooth pairing to phone



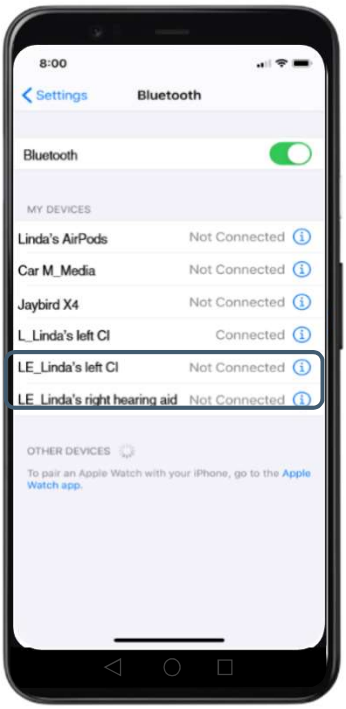
Pairing to the Bluetooth Phone

Pairing the hearing instrument(s) to the phone is a necessary step if the recipient will be using their phone to stream phone calls or media via Bluetooth.

However, the phone does not need to be paired to the hearing instrument(s) if the recipient will only be using the phone to access the AB Remote mobile application and will not be streaming via Bluetooth.

Pro Tip: In the device name under My Devices, LE stands for Low Energy, indicating pairing to the AB Remote mobile app.

Bluetooth pairings to AB Remote mobile application



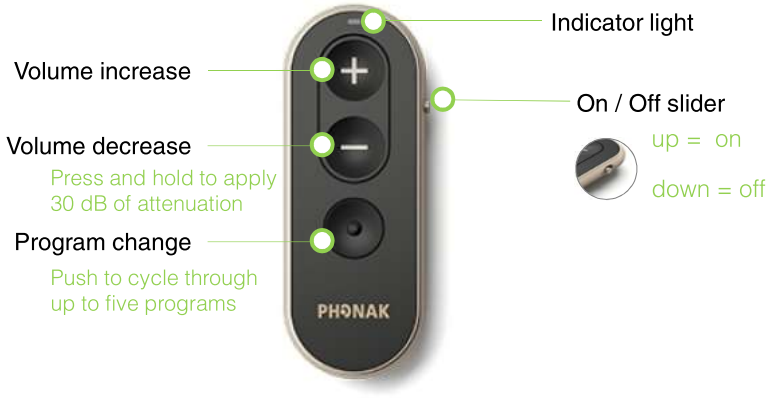
Phonak RemoteControl

- **Provides basic controls**
  Adjust volume and program settings
- **Simple**
  Great for non-smartphone users and recipients with limited dexterity



Phonak RemoteControl

The parts of the Phonak Remote Control.

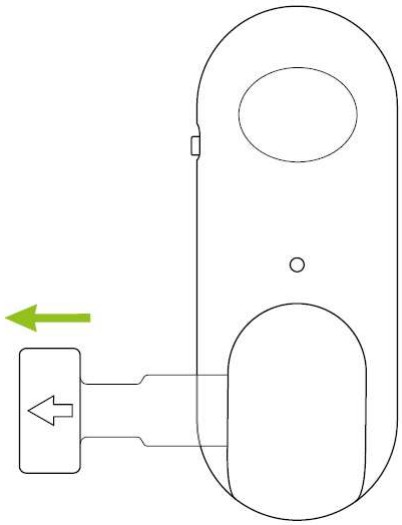


Phonak RemoteControl

Activation

Pull out the battery protective tab to activate the Phonak RemoteControl.

The Phonak RemoteControl uses a lithium button cell (CR2032).



Knowledge Check

Select the correct answer below. In order to use the Phonak RemoteControl, how often must recipients pair it to their devices?

A. After every battery change
B. Every time they want to use it
C. After using any devices that uses Bluetooth
D. Once



Phonak RemoteControl

Manual pairing

1. Ensure hearing device(s) are in pairing mode by switching them on or restarting them.
2. Press and hold the volume increase + button on Phonak RemoteControl.
3. Switch on the Phonak RemoteControl while pressing the volume increase + button.
4. Release the volume increase + button when the indicator light starts to blink blue.
5. The Phonak RemoteControl and the hearing device(s) will pair.
6. After a successful pairing, the indicator light is solid green for 5 seconds and the recipient may hear a notification beep.



Bluetooth Classic

Bluetooth Classic



Bluetooth Classic is designed for continuous two-way data transfer. It is an ideal solution for streaming audio, video, and phone calls which all require a continuous, broadband link.

New

Marvel CI supports two pairings to Bluetooth Classic devices.

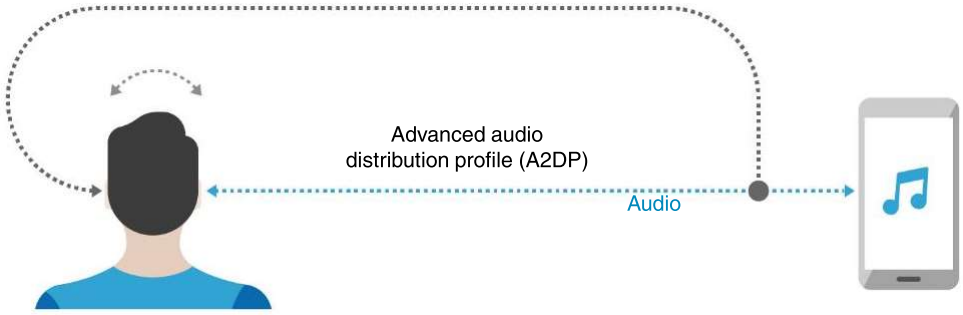
HFP: Phone call in both ears



By using a proprietary extension of the standard Bluetooth Classic protocol, Marvel CI can receive signals bilaterally. One hearing instrument is paired and connected to the smartphone. It receives the audio from the phone and picks up the voice of the user, while the contra-lateral hearing device only receives the phone's audio.

The ring tone of the phone and the phone call itself will always be heard on both sides.

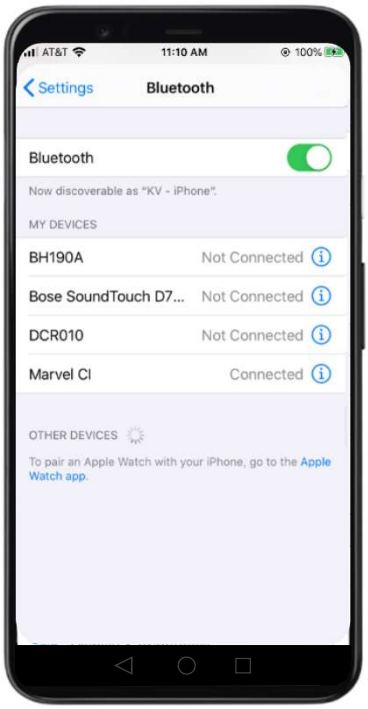
A2DP: Binaural Audio Streaming



Setting up audio streaming is just as easy as setting up a binaural phone call. One Marvel CI is paired and connected to the streaming device. The contralateral Marvel CI is able to detect the path between the connected hearing instrument and the Bluetooth device and picks up the same data which is sent to the connected hearing instrument.

Since A2DP provides a stereo signal, both devices are checking with one another to make sure the signal is complete.

Pairing via Bluetooth



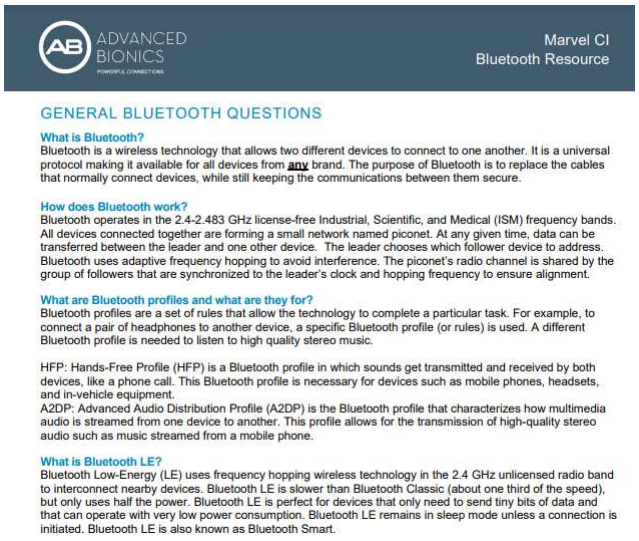
Skill Practice

Integrated Bluetooth

Another CI manufacturer has integrated Bluetooth.
What's special about Marvel CI?



Bluetooth Connectivity Resource



ADVANCED BIONICS
POWERFUL CONNECTIONS

Marvel CI
Bluetooth Resource

GENERAL BLUETOOTH QUESTIONS

What is Bluetooth?
Bluetooth is a wireless technology that allows two different devices to connect to one another. It is a universal protocol making it available for all devices from **any** brand. The purpose of Bluetooth is to replace the cables that normally connect devices, while still keeping the communications between them secure.

How does Bluetooth work?
Bluetooth operates in the 2.4-2.483 GHz license-free Industrial, Scientific, and Medical (ISM) frequency bands. All devices connected together are forming a small network named piconet. At any given time, data can be transferred between the leader and one other device. The leader chooses which follower device to address. Bluetooth uses adaptive frequency hopping to avoid interference. The piconet's radio channel is shared by the group of followers that are synchronized to the leader's clock and hopping frequency to ensure alignment.

What are Bluetooth profiles and what are they for?
Bluetooth profiles are a set of rules that allow the technology to complete a particular task. For example, to connect a pair of headphones to another device, a specific Bluetooth profile (or rules) is used. A different Bluetooth profile is needed to listen to high quality stereo music.

HFP: Hands-Free Profile (HFP) is a Bluetooth profile in which sounds get transmitted and received by both devices, like a phone call. This Bluetooth profile is necessary for devices such as mobile phones, headsets, and in-vehicle equipment.
A2DP: Advanced Audio Distribution Profile (A2DP) is the Bluetooth profile that characterizes how multimedia audio is streamed from one device to another. This profile allows for the transmission of high-quality stereo audio such as music streamed from a mobile phone.

What is Bluetooth LE?
Bluetooth Low-Energy (LE) uses frequency hopping wireless technology in the 2.4 GHz unlicensed radio band to interconnect nearby devices. Bluetooth LE is slower than Bluetooth Classic (about one third of the speed), but only uses half the power. Bluetooth LE is perfect for devices that only need to send tiny bits of data and that can operate with very low power consumption. Bluetooth LE remains in sleep mode unless a connection is initiated. Bluetooth LE is also known as Bluetooth Smart.

AirStream

AirStream



AirStream™ is a Sonova proprietary 2.4 GHz streaming protocol that provides high quality audio signals.

The Phonak TV Connector and PartnerMic are both using this proprietary streaming protocol.

Phonak TV Connector

Phonak TV Connector

The TV Connector is a simple plug and play interface for TVs and other audio sources. It is designed to simplify setup and usage.



Phonak TV Connector Compatibility



Phonak TV Connector Compatibility



For recipients who have more than one TV at home, Marvel CI can connect to two Phonak TV Connectors, so the user can seamlessly move from one TV to another.

An unlimited number of compatible devices can be connected to the TV Connector at the same time.

In households with more than one recipient with compatible devices, all recipients can connect to the same TV Connector.

Phonak Partner Mic

Phonak PartnerMic

This easy-to-use lapel-worn microphone is ideal for one-to-one conversations in noisy environments.

- Uses AirStream technology
- Designed for one-to-one conversations
- Streams to Naída CI M, Sky CI M and compatible Phonak hearing aids
- Always directional regardless of the microphone orientation
- Easy to use



Phonak PartnerMic

Controls and pairing



Out-of-the-box pairing
Pair the PartnerMic with the hearing devices by simply switching it on and holding the PartnerMic close to the hearing devices.

Alternatively, hearing devices can be paired to the PartnerMic by pressing the connect button when they are in close proximity (10 cm / 4 inches).

The PartnerMic will work with one pair of hearing devices at the time.

Phonak PartnerMic

Always directional regardless of position



PartnerMic is designed to deliver equivalent speech quality regardless of the orientation on the torso of the speaker.

PartnerMic automatically chooses the beam from the three microphones which optimizes the signal-to-noise ratio.

Pro Tip: Placing the PartnerMic on a table will result in the directional beam pointing in the direction of the Phonak logo. It does not go into an omnidirectional mode like Roger microphones.

Comparison of Phonak PartnerMic and Roger



Phonak Roger	Phonak PartnerMic
Complete system	Single microphone use
Various use cases (ex: table, pointing, lapel)	One mode, lapel
Adaptive gain	Fixed gain
Multiple speakers	One-to-one conversation
MultiBeam Technology	Orientation independent positioning
Multiple networks available	Pairs to one set of hearing instruments
Universally compatible	Compatible with Phonak Marvel HI and Marvel CI

AB Connectivity Resource



ADVANCED BIONICS

AB Connectivity Resource

Marvel CI provides numerous ways for recipients to stream audio from their favorite devices and connect with the ones they love. With Marvel CI, recipients can stream using Bluetooth, Roger, and AirStream technologies. This clinical resource is designed to identify which streaming options are available for the recipient based on which hearing instrument the recipient is using with Marvel CI.

Naída CI M90 on one side

	Hearing instrument on the other side	Bluetooth	Roger	AirStream
Recommended instrument for the other side	Naída CI M90	Bilateral/Bimodal streaming via integrated Bluetooth	Bilateral/Bimodal streaming (Roger mic input only)* Microphones: Roger iN or Roger* Receivers: Roger installed into each device via Roger iN microphone or via Roger X + Roger installer	Bilateral/Bimodal streaming with Phonak TV Connector and PartnerMic
	Phonak Naída Link M			
Other hearing instruments	Sky CI M90	Unilateral streaming to the selected hearing instrument via integrated Bluetooth	Bilateral/Bimodal streaming (Roger mic input only)* Microphones: Roger iN or Roger* Receivers: Roger installed into each device via Roger iN microphone or via Roger X + Roger installer	Bilateral/Bimodal streaming with Phonak TV Connector Unilateral streaming to the paired hearing instrument with Phonak PartnerMic
	Phonak Paradise or Marvel HA			
	Naída CI Q90	Unilateral streaming to Naída CI M90 via integrated Bluetooth OR to Naída CI Q90 via Naída CI Connect, Roger 17, or ComPilot	Bilateral streaming (Roger mic input only)* Microphones: Roger iN or Roger* Receivers: Roger installed into Naída CI M90 via Roger iN microphone or via Roger X + Roger installer and Roger 17 for Naída CI Q90	Bilateral streaming with Phonak TV Connector when Naída CI Connect is attached to Naída CI Q90 Unilateral streaming to Naída CI M90 with Phonak PartnerMic
	Phonak Naída Link Q	Unilateral streaming to Naída CI M90 via integrated Bluetooth OR to Naída Link Q via Roger (Roger 10 or Roger 15) or ComPilot	Bimodal streaming (Roger mic input only)* Microphones: Roger iN or Roger* Receivers: Roger installed into Naída CI M90 via Roger iN microphone or via Roger X + Roger installer and Roger 10 or Roger 15 attached to Naída Link Q	Unilateral streaming to Naída CI M90 via Phonak TV Connector and PartnerMic
	Chorus	Unilateral streaming to Naída CI M90 via integrated Bluetooth OR to Chorus via integrated Roger	Bilateral streaming (Roger mic input only)* Microphones: Roger iN or Roger* Receivers: Roger installed into Naída CI M90 via Roger iN microphone or via Roger X + Roger installer. Roger 02 is integrated into Chorus.	Unilateral streaming to Naída CI M90 via Phonak TV Connector and PartnerMic

*Bluetooth on Roger microphone should be disabled because Marvel and Paradise have integrated Bluetooth

FOR INTERNAL USE ONLY



ADVANCED BIONICS
POWERFUL CONNECTIONS

Marvel CI
PROGRAMMING GUIDE

Target CI is designed for easier, faster, and smarter fitting. It provides an intuitive and streamlined workflow for a more efficient fitting experience.

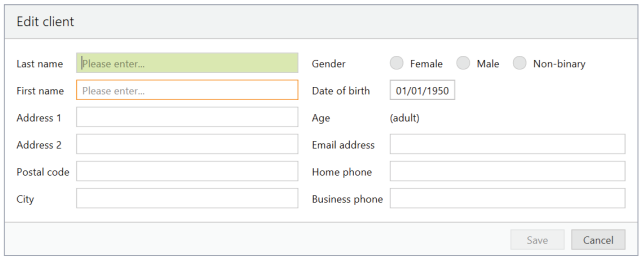
FITTING HARDWARE

Marvel CI sound processors are programmed in the Target CI fitting software, using either the Noahlink Wireless or CPI-3 programming interface.

FITTING GUIDE

Open Target CI and follow the steps below to navigate a **unilateral CI fitting.** Work through the tabs from left to right to complete the required fitting steps.

1. CREATE THE CLIENT FILE



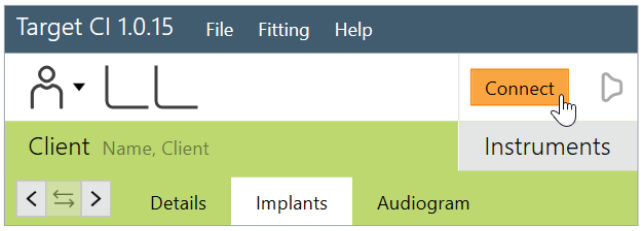
For a New client

- Select *New client.* Enter the client details and *Save.*
- Select *New session* to open a new fitting session.[1]

For an Existing client

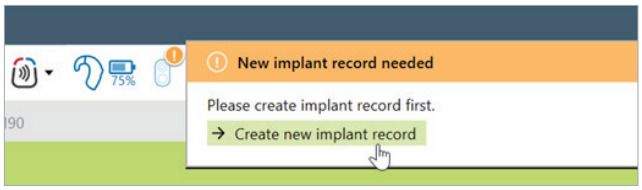
- Search and select the client's file, then click *Open session*.[2]

2. CONNECT TO THE HEARING INSTRUMENT



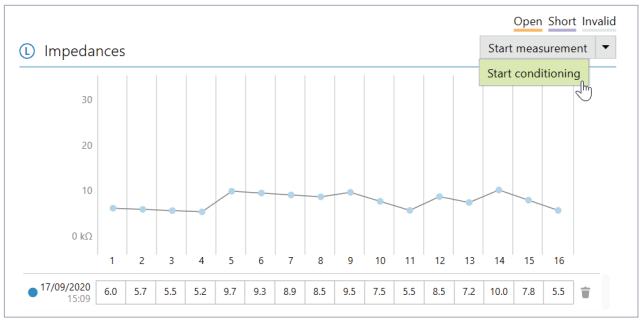
- Connect to the hearing instrument via Noahlink Wireless or CPI-3.
- If using the Noahlink Wireless, ensure that a fully charged rechargeable battery is used. Remove and re-attach the battery to put the sound processor into pairing mode. Click the *Connect* button within the 3-minute pairing window.
- Verify the side for which the device is intended to be used.
- Once device connection is successful, *Close* to proceed.

3. CONNECT TO THE INTERNAL DEVICE



- Place the headpiece on the recipient's head to achieve lock with the implant.
- For a new client, create a new implant record by clicking on the implant icon and following the prompts to add a new implant.
- Add the required implant information, then select *Save*.

4. MEASURE IMPEDANCES AND NEURAL RESPONSE IMAGING (NRI)



- Under *Client* access the *Impedance* tab to run impedances and conditioning.
- Access the *NRI* tab to measure NRI, if desired.

5. SELECT THE ATTACHMENTS

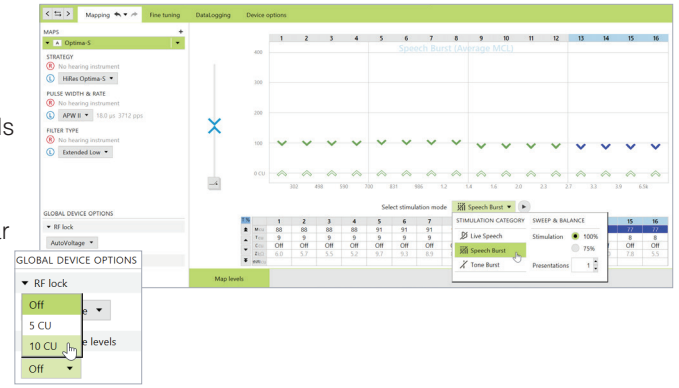
- Under the *Instruments* tab, go to *Acoustic parameters* and ensure that T-Mic/Standard is selected as the appropriate attachment.

1. Always enter the client's ***Date of birth*** so that the appropriate default settings can be applied.
2. Open session should be used at all follow-up visits to allow access to past impedance and NRI data.

ADVANCED BIONICS
POWERFUL CONNECTIONS

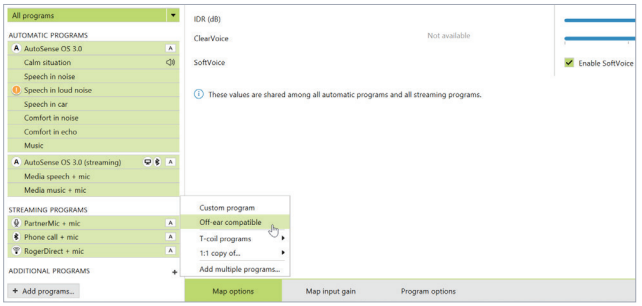
Marvel CI
PROGRAMMING GUIDE

6. CREATE A MAP



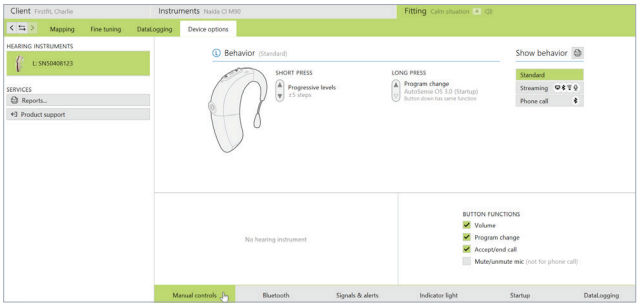
- Under *Fitting*, access the *Mapping* tab to set the appropriate map parameters i.e. stimulation strategy, pulse width, etc.
- Select the *Stimulation mode* type to measure M-Levels levels. T-Levels will default to 10% of the set M-Levels.
- To start and stop stimulation, click the play button, or the “unmute” and “mute” control in the dashboard or press the S-key and spacebar on the keyboard.
- Verify comfort using *Live Speech stimulation*.
- If desired, create progressively louder levels under *Global device options*.[3]

7. FINE TUNING



- *AutoSense OS™ 3.0* operating system offers one easy-to-use automatic program that senses the recipient’s listening environment and adjusts the device automatically.
- Confirm settings for the *AutoSense OS* program, as desired.
- Add any *Additional programs [+]*, if required, based on the recipient’s unique listening needs. For example, select *Off-ear compatible* for off-ear device usage with the headpiece microphone active.
- Confirm settings in the *Map options* tab, as desired.[4]
- Access the *Program options* tab to fine tune individual programs further, if desired.[5]

8. MANAGE DEVICE OPTIONS



- Access the *Device options* tab to manage Manual controls, Bluetooth, Signals & alerts, Indicator light, Startup and Datalogging, as needed, based on each recipient’s unique preferences.
- For ease of discovering the device during Bluetooth pairing, access the *Bluetooth* tab and label each side with the recipient’s name.

9. SAVE AND CLOSE THE SESSION

- Select *Save & close session* to finalize the fitting session.
- Run and review the sound processor *Battery estimation*, if desired.
- Add any notes to the fitting session, if desired.
- Follow the prompts to *Save* the fitting session to the Hearing instruments and/or the Database.
- Select *Close* to complete the fitting session.

If further support is required, please contact your local Advanced Bionics representative.

3. The recipient can adjust the progressive level using the multi-functional button or the AB Remote mobile app.
4. IDR, ClearVoice and SoftVoice settings are applied to all automatic programs and streaming programs.
5. Microphone mode and comfort features can be adjusted in the Program options tab for each individual program, if desired.

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ADVANCED BIONICS

Target CI
KEYBOARD SHORTCUTS

Designed for EASIER, FASTER, SMARTER fitting, Target CI offers an efficient and intuitive experience.

Use the *keyboard shortcuts* below to save time and clinical effort when fitting.

KEY	ACTION
GENERAL	
F1	Web help *will be enabled in Target CI 1.1
Alt + F4	Close Window (if there is a “x” to close the window)
Esc	Close Window (if there is a “Cancel” button)
Enter	Close window with default action (e.g. “Ok” button) or navigate to next wizard step
Ctrl + Tab	Navigate to next screen on current major section (Client / Instruments / Fitting) *selection of tab type will navigate through those screens
Shift + Ctrl + Tab	Navigate to previous screen on current major section (Client / Instruments / Fitting) *selection of tab type will navigate through those screens
Ctrl + P	Open reports
Ctrl + S	Save session
Ctrl + W	Save & close session
MAPPING | NRI	
Spacebar	Stop All Stimulation
Page Down	Adjust All Markers Down
Page Up	Adjust All Markers Up
Down Arrow	Adjust Markers Down (M, T, Clipping)
Up Arrow	Adjust Markers Up (M, T, Clipping)
L or Ctrl + Left Arrow	Bilateral Window: Focus Left Side
R or Ctrl + Right Arrow	Bilateral Window: Focus Right Side
0-9	Data Entry
Alt + Left Arrow	Move Entire Channel Selection to the Left
Alt + Right Arrow	Move Entire Channel Selection to the Right
Left Arrow	Move Selection Left
Right Arrow	Move Selection Right
C	Select Clipping Marker
G (goes to Map Input Gain tab)	Select Gain Marker
H	Select High Markers (NRI)
L	Select Low Markers (NRI)
M	Select M Marker
T	Select T Marker
Shift + Left Arrow	Select Multiple Channels to the Left
Shift + Right Arrow	Select Multiple Channels to the Right
S	Toggle Stimulation On/Off
Ctrl + Z	Undo
Ctrl + Y	Redo
Shift + Tab	Move Numerical Data Entry Selection Left
Tab	Move Numerical Data Entry Selection Right
Ctrl + A	Select All Markers
FINE TUNING	
Ctrl + Z	Undo
Ctrl + Y	Redo
AUDIOGRAM DIRECT	
Space	Play Signal
Enter	Save point
T	Talk to client
E	Enable HL > 100dB

ADVANCED BIONICS
POWERFUL CONNECTIONS

M Acoustic Earhook
PROGRAMMING GUIDE

The M Acoustic Earhook allows recipients to take advantage of any usable acoustic hearing in the implanted ear.

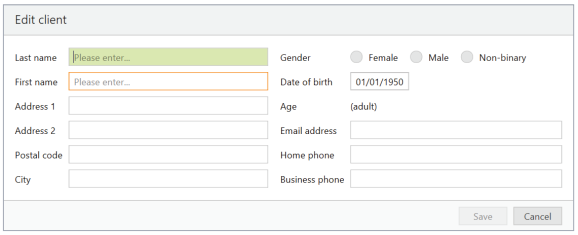
FITTING HARDWARE

Marvel CI sound processors with M Acoustic Earhook are programmed in the Target CI fitting software, using either the Noahlink Wireless or CPI-3 programming interface.

FITTING GUIDE

Open Target CI and follow the steps below to navigate fitting of Naída™ CI M90 or Sky CI™ M90 sound processors with the M Acoustic Earhook. Work through the tabs from left to right to complete the required fitting steps.

1. CREATE THE CLIENT FILE



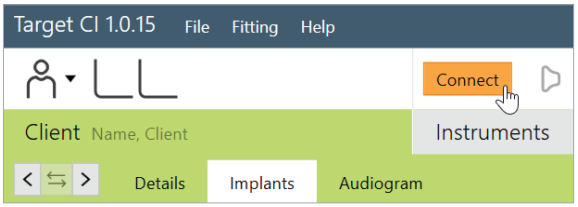
For a New client:

- Select *New client*. Enter the client's details[1] and *Save*.
- Select *New session* to open a new fitting session.

For an Existing client:

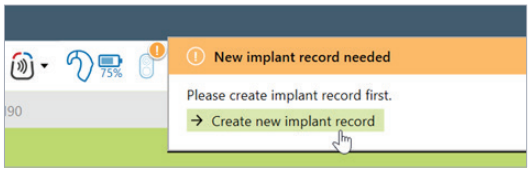
- Search and select the client's file; then select *Open Session*[2].

2. CONNECT TO THE HEARING INSTRUMENTS



- Connect to the hearing instrument(s) via Noahlink Wireless or CPI-3.
- If using the Noahlink Wireless, ensure that a fully charged rechargeable battery is used. Remove and reattach the battery to put the sound processor into pairing mode. Click the *Connect* button within the 3-minute pairing window.
- Verify the sides for which each device is intended to be used.
- Once the device connection is successful, *Close* to proceed.

3. CONNECT TO THE INTERNAL DEVICE



- Place the headpiece on the recipient's head to achieve lock with the implant.
- For a new client, create a new implant record by clicking on the implant icon and follow the prompts to add a new implant.
- Add the required implant information, then select *Save*.

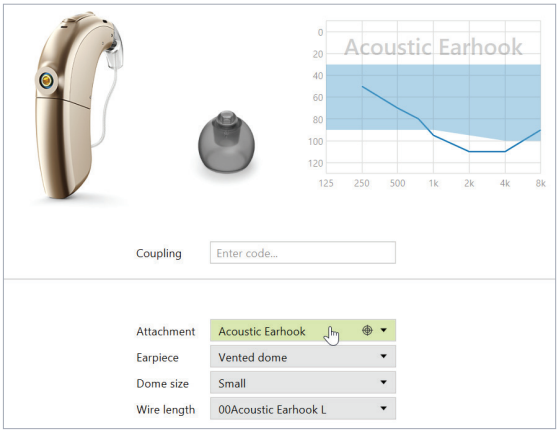
4. MEASURE IMPEDANCES AND NEURAL RESPONSE IMAGING (NRI)

- Under *Client*, access the *Impedance* tab to run impedances and conditioning.
- Access the *NRI* tab to measure NRI, if desired.

5. ENTER THE RECIPIENT'S LATEST AUDIOGRAM

- Access the *Audiogram* tab to enter the client's latest audiogram[3]. Select the transducer type used.
- AudiogramDirect allows the measurement of an audiogram via the M Acoustic Earhook. To access it, click *AudiogramDirect*, then *Start* and follow the prompts.

6. SELECT THE APPROPRIATE ATTACHMENTS



- Under the *Instruments* tab, access the *Acoustic Parameters*, select *Acoustic Earhook,* the appropriate earpiece, dome size, and wire length.
- For optimal fitting, *SlimTip* is recommended (order from Phonak).

7. PERFORM THE FEEDBACK AND REAL EAR TEST

- Under the *Fitting* tab, access *Feedback & real ear test*.
- Instruct the patient to remain quiet for the duration of the measurement.
- Select *Start* to run the feedback management test.

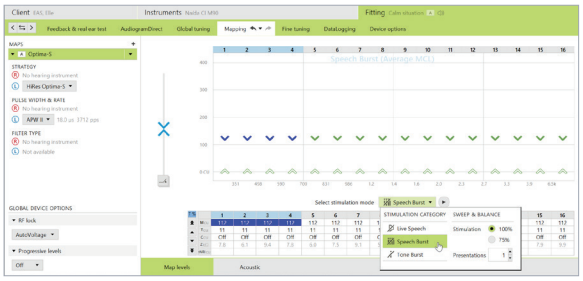
1. Always enter the client's Date of birth so that the appropriate default settings can be applied.
2. Open session should be used at all follow-up visits to allow access to past impedance and NRI data.
3. If using Noah, enter the client's details and audiogram in Noah, prior to accessing Target CI.

ADVANCED BIONICS
POWERFUL CONNECTIONS

M Acoustic Earhook
PROGRAMMING GUIDE

8. PERFORM GLOBAL TUNING AND SELECT FITTING FORMULA

- Access the *Global tuning* tab to confirm the fitting formula and to view acoustic gain.
- Consider using the *Adaptive Phonak Digital Bimodal fitting formula*, as appropriate.

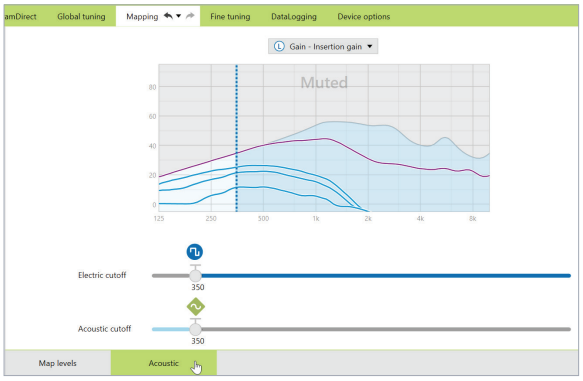


9. CREATE A MAP FOR THE ELECTRIC MODE

- Under *Fitting*, access the *Mapping* tab, set the appropriate electric parameters (i.e. stimulation strategy, pulse width, etc.).
- Select the *Stimulation mode* type to measure M-Levels. T-Levels will default to 10% of the set M-Levels.

If electrodes are extra-cochlear:

- Disable electrodes which are suspected to be located outside the cochlea.
- Disable the first electrode located inside the cochlea (e.g. if electrodes 15 and 16 are outside the cochlea, disable electrodes 14 -16 in the map).
- Check M-Level on remaining active electrodes using tone burst stimulation. If the recipient reports sound as uncomfortably loud or unpleasant (e.g. tinny, shrill), reduce M-Level to a comfortable level[4].

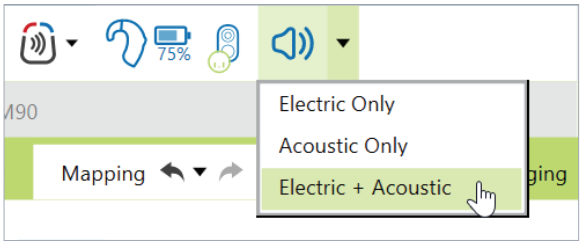


10. SET ACOUSTIC AND ELECTRIC CUTOFF FREQUENCIES

- Select the *Acoustic* tab to access acoustic and electric cutoffs.
- Cutoffs will default to the point at which recipient's threshold exceeds 70 dB HL[5].

11. VERIFY SOUND QUALITY AND COMFORT

- Click the dropdown next to the *Mute/Unmute* icon, to stimulate *Electric only*, *Acoustic only*, or *Electric + Acoustic* together.
- Verify sound quality and comfort using live speech stimulation.



12. FINE TUNING

- Access *Fine tuning* to confirm settings, as desired.
- Access the *Gain & MPO tab* to set acoustic gains and maximum acoustic earhook output.

13. MANAGE DEVICE OPTIONS

- Access the *Device options* tab to set controls and alerts according to the recipient's preference.
- For ease of discovering the device during Bluetooth®[6] pairing, access the *Bluetooth* tab and label each side with the recipient's name.

14. SAVE & CLOSE THE SESSION

- Select *Save & close* to complete the fitting session.
- Run and review the sound processor *Battery estimation*, if desired.
- Add any notes to the fitting session, if desired.
- Follow the prompts to *Save* the fitting session to the Hearing instruments and the Database.
- Select *Close* to complete the fitting session.

FOR MORE INFORMATION

If further support or information regarding product availability is required, please contact your local AB representative.

4. Additional electrodes should be disabled if any of the following are noted with individual electrode stimulation: non-auditory percept, abnormal or absent loudness growth, or atonal or abnormal stimulus sound quality.
5. To allow for more frequency boundary overlap, consider using a minimum acoustic cutoff of 500 Hz, or set the acoustic cutoff 2 steps above the Target CI default cutoff frequency, whichever is higher. When the electric cutoff frequency is changed, this will change the frequency assignment of the electrical channels within the map.
6. The Bluetooth® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by Sonova AG is under license.

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ADVANCED BIONICS
POWERFUL CONNECTIONS

Marvel CI Bimodal Solution

PROGRAMMING GUIDE

Target CI is designed for easier, faster, and smarter fitting. Target CI is the first hearing care software to allow the fitting of a sound processor and compatible hearing aid at the same time in one fitting software. It provides a streamlined workflow for an efficient bimodal fitting experience.

COMPATIBILITY

The Naída Link M Bimodal Solution allows recipients to take advantage of any usable acoustic hearing in the contralateral ear:

- The Naída Link M hearing aid is compatible with the Naída CI M90 sound processor.
- The Sky Link M hearing aid is compatible with the Sky CI M sound processor.

FITTING HARDWARE

Marvel CI sound processors and hearing aids can be programmed in the Target CI fitting software, using the Noahlink Wireless.

FITTING GUIDE

Open Target CI and follow the steps below to navigate the fitting of both Marvel devices in one session. Work through the tabs from left to right to complete the required fitting steps.

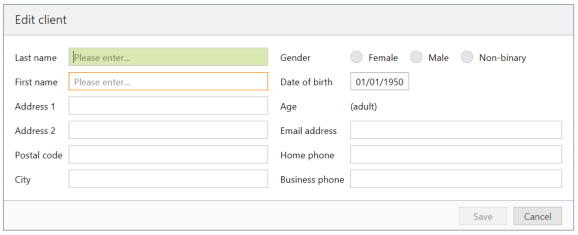
1. CREATE THE CLIENT FILE

For a New client:

- Select *New client*. Enter the client details[1] and *Save*.
- Select *New session* to open a new fitting session.

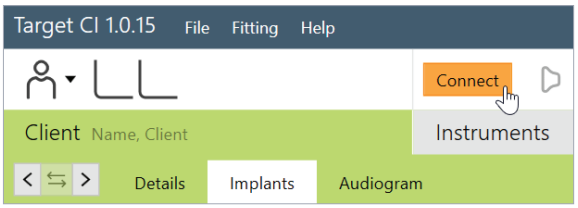
For an Existing client:

- Search and select the client's file; then select *Open Session*[2].



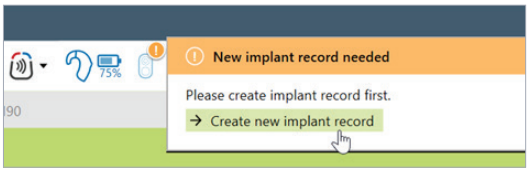
2. CONNECT TO THE HEARING INSTRUMENTS

- Connect to both hearing instruments via Noahlink Wireless.
- Ensure that fully charged batteries are used for both devices. Remove and re-attach the battery to put the devices into pairing mode. Click the *Connect* button within the 3-minute pairing window.
- Verify the sides for which each device is intended to be used.
- Once the device connections are successful, *Close* to proceed.



3. CONNECT TO THE INTERNAL DEVICE

- Place the headpiece on the recipient's head to achieve lock with the implant.
- For a new client, create a new implant record by clicking on the implant icon and follow the prompts to add a new implant.
- Add the required implant information, then select *Save*.



4. MEASURE IMPEDANCES AND NEURAL RESPONSE IMAGING (NRI)

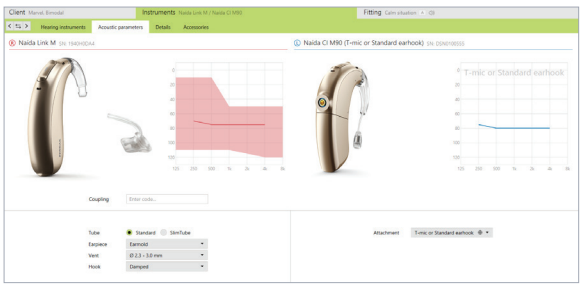
- Under *Client* access the *Impedance* tab to run impedances and conditioning.
- Access the *NRI* tab to measure NRI, if desired.

5. ENTER THE AUDIOGRAM

- Access the *Audiogram* tab to enter the client's latest audiogram[3]. Select the transducer type used.
- Optional: AudiogramDirect allows the measurement of an audiogram via the hearing aid and acoustic coupling. To access it, click *AudiogramDirect*, then *Start* and follow the prompts.

6. SELECT THE APPROPRIATE ATTACHMENTS

- Under the *Instruments* tab, access the *Acoustic Parameters*, select the *Attachment* for the sound processor.
- For the hearing aid, select the appropriate earpiece option.



1. Always enter the client's Date of birth so that the appropriate default settings can be applied.
2. Open session should be used at all follow-up visits to allow access to past impedance and NRI data.
3. If using Noah, enter client details and audiogram in Noah, prior to accessing Target CI.

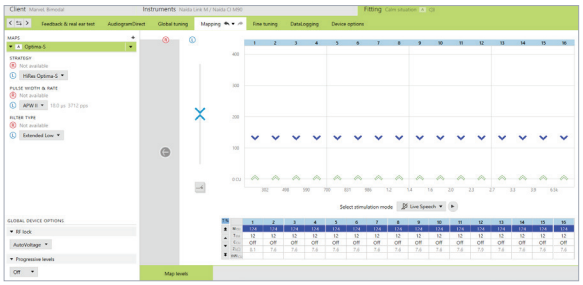
ADVANCED BIONICS
POWERFUL CONNECTIONS

Marvel CI Bimodal Solution
PROGRAMMING GUIDE

7. PERFORM THE FEEDBACK AND REAL EAR TEST
- Under the *Fitting* tab, access *Feedback & real ear test*.
- Instruct the patient to remain quiet for the duration of the measurement.
- Select *Start* to run the feedback management test.

8. PERFORM GLOBAL TUNING AND SELECT FITTING FORMULA
- Access the *Global tuning* tab to confirm the fitting formula and to view acoustic gain[4].
- Consider using the *Adaptive Phonak Digital Bimodal fitting formula*, as appropriate.

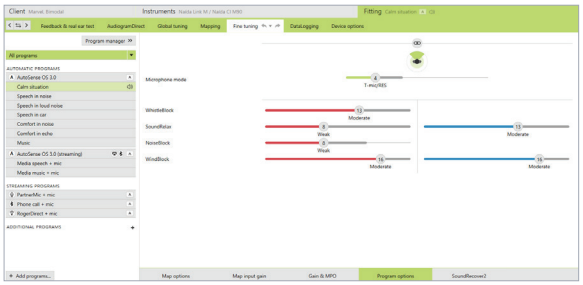
9. CREATE A MAP AND VERIFY SOUND QUALITY OF THE SOUND PROCESSOR
- Under *Fitting*, access the *Mapping* tab to set the appropriate map parameters (i.e. stimulation strategy, pulse width, etc.).
- Select the *Stimulation mode* type to measure M-Levels. T-Levels will default to 10% of the set M-Levels.
- To start and stop stimulation, click the play button, or the “unmute” and “mute” control in the dashboard, or press the S-key and spacebar on the keyboard.
- Verify comfort using *Live Speech stimulation*.
- If desired, create progressively louder levels under *Global device options*.





10. FINE TUNE THE HEARING AID SETTINGS
- Access the *Fine tuning* tab, then the *Gain & MPO* tab to manage acoustic settings for the hearing aid.

11. FINE TUNE BOTH DEVICES IN PROGRAM OPTIONS
- Access the *Program options* tab to fine tune individual programs further, if desired[5].
- Microphone mode and comfort features can be adjusted for each individual program, if desired.
- Add any *Additional programs [+]*, if needed, based on the client’s unique listening needs.



12. MANAGE DEVICE OPTIONS
- Access the *Device options* tab to manage Manual controls, Bluetooth®, Signals & alerts, Indicator light, Startup and Datalogging, as needed, based on each recipient’s unique preferences.
- For ease of discovering the device during Bluetooth[6] pairing, access the *Bluetooth* tab and label each side with the recipient’s name.
- Consider assigning the Bluetooth Side to the side with better hearing and/or longer battery life.

13. SAVE & CLOSE THE SESSION
- Select *Save & close* to finalize the fitting session.
- Run and review the sound processor *Battery estimation*, if desired.
- Add any notes to the fitting session, if desired.
- Follow the prompts to *Save* the fitting session to the Hearing instruments and/or the Database.
- Select *Close* to complete the fitting session.

FOR MORE INFORMATION
If further support or information regarding product availability is required, please contact your local AB representative.

4. The gain level and compression settings are based on the user’s experience.
5. By default, the settings are applied to both the CI and HA; however, settings for each device can be customized by unlinking the devices.
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Hands-On Review with Target CI



Bimodal Fitting in Target CI

Bimodal Fitting

Target CI

CI Audiologist programs Marvel CI and Link M

- If both devices are being fit on the same date, simply connect both devices and proceed with fitting.
- If Link M is being fit at a later date, program Marvel CI unilaterally and add Link M when the recipient is ready.



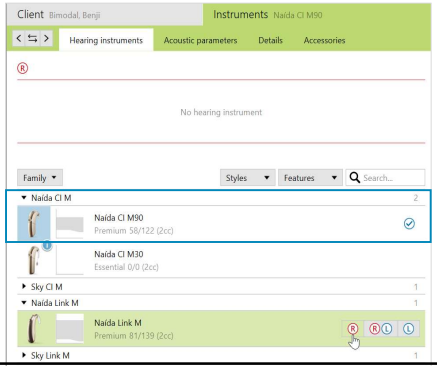


Bimodal Fitting

Target CI

A bimodal session can be created by **connecting** a Link M hearing aid or **adding** Link M in the *Hearing instruments* tab.

This will provide access to:
- Binaural VoiceStream Technology (BVST) features
- Bimodal Bluetooth streaming



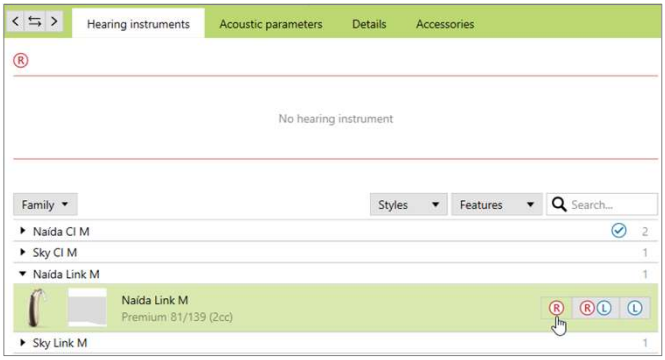


Bimodal Fitting

Phonak Target

Marvel CI and Link M are fit by **two different** professionals.

- It is recommended that the CI Audiologist add the Link M to Target CI to set up the processor for a future bimodal fitting.
- If the Link M is not added to Target CI, the bimodal recipient will not have access to Binaural VoiceStream Technology features (e.g. no QuickSync, Speech in Loud Noise, etc.) or bimodal Bluetooth streaming.
  - Can still use the Adaptive Phonak Digital Bimodal Fitting formula and stream Roger and TV Connector bimodally



Bimodal Fitting

Phonak Target



The HA Clinician should connect both the Marvel CI and Link M to Phonak Target 7.1.

The program structure will be read from the Marvel CI processor.



Shared Settings

This technology is shared between the two devices and the HA settings are based on the CI settings.

- AutoSense OS / AutoSense Sky OS 3.0
- Program Structure
- BVST
- Microphone attenuation
- Enabling Datalogging
- Bluetooth and Own Voice Pick-up side
- Indicator light
- Junior mode settings



Independent Settings

Independent settings can be adjusted for the hearing aid in Phonak Target.

- Acoustic parameters
- Fitting Formula
- Feedback & real ear test
- Fine tuning of Gain & MPO
- Program option settings
- SoundRecover 2
- Signals & Alerts



Programming Interface

Noahlink Wireless

Noahlink Wireless provides the unique ability to connect Marvel CI sound processors and Link M hearing aids for bimodal fitting.





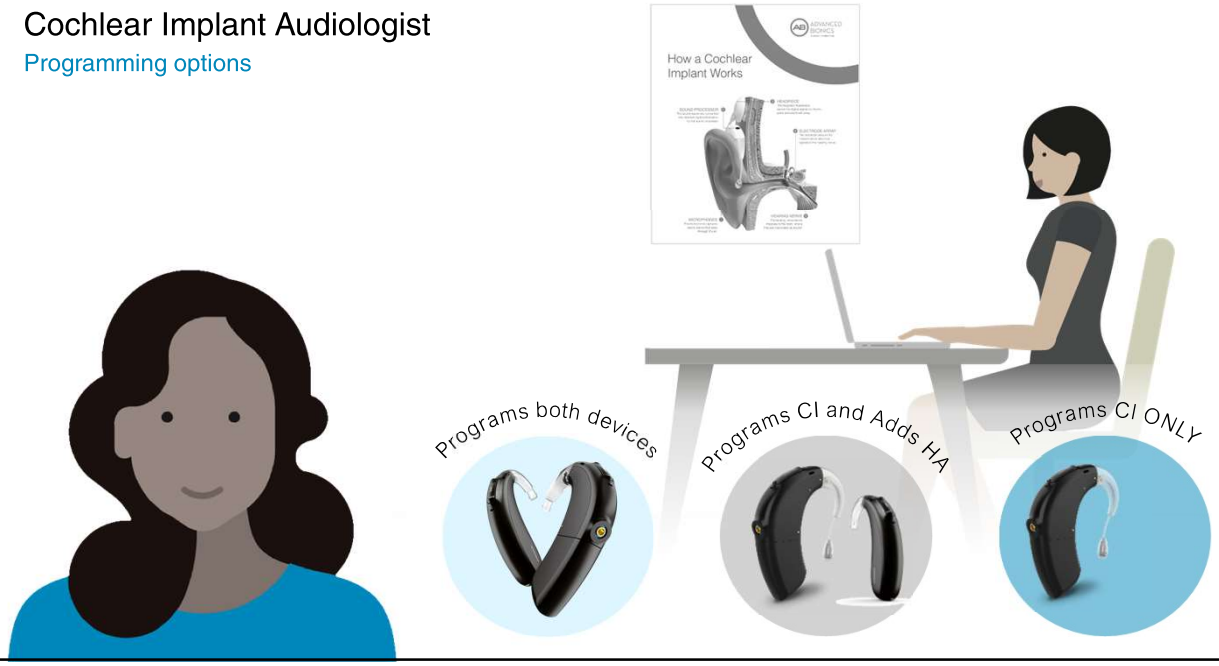


Bimodal Fitting Scenarios

PROGRAMMING IN TARGET CI

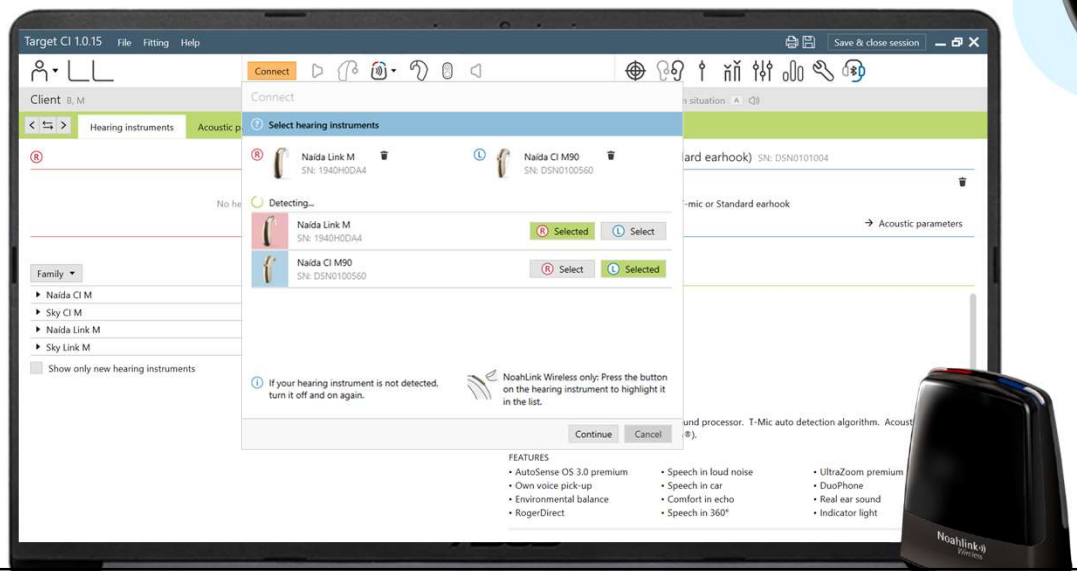
Cochlear Implant Audiologist

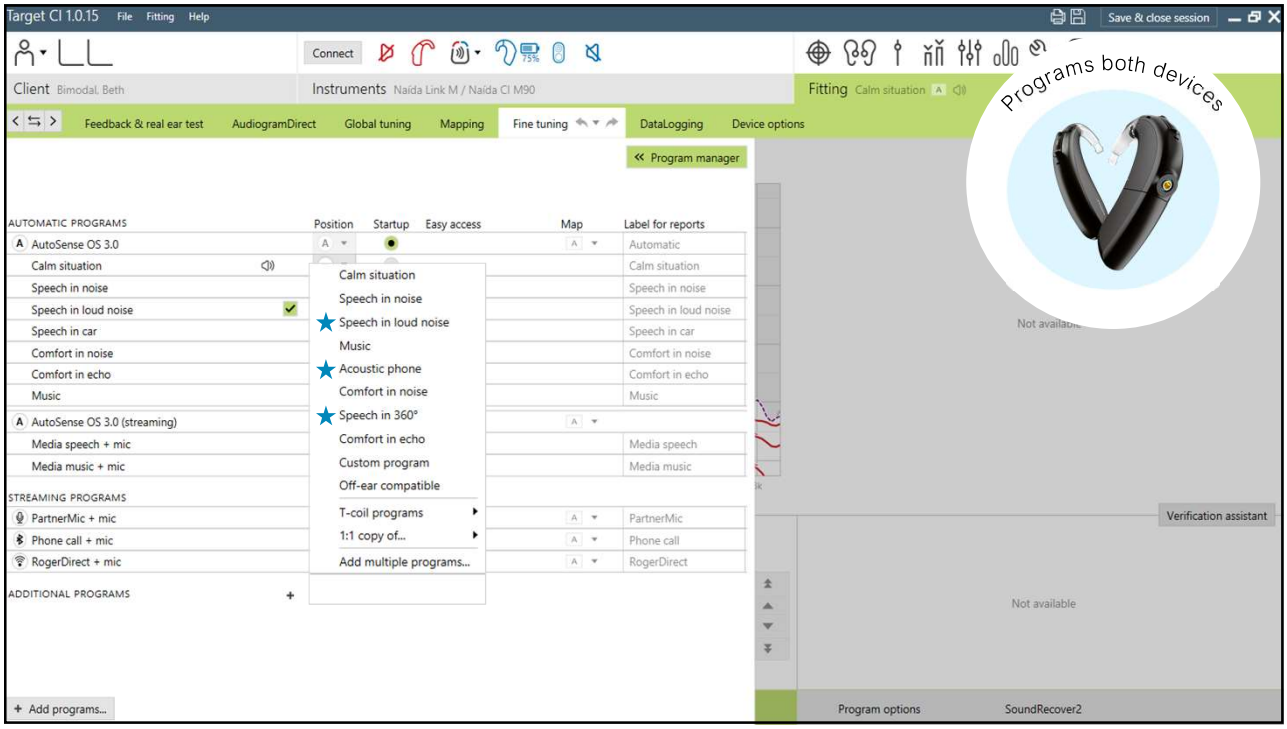
Programming options



Cochlear Implant Audiologist

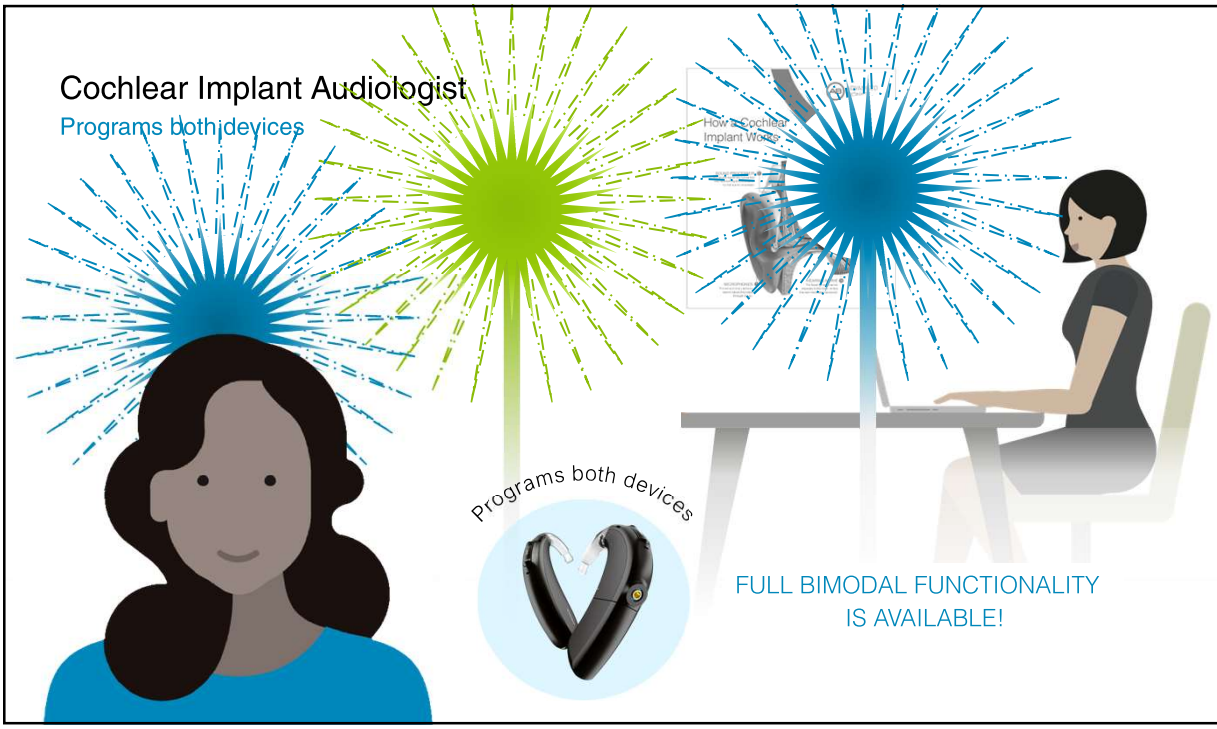
Programs both devices





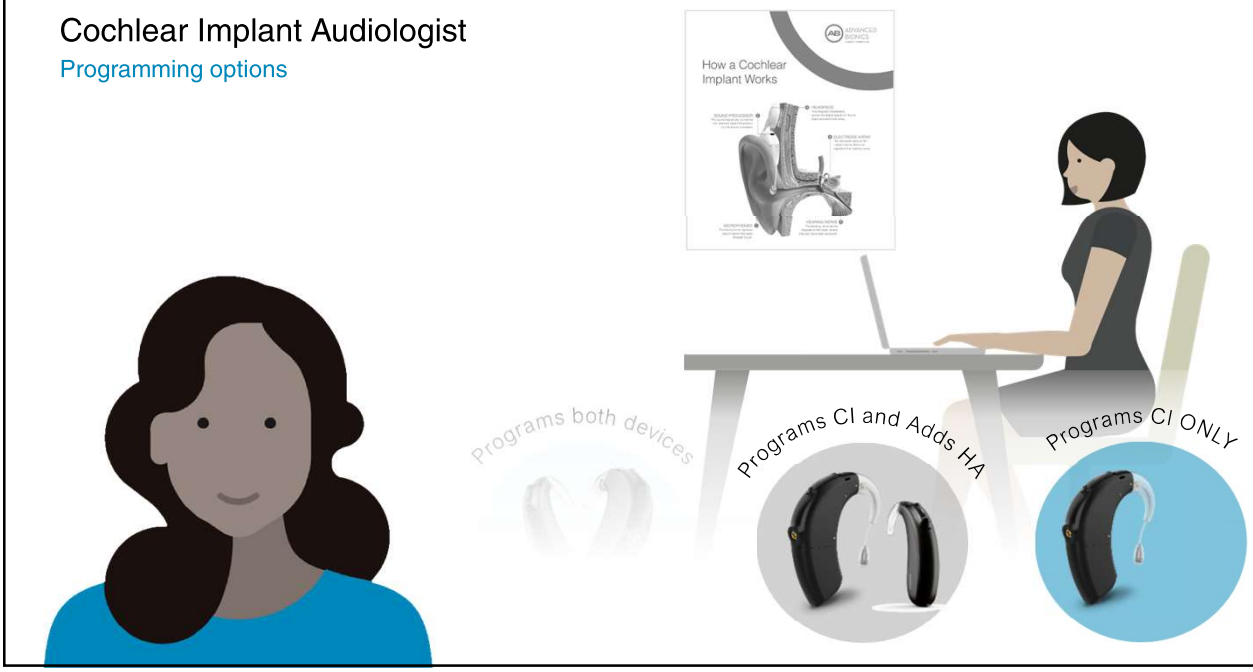
Cochlear Implant Audiologist

Programs both devices



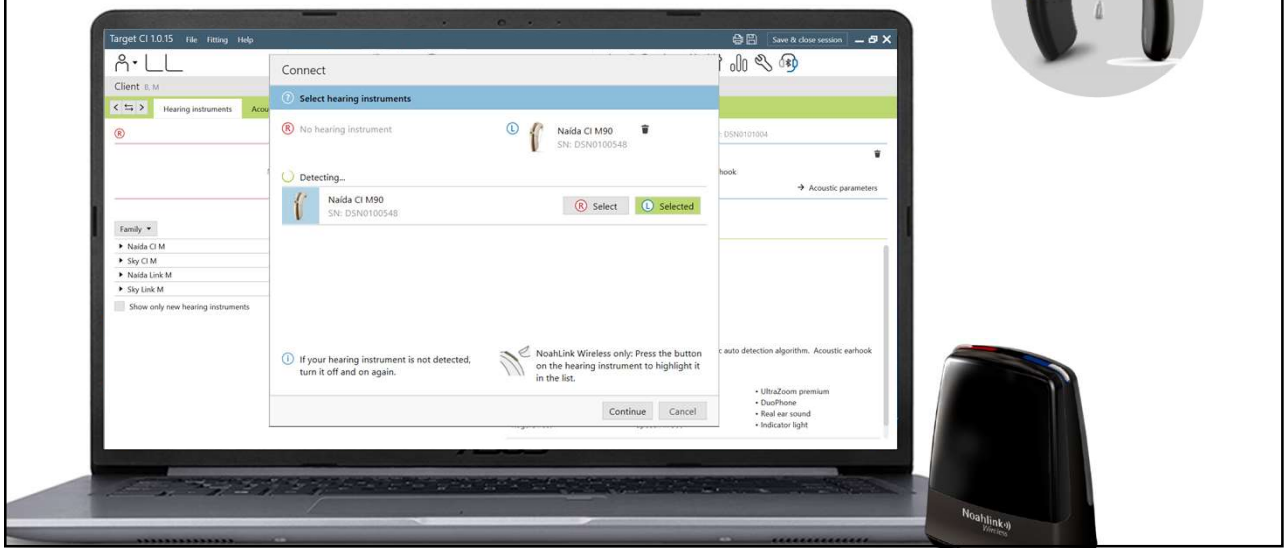
Cochlear Implant Audiologist

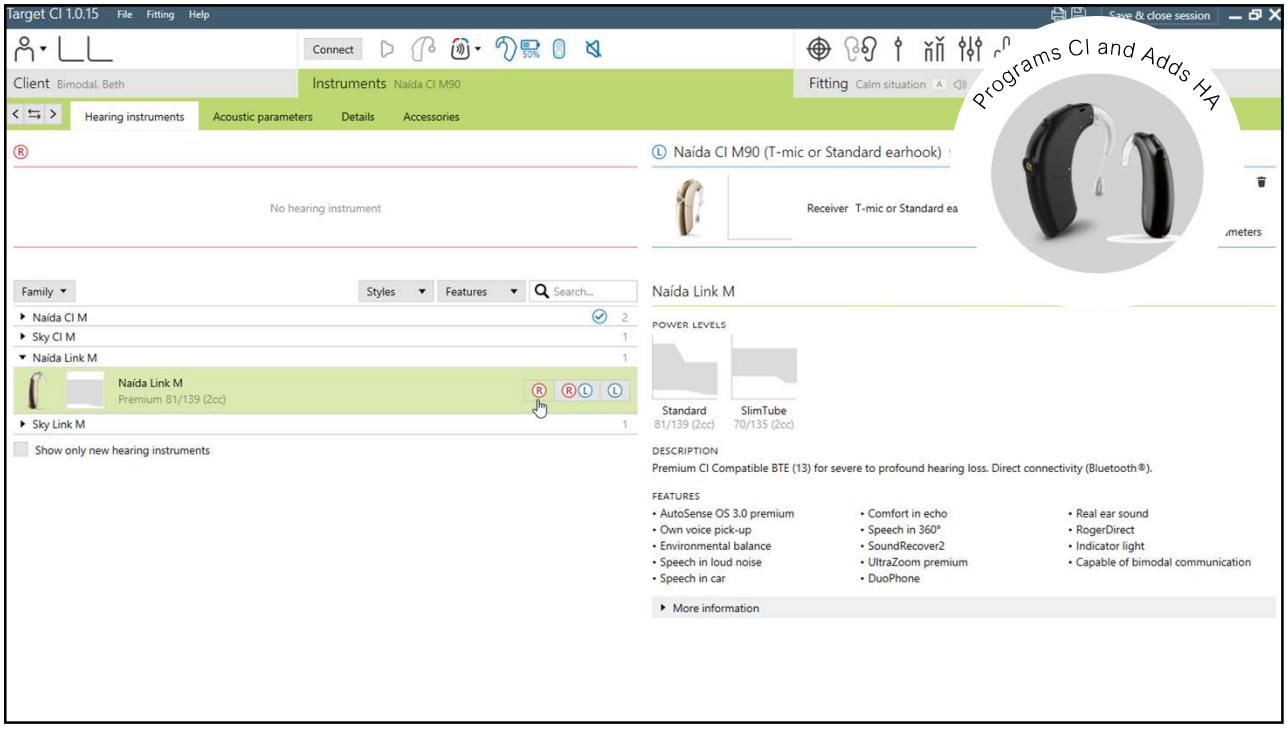
Programming options

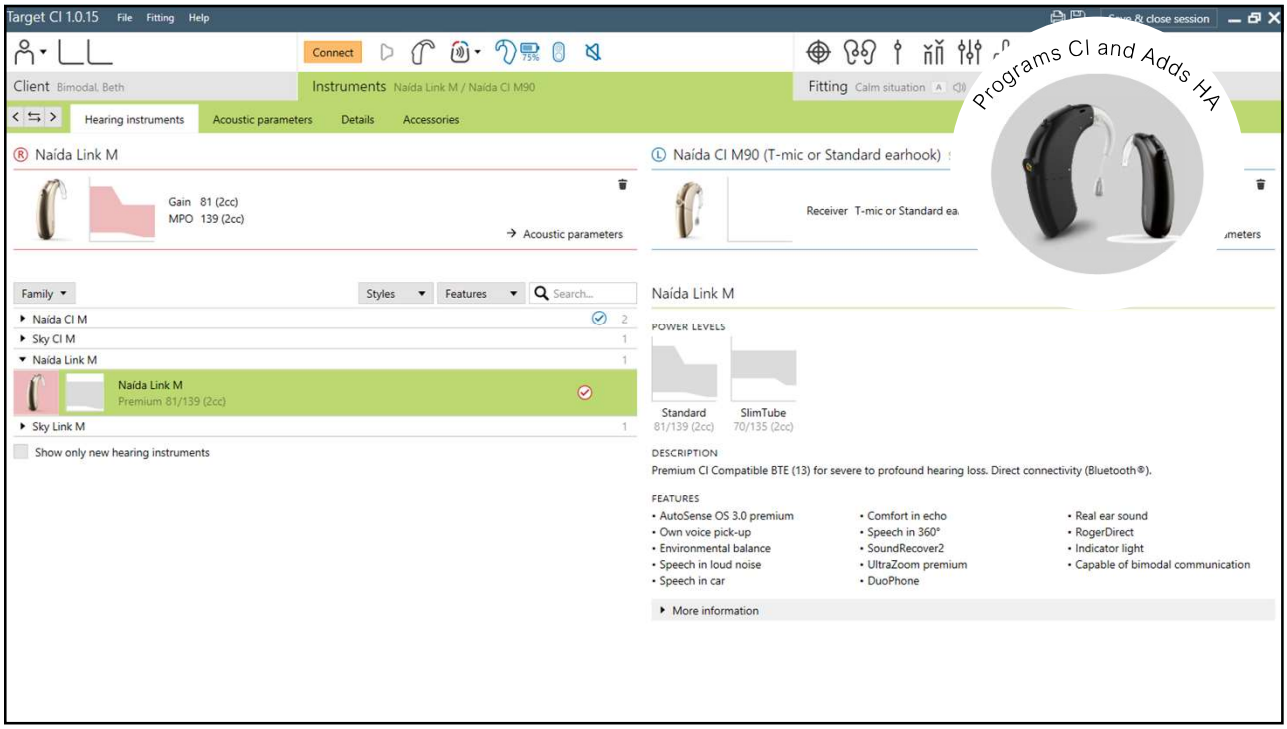


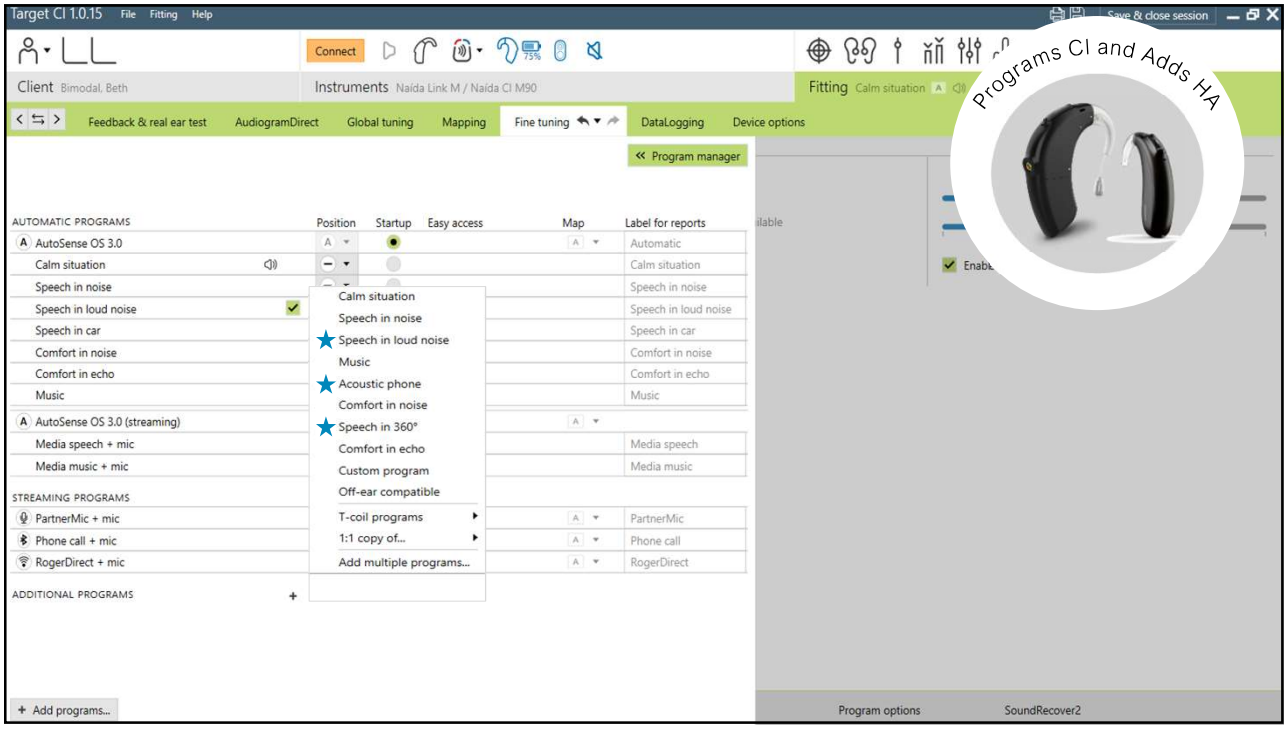
Cochlear Implant Audiologist

Programs CI and adds HA



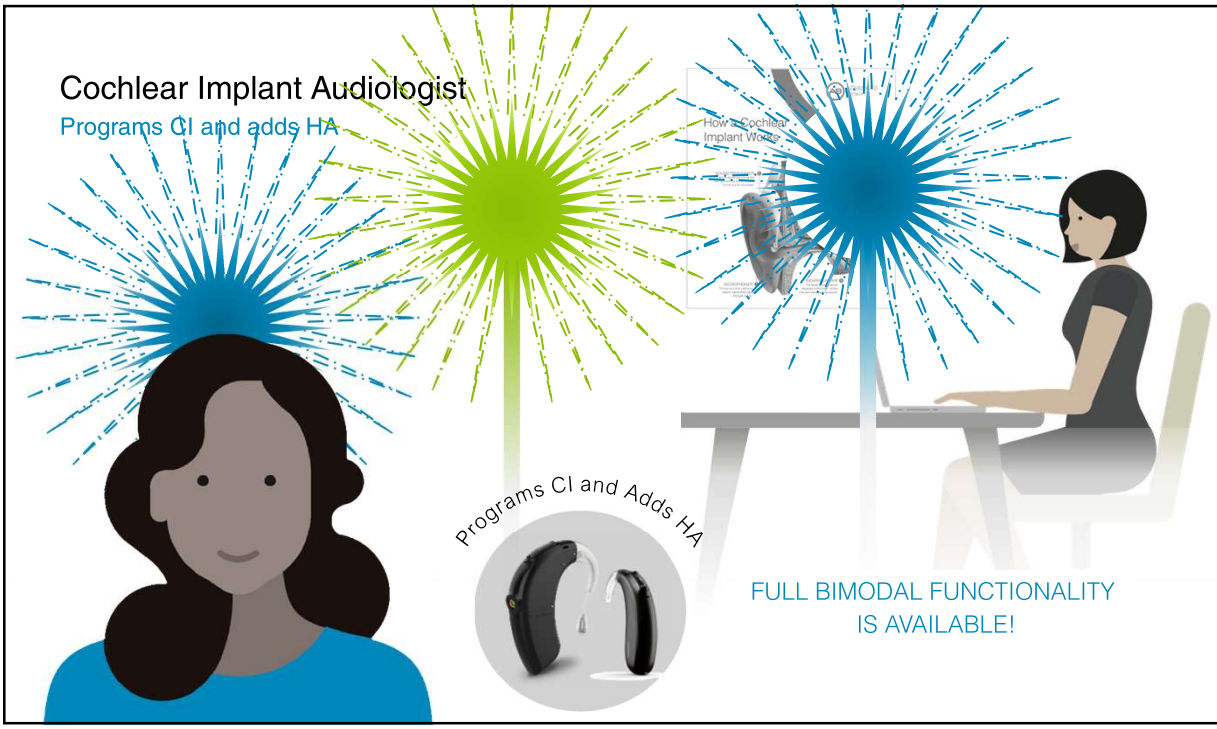



Target CI 1.0.15
File
Fitting
Help
Connect
Client Bimodal, Beth
Instruments Naída Link M / Naída CI M90
Fitting Calm situation
Hearing instruments
Acoustic parameters
Details
Accessories
Naída Link M
Gain 81 (2cc)
MPO 139 (2cc)
Acoustic parameters
Naída CI M90 (T-mic or Standard earhook)
Receiver T-mic or Standard ea
Programs CI and Adds HA
Family
Styles
Features
Search...
Naída CI M
Sky CI M
Naída Link M
Naída Link M
Premium 81/139 (2cc)
Sky Link M
Show only new hearing instruments
Naída Link M
POWER LEVELS
Standard
81/139 (2cc)
SlimTube
70/135 (2cc)
DESCRIPTION
Premium CI Compatible BTE (13) for severe to profound hearing loss. Direct connectivity (Bluetooth®).
FEATURES
• AutoSense OS 3.0 premium
• Own voice pick-up
• Environmental balance
• Speech in loud noise
• Speech in car
• Comfort in echo
• Speech in 360°
• SoundRecover2
• UltraZoom premium
• DuoPhone
• Real ear sound
• RogerDirect
• Indicator light
• Capable of bimodal communication
More information


Target CI 1.0.15
File
Fitting
Help
Connect
Client Bimodal, Beth
Instruments Naída Link M / Naída CI M90
Fitting Calm situation
Programs CI and Adds HA
Feedback & real ear test
AudiogramDirect
Global tuning
Mapping
Fine tuning
DataLogging
Device options
Program manager
AUTOMATIC PROGRAMS
Position
Startup
Easy access
Map
Label for reports
AutoSense OS 3.0
Calm situation
Speech in noise
Speech in loud noise
Speech in car
Comfort in noise
Comfort in echo
Music
AutoSense OS 3.0 (streaming)
Media speech + mic
Media music + mic
STREAMING PROGRAMS
PartnerMic + mic
Phone call + mic
RogerDirect + mic
ADDITIONAL PROGRAMS
Automatic
Calm situation
Speech in noise
Speech in loud noise
Speech in car
Comfort in noise
Comfort in echo
Music
Media speech
Media music
PartnerMic
Phone call
RogerDirect
Calm situation
Speech in noise
Speech in loud noise
Music
Acoustic phone
Comfort in noise
Speech in 360°
Comfort in echo
Custom program
Off-ear compatible
T-coil programs
1:1 copy of...
Add multiple programs...
Add programs...
Program options
SoundRecover2

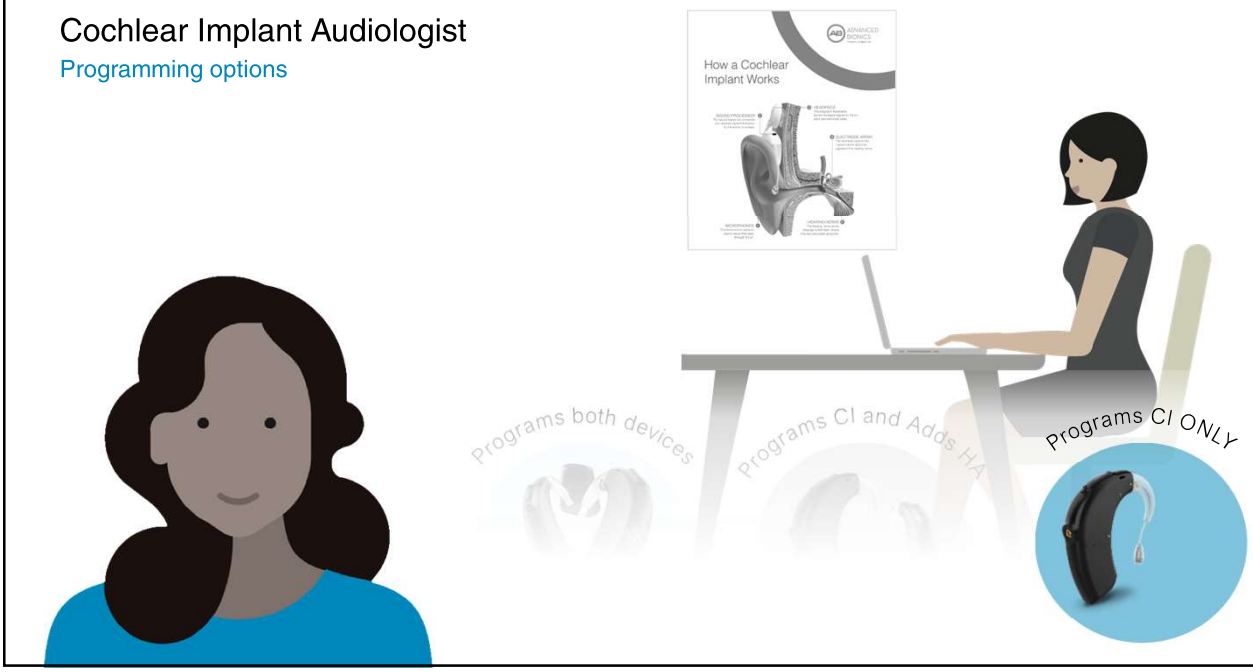
Cochlear Implant Audiologist

Programs CI and adds HA



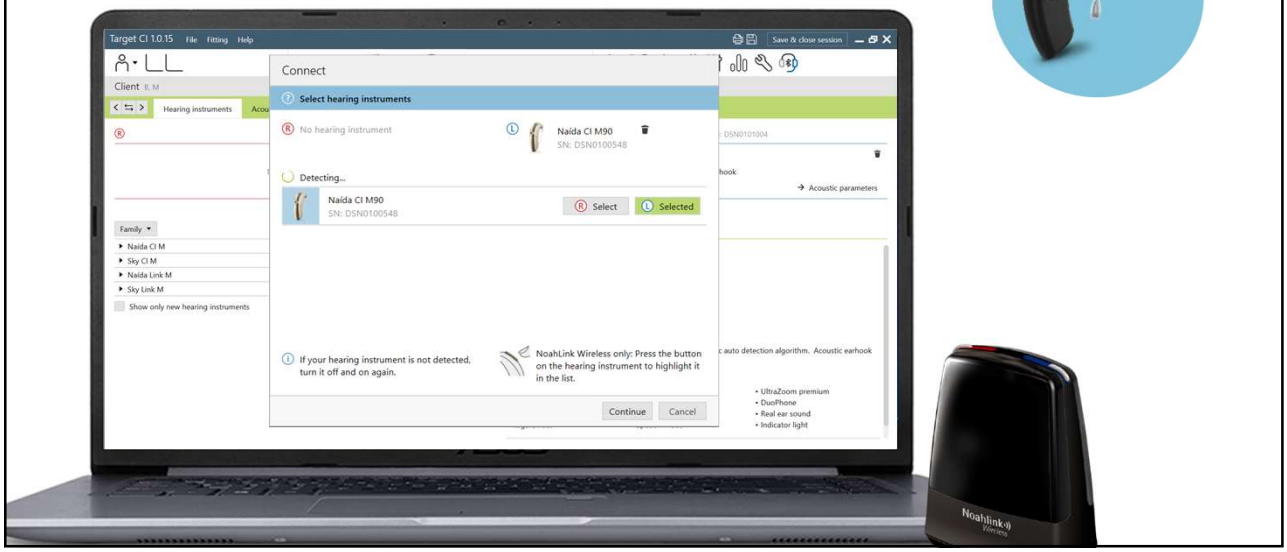
Cochlear Implant Audiologist

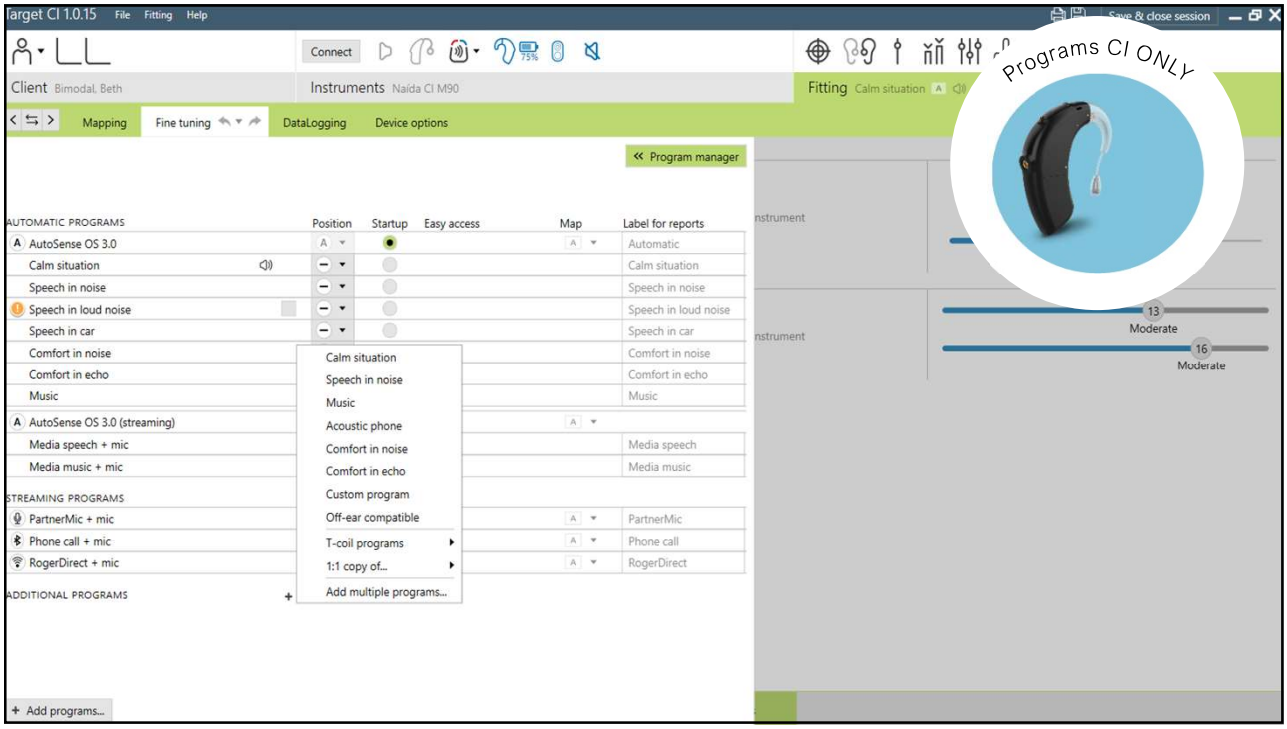
Programming options



Cochlear Implant Audiologist

Programs CI only

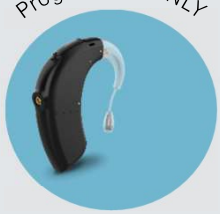


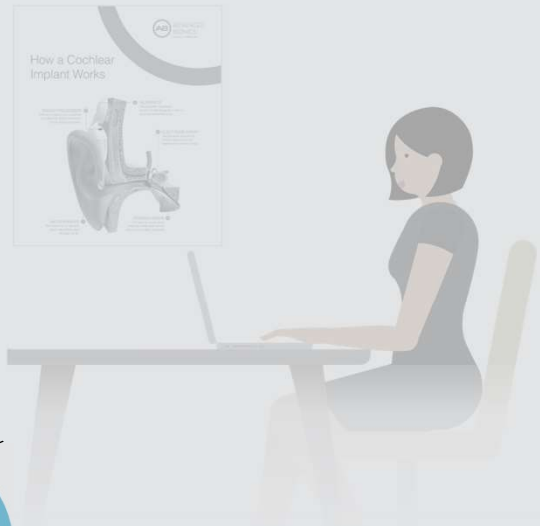


Cochlear Implant Audiologist

Programs CI only







BIMODAL FUNCTIONALITY IS NOT AVAILABLE!

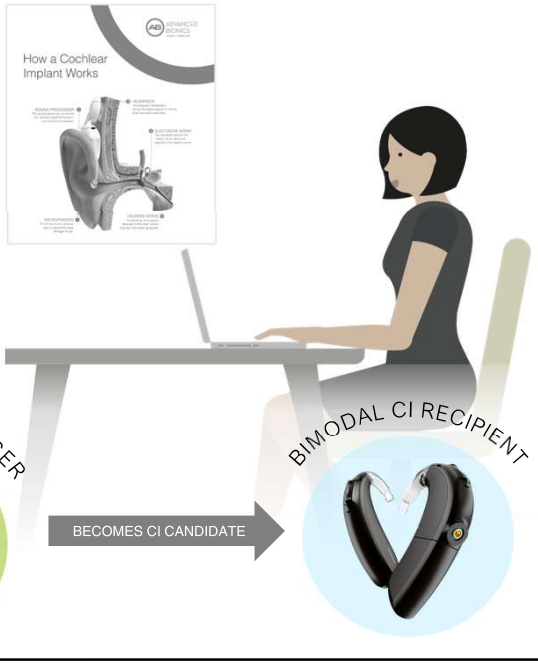
Cochlear Implant Audiologist

Programming options





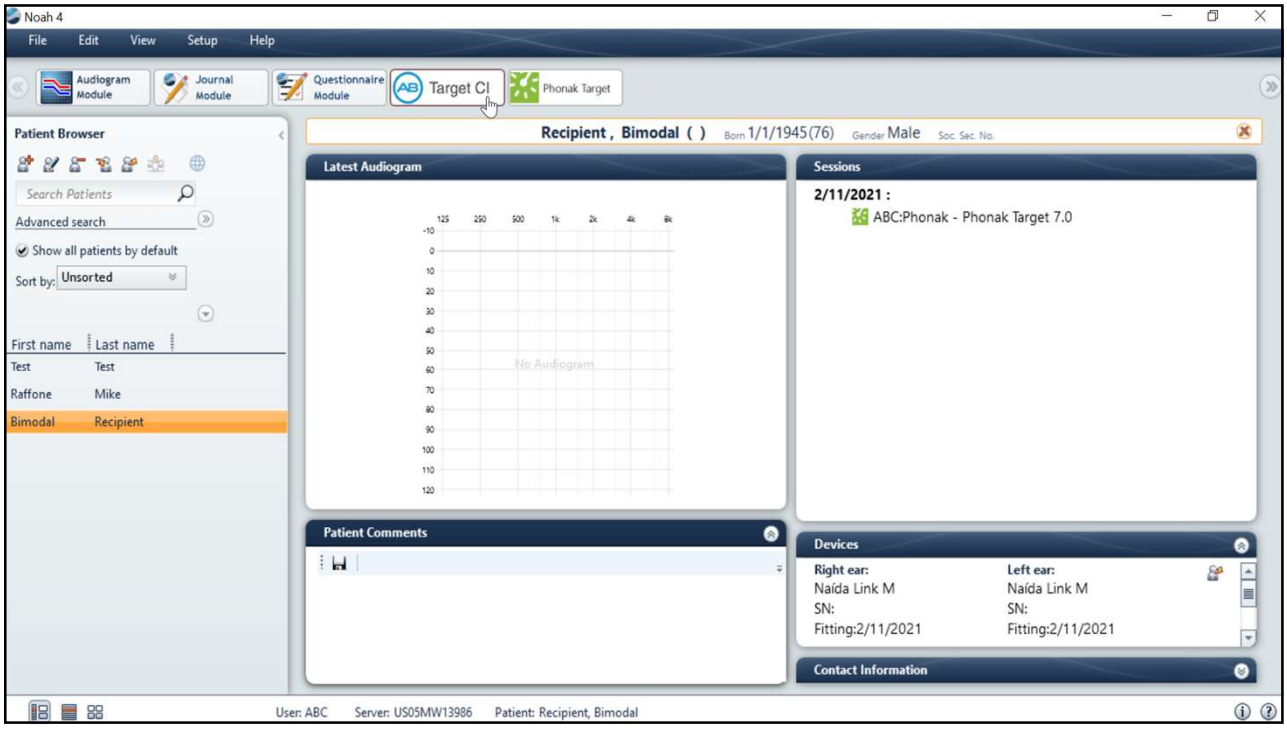
BECOMES CI CANDIDATE

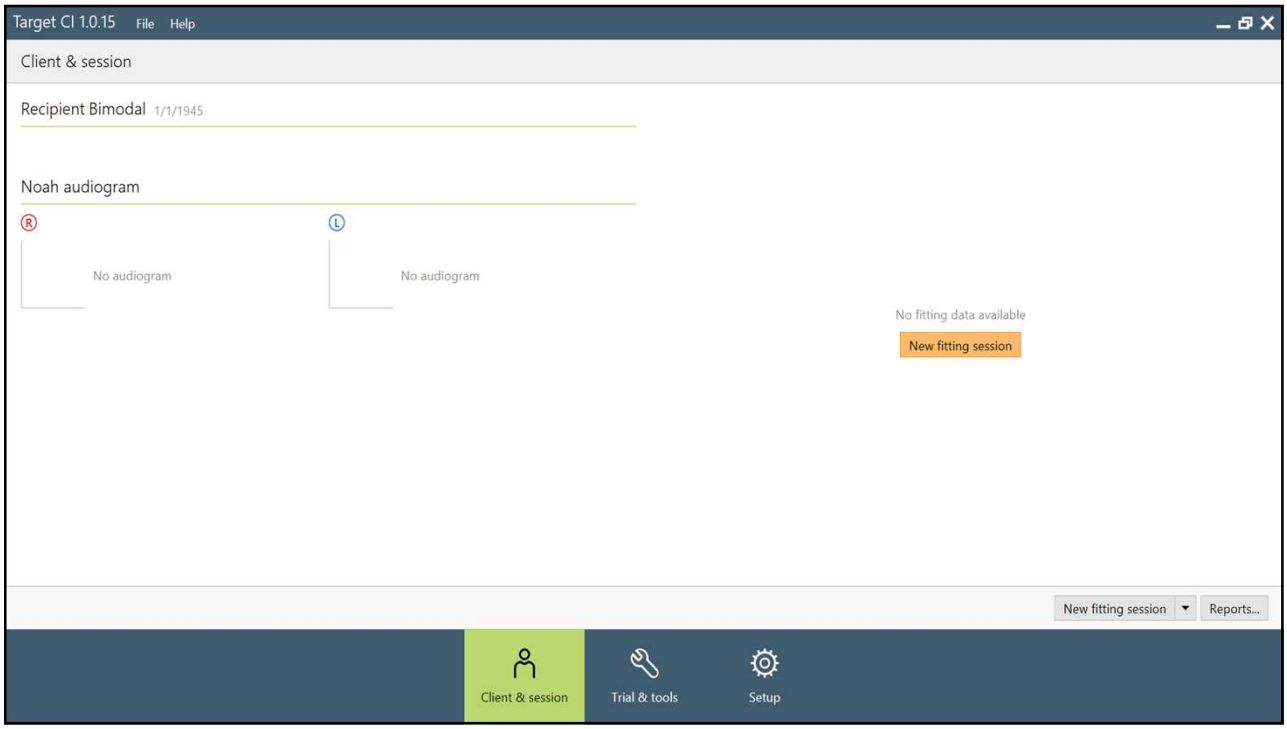


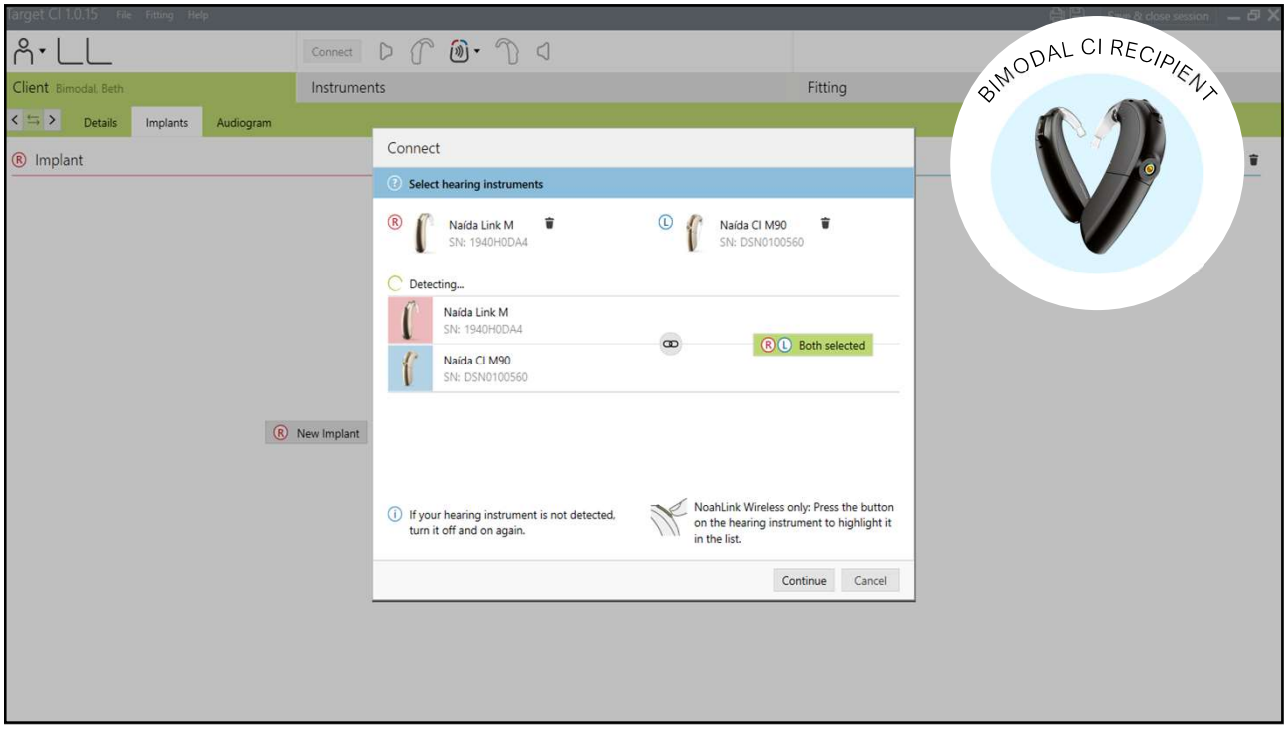
Cochlear Implant Audiologist

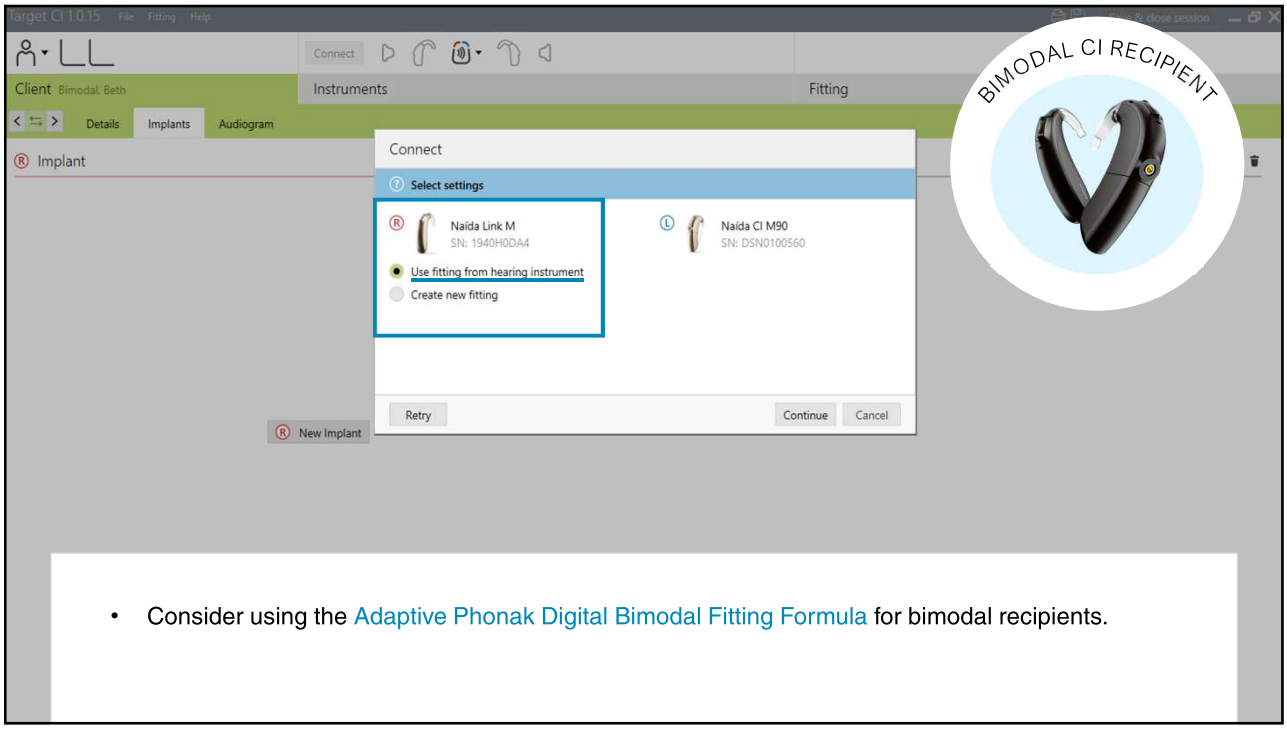
Programs both devices



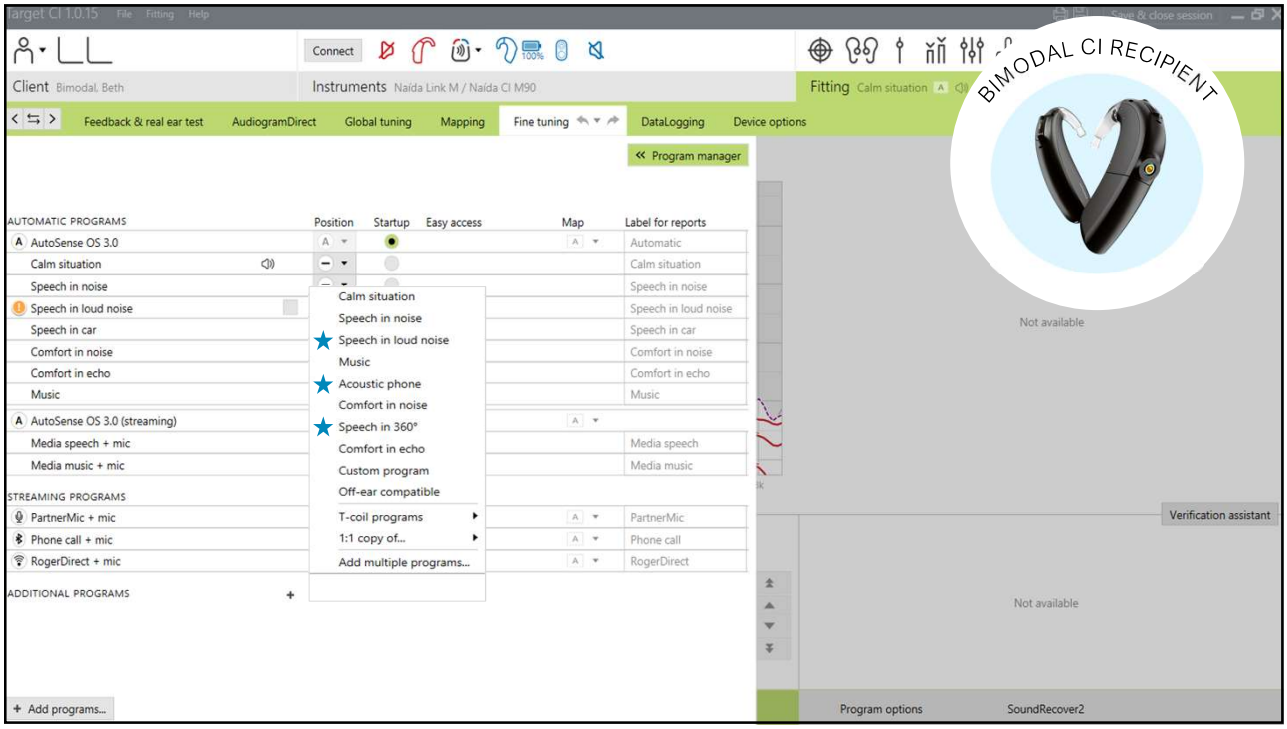


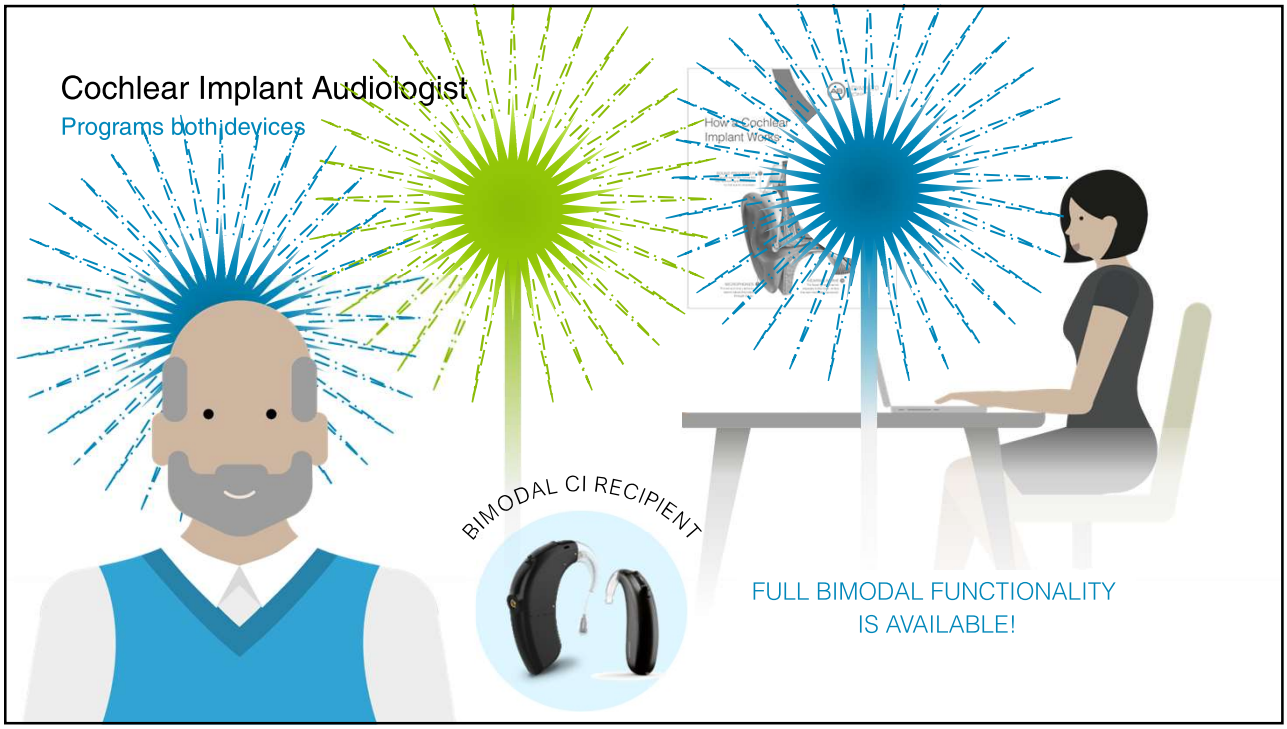

Target CI 1.0.15
File
Help
Client & session
Recipient Bimodal 1/1/1945
Noah audiogram
No audiogram
No audiogram
No fitting data available
New fitting session
New fitting session
Reports...
Client & session
Trial & tools
Setup


Connect
Client Bimodal, Beth
Instruments
Fitting
Details
Implants
Audiogram
Implant
New Implant
Connect
Select hearing instruments
Naída Link M
SN: 1940H0DA4
Naída CI M90
SN: DSN0100560
Detecting...
Naída Link M
SN: 1940H0DA4
Naída CI M90
SN: DSN0100560
Both selected
If your hearing instrument is not detected, turn it off and on again.
NoahLink Wireless only: Press the button on the hearing instrument to highlight it in the list.
Continue
Cancel
BIMODAL CI RECIPIENT



- Consider using the Adaptive Phonak Digital Bimodal Fitting Formula for bimodal recipients.



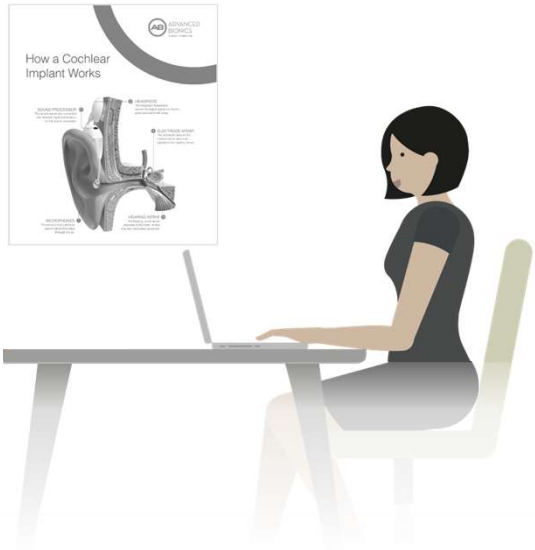


Knowledge Check

Target CI

If the CI audiologist programs Marvel CI for a recipient who is going to have Link M programmed by another professional, what should the CI audiologist do to ensure full bimodal functionality with Link M?

Add Link M in Target CI



PHONAK+ AB



	Target CI Workflow	Phonak Target 7.1 Workflow	Link M follows structure of Marvel CI in Phonak Target	Access to BVST Features	Access to Bimodal Bluetooth Streaming
BIMODAL FITTING WORKFLOW	Programs CI and HA	N/A	N/A	Yes	Yes
	Programs CI and connects HA*	Connects CI and HA	Yes	Yes	Yes
OTHER FITTING WORKFLOWS	Programs CI and connects HA*	Connects HA only	No	No	No
	Programs CI and does not connect HA	Connects CI and HA	Yes	No	No
	Programs CI and does not connect HA	Connects HA only	No	No	No

*Must save to both hearing instruments at the end of the fitting session, even if the HA is not programmed.



ADVANCED BIONICS
POWERFUL CONNECTIONS

Performing NRI in Target CI

PROGRAMMING GUIDE

Neural Response Imaging (NRI) is a valuable tool used by clinicians to obtain an objective measurement of the electrically-evoked compound action potential (eCAP) which can assist with intra-operative testing and post-operative cochlear implant programming. This guide provides the basic information needed to get started with performing NRI in Target CI.

FITTING HARDWARE

NRI can be performed in Target CI fitting software using a Marvel CI sound processor and either the Noahlink Wireless or CPI-3 programming interface.

PERFORMING NRI MEASUREMENTS

1. OPEN TARGET CI

2. ACCESS THE CLIENT FILE AND OPEN A FITTING SESSION

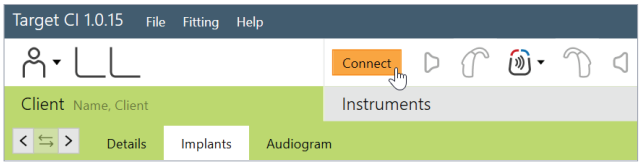
For a New client:

- Select *New client*. Enter the client details[1] and *Save*.
- Select *New session* to open a new fitting session.

For an Existing client:

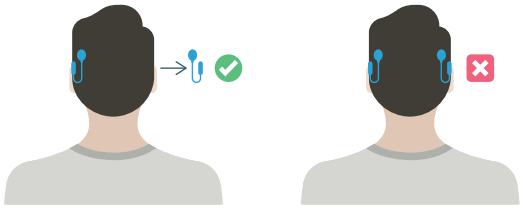
- Search and select the client's file; then select *Open Session*[2].

3. CONNECT TO THE HEARING INSTRUMENT



- Connect to the hearing instrument via Noahlink Wireless or CPI-3.
- If using the Noahlink Wireless, ensure that a fully charged rechargeable battery is used. Remove and re-attach the battery to put the sound processor into pairing mode. Select the *Connect* button within the 3-minute pairing window.
- Verify the side for which the device is intended to be used.
- Once device connection is successful, *Close* to proceed.

4. CONNECT TO THE INTERNAL DEVICE



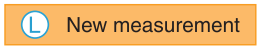
- Place the headpiece on the recipient's head to achieve lock with the implant.
- For a new client, create a new implant record.
- Remove the contralateral sound processor[3] prior to running NRI (if applicable). Otherwise, excessive noise will be observed in the NRI tracing.

5. REVIEW IMPEDANCES

- Under *Client*, access the *Impedance* tab to review impedances and run conditioning, if desired.
- Only run NRI on electrodes with normal impedances[4].

6. ACCESS NEURAL RESPONSE IMAGING (NRI)

- Under *Client*, access the *NRI* tab to measure NRI[5].
- Select *New measurement* to open the NRI measurement window.



1. Always enter the client's Date of birth so that the appropriate default settings can be applied.
2. Open session should be used at all follow-up visits to allow access to past impedance and NRI data.
3. It is okay for the recipient to wear contralateral hearing aid during NRI measurements.
4. Do not perform NRI on extra-cochlear, shorted, open, or out of compliance electrodes.
5. Due to probable impedance changes after surgery, it is best to re-run NRI in the clinic prior to creating new maps for the recipient instead of using NRI data collected in the OR.

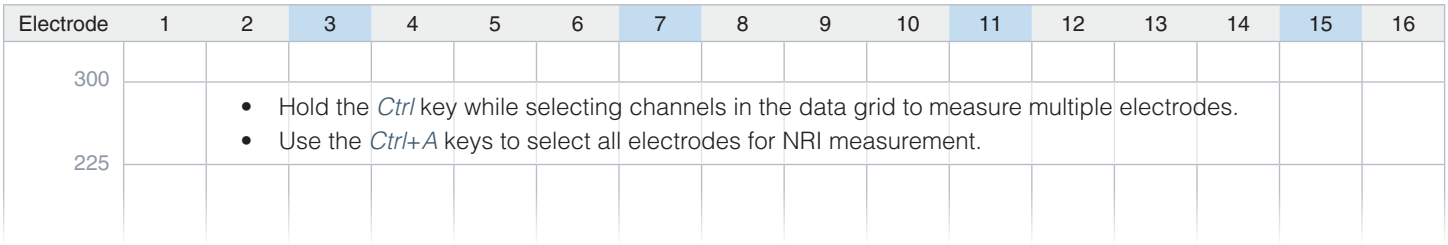
ADVANCED BIONICS
POWERFUL CONNECTIONS

Performing NRI in Target CI

PROGRAMMING GUIDE

7. DETERMINE ELECTRODES TO MEASURE

- To add/remove electrodes, select the stimulating electrode(s) in the NRI window
- Use keyboard shortcuts to select more than one electrode at a time.



8. ADJUST NRI SETTINGS

- Set High and Low CU values for electrode(s) to be measured.
  - Behavioral M-Levels can be used as a guide to establish initial low and high CU values.
  - A minimum range of 150 – 200 CU should be considered where the low CU value results in one or two responses within the noise floor.
- Choose number of *Data points*, as appropriate.
  - Target CI will populate 5 data points by default; however more can be added, as needed.
  - Unmeasured data points are indicated by an open circle. Filled data points indicate a completed measurement.
- Choose the appropriate *Stim Level Ordering*.
  - Select *Low to High* for use in the clinic.
  - Select *High to Low* for use in the operating room.
- Consider using the following settings as a starting guide for measuring NRI:

FOR USE IN OPERATING ROOM

- Low CU = 150
- High CU = 400
- Data points = 5
- Stim Level Ordering = High to Low

FOR POST-OPERATIVE USE (ADULTS)

- Low CU = 100
- High CU = 300
- Data points = 5
- Stim Level Ordering = Low to High

FOR POST-OPERATIVE USE (PEDIATRICS)

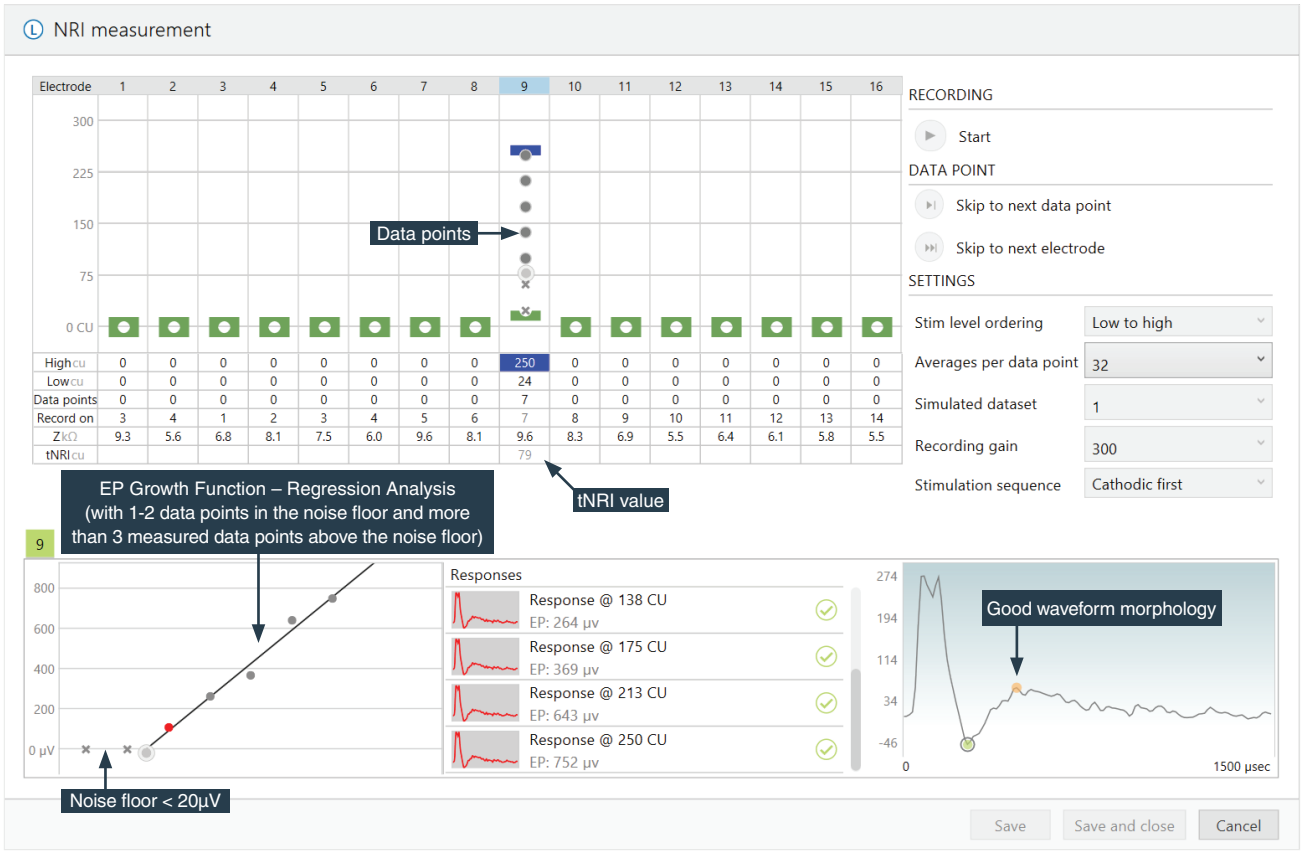
- Low CU = 50
- High CU = 250
- Data points = 5
- Stim Level Ordering = Low to High

9. SELECT START

- NRI will continue to conduct measurements until all data points have been obtained.
- When measuring NRI post-operatively, monitor the recipient for signs of discomfort while NRI is running to ensure stimulus levels are not exceeding the recipient's comfort levels.
- Press *Pause* or the *Space bar* to stop running a measurement at any time.

Performing NRI in Target CI
PROGRAMMING GUIDE

10. NRI ANALYSIS

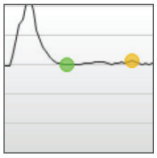


GOOD RESPONSE



- It is important to obtain 1-2 data points within the noise floor and a minimum of 3-4 data points rising from the noise floor for an accurate calculation of tNRI.
- Confirm accuracy of selected N1 and P2 peaks for each waveform. N1 and P2 latencies will remain stable with increased stimulation levels.

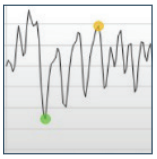
NO RESPONSE



If there is no visible response:

- Increase the stimulation level (up to levels of compliance), while monitoring recipient for comfort.
- Use a different recording electrode to measure the NRI response.

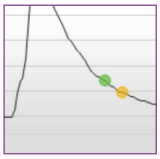
NOISY RESPONSE



If waveform tracing appears noisy:

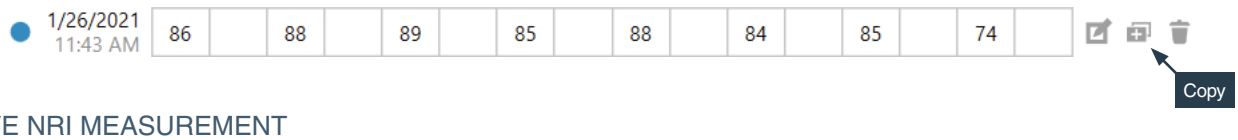
- For bilateral recipients, confirm that the contralateral processor is removed.
- Increase the number of Averages per data point.

RESPONSE WITH ARTIFACT



If artifact is present, use a different recording electrode to measure the NRI response

- NRI waveforms are not accessible after the programming session is complete. Verifying correct tNRI values prior to saving and closing the session will ensure correct tNRI values are calculated.
- To repeat measurements in future sessions, use the copy setting function, as shown below.



11. SAVE NRI MEASUREMENT

- *Save and close* the NRI measurement.

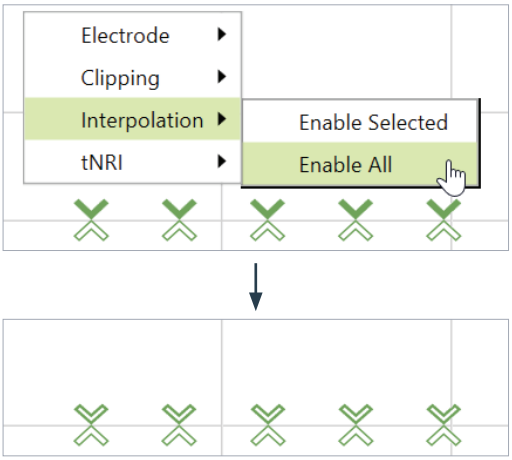
ADVANCED BIONICS
POWERFUL CONNECTIONS

Performing NRI in Target CI

PROGRAMMING GUIDE

FITTING GUIDE

1. CREATE A MAP USING NRI DATA



- Access the *Fitting* tab to begin the fitting process.
- In the *Mapping* tab, right-click on any channel and select *Interpolation*; then, *Enable all*. All markers will change to unfilled or open arrows.
- On channels with measured tNRI, set M-Levels to tNRI values.
- Confirm *Live Speech* as the stimulation mode.
- Globally reduce the M-Levels slightly to ensure recipient comfort and *Start stimulation*.
- Gradually increase M-Levels to find recipient's most comfortable level (level 6 on the loudness scale).
- Consider loudness balancing across each electrode.
- Verify settings (i.e. Ling Sounds, soundfield detection, etc.).

2. FINALIZE THE FITTING SESSION

- Continue with fitting process by managing program settings in *Fine Tuning Tab*.
- *Save and close* the fitting session.

NOTE: only tNRI values are accessible after the programming session is complete. In cases where it is preferable to access historical NRI waveforms (such as for continued monitoring of HiRes™ Ultra V1 devices), NRI can be conducted in SoundWave 3.2.

NEURAL RESPONSE IMAGING (NRI) RESOURCES

- Koch, D. B., Overstreet, E.H. (2003). Neural Response Imaging: Measuring Auditory-Nerve Responses from the Cochlear with the HiResolution™ Bionics Ear System. Advanced Bionics White Paper.
- He, S., Teagle, H., Buchman, C. (2017). The Electrically Evoked Compound Action Potential: From Laboratory to Clinic. *Frontiers in Neuroscience*, Volume 11, Article 339.
- Hughes, M., Audiology Online. *Fundamentals of Clinical ECAP Measures in Cochlear Implants Part 2: Measurement Techniques and Tips.*

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Hands-On Review with Target CI



NRI

Knowledge Check

NRI

Review from pre-learning:

What is a Compound Action Potential?



Compound Action Potential

CAP

Action Potential – a small change in voltage resulting from the firing of neurons

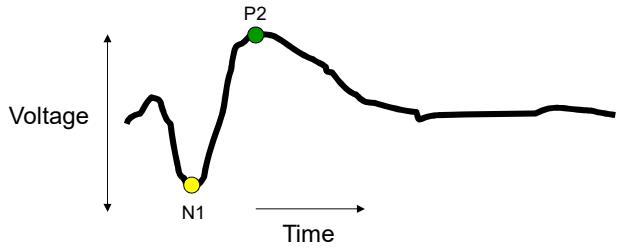
The synchronous firing of neurons creates a Compound Action Potential.

- The CAP can be recorded in the Advanced Bionics Cochlear Implant using the system's telemetry and the intracochlear electrodes.
- The resulting waveform is Wave I noted during ABR.

Neural Response Imaging

NRI

- Measurement of the neural response (ECAP–Electrically Evoked Compound Action Potential)
- Measured using the intracochlear electrodes & Target CI programming software



Knowledge Check

NRI

Review from pre-learning:

Why do we use NRI?

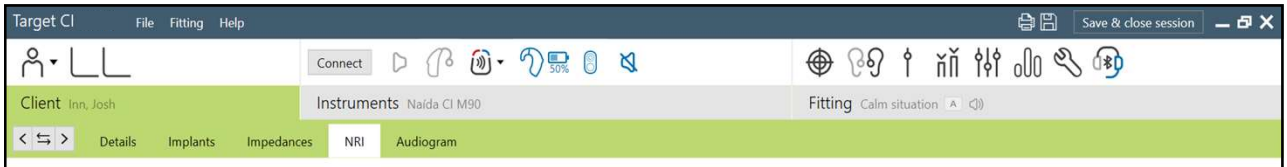


NRI

Clinical Use

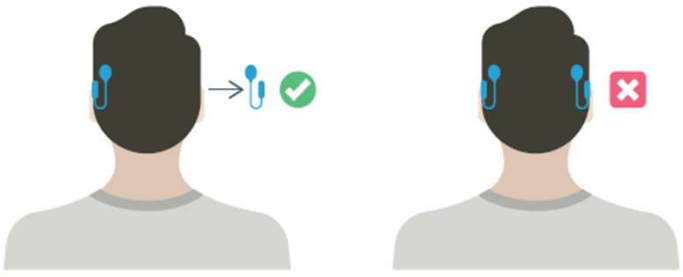
- Verify that the auditory nerve is responsive
- Verify subjective responses (M-Levels)
- Estimate psychophysical (M-Levels) when a patient is not able to respond consistently
- Use as a counseling tool to provide reassurance to the family and/or recipient

ECAP results DO NOT indicate potential
for patient performance or device integrity.

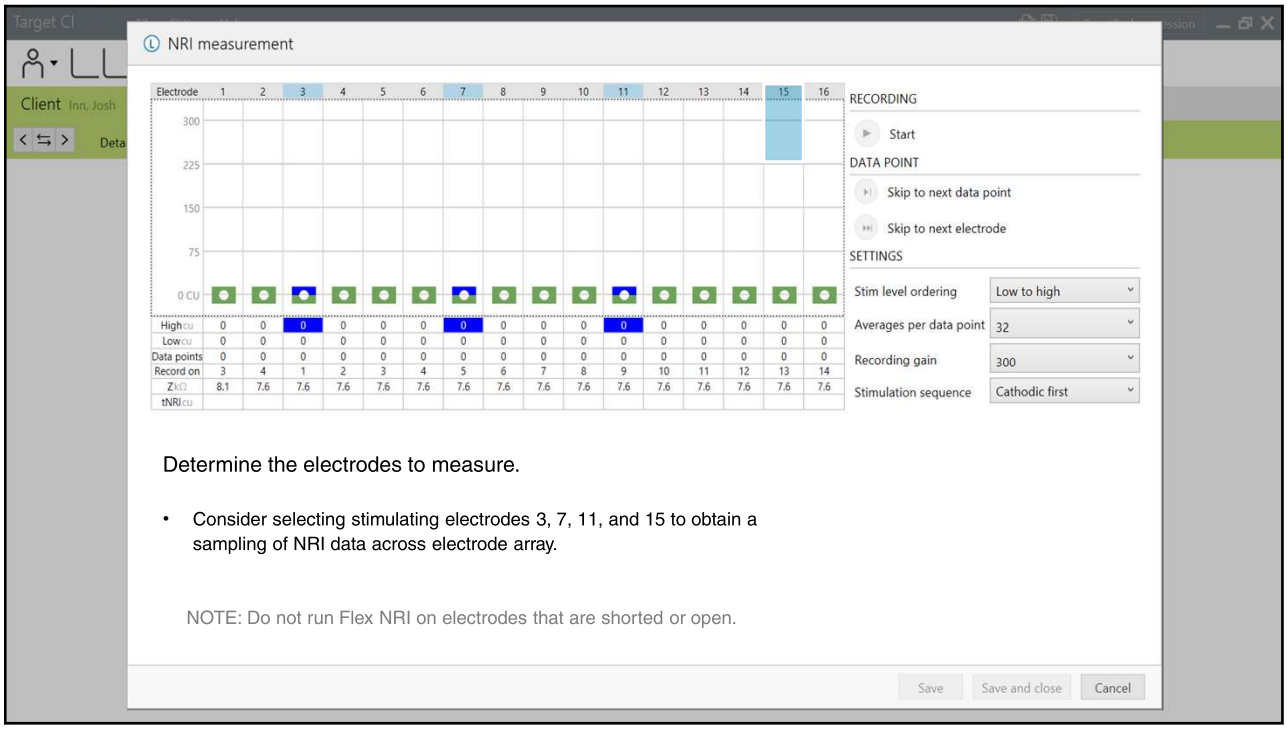


Connect to the internal device.

- Place the headpiece on the recipient's head to achieve lock with the implant.
- Remove the contralateral sound processor prior to running NRI (if applicable). Otherwise, excessive noise will be observed in the NRI tracing.



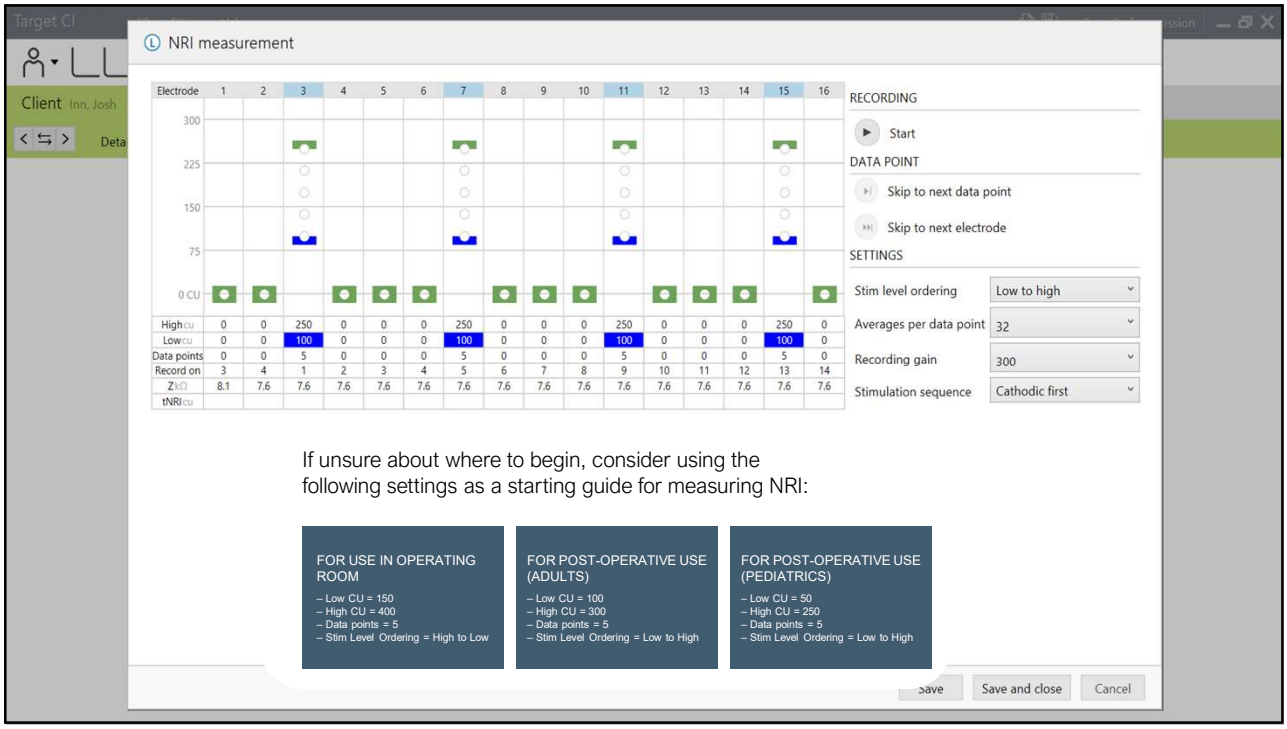
NOTE: It is okay for the recipient to wear contralateral hearing aid during NRI measurements.



Determine the electrodes to measure.

- Consider selecting stimulating electrodes 3, 7, 11, and 15 to obtain a sampling of NRI data across electrode array.

NOTE: Do not run Flex NRI on electrodes that are shorted or open.

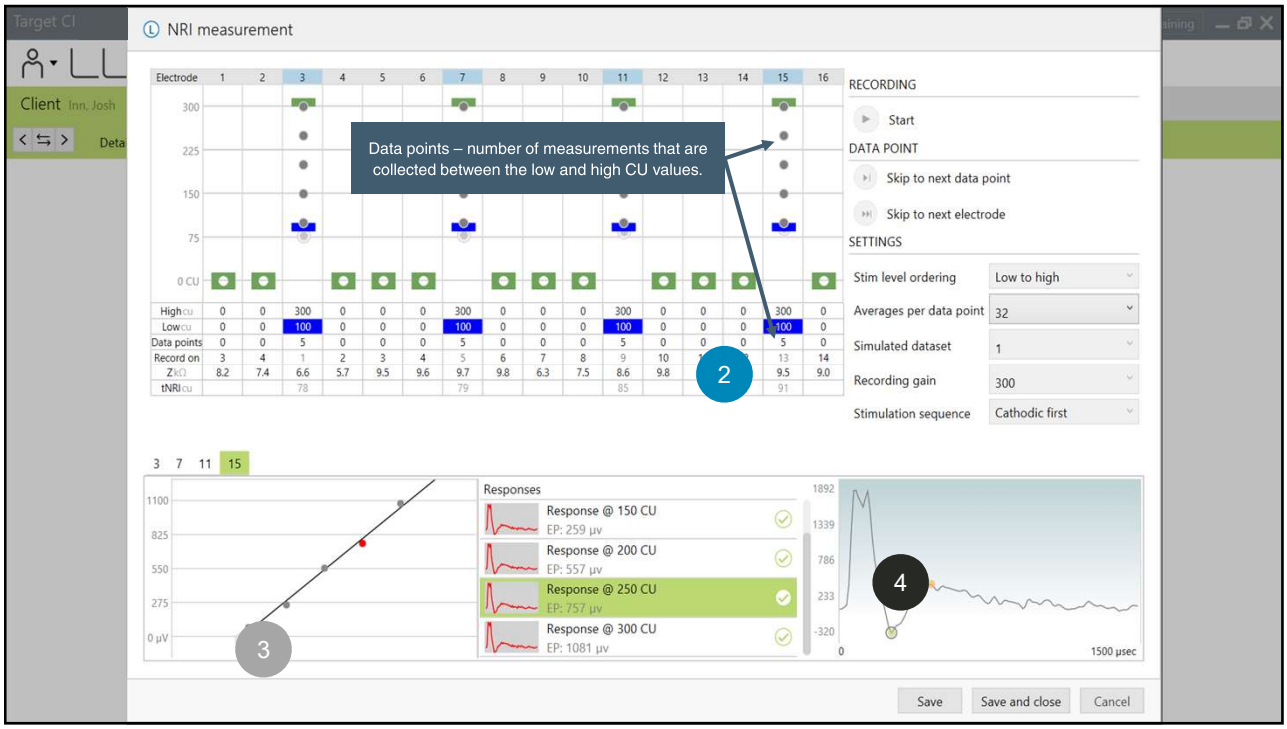


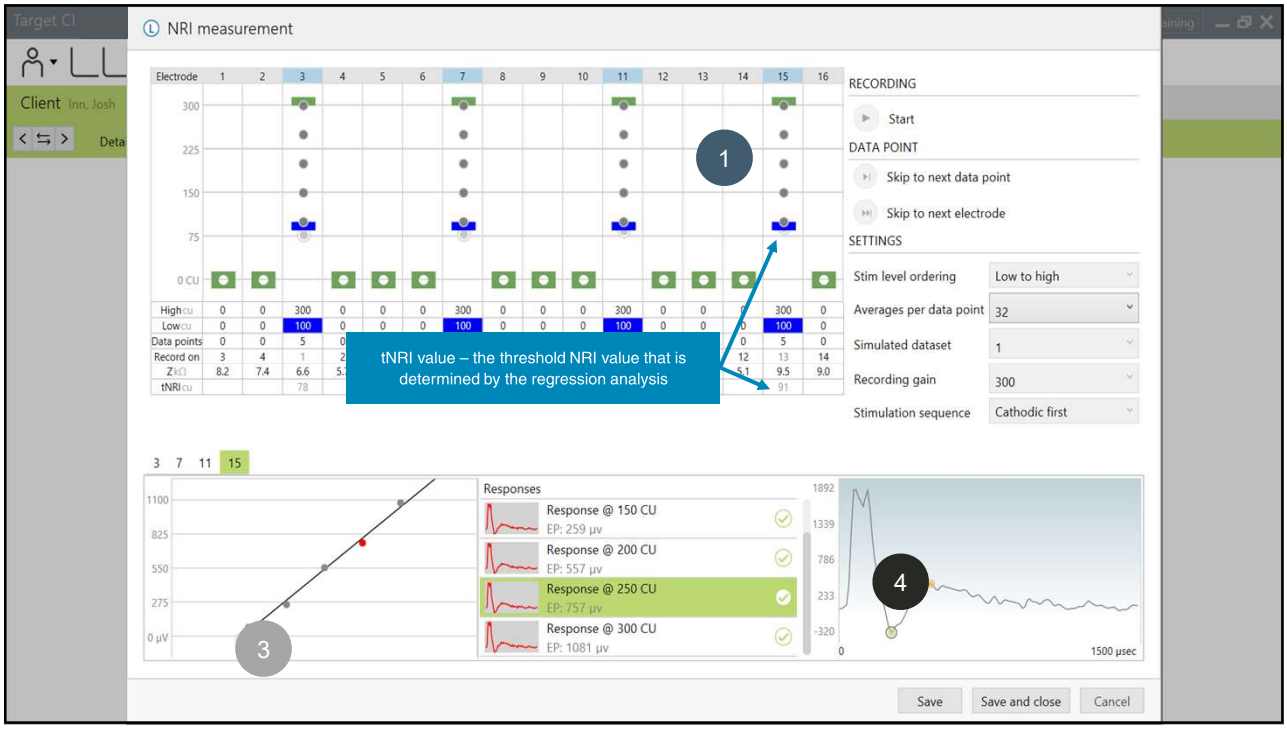
If unsure about where to begin, consider using the following settings as a starting guide for measuring NRI:

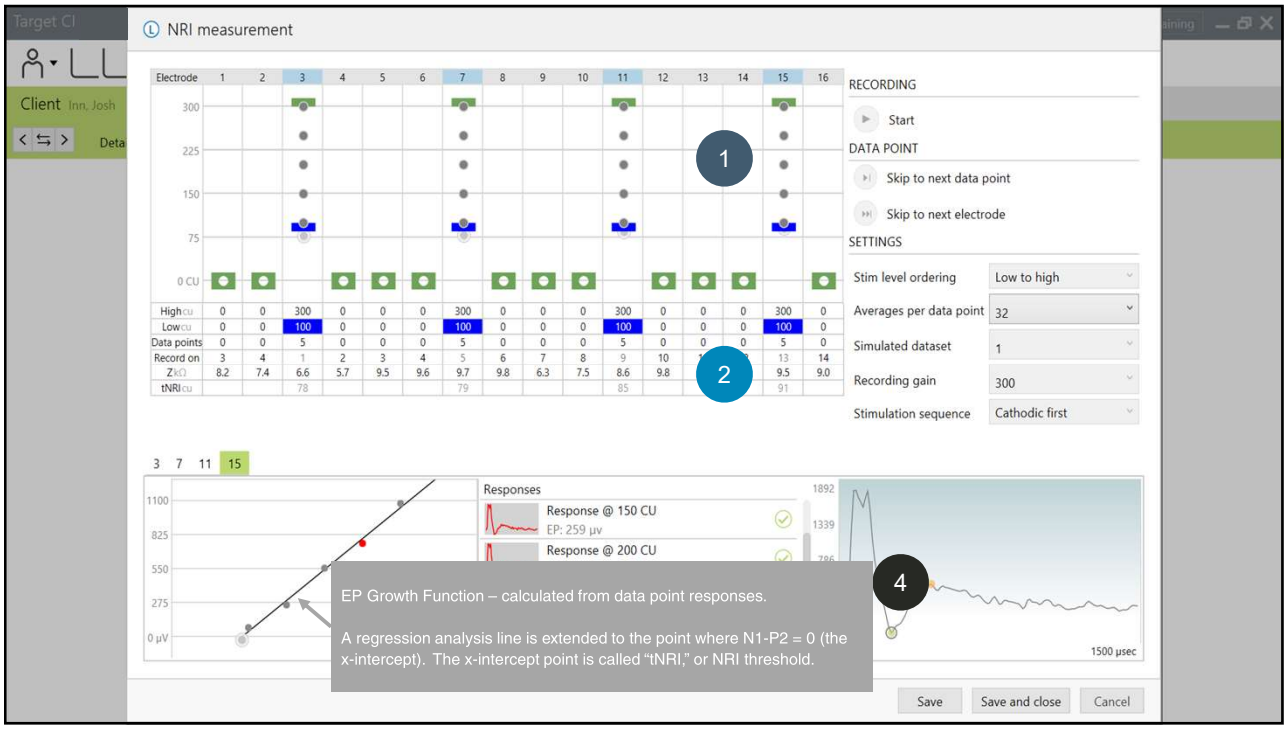
FOR USE IN OPERATING ROOM
- Low CU = 150
- High CU = 400
- Data points = 5
- Stim Level Ordering = High to Low

FOR POST-OPERATIVE USE (ADULTS)
- Low CU = 100
- High CU = 300
- Data points = 5
- Stim Level Ordering = Low to High

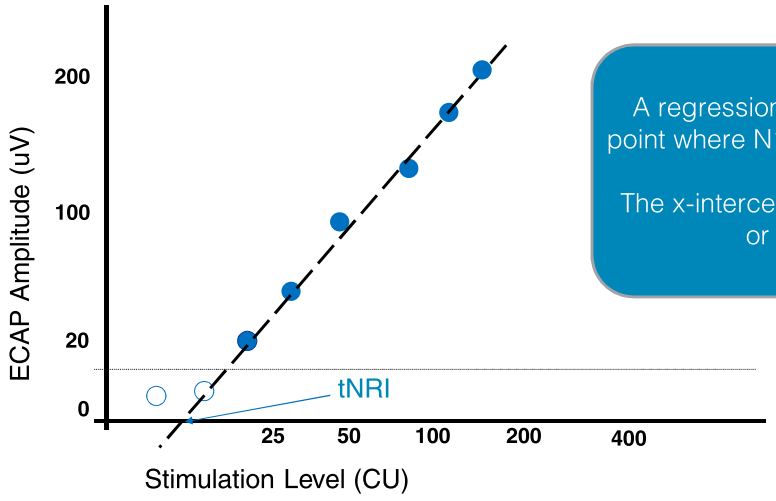
FOR POST-OPERATIVE USE (PEDIATRICS)
- Low CU = 50
- High CU = 250
- Data points = 5
- Stim Level Ordering = Low to High


NRI measurement
Data points – number of measurements that are collected between the low and high CU values.
RECORDING
Start
DATA POINT
Skip to next data point
Skip to next electrode
SETTINGS
Stim level ordering
Low to high
Averages per data point
32
Simulated dataset
1
Recording gain
300
Stimulation sequence
Cathodic first
Responses
Response @ 150 CU
EP: 259 µv
Response @ 200 CU
EP: 557 µv
Response @ 250 CU
EP: 757 µv
Response @ 300 CU
EP: 1081 µv
1500 µsec
Save
Save and close
Cancel
2
3
4


NRI measurement
tNRI value – the threshold NRI value that is determined by the regression analysis
RECORDING
Start
DATA POINT
Skip to next data point
Skip to next electrode
SETTINGS
Stim level ordering
Low to high
Averages per data point
32
Simulated dataset
1
Recording gain
300
Stimulation sequence
Cathodic first
Responses
Response @ 150 CU
EP: 259 µv
Response @ 200 CU
EP: 557 µv
Response @ 250 CU
EP: 757 µv
Response @ 300 CU
EP: 1081 µv
1500 µsec
Save
Save and close
Cancel
1
3
4



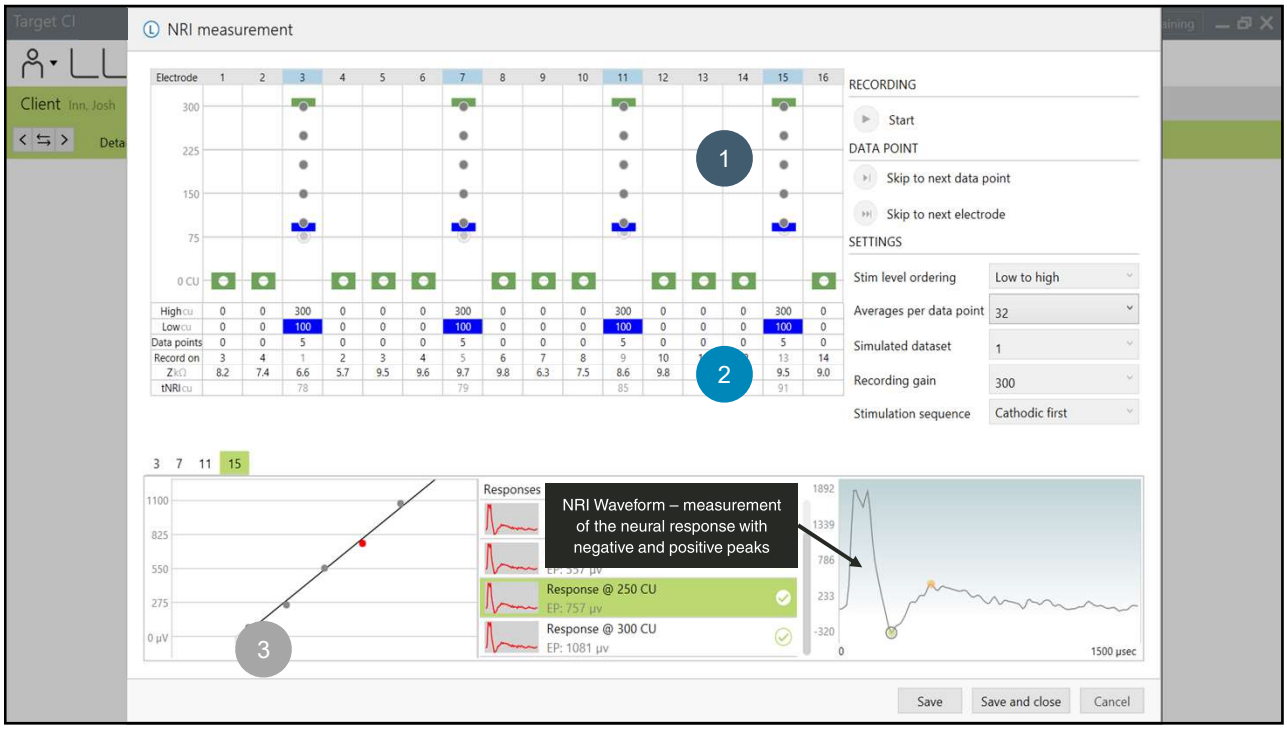
EP Growth Function

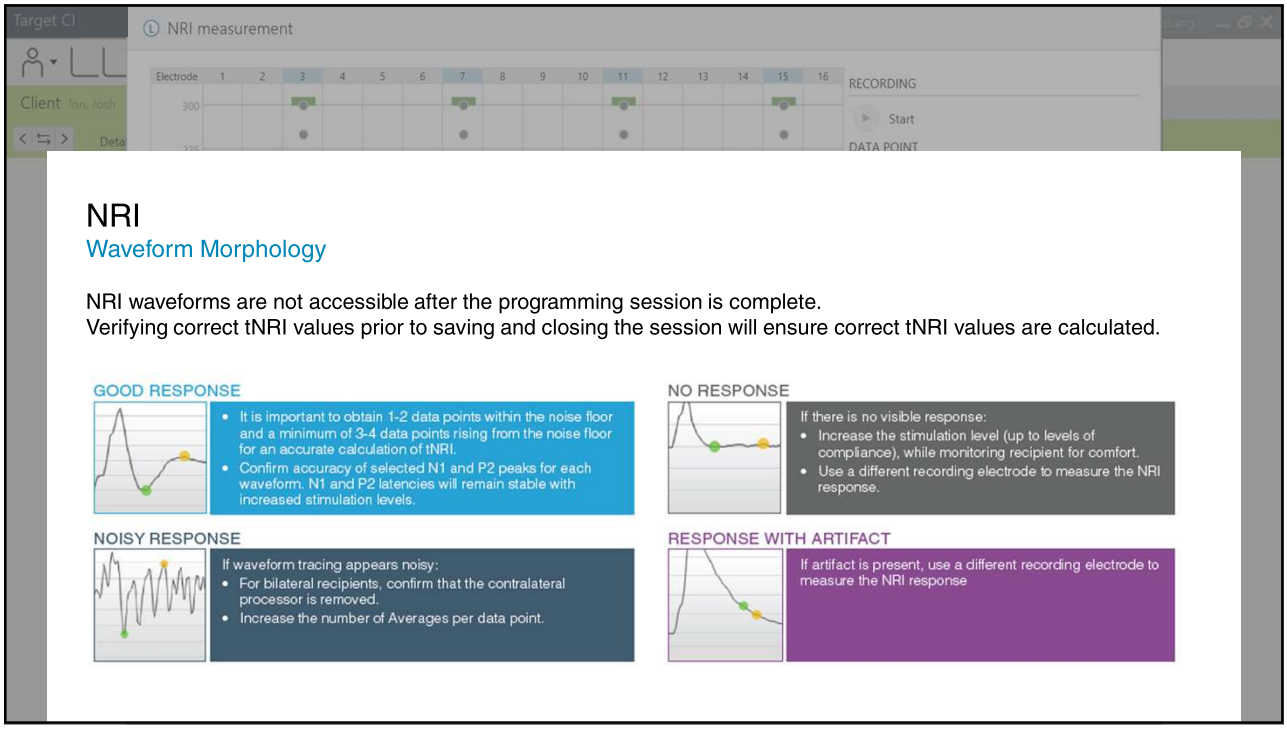


A regression line is extended to the point where N1-P2 = 0 (the x-intercept).

The x-intercept point is called "tNRI", or NRI threshold

NRI recordings ("output") are plotted as a function of stimulus amplitude ("input").





NRI

Waveform Morphology

NRI waveforms are not accessible after the programming session is complete.
Verifying correct tNRI values prior to saving and closing the session will ensure correct tNRI values are calculated.

GOOD RESPONSE

- It is important to obtain 1-2 data points within the noise floor and a minimum of 3-4 data points rising from the noise floor for an accurate calculation of tNRI.
- Confirm accuracy of selected N1 and P2 peaks for each waveform. N1 and P2 latencies will remain stable with increased stimulation levels.

NO RESPONSE

If there is no visible response:

- Increase the stimulation level (up to levels of compliance), while monitoring recipient for comfort.
- Use a different recording electrode to measure the NRI response.

NOISY RESPONSE

If waveform tracing appears noisy:

- For bilateral recipients, confirm that the contralateral processor is removed.
- Increase the number of Averages per data point.

RESPONSE WITH ARTIFACT

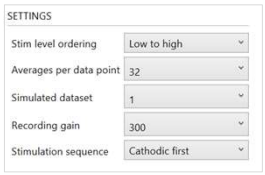
If artifact is present, use a different recording electrode to measure the NRI response

NRI

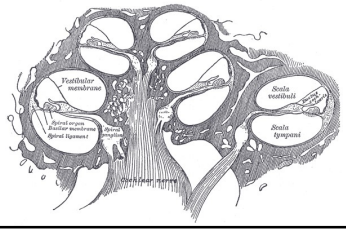
Waveform Morphology

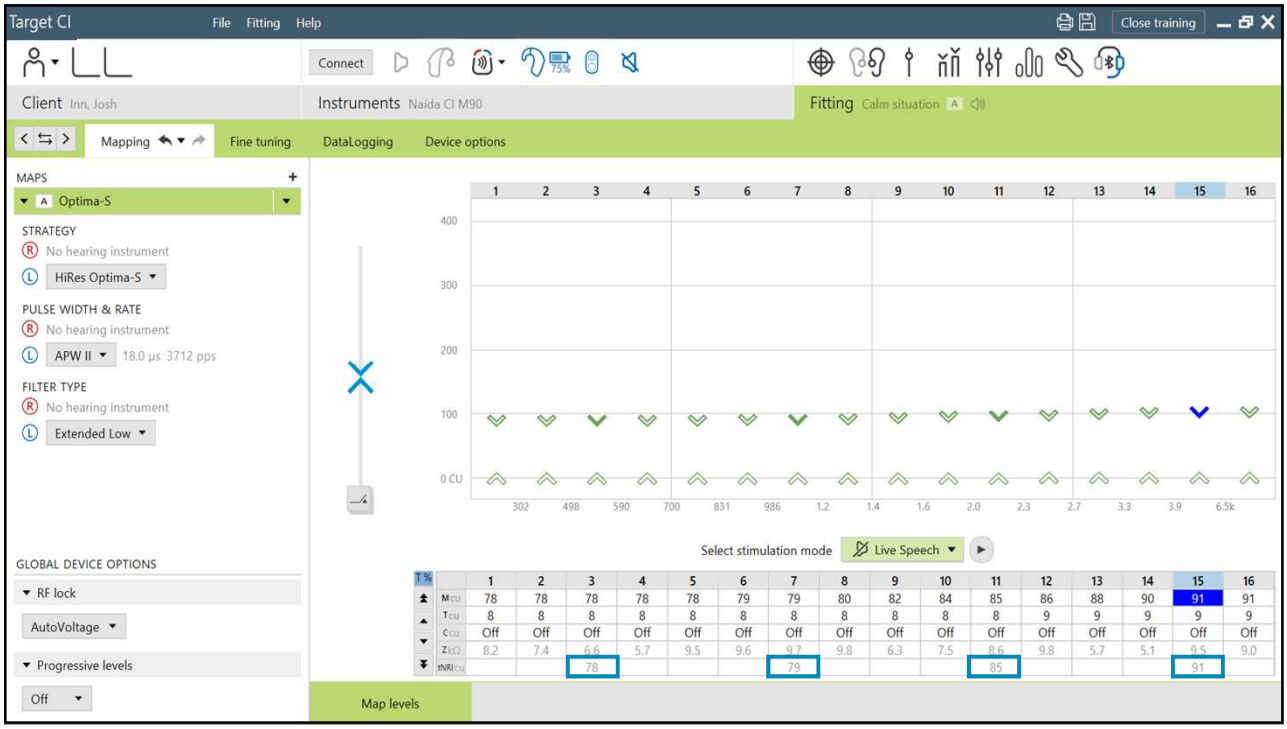
If NRI waveforms cannot be obtained, consider the following:

- Recording parameters may need to be optimized (see previous slide).



- There may be poor neural survival.

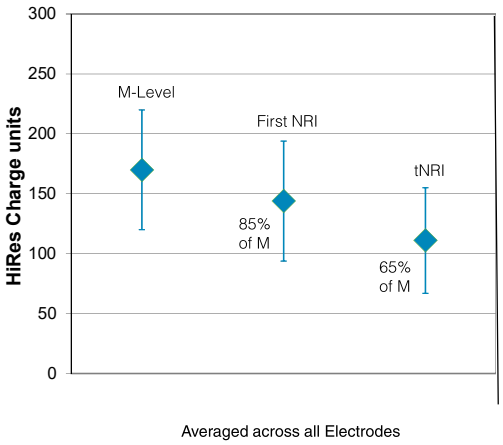




The Relationship of Flex NRI to Program Levels

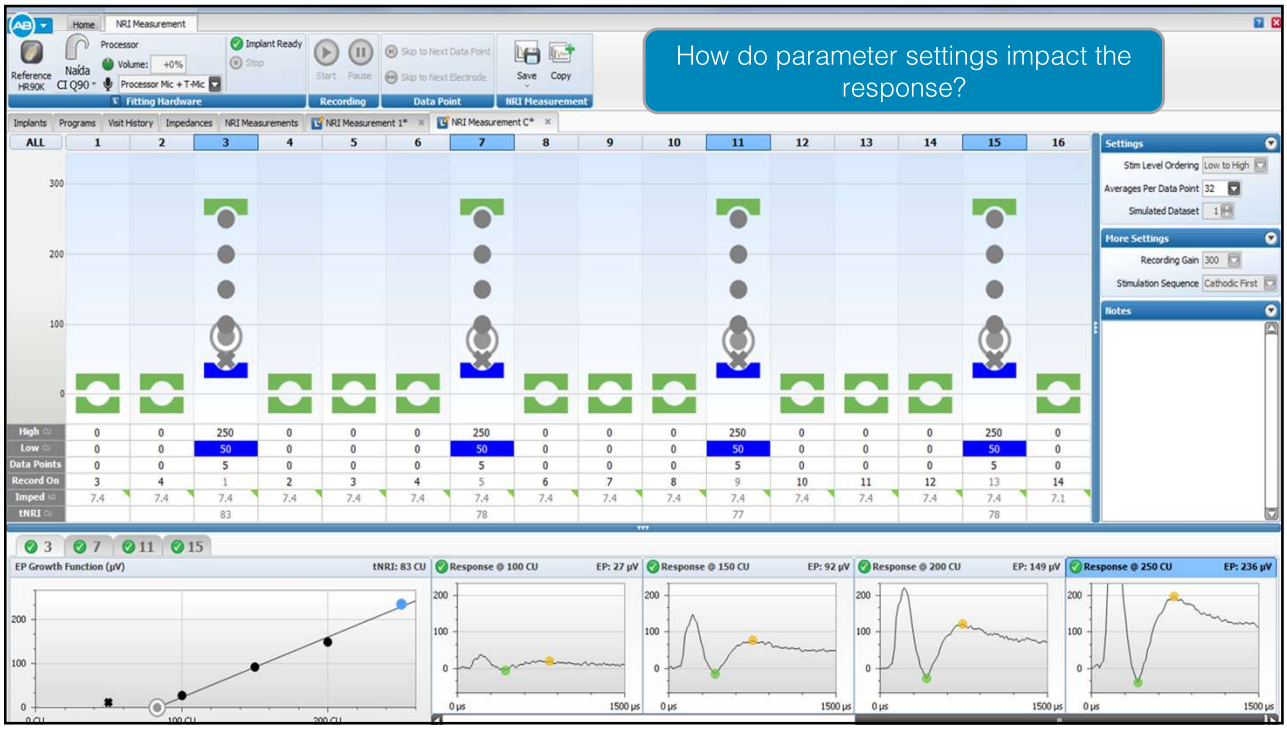
NRI Whitepaper

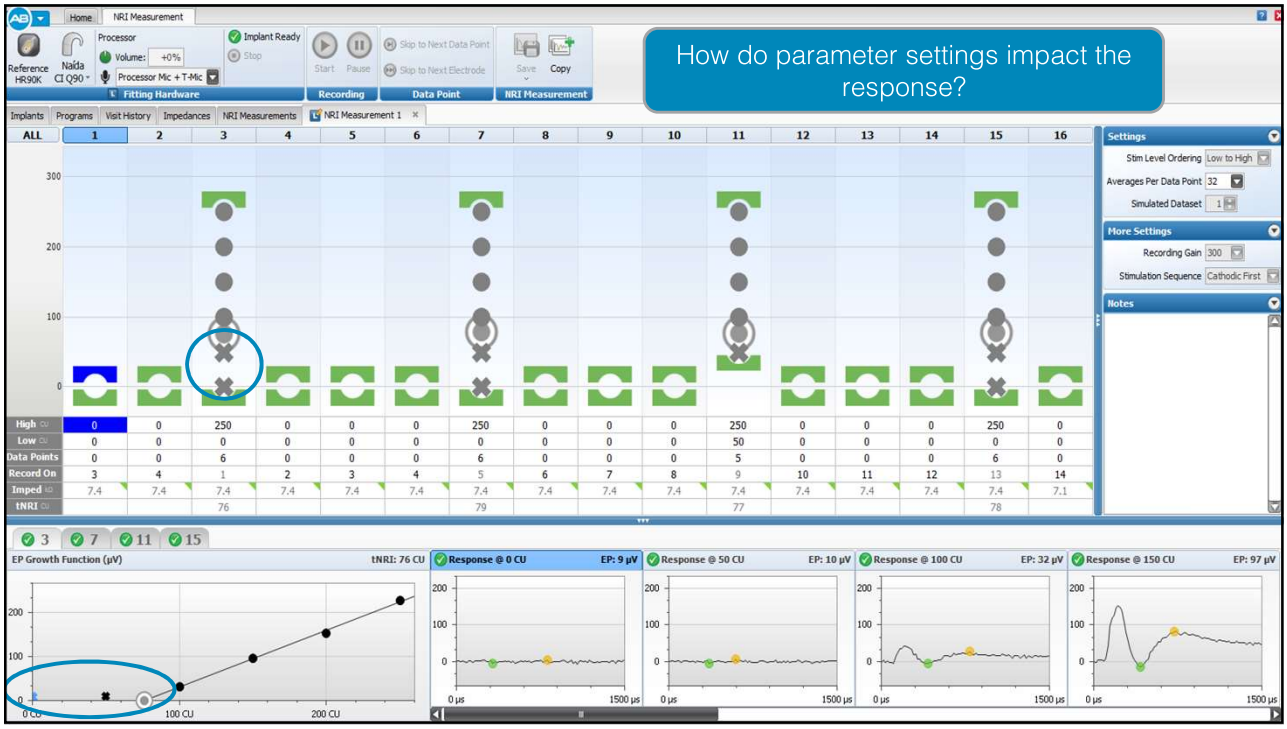
- NRI responses can provide guidelines for programming levels.
- There is no exact correlation between tNRI and M-Levels.
- On average, tNRI value is below M-Level for most recipients.
- tNRI value should be audible for recipient, but not uncomfortable.

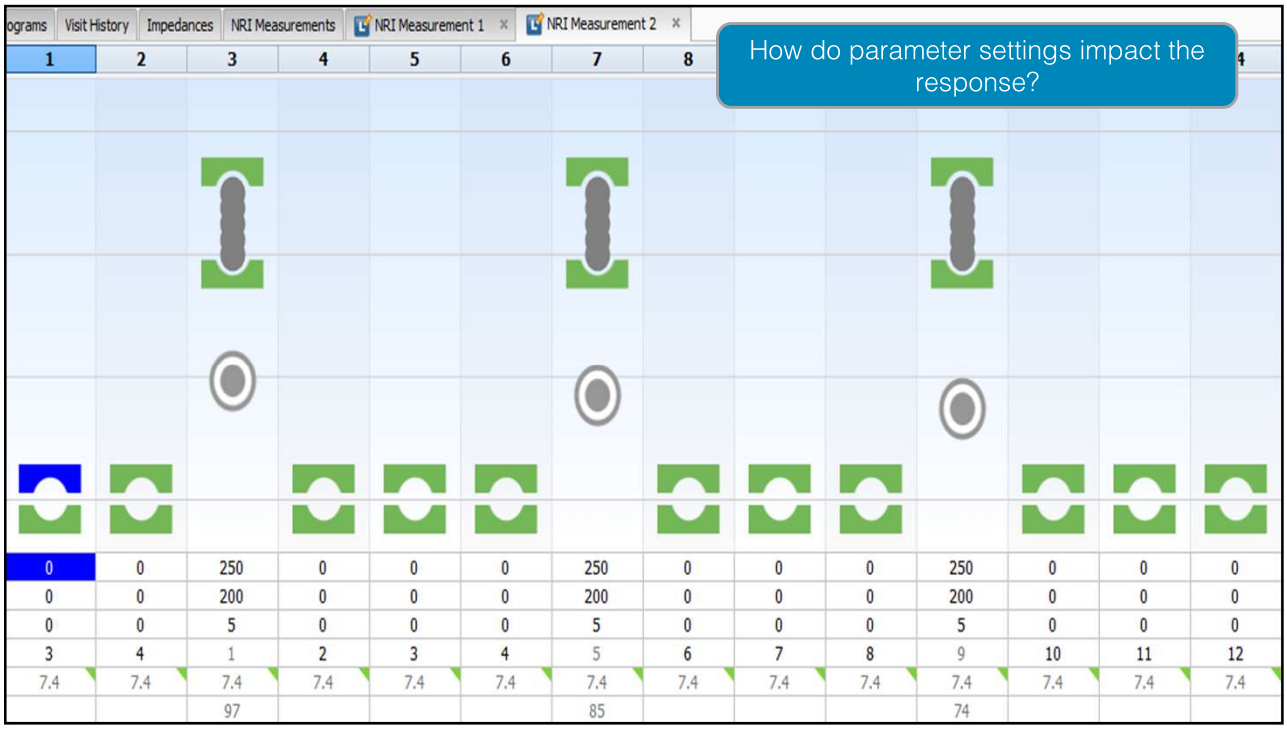


* Data from 19 PLD ADULT HiRes® IDE patients
* All Flex NRI stimuli at 30 Hz & 32 µs, Alternating Polarity
* HiRes pulse widths range from 11 to 53 µs

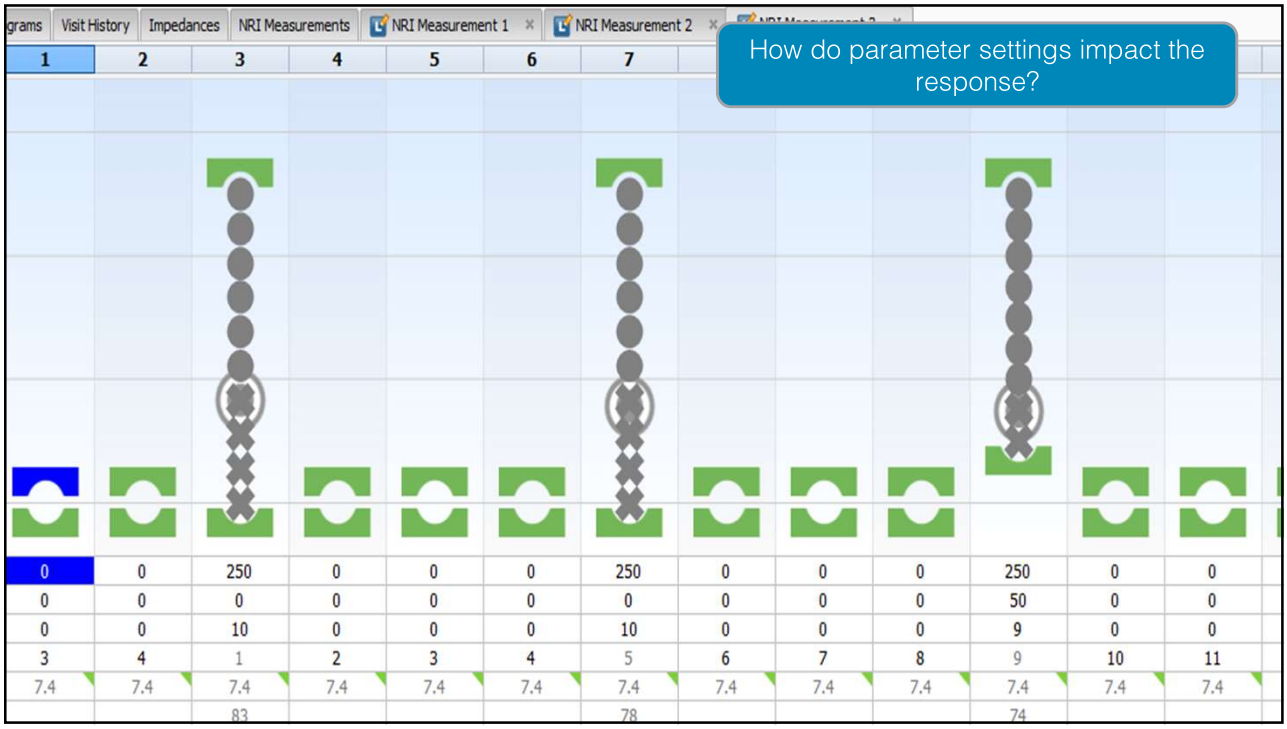
Examples in SoundWave


How do parameter settings impact the response?


How do parameter settings impact the response?

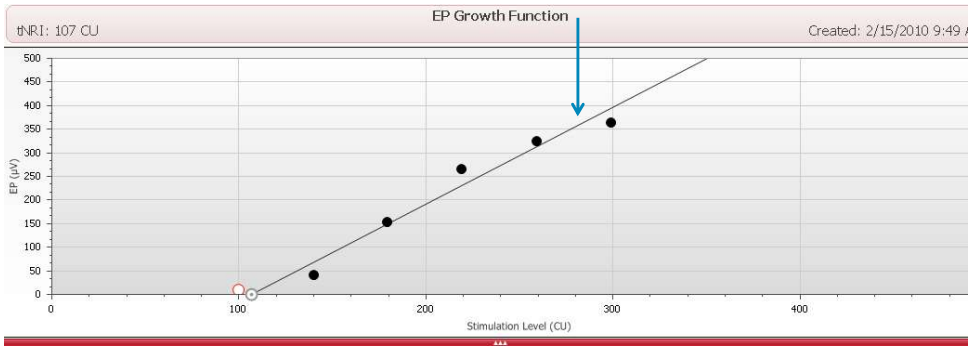


1	2	3	4	5	6	7	8						
0	0	250	0	0	0	250	0	0	0	250	0	0	0
0	0	200	0	0	0	200	0	0	0	200	0	0	0
0	0	5	0	0	0	5	0	0	0	5	0	0	0
3	4	1	2	3	4	5	6	7	8	9	10	11	12
7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
		97				85				74			

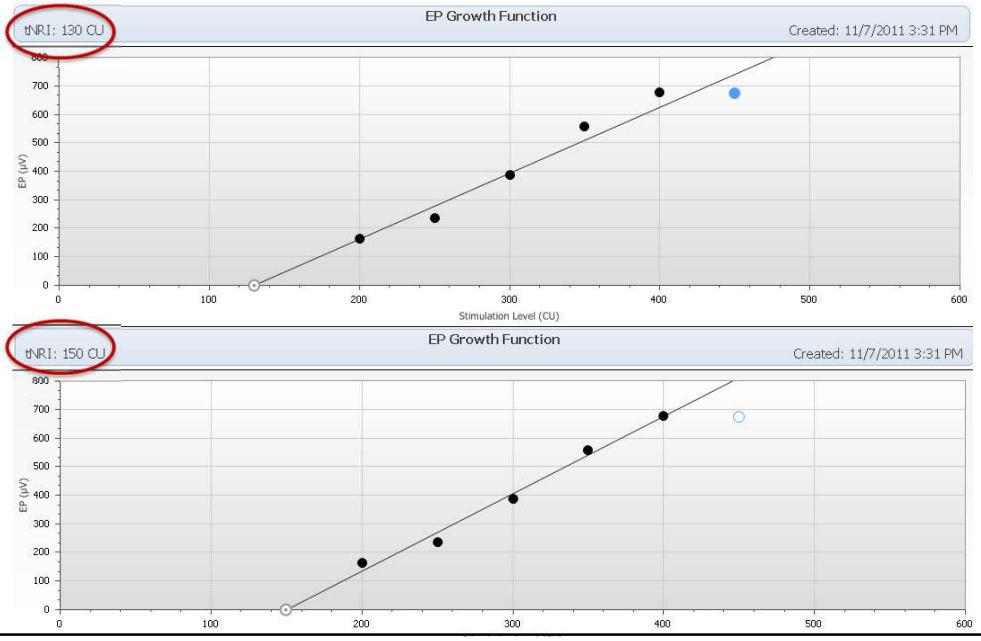


1	2	3	4	5	6	7						
0	0	250	0	0	0	250	0	0	0	250	0	0
0	0	0	0	0	0	0	0	0	0	50	0	0
0	0	10	0	0	0	10	0	0	0	9	0	0
3	4	1	2	3	4	5	6	7	8	9	10	11
7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
		83				78				74		

Neural Saturation

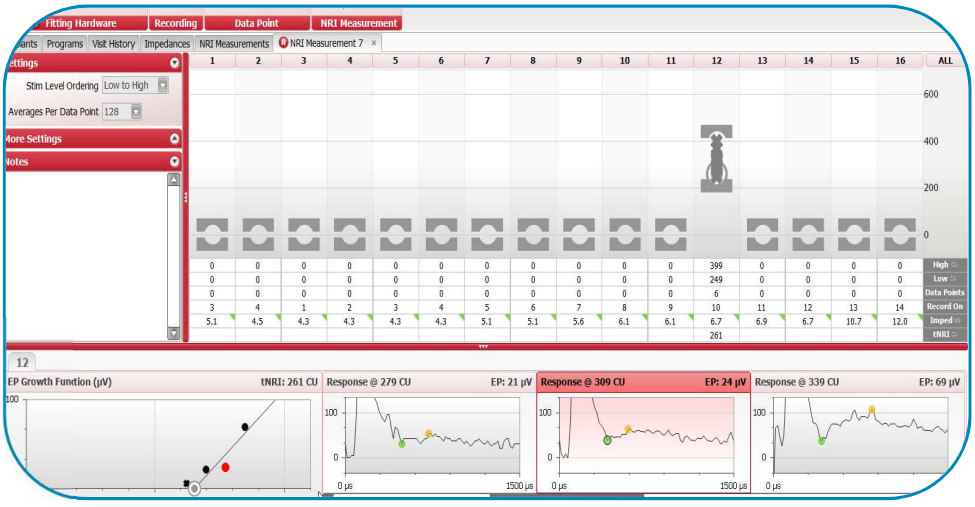


How will this impact the tNRI?



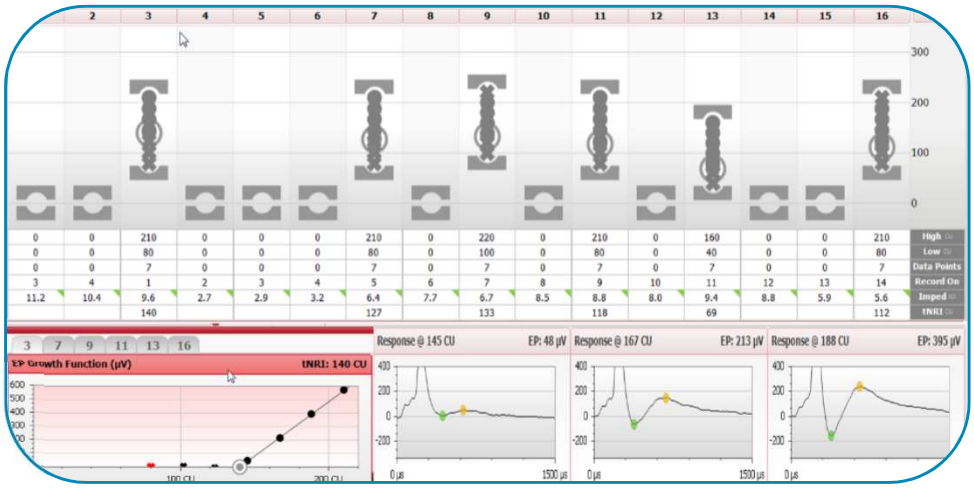
NRI in the Operating Room






Programs
Visit History
Impedances
NRI Measurements
NRI Measurement 4
Stim Level Ordering
Low to High
Averages Per Data Point
128
More Settings
Notes
EP Growth Function (μV)
tNRI: N/A
Response @ 208 CU
EP: 9 μV
Response @ 231 CU
EP: 23 μV
Response @ 254 CU
EP: 35 μV

ion


EP Growth Function (μV)
tNRI: 140 CU
Response @ 145 CU
EP: 48 μV
Response @ 167 CU
EP: 213 μV
Response @ 188 CU
EP: 395 μV

Can NRI Results Change Over Time?



ADVANCED BIONICS
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Marvel CI Upgrade
PROGRAMMING GUIDE

This guide provides the fitting steps needed to upgrade an existing recipient to Marvel CI.

FITTING HARDWARE

Marvel CI sound processors (Naída CI M90, Naída CI M30 and Sky CI M90) are programmed in the Target CI fitting software, using either the Noahlink Wireless or CPI-3 programming interface.

FITTING GUIDE

When migrating client data from SoundWave 3.2 to Target CI, it is recommended that individual client files be migrated at the time that each recipient chooses to upgrade to Marvel CI. This ensures that the most recent recipient information is transferred to Target CI at the time of the upgrade.

1. VERIFY SETTINGS IN SOUNDWAVE 3.2

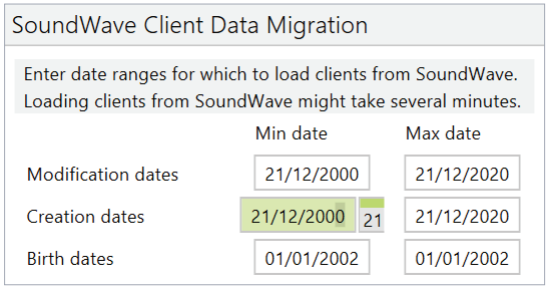
- Ensure the recipient's preferred program is saved to Program Slot 1, as information from Program Slot 1 in the most recent SoundWave 3.2 Visit History will be migrated to Target CI[1].
- Note the client's date of birth in SoundWave 3.2. Close SoundWave 3.2 fitting software[2].

2. OPEN TARGET CI AND MIGRATE CLIENT DATA

If Target CI is used as standalone software, migrating client data will add a new client to the database.

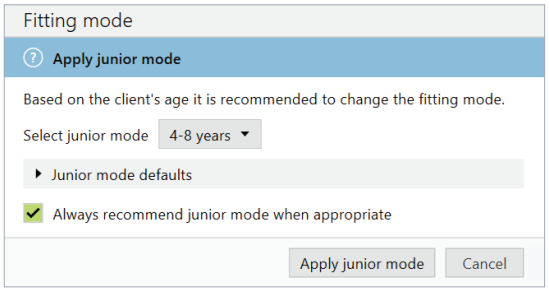
If Target CI is installed as a Noah module, it's necessary to first enter the recipient demographic information into Noah, select the client, and open a new fitting session.

- In Target CI access the *File* menu and select *Migrate client data*[3].
- Enter the required information in the *SoundWave Client Data Migration* window (Modification dates, Creation dates, Birth dates).
  - Enter the date of birth accurately.
  - Enter a wide *Modification* and *Creation* date under the *Min date* e.g. dd/mm/2000, then click *Start*.
- Verify the client's name. Confirm that the appropriate sound processor is chosen for the upgrade.
- Click *Start* and follow any prompts.
- The session is now available in the client file.
  The *Notes* section of the client details will indicate the session was migrated.



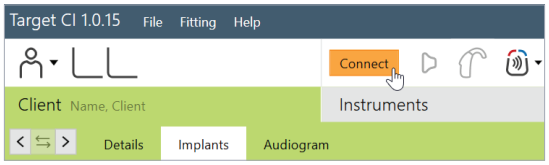
For pediatric Marvel CI upgrades:

- Target CI will ask if the clinician wants to apply *Junior mode* default settings (based on the client's age) to the map.
- Be sure to select *Cancel* to preserve the map parameters when managing Marvel CI upgrades. As selecting *Apply junior mode* will reset all map parameters (including setting M- and T-Levels to zero).



3. CONNECT TO THE HEARING INSTRUMENT

- Connect to the hearing instrument via Noahlink Wireless or CPI-3.
- If using the Noahlink Wireless, ensure that a fully charged rechargeable battery is used. Remove and re-attach the battery to put the sound processor into pairing mode. Click the *Connect* button within the 3-minute pairing window.
- Verify the side for which the device is intended to be used.
- Once device connection is successful, *Close* to proceed.



4. CONNECT TO THE INTERNAL DEVICE

- Place the headpiece on the recipient's head to achieve lock with the implant. If lock is not achieved, the sound processor will not stimulate the implant and the fast blinking red LED will be observed.

1. The SoundWave 3.2 file must have a Visit History and Intellilink enabled in order to migrate the recipient information.
2. It is important to close both SoundWave 3.2 and Target CI between migration. This ensures that the most current data is migrated from SoundWave 3.2 to Target CI.
3. Migrate one patient file at a time.

ADVANCED BIONICS
POWERFUL CONNECTIONS

Marvel CI Upgrade
PROGRAMMING GUIDE

5. SELECT THE APPROPRIATE ATTACHMENT

- Under the *Instruments* tab, go to *Acoustic parameters* and ensure that *T-Mic/Standard* is selected as the appropriate attachment.

6. MEASURE IMPEDANCES AND NEURAL RESPONSE IMAGING (NRI)

- Impedances will run automatically. Under *Client*, access the *Impedance* tab to run impedances.

7. VERITY THE MAP SETTINGS AND COMFORT

- Under the *Fitting* tab, access *Mapping* to verify the electrical parameters like M-Levels and T-Levels, Strategy, Pulse Width, IDR, etc. The settings in the table below should be considered.
- Verify comfort using *Live Speech stimulation*.

The following settings from the SoundWave 3.2 data migration should be considered:

SETTINGS PRESERVED FROM SOUNDWAVE

- M-Levels / T-Levels
- ClearVoice – If Enabled in SoundWave 3.2, will be set to Medium in Target CI.
- SoftVoice
- IDR
- Disabled / Spanned / Clipped electrodes
- Strategy
- Filter type
- RF (AutoVoltage)

RE-EVALUATE IN TARGET CI

- **Acoustic parameters** – The audiogram must be manually entered in Target CI.
- **Pulse Width** – May be impacted by New Impedance Measurement.

SETTINGS DIFFERENT IN TARGET CI

- **Program structure** – Autosense OS now available
- **T-Mic + Processor Mic** – This microphone option is not available for Marvel CI

CANNOT BE MODIFIED IN TARGET CI

- AGC (AGC II)
- QuickSync is always enabled
- Volume Min/Max (±20%)
- Sensitivity (not available)

8. FINE TUNING

- Access the *Fine tuning* tab to verify the program settings. Confirm settings in the *Map options* tab, as desired.
- Access the *Program options* tab to fine tune individual programs further, if desired.

9. MANAGE DEVICE OPTIONS

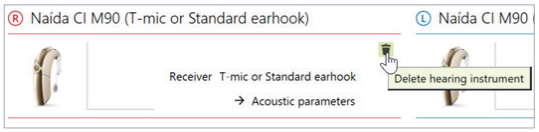
- Access the *Device options* tab to manage Manual controls, Bluetooth®, Signals & alerts, Indicator light, Startup and Datalogging, as needed, based on each recipient's unique preferences.
- For ease of discovering the device during Bluetooth pairing, access the *Bluetooth* tab and label each side with the recipient's name.

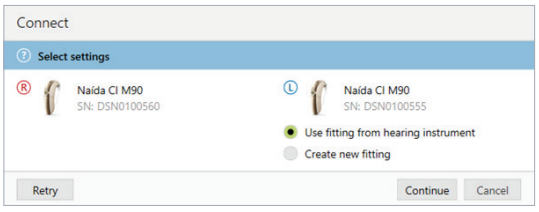
10. SAVE AND CLOSE THE SESSION

- Select *Save & close* to finalize the fitting session.
- Run and review the sound processor *Battery estimation*, if desired.
- Add any notes to the fitting session, if desired.
- Follow the prompts to *Save* the fitting session to the Hearing instruments and/or the Database. Select *Close* to complete the session.

CONSIDERATIONS FOR BILATERAL RECIPIENTS UPGRADING ONLY ONE SIDE TO MARVEL CI

- When migrating a recipient's SoundWave 3.2 file into Target CI, data from both sides are migrated over. For a simpler fitting experience, it may be helpful to delete the hearing instrument on the side that you do not intend to upgrade, in the *Hearing Instruments* tab.
- Access the *Fine Tuning* tab. Under *Automatic programs*, ensure *Speech in loud noise* is not enabled (this program requires a compatible hearing instrument on the contralateral ear).





When upgrading the second side to Marvel CI:

- Simply repeat the migration of the recipient's SoundWave 3.2 file into Target CI.
- When connecting to the hearing instruments, select *Use fitting from hearing instrument* on the side that was previously upgraded. Select *Continue* to proceed with the fitting.

If further support or information regarding product availability is required, please contact your local AB representative.

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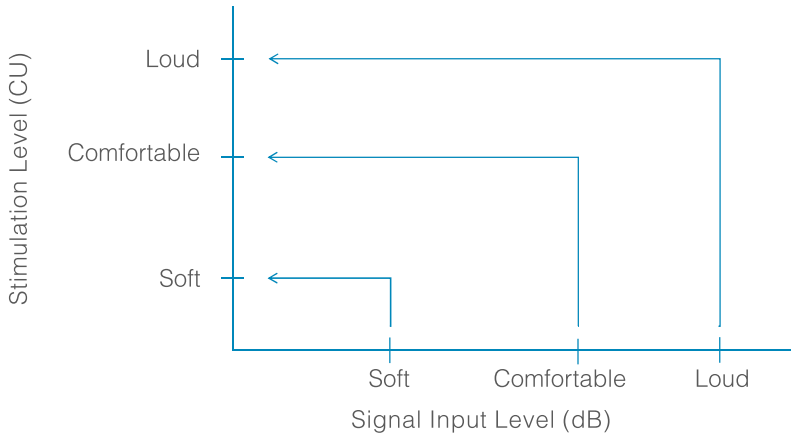
027-N276-03 Rev A

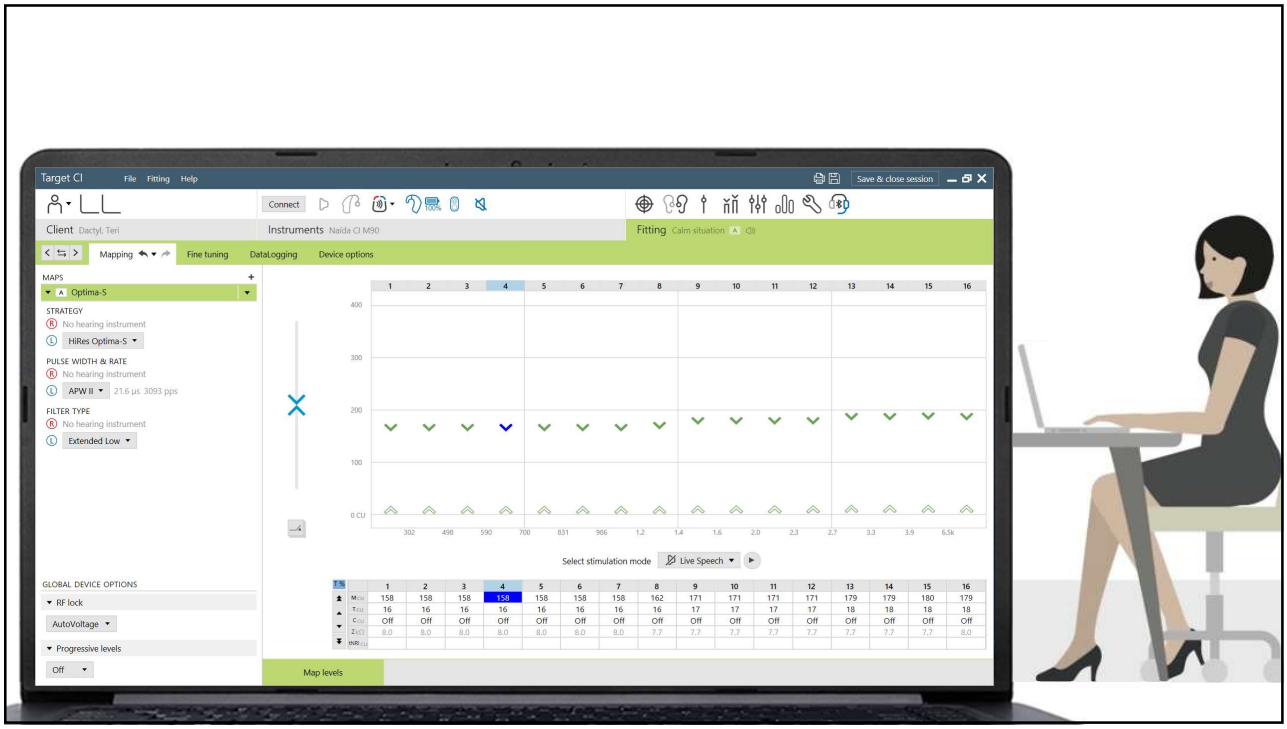
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Parameter Interactions

Mapping Function



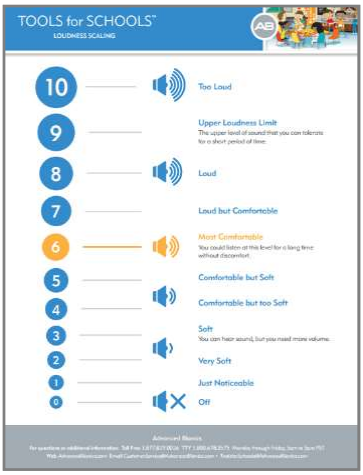


M-Levels

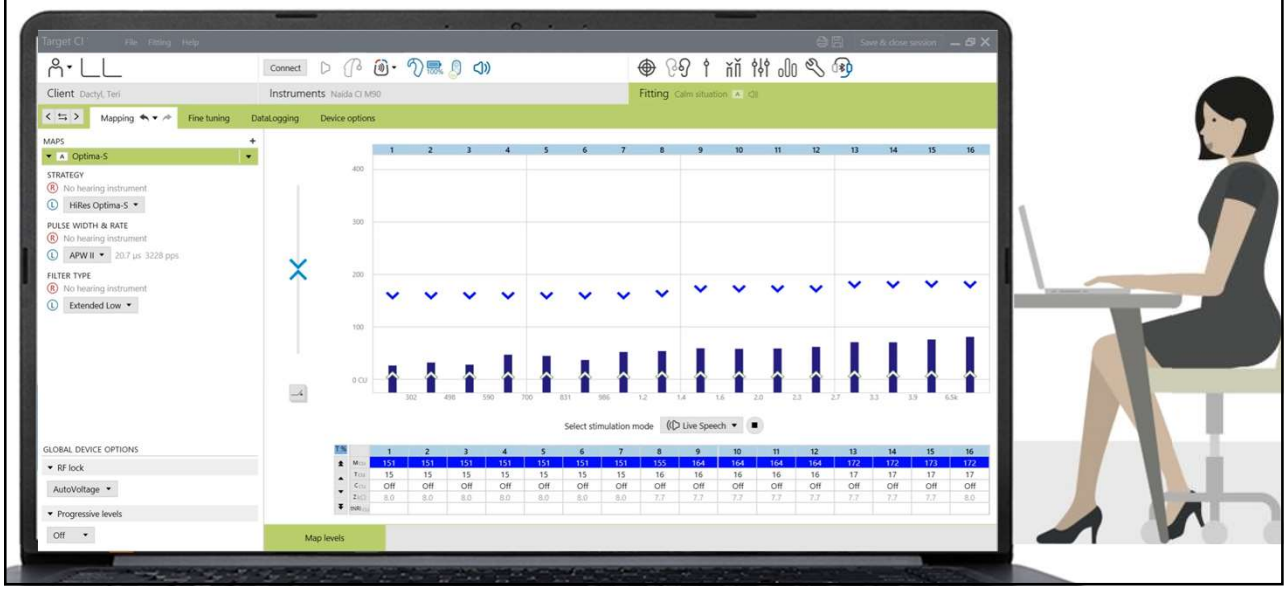
What are M-Levels?

Review

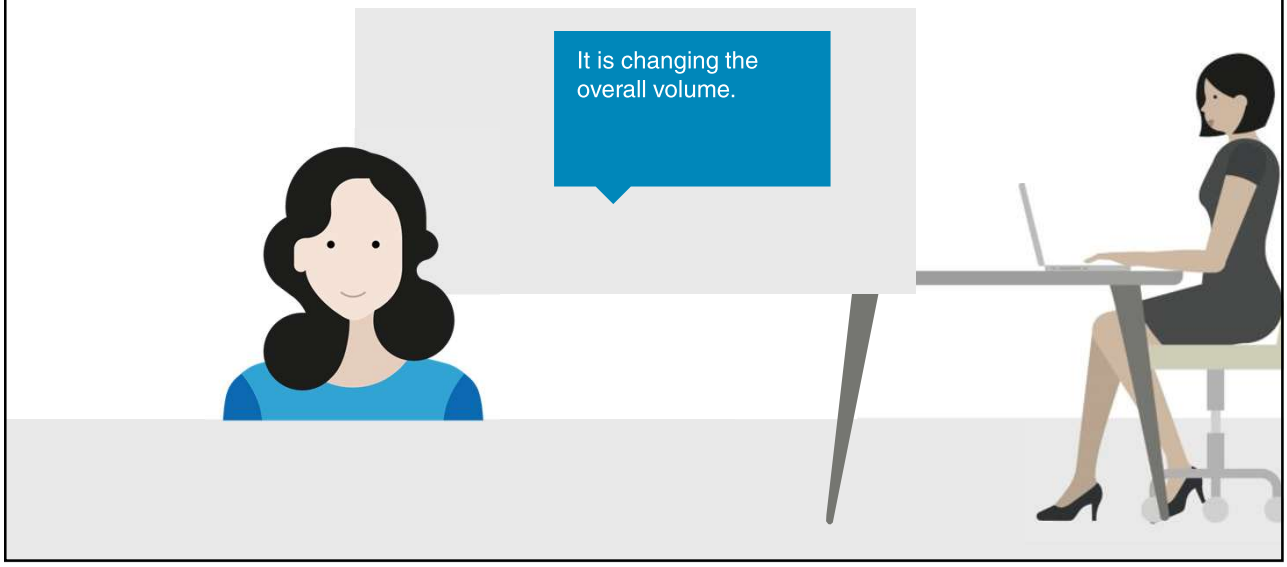
- What are M-Levels?
  - Most Comfortable Loudness levels
  - Set to subjective 6 out of 10 on the loudness scale (the upper limit of a recipient's most comfortable loudness)
  - Kneepoint (where compression begins) set to M-Levels



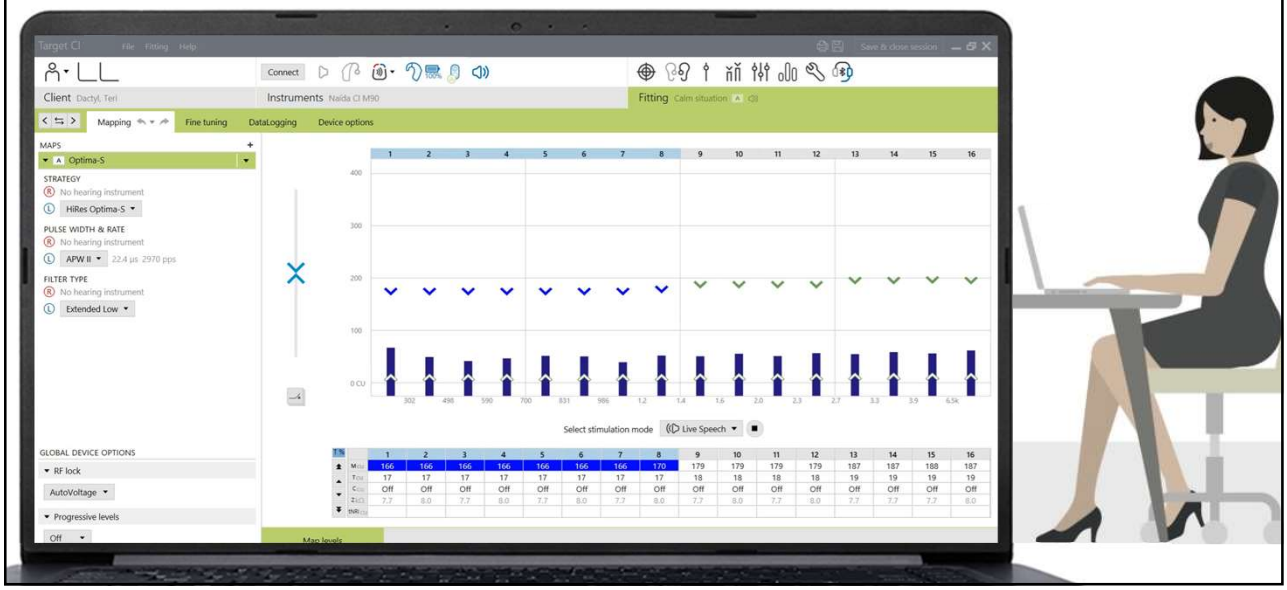
How Does Adjusting M-Levels Impact Recipients?



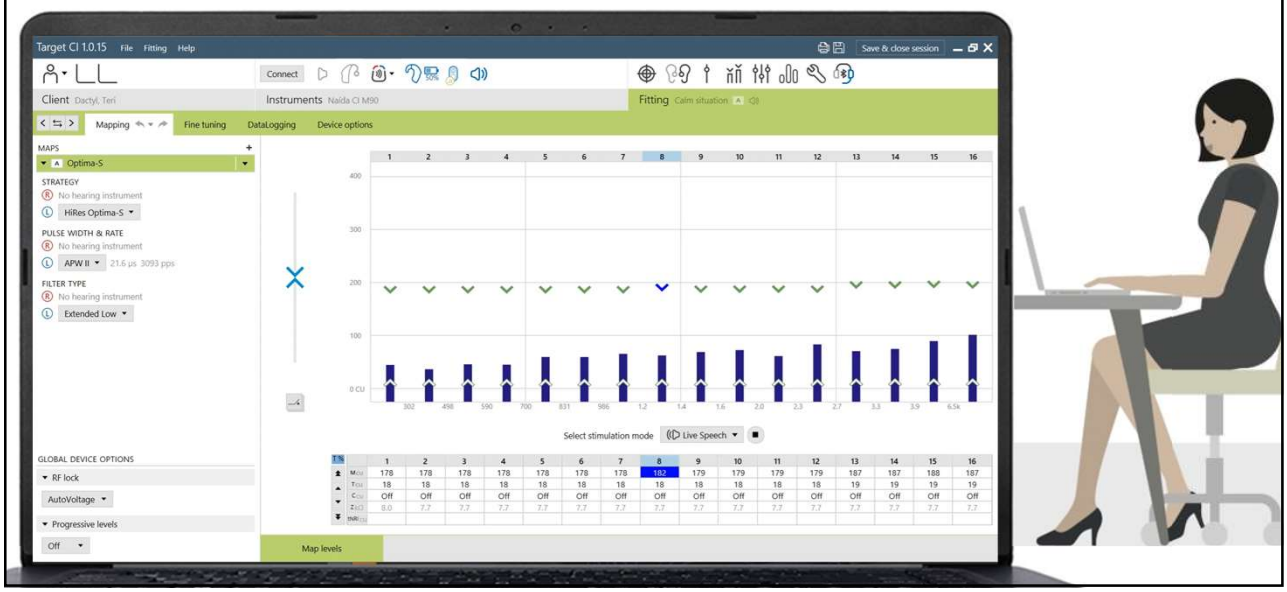
How Does Adjusting M-Levels Impact Recipients?



How Does Adjusting M-Levels Impact Recipients?



Loudness Balancing




M-Levels
AB provides the flexibility to measure M-Levels via Live Speech, Speech Bursts, or Tone Bursts.

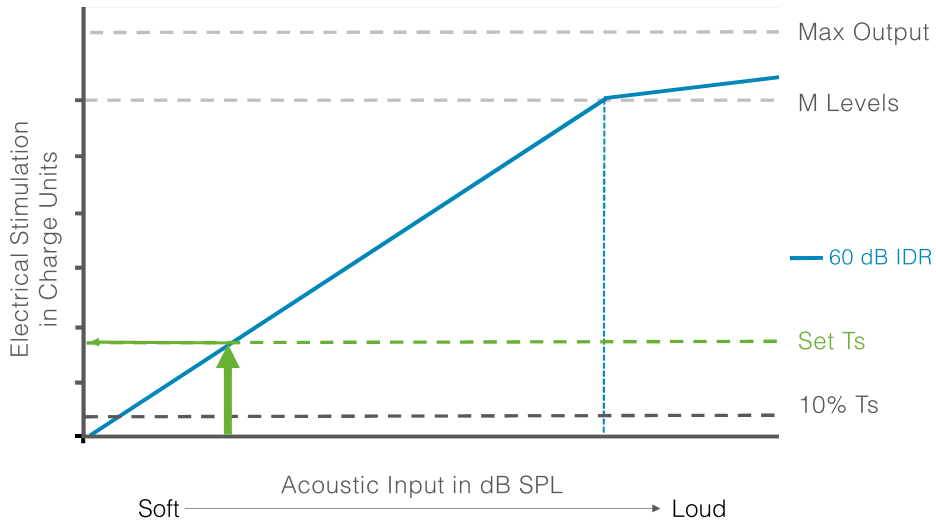
T-Levels

What are T-Levels?

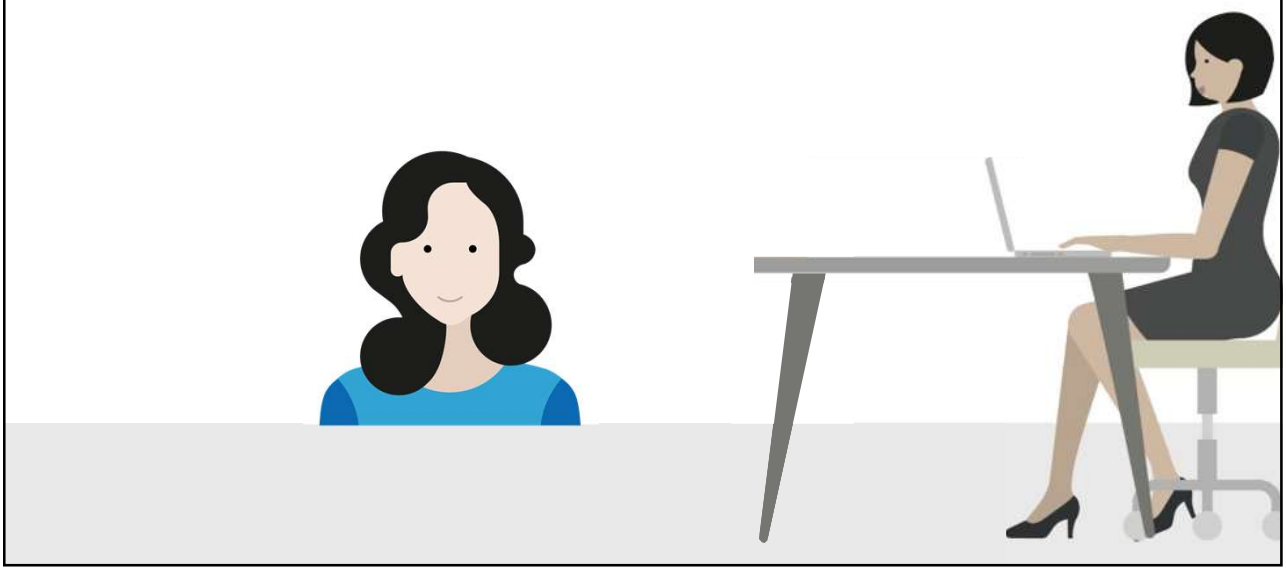


- What are T-Levels?
  - Threshold levels
  - The level at which a recipient detects a sound 50% of the time
  - T-Levels default to 10% of M-Levels in AB's software
- T-Level settings affect the audibility of

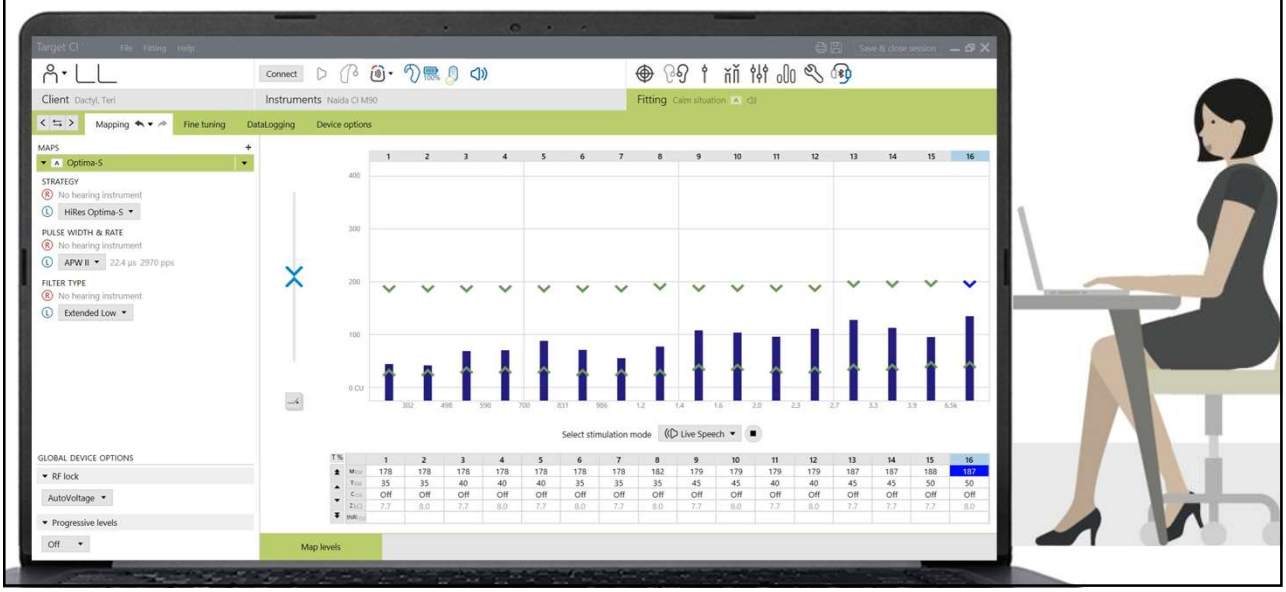
T-Levels



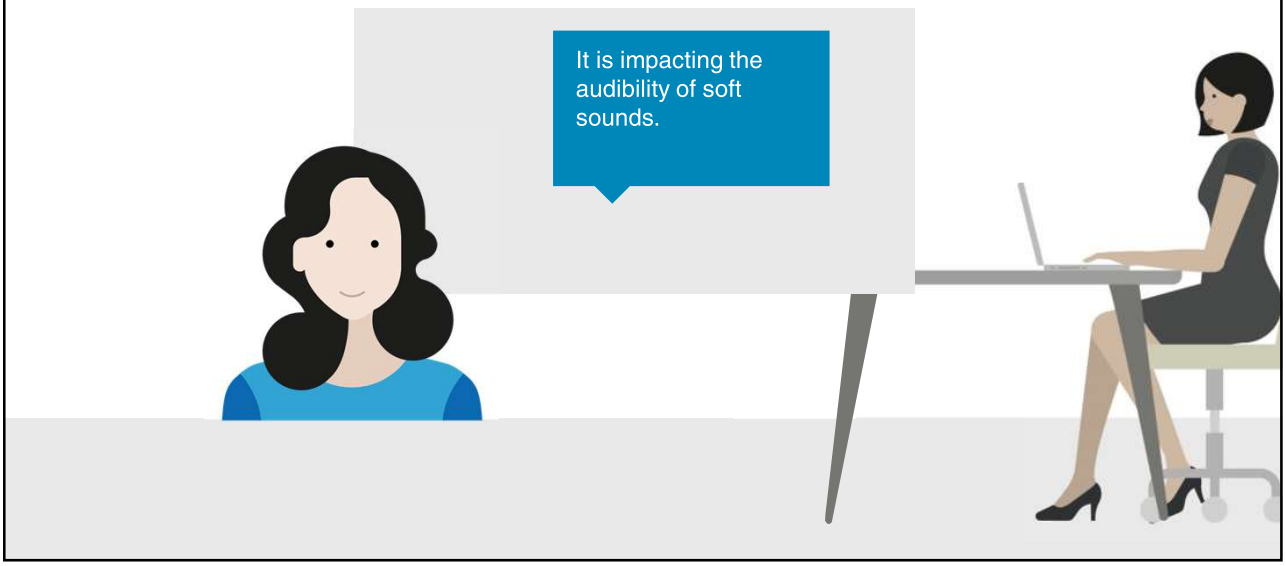
How Does Adjusting T-Levels Impact Recipients?



How Does Adjusting T-Levels Impact Recipients?



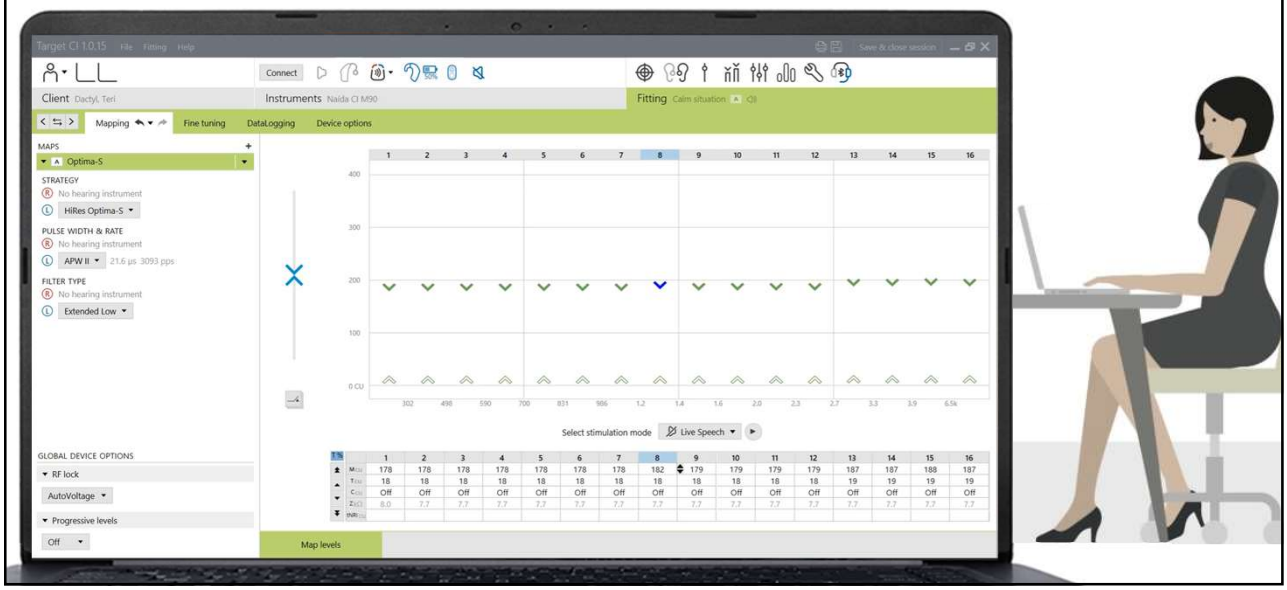
How Does Adjusting T-Levels Impact Recipients?



Aided Detection Levels

- Goal of managing lower stimulation levels = ensure audibility for low-level speech
- For pediatrics, minimal response levels in the sound field to frequency-specific stimuli should be[1]:
  - No greater than 30 dB HL in the low frequencies (250-500 Hz)
  - No greater than 25 dB HL in the mid to high frequencies
- For adults, minimal response levels in the sound field to frequency-specific stimuli should be[1]:
  - No greater than 30 dB HL

Measuring T-Levels

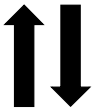


T-Levels

- Ts are set to 10% of Ms by default and that is appropriate for most patients
- Can use common audiological threshold bracketing technique
- No specialized counting technique required

Volume

What is Volume?

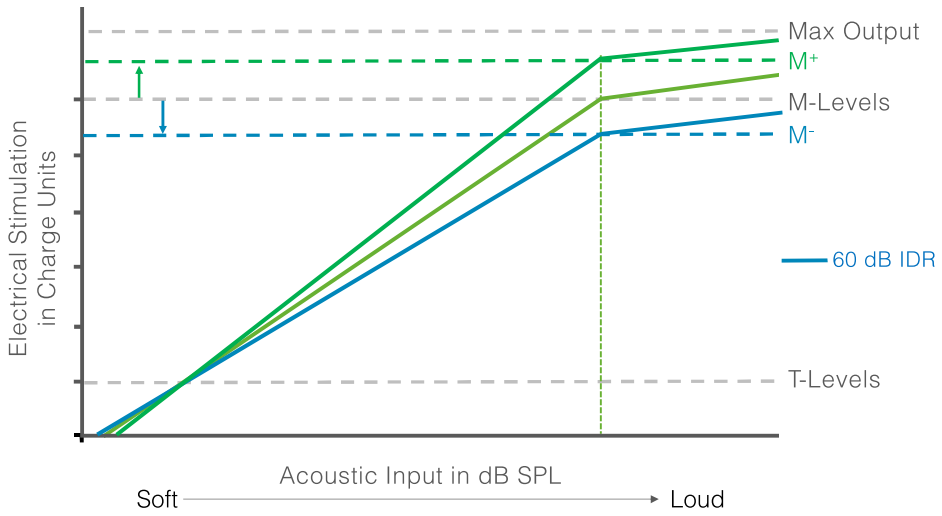


Volume

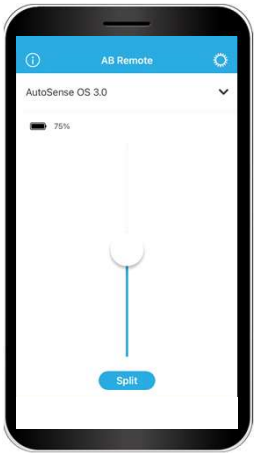
Changing the volume on the sound processor changes the recipient's

Volume (Min/Max) values are a percentage of the electrical dynamic range (difference between M and T values).

Volume

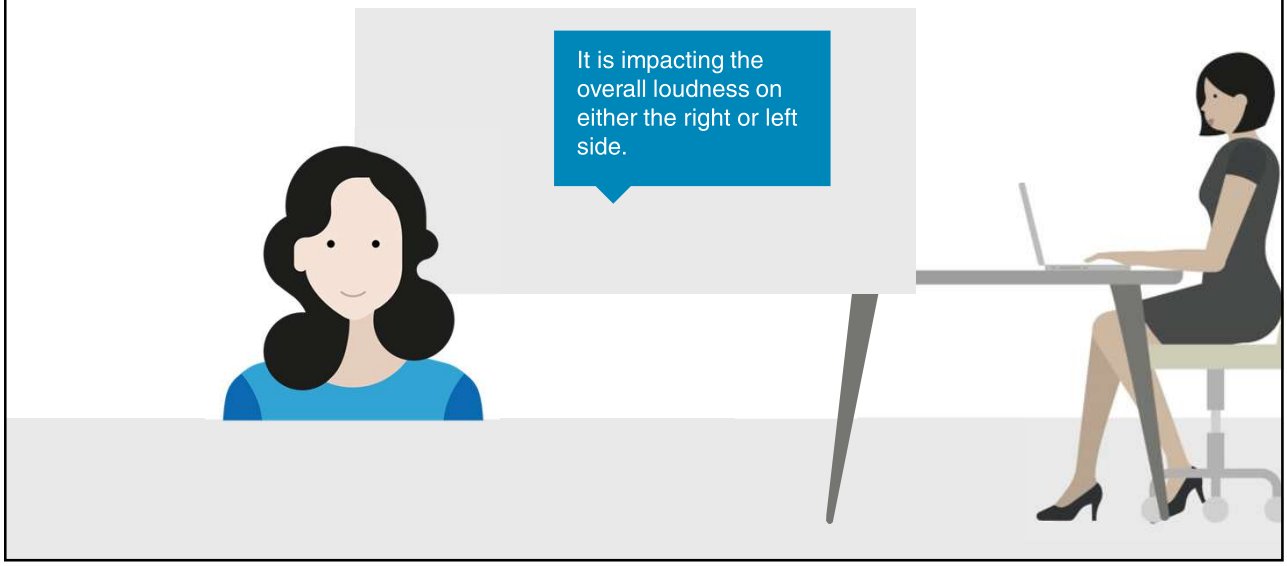


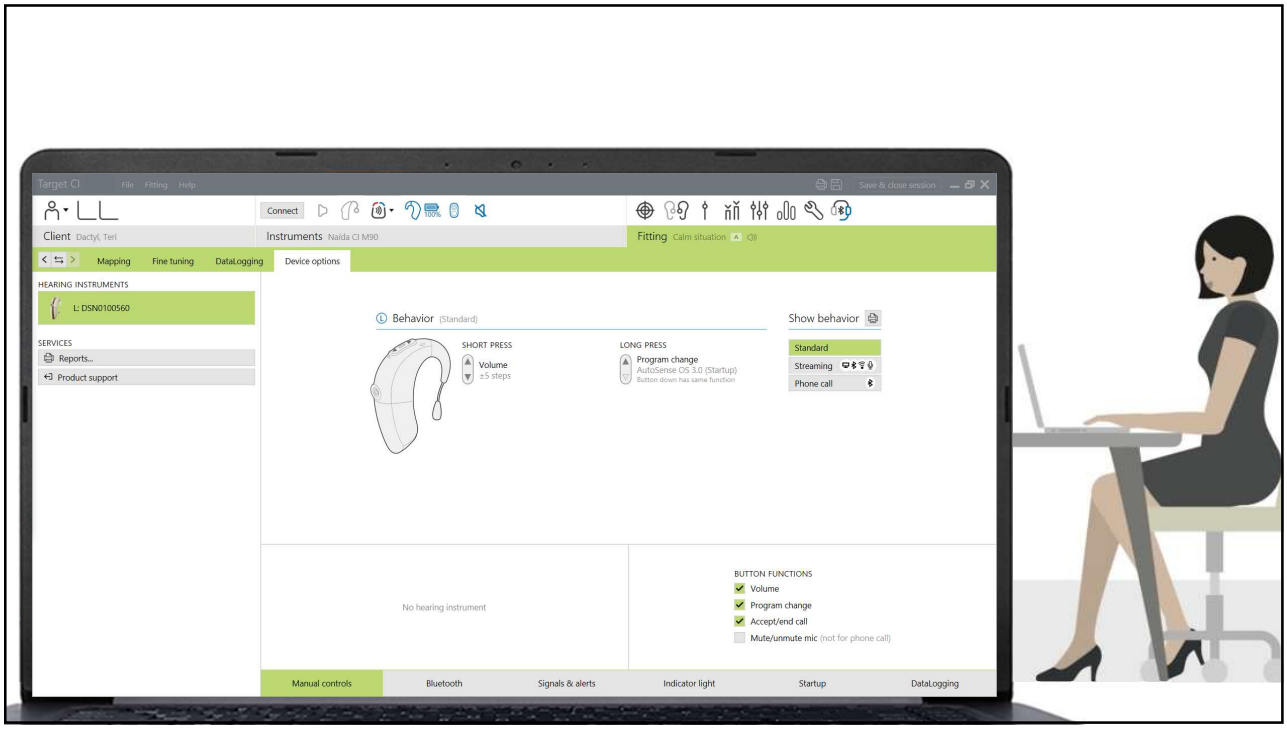
How Does Adjusting Volume Impact Recipients?





How Does Adjusting Volume Impact Recipients?





Gain

What is Gain?

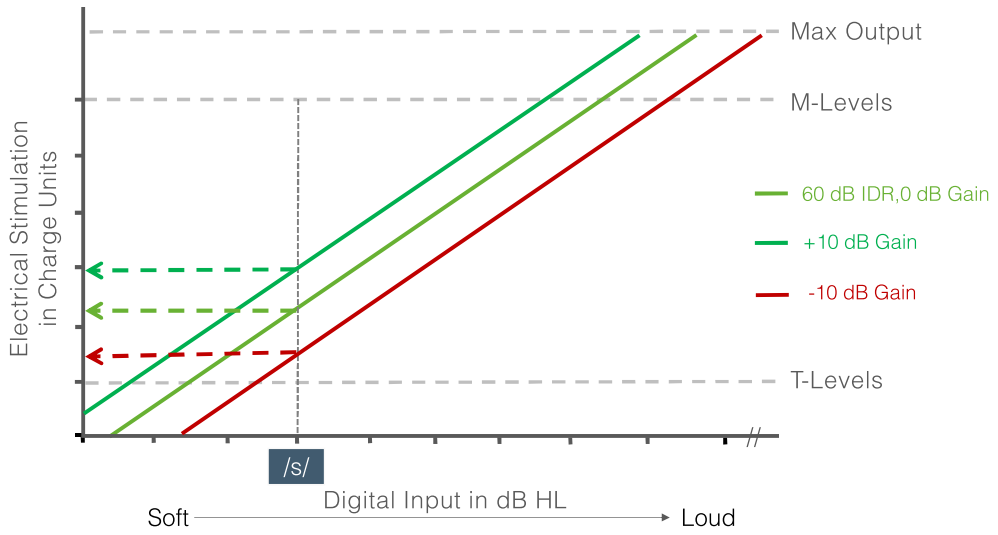


Gain

Gain settings determine how much amplification or attenuation is applied to the for each frequency band.

Gain settings can be selected on a channel-by-channel basis.

Gain

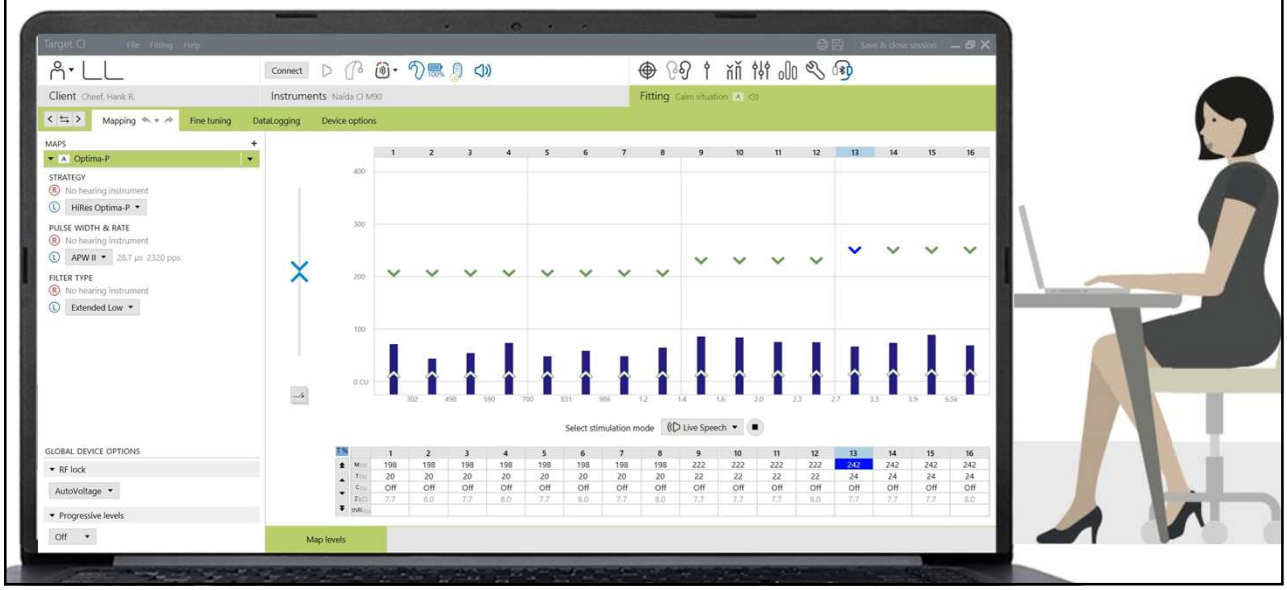


When to Consider Adjusting Gain

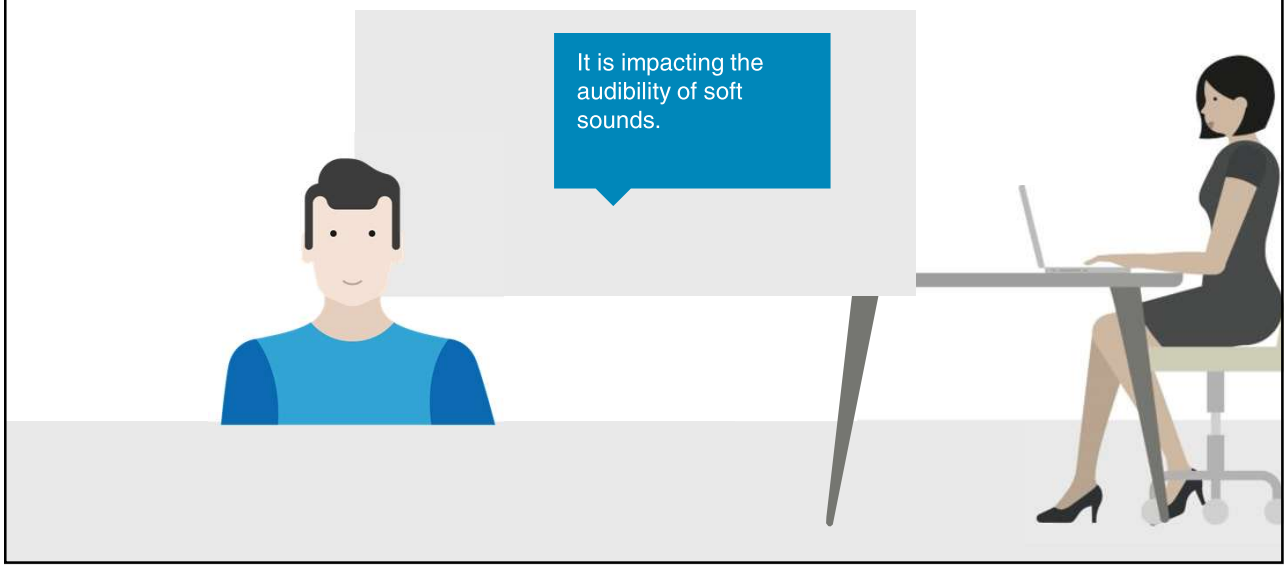
Situations or recipient reports that would lead you to adjust gain

- Address subtle sound quality reports or speech recognition difficulties
- Manage facial nerve stimulation

How Does Adjusting Gain Impact Recipients?



How Does Adjusting Gain Impact Recipients?



Strategy

Knowledge Check

Strategies

Review:
What are AB's most recent sound processing strategies?

How do they impact the way recipients hear?

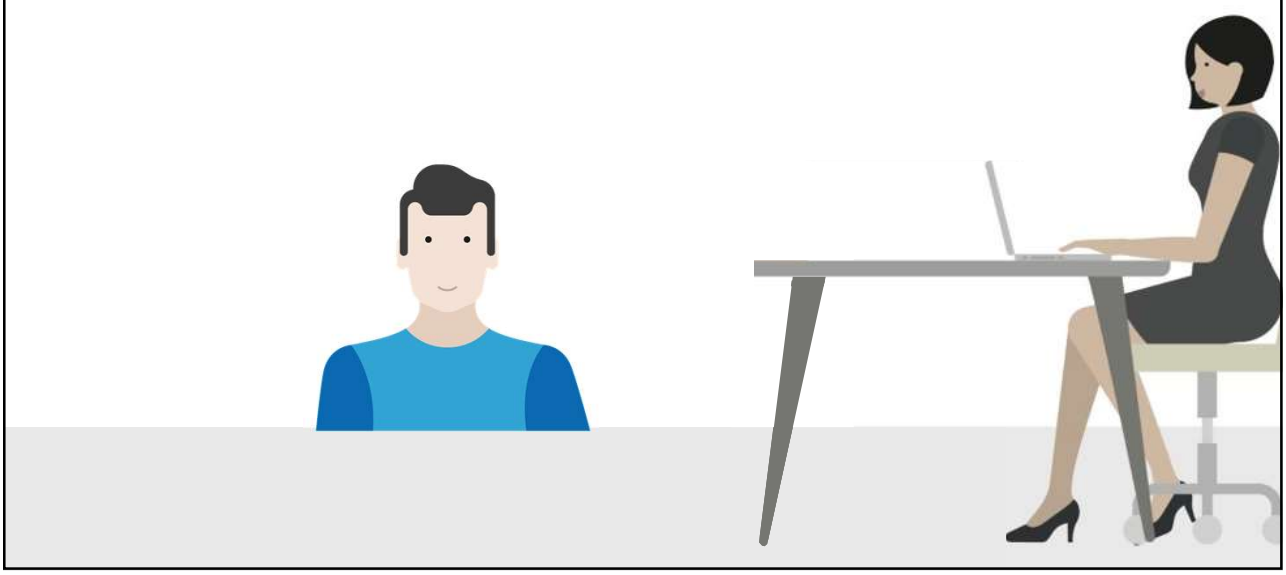


When to Consider Adjusting Strategy

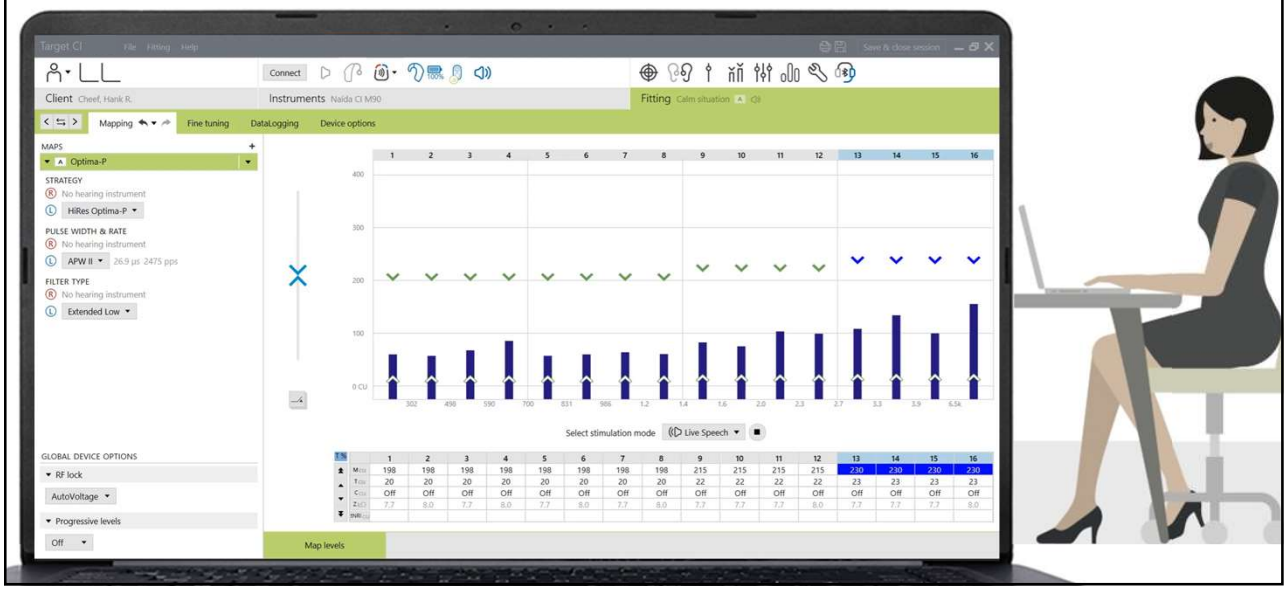
Situations or recipient reports that would lead you to change strategies

- Patient reports:
  - "Too much"
  - "Too harsh"
  - "Still difficult to understand speech"
  - "I've done all my listening homework and don't see much improvement"
  - Persistent sound quality that can't be programmed out using other parameters
- Other considerations:
  - Performance is not what is expected- consider performance testing
  - Patient questionnaire indicates need
  - Facial nerve stimulation
  - Confirmed auditory fatigue

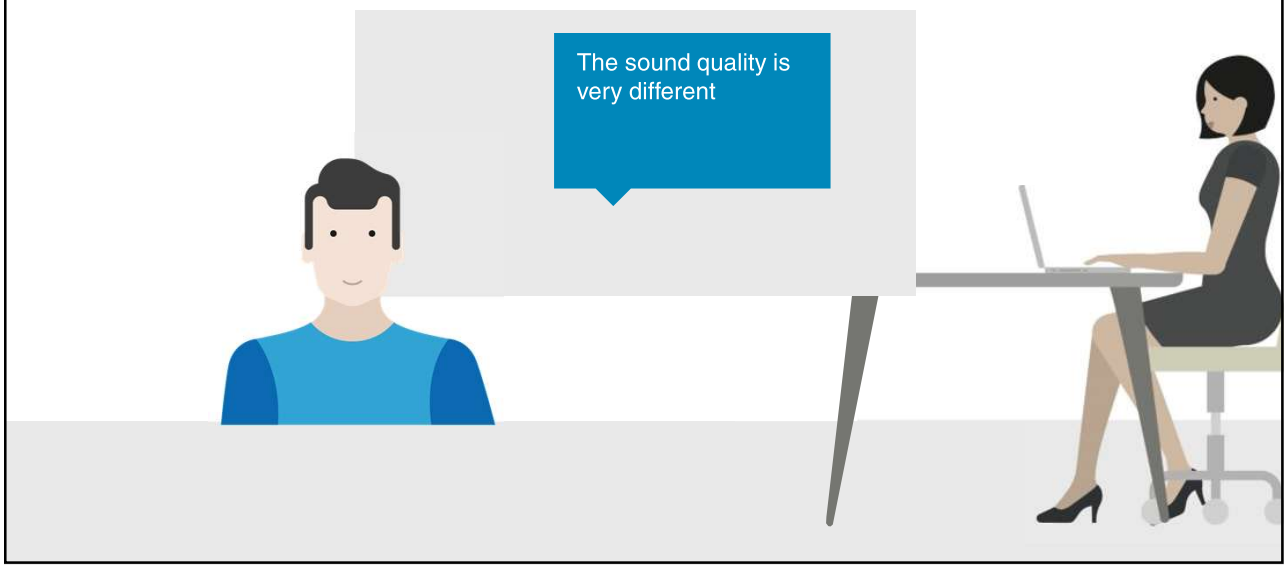
How Does Adjusting Strategy Impact Recipients?



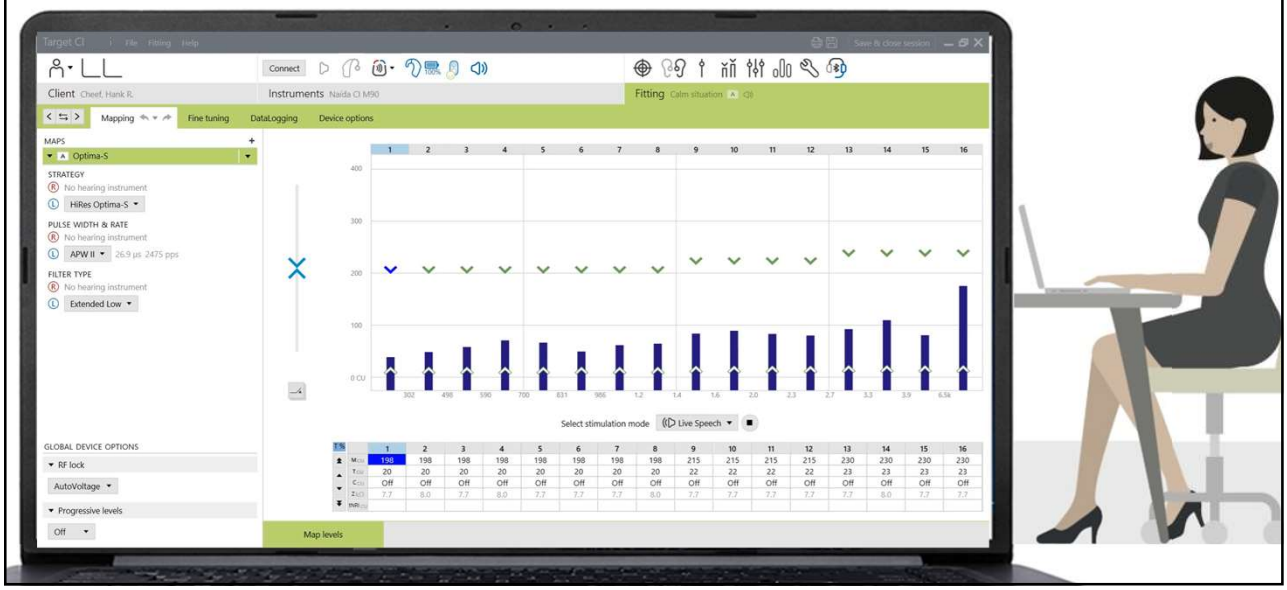
How Does Adjusting Strategy Impact Recipients?



How Does Adjusting Strategy Impact Recipients?



How Does Adjusting Strategy Impact Recipients?



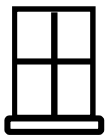
Strategy

- AB is the only company that offers both a paired and a sequential strategy.
- Both offer unique benefits to recipients.
- Recipients may have a preference.

IDR

What is IDR?

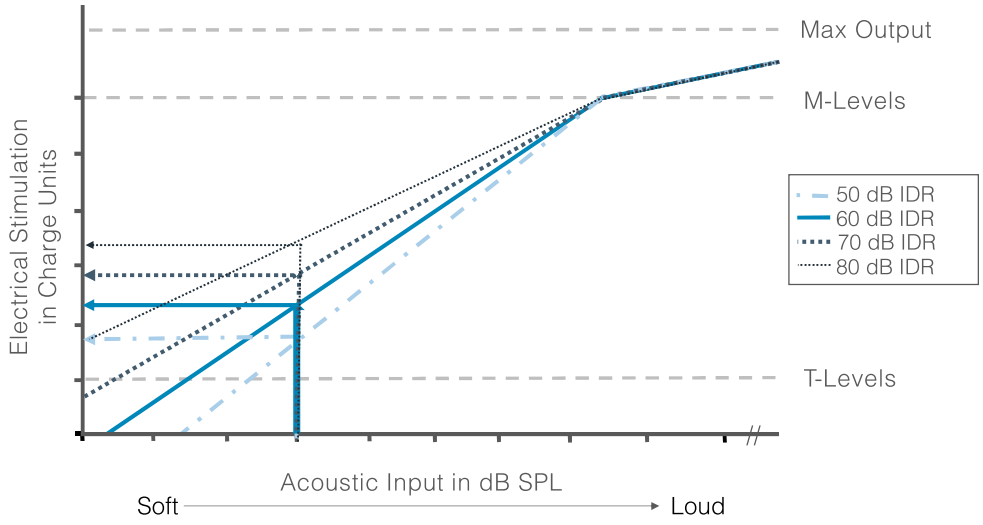
Review from Sound Processing



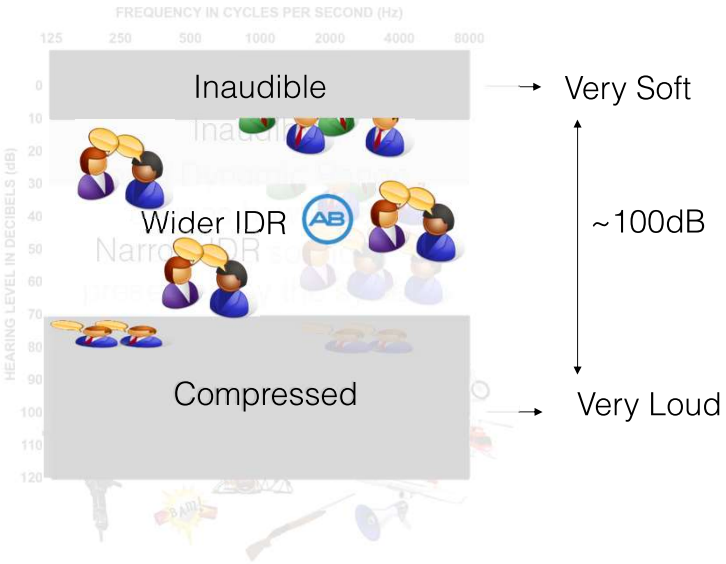
IDR

IDR (Input Dynamic Range) determines how much of the sound that is picked up by the microphone is delivered to the recipient.

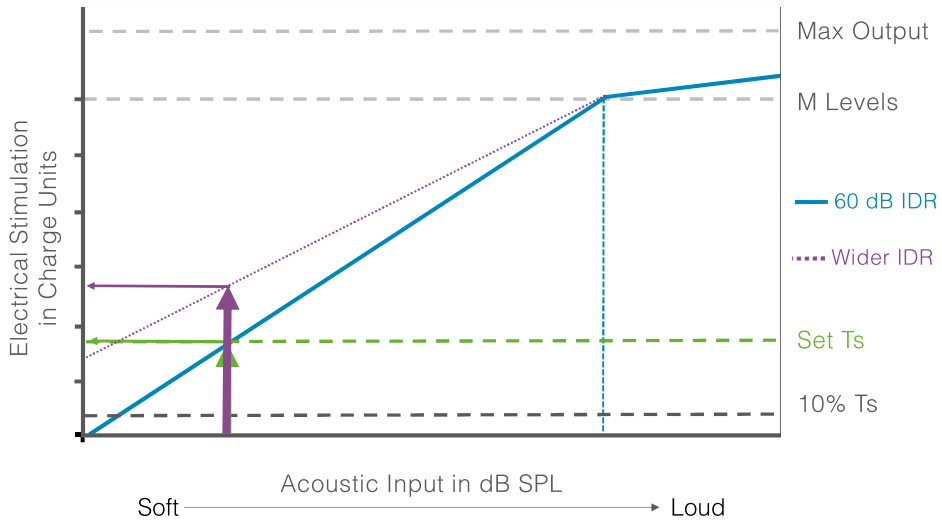
Input Dynamic Range (IDR)



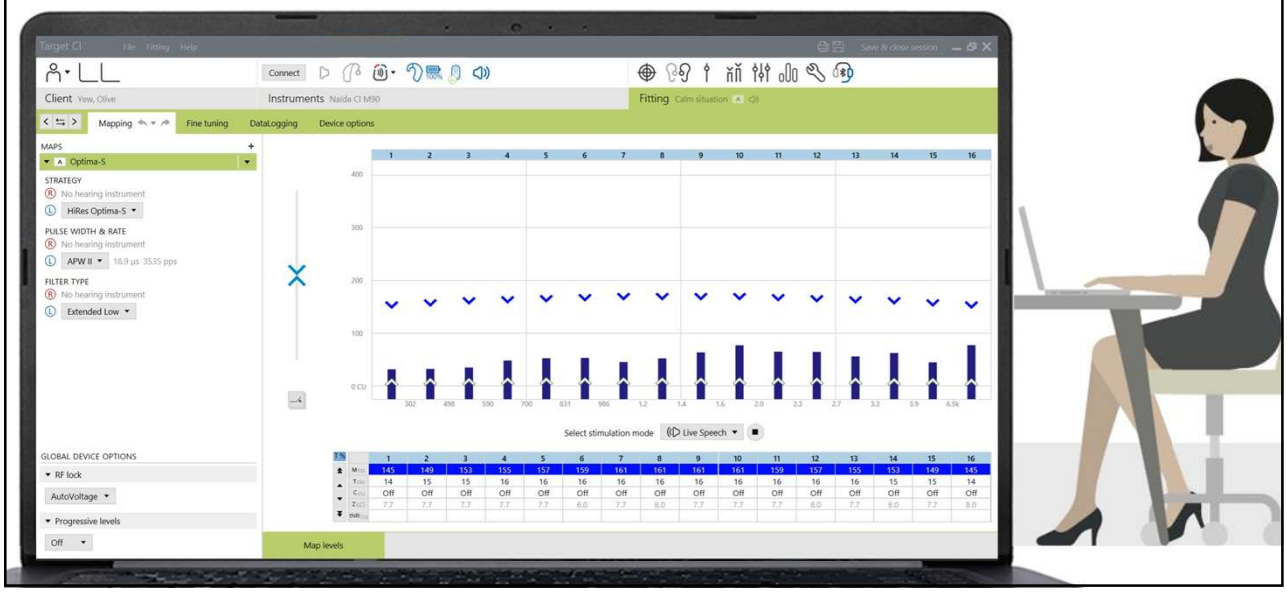
IDR



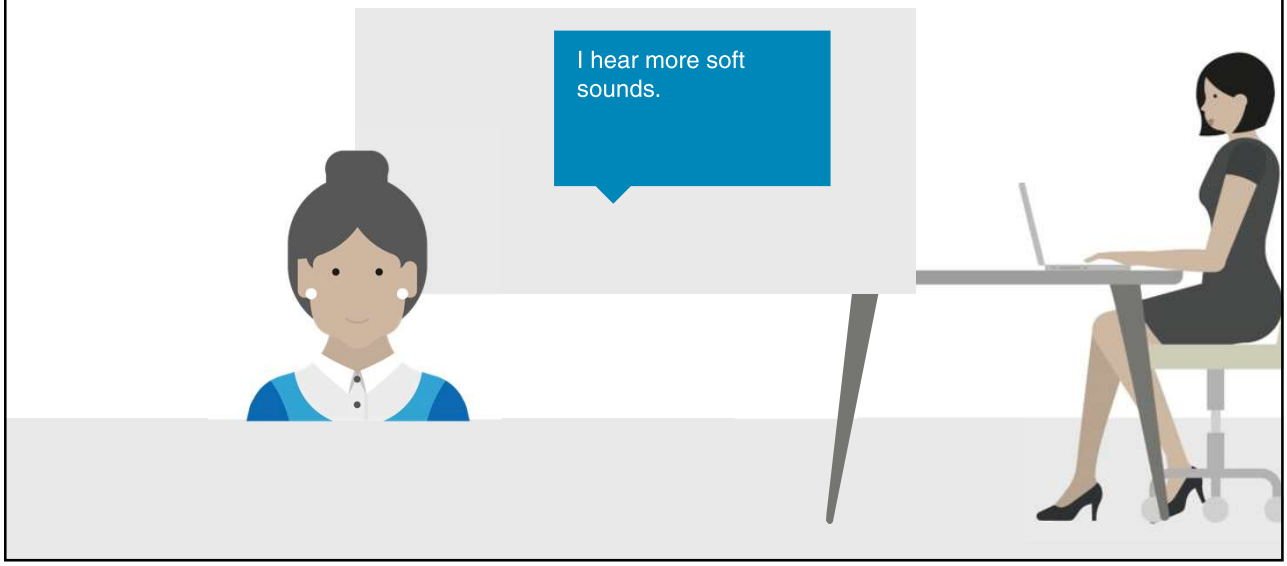
T-Levels and IDR



How Does Adjusting IDR Impact Recipients?



How Does Adjusting IDR Impact Recipients?





Electrode Management

When to Manage Electrodes

Situations or recipient reports that would lead you to manage electrodes



Change in impedances



Inadequate loudness growth

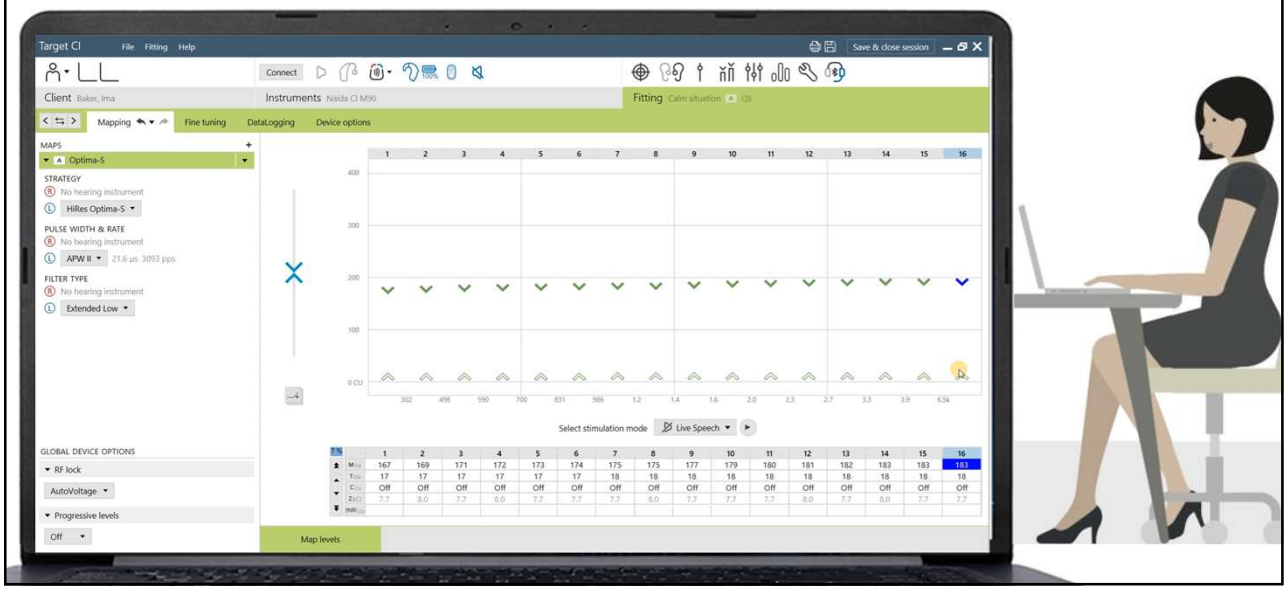


Pitch confusion

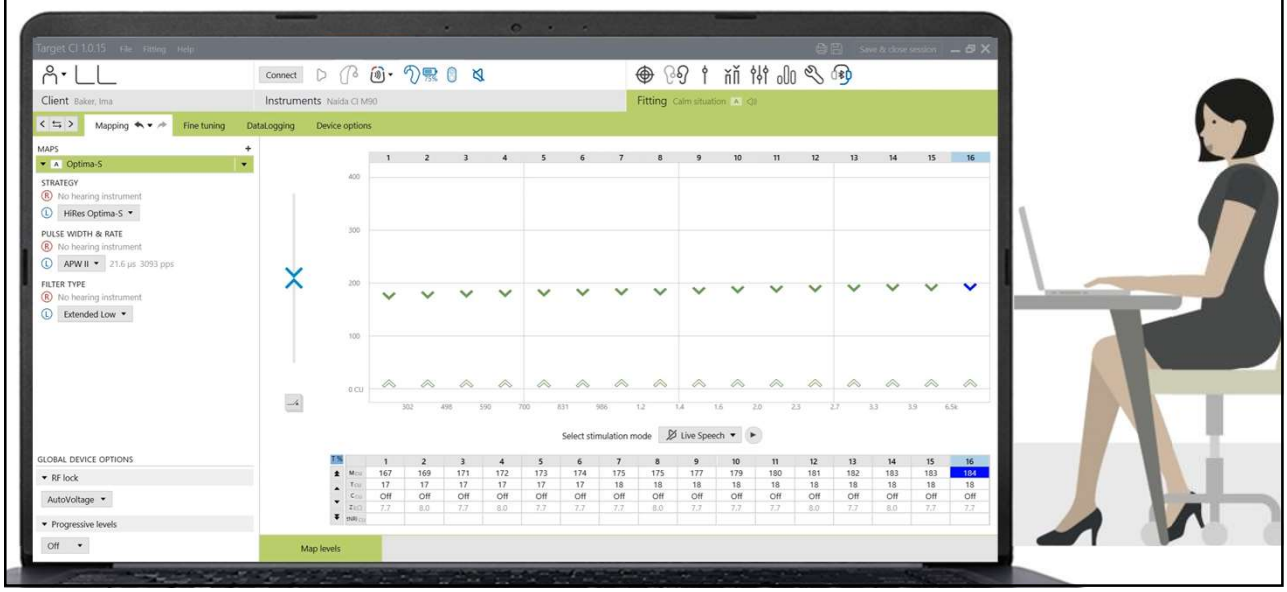


Electrode outside of the cochlea

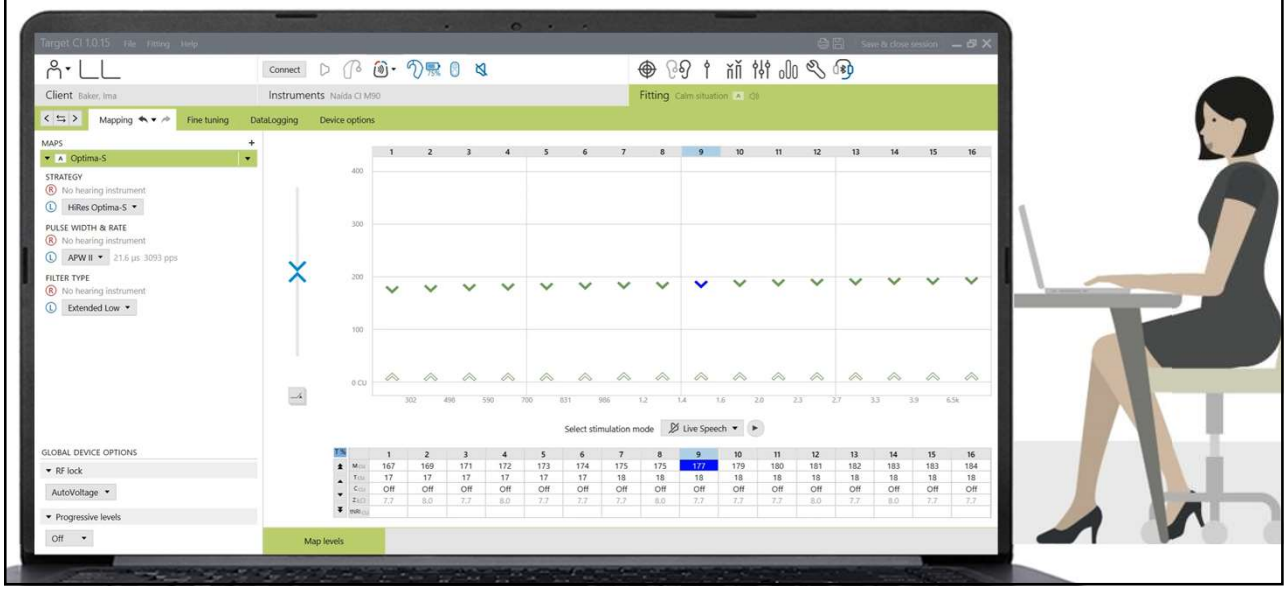
Disabling an Electrode



Clipping an Electrode



SPAN

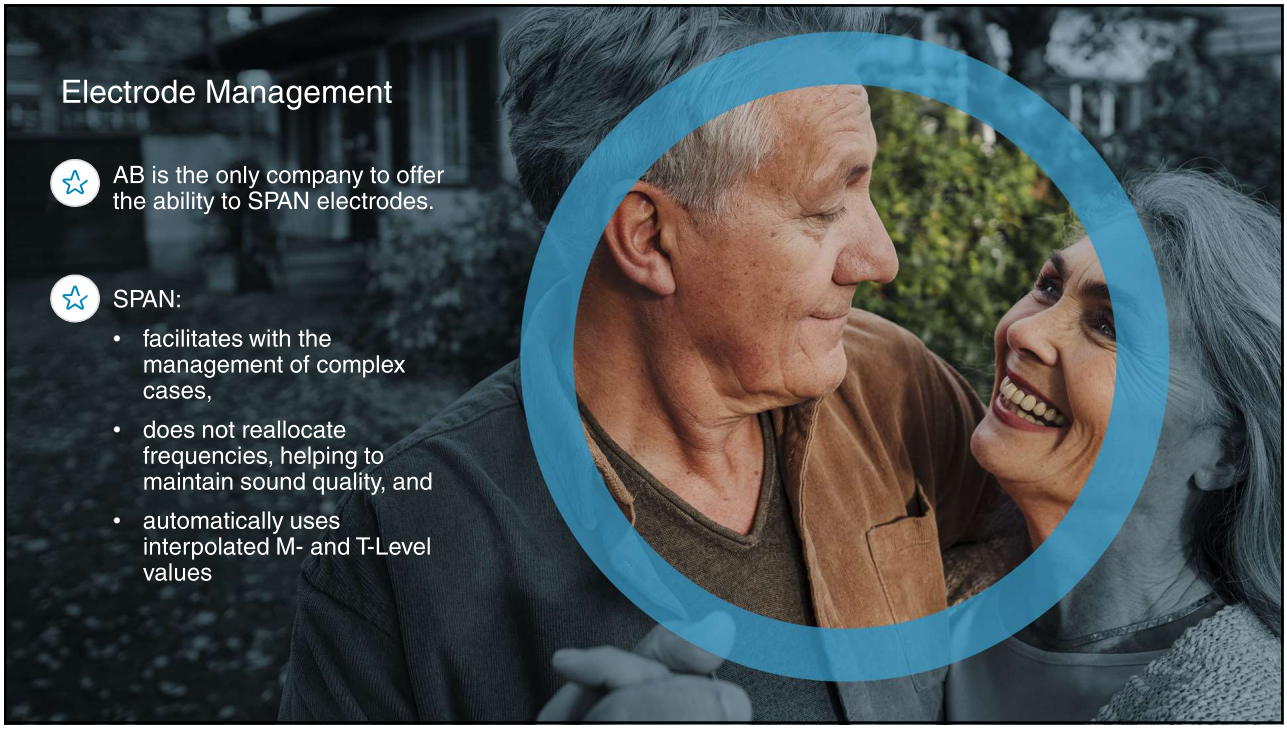


Electrode Management

AB is the only company to offer the ability to SPAN electrodes.

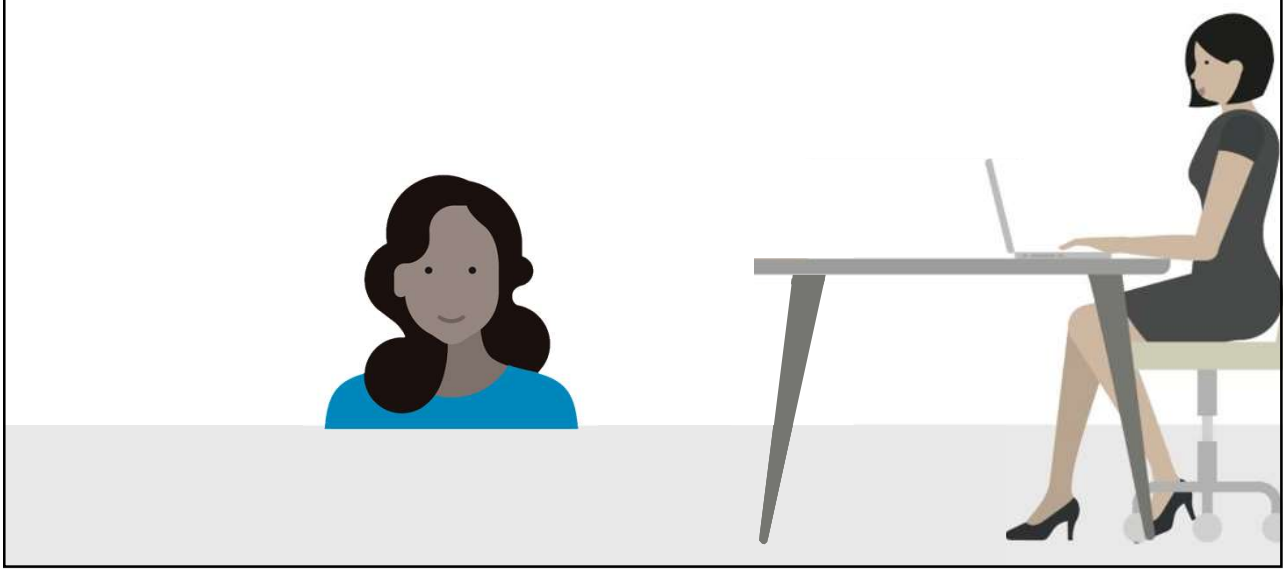
SPAN:

- facilitates with the management of complex cases,
- does not reallocate frequencies, helping to maintain sound quality, and
- automatically uses interpolated M- and T-Level values

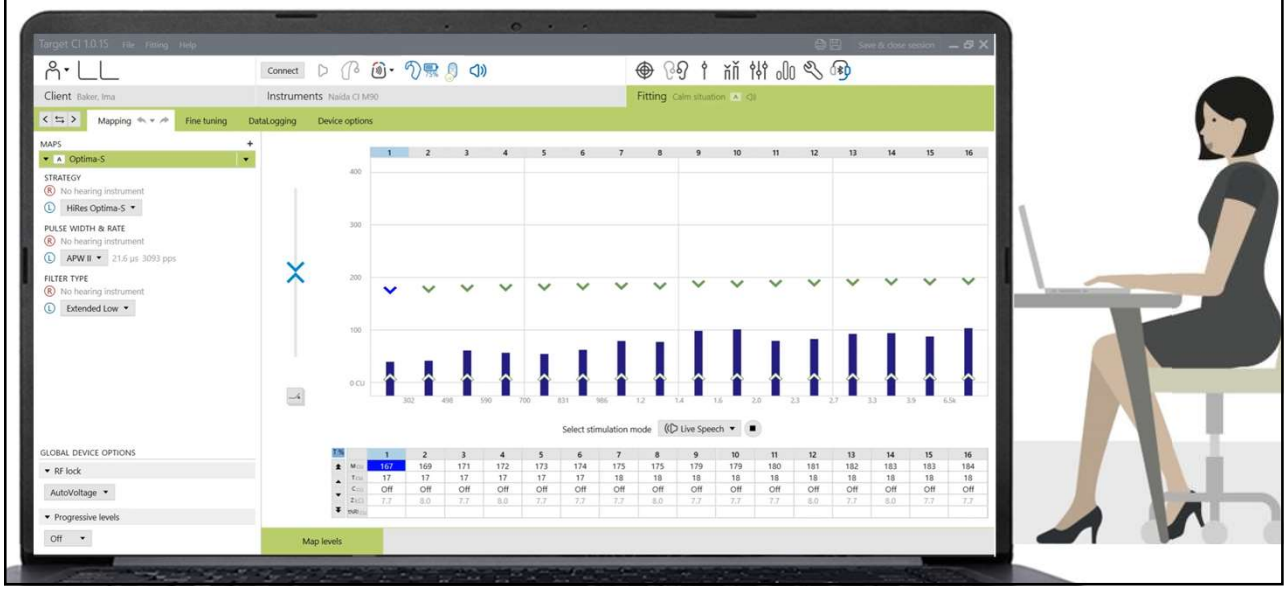


ClearVoice

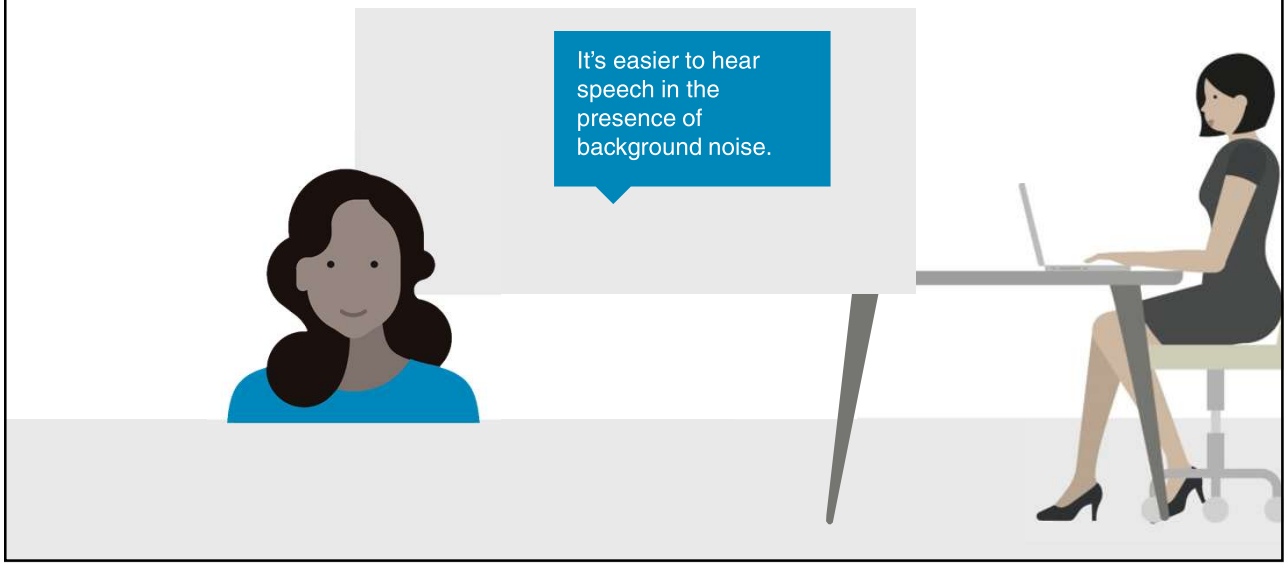
How Does Adjusting ClearVoice Impact Recipients?

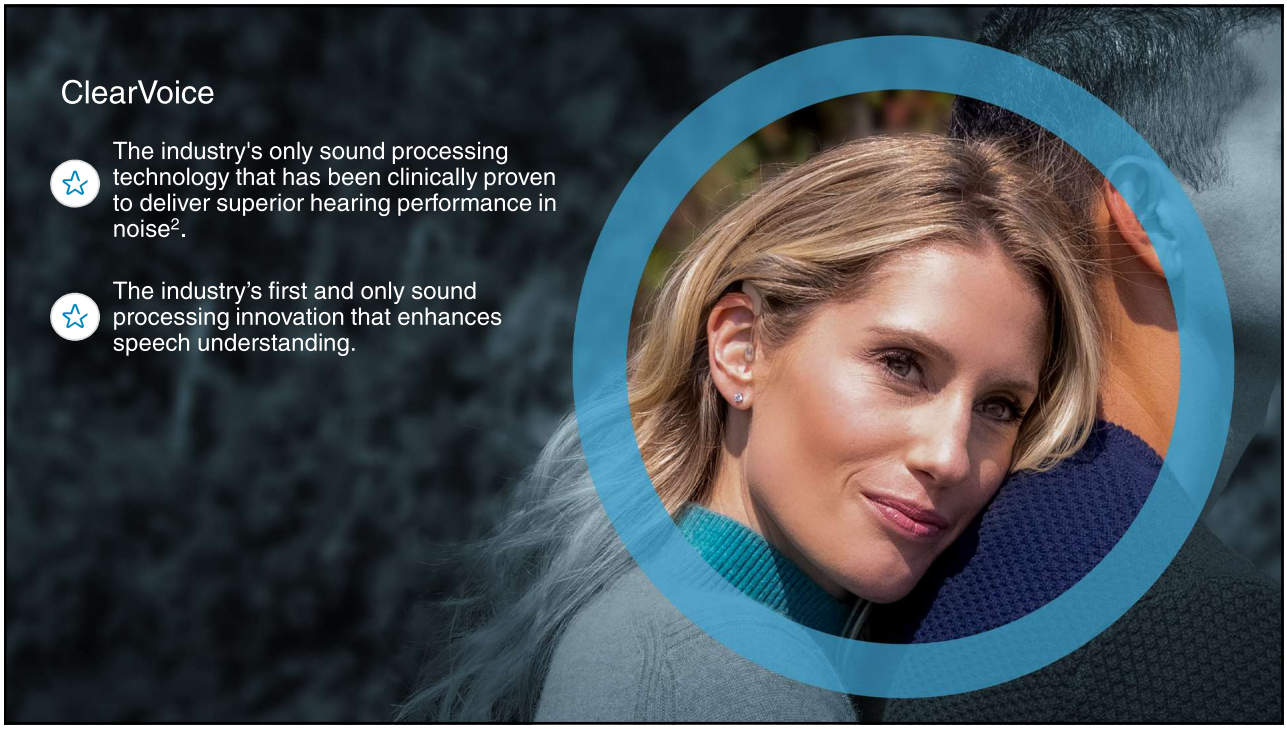


How Does Adjusting ClearVoice Impact Recipients?



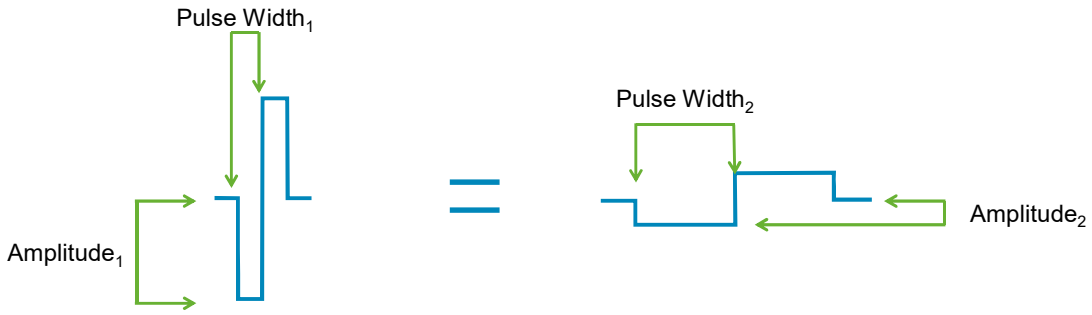
How Does Adjusting ClearVoice Impact Recipients?




ClearVoice
The industry's only sound processing technology that has been clinically proven to deliver superior hearing performance in noise[2].
The industry's first and only sound processing innovation that enhances speech understanding.

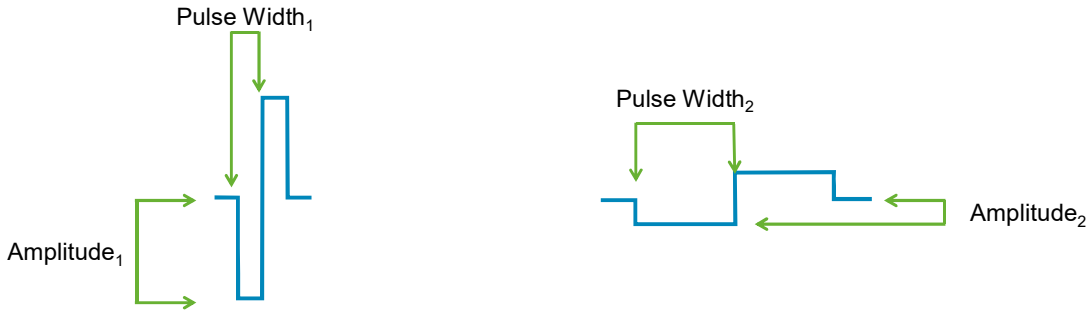
Pulse Width

Current Delivery



$Amp_1 * PulseWidth_1 = Amp_2 * PulseWidth_2$
Equal Charge & Equal Loudness

Current Delivery



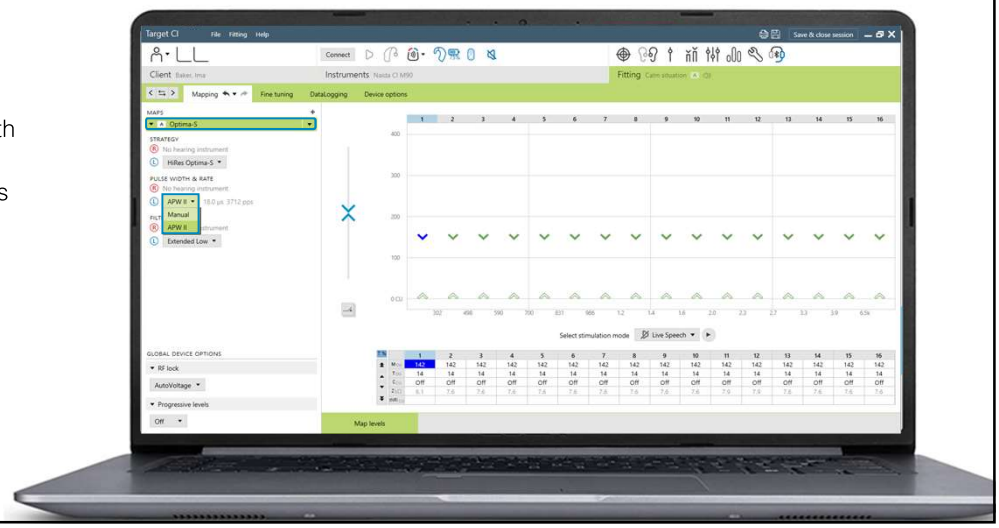
In SoundWave and Target CI, stimulation levels (M-Levels and T-Levels) are in Clinical Units (CU) and represent constant charge. The delivered charge will dictate loudness: increase charge to increase loudness.

Pulse Width

Available settings

Settings available with HiRes Optima sound processing strategies

- Manual
- APW II (default)

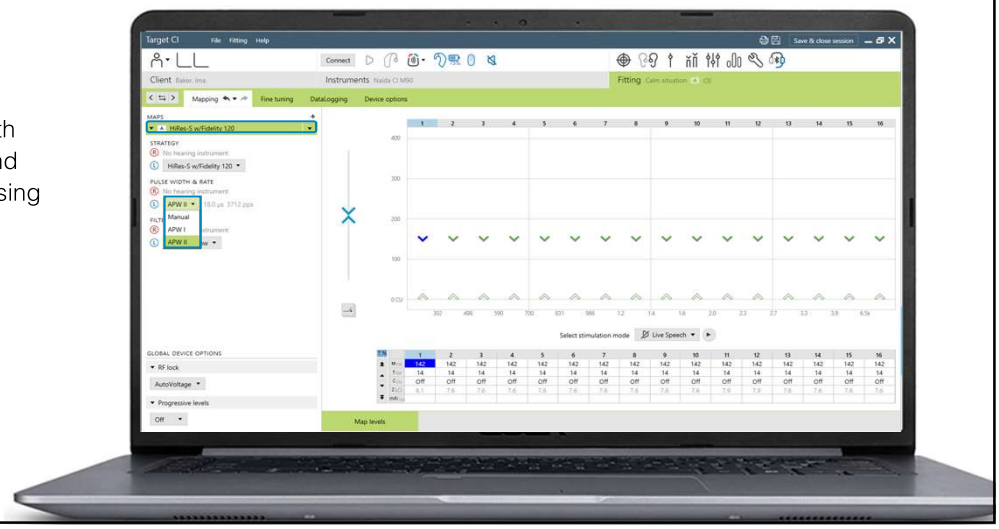


Pulse Width

Available settings

Settings available with HiRes Fidelity 120 and HiRes sound processing strategies

- Manual
- APW I (default)
- APW II

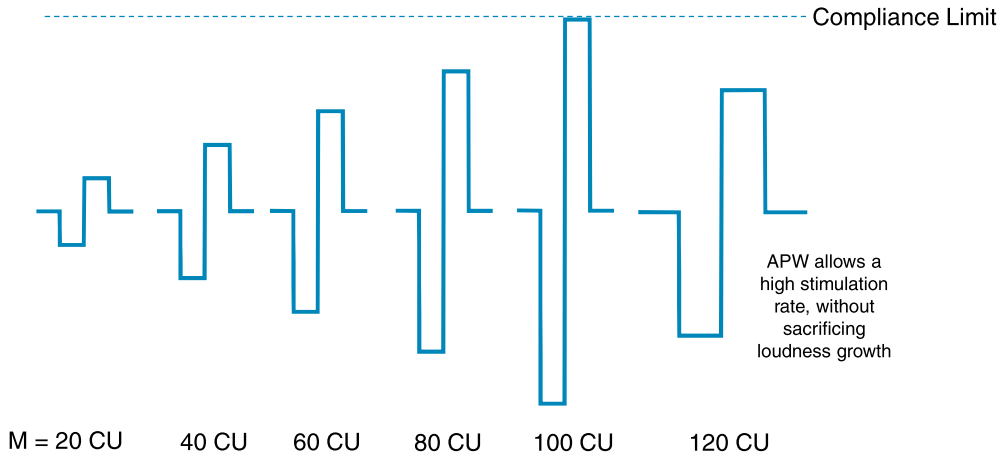


Automatic Pulse Width (APW)

APW I and APW II

- The APW algorithms are designed to optimize performance by maintaining the narrowest pulse width and the fastest rate for a selected strategy for a given patient while staying within system compliance.
- Compliance is the ability of the internal device to deliver a specified amount of current. There are limits to the amount of current that can be delivered (i.e. a maximum of 4V with HiRes Optima sound processing strategies.
- The algorithms take into account each patient's impedances and M-Levels and perform all the necessary computations to keep charge constant each time M-Levels are changed.

Automatic Pulse Width (APW)



APW I

- Sets the most narrow pulse width for the fastest rates without exceeding compliance limits
- Available with HiRes Fidelity 120 and HiRes sound processing strategies in Target CI and SoundWave

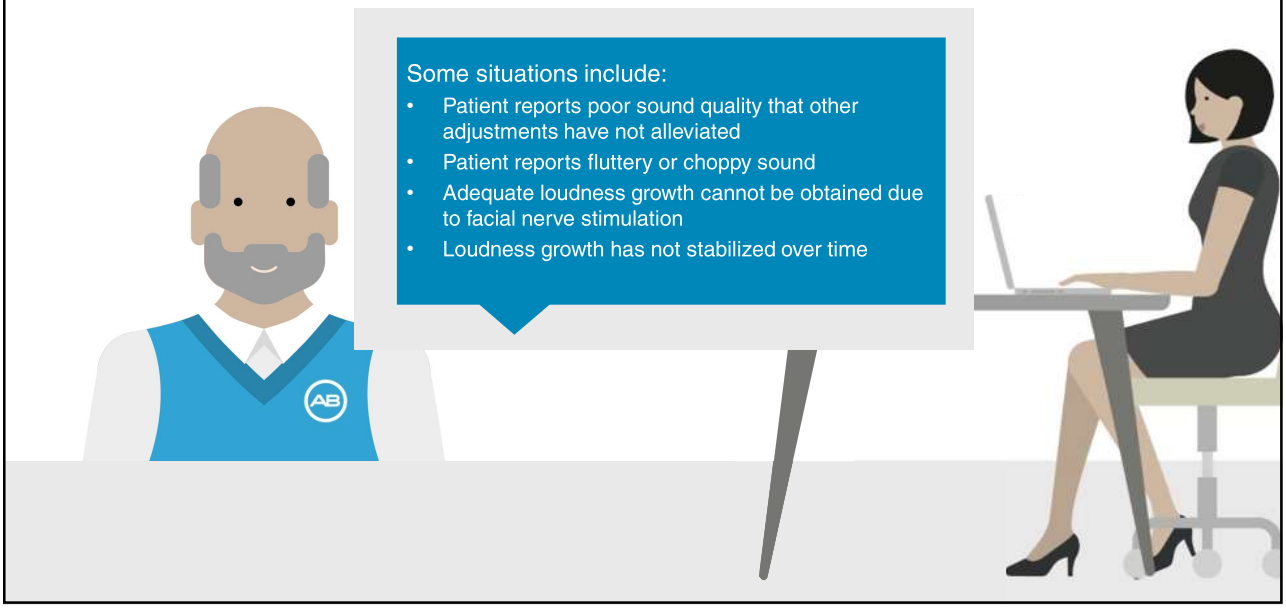
APW II

- More conservative in its determination of the minimum pulse width setting, aiming to prevent any electrode from operating out of compliance
- Is available with all sound processing strategies in Target CI and SoundWave

APW II

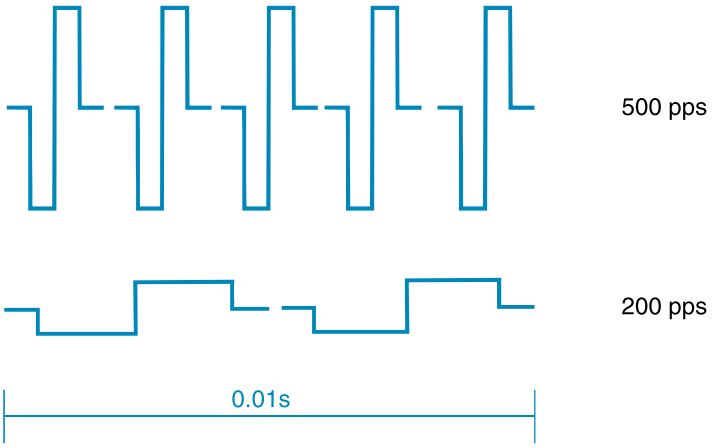
- To achieve the goal of keeping every electrode in compliance, APW II may select a wider pulse width, and therefore slower stimulation rate, for each map as compared to the APW I.
- Since HiRes Optima is operating on 4V instead of 8V, APW II manages the pulse width more aggressively to keep the system within compliance.
- APW II also provides more compliance headroom so that sound quality is less likely to be affected by fluctuating impedances (ME infection, LVAS, hormonal changes, etc.).

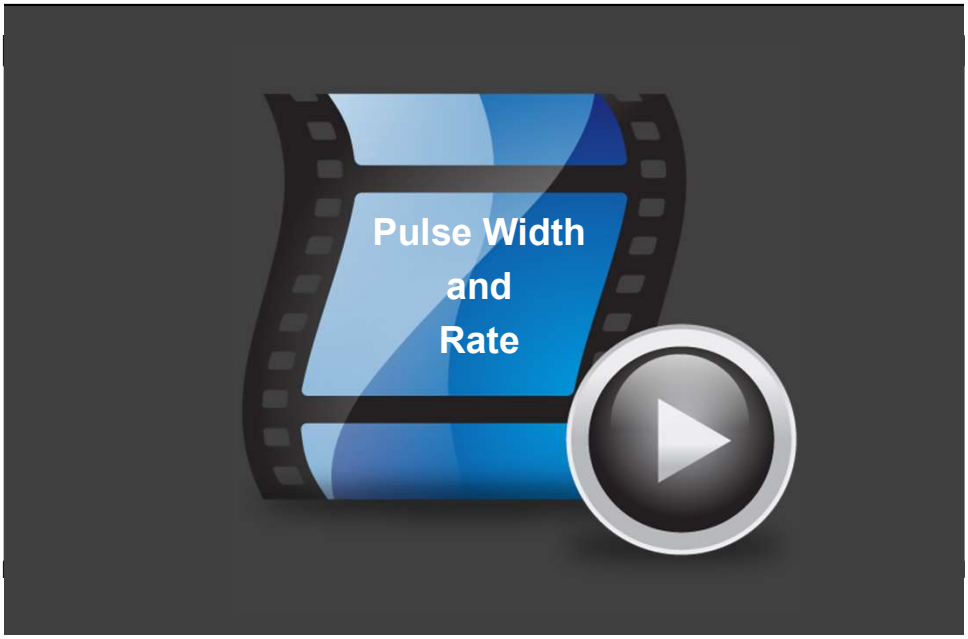
When would it be beneficial to manually adjust the pulse width?



Pulse Width

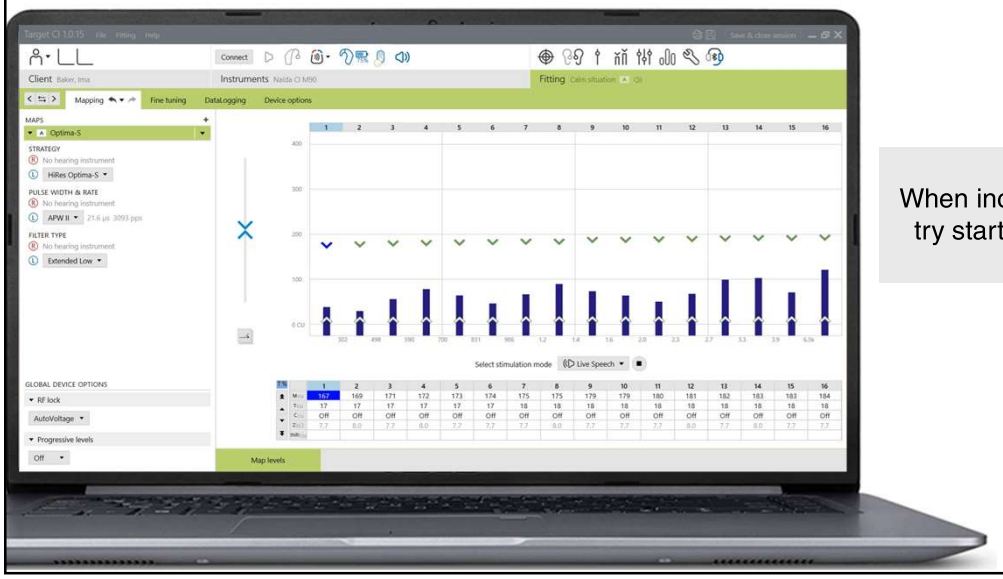
Increasing Pulse Width Decreases Stimulation Rate
(pulses per second)





Pulse Width Adjustments

Adjustments in Target CI

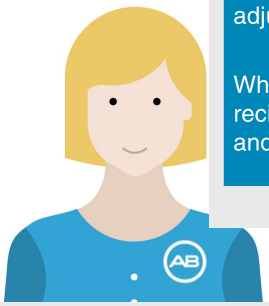


When increasing pulse width, try starting with a doubling.

How Does Increasing the Pulse Width Impact Recipients?

Because of the use of constant charge in SoundWave and Target CI, recipients should not perceive a change in loudness with pulse widths up to ~ 50 µs and should require little or no M-Level adjustments with an increase in pulse width[1].

When the pulse width is increased above 50 µs, the recipient may perceive the overall loudness as softer and require a slight increase in M-Levels.





Pulse Width

- APW I and APW II automatically manage the pulse width as M-Levels are increased.
- AB does not require re-measurement of M-Levels when manually adjusting pulse width.



Power Management

Power Management

Why is power management in our systems important?

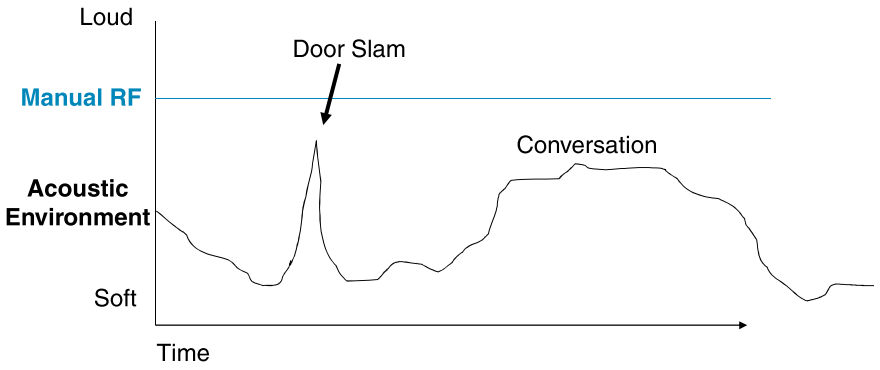
- Maintain audibility of sounds in all listening environments
- Provide usable and practical battery life

Power Management Terminology

- What is RF?
  - Radio Frequency: A transcutaneous electromagnetic link between the external sound processor and the ICS to transmit power and data
- What is RF Lock?
  - Established communication between the ICS and the sound processor
- What is Tank Voltage?
  - The amount of charge held within the cochlear implant after power up
- What is Compliance Voltage?
  - The maximum voltage held within the ICS

Power Management

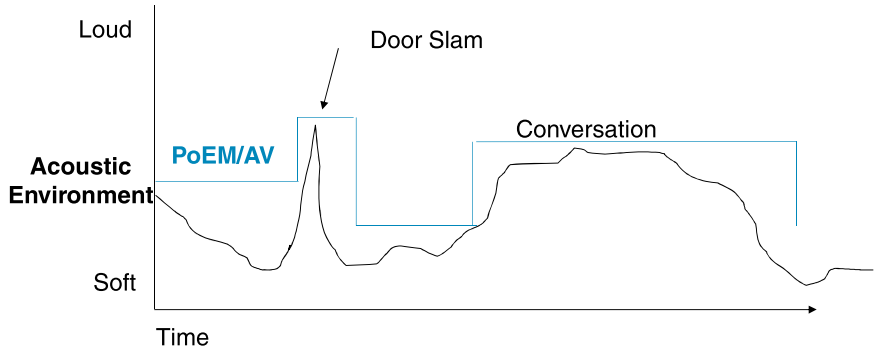
Manual versus Automatic



Manual RF applies the **same amount of power over time** and across the acoustic environment.

Power Management

Manual versus Automatic



PoEM/AutoVoltage monitors the acoustic environment & dynamically manages the power level.

Power Management with AB

PoEM

Power Estimator

- Available with HiRes and HiRes Fidelity 120 strategies in SoundWave
- Proactively adjusts the power delivery to the implant without relying on the amount of power present in the implant
- Power needs are calculated in a PoEM table
- Goal: maintain a target level vs. monitoring for a dip in tank voltage

Power Management with AB

AutoVoltage

- Available with all strategies in Target CI and HiRes Optima strategies in SoundWave
- Dynamically manages the power level to maintain lock efficiently while optimizing battery life
- Operates within 4V for improved battery life (versus 8V)

Power Management with Marvel CI

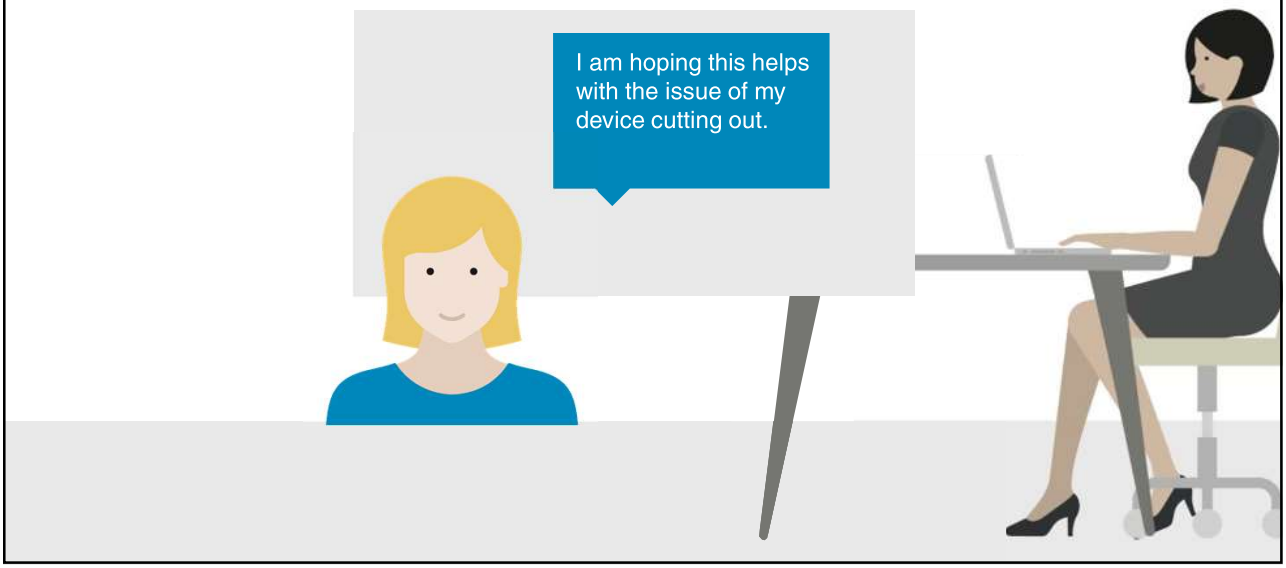
Instant start-up and program change

- Marvel CI's AutoVoltage calculates power needs for each individual while they are listening, taking into account the recipient's specific environment
- AutoVoltage learns the recipient's RF needs across time and environments and dynamically adjusts RF power to optimize battery life for each individual

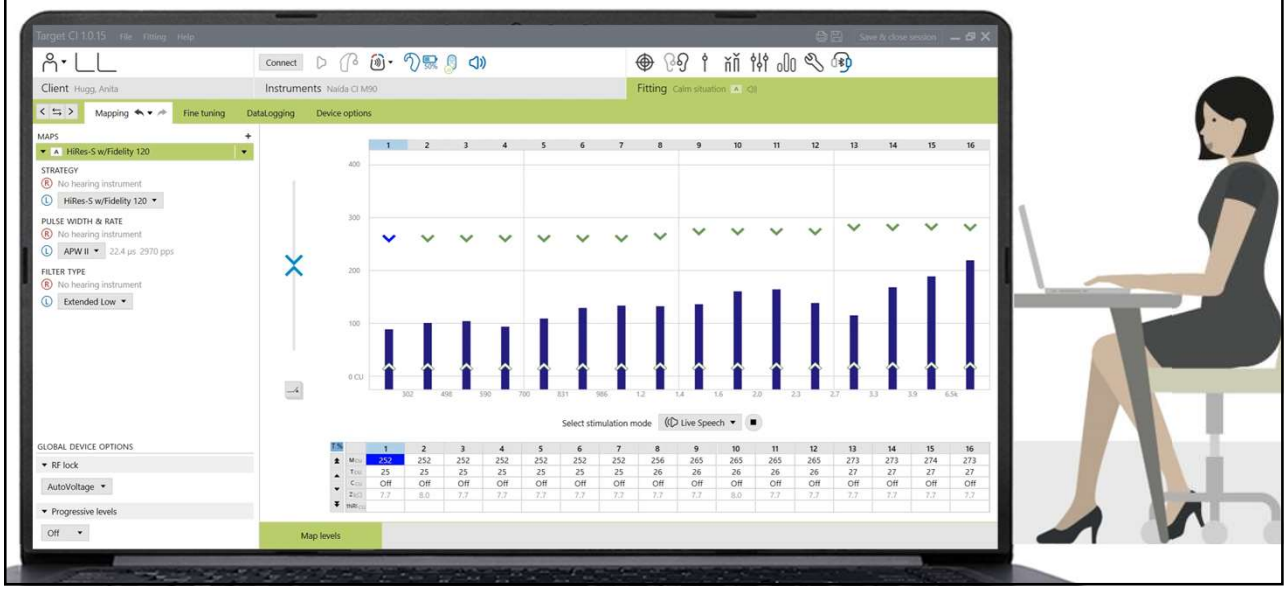


Pro Tip: Marvel CI's new AutoVoltage calculation allows recipients to experience instant start-up and program changes while optimizing battery life.

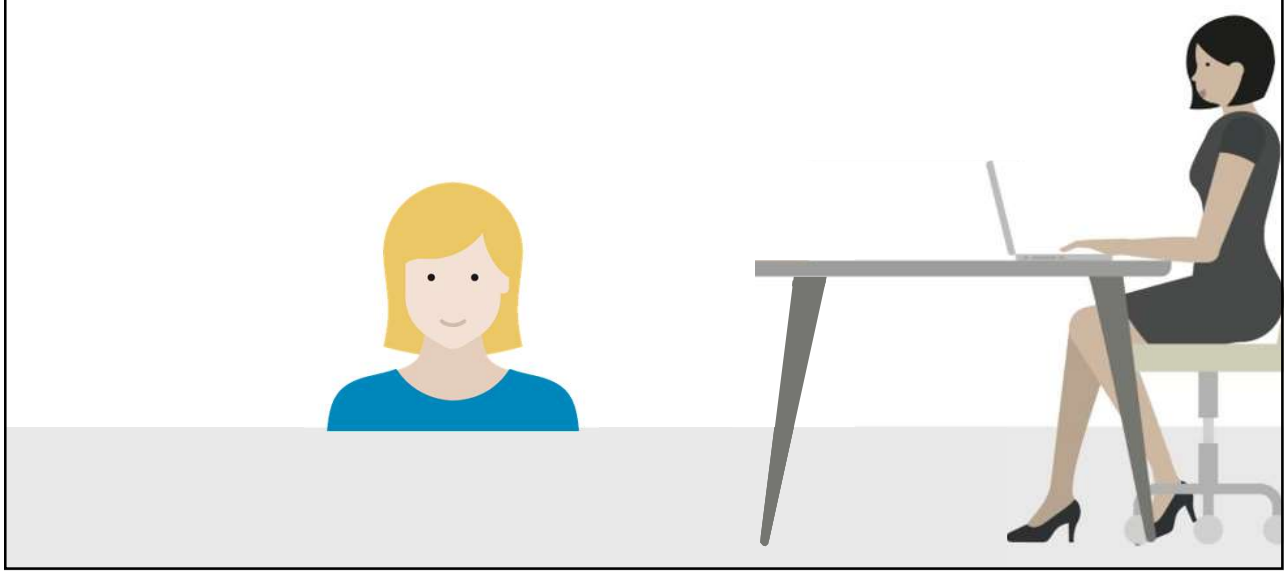
How Does Adjusting Power Management Impact Recipients?



How Does Adjusting Power Management Impact Recipients?

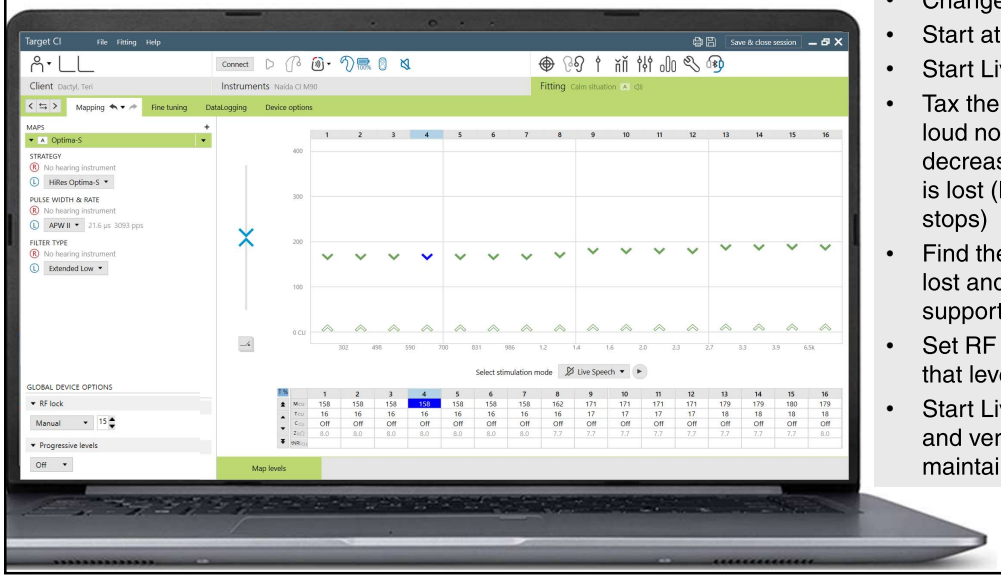


How Does Adjusting Power Management Impact Recipients?

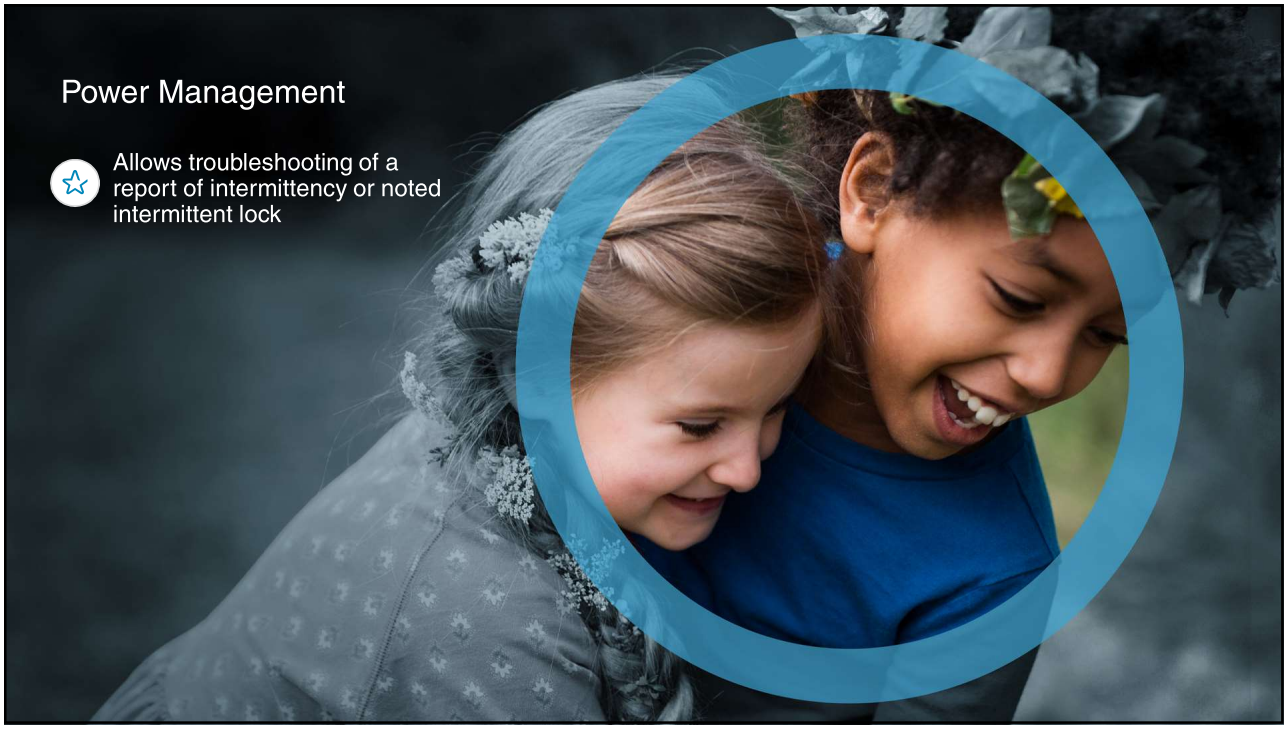


How to Adjust RF Lock

Adjustments in Target CI

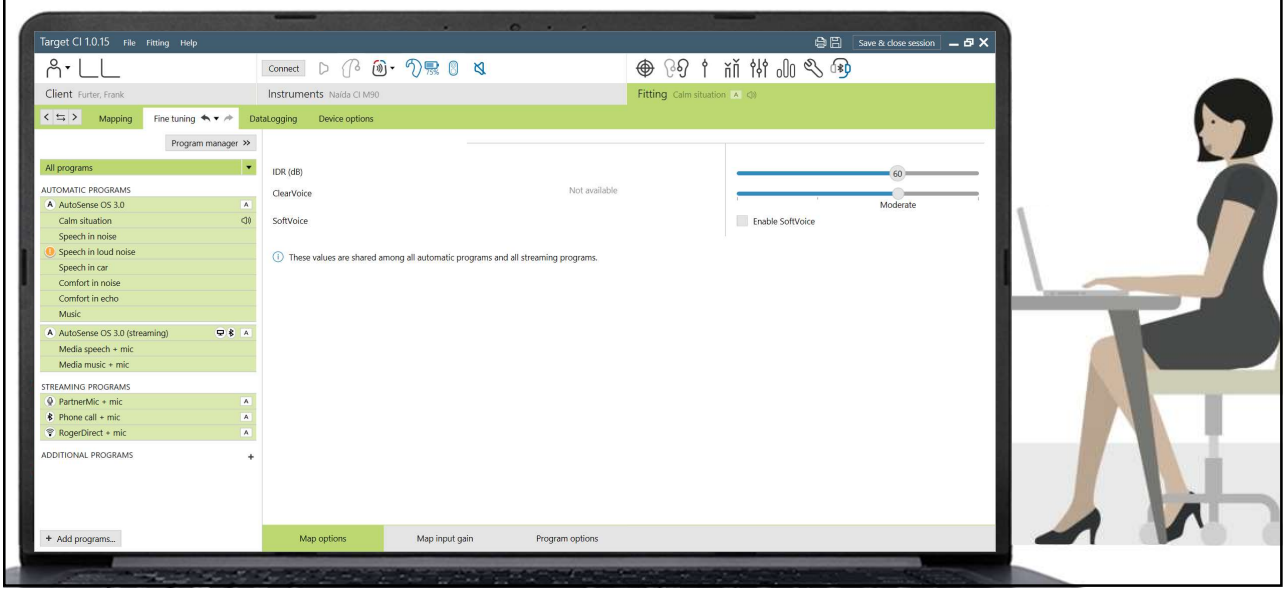


- Change RF Lock to **Manual**
- Start at the default RF Lock of 7
- Start Live Speech stimulation
- Tax the system by making a loud noise (i.e. clapping) and decrease the RF value until lock is lost (Live Speech Stimulation stops)
- Find the level at which lock is lost and stimulation cannot be supported
- Set RF value two steps above that level
- Start Live Speech Stimulation and verify consistent lock is maintained

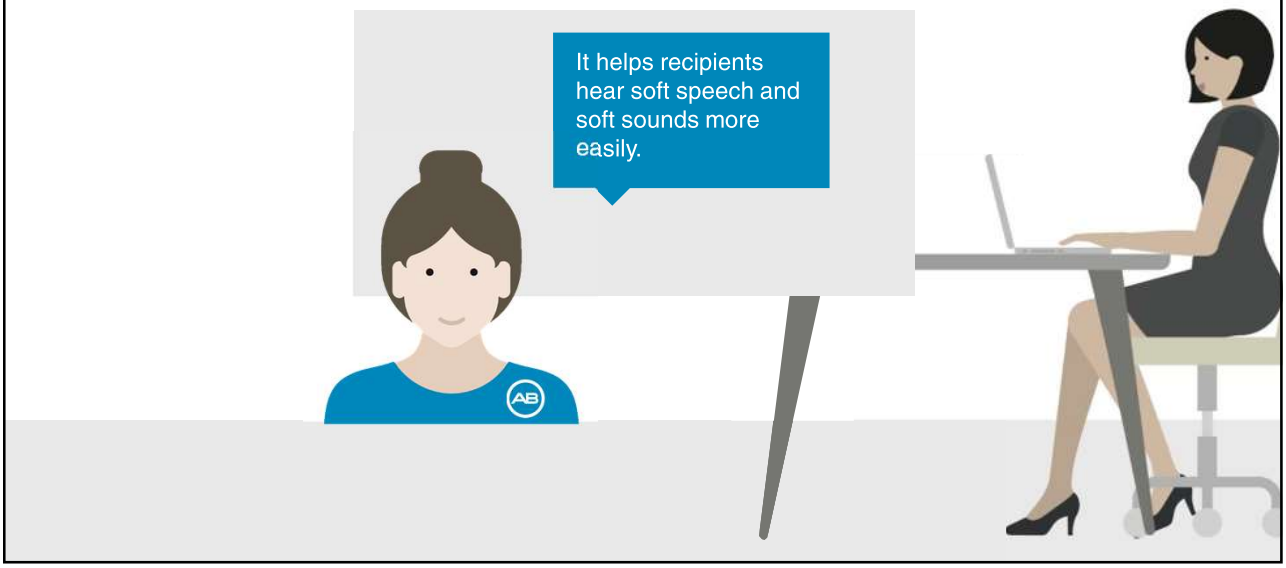


SoftVoice

How Does Adjusting SoftVoice Impact Recipients?



How Does Adjusting SoftVoice Impact Recipients?



What Do I Do if I'm Still Stumped?

- Detailed history
- RADIUS patient file
- Equipment
- Mentor, experienced clinician, AOC



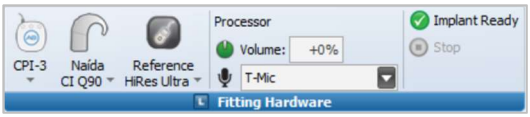
References

1. Wolfe, J., & Schafer, E. C. (2014). Programming cochlear implants. Pgs. 110-248.
2. Advanced Bionics. (2012) ClearVoice Clinical Results White Paper.

Programming Naída™ CI in SoundWave™

SoundWave offers an intuitive fitting workflow for clinical efficiency and supports fittings based on each recipient's unique lifestyle and listening needs. Follow the steps below to program Naída CI.

Open SoundWave and Connect the Fitting Hardware



Create a New Patient

- Select New in the Action Pane
- Enter the required Patient Information (* indicates required data must be entered)
  Note: Test Patient should only be used for the purposes of training or troubleshooting. Once this option is set, it cannot be undone.
- Select Ok

Enter the Implant Information

- Place the headpiece on the implant site to connect to the internal device; the implant information will auto-populate
- Input any additional required information (* indicates required data must be entered)
- Select Ok

Condition Electrodes and Review Impedances

Conditioning electrodes introduces a very low level stimulation to all electrode contacts to stabilize impedances prior to programming. Conditioning should be completed:

- Prior to interoperative testing
- Prior to initial stimulation
- Prior to stimulating an electrode that has been turned off for a period of time

Impedances provide information regarding the electrode status. Impedances will run automatically by default when connected to the patient's implant.

Color	Impedance Type	Indication
Green	Valid	Impedance value is within acceptable limits.
Purple	Short	Impedance value is <1kΩ. Electrical current is traveling along unintended path.
Yellow	Open	Impedance value is >30kΩ. Normal path of current has been interrupted.
Gray	Invalid	No impedance records are available. Default impedance values (7.5kΩ) were assigned to all electrodes.

Initialize the Sound Processor

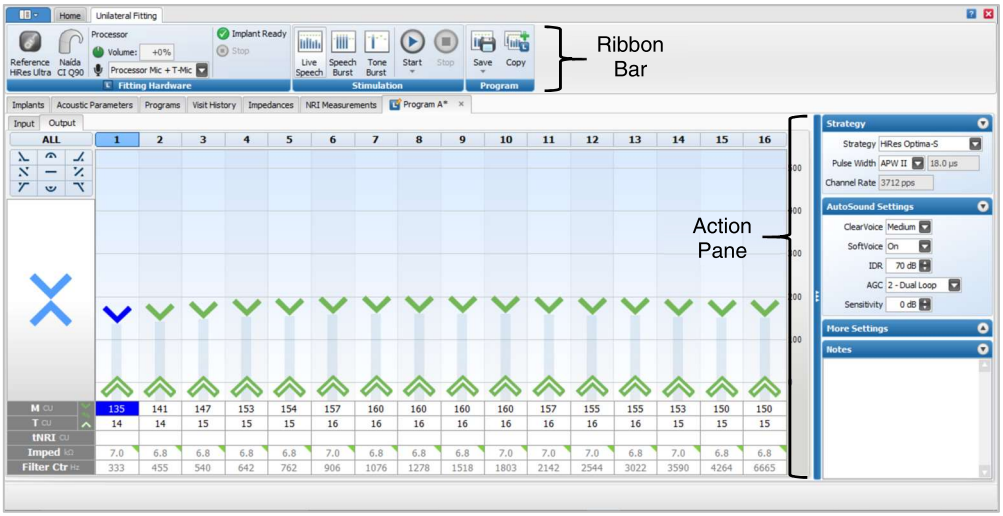
- Initialize the processor
- Choose the appropriate Naída solution for each recipient

  Note: Available options will populate based on configuration of connected hardware.

Unilateral Initialization For unilateral use; Required for Acoustic Mode		Left		Right
Bimodal Initialization Enables bimodal communication with Naída Link HA		Left + HA Right		Right + HA Left
CROS Initialization Enables communication with Naída Link CROS		Left + CROS Right		Right + CROS Left
Bilateral Initialization Allows either processor to be worn on either ear		Bilateral		

Create a Baseline Program

- In the Program Tab, select a New Right or New Left program
- Set the electrical programming parameters in the Action Pane
- Set M-Levels using Live Speech, Speech Burst, or Tone Burst stimulation
  Note: M-Levels should be set at most comfortable (Level 6 on the Loudness Scale).



- Verify comfort using Live Speech stimulation
- Save and Close the program

Manage the Processor Pane

- Place the baseline program in slot 1
- Add program slots based on the recipient's unique listening needs, and apply a program intention



Program Intention – program features applied based on intended use

- Select the preferred Slot Intentions based on the recipient's listening needs
  Note: AutoSound OS is the default intention for program slot 1, but can be changed if desired
- Features for each Slot Intention may be edited from the program slot drop-down menu on the left

Progressive Programs – progressively louder programs help with device acclimatization following device activation

- If creating progressive programs (optional), select Create Progressive Programs from the program slot drop-down menu on the left and select the desired increment steps (5, 10, or 15 CU)

Download to Processor

- Select Download to save the programs and settings to the recipient's processor

  Note: Use the drop-down menu next to Download to Estimate Battery Life, if desired. Or, select Automatic Battery Estimates in Preferences to run automatically for every recipient.

Review Data Logs On Subsequent Visits

- Data Logs are automatically retrieved from a Naída CI processor if at least one day has passed since it was programmed
- To review Data Logs:
  - Open the Patient File
  - Connect the Naída CI processor and select the Data Logs Tab

If you require further support, please contact your local Advanced Bionics representative.



Active Insertion Monitoring (AIM)

Quick Guide

A Sonova brand

Knowledge Check

AIM

Review from pre-learning:
What is the AIM system

How does it provide benefit to surgeons? To clinicians?



What does the AIM System offer?

1

Real-time ECochG Measurement

Monitoring the function of the patient's cochlea during electrode insertion

2

Objective Audiometry

Fast and automated objective measurement of thresholds

3

Objective Measures Suite

Designed for intra-operative and post-operative clinical use

3

Knowledge Check

AIM

Review from pre-learning:

The AIM System takes the ECochG measurement and plots the _____ recorded from the implant during cochlear implant surgery.

a. Summating Potential (SP)
b. Compound Action Potential (CAP)
c. Cochlear Microphonic (CM)
d. Summating Microphonic (SM)



Knowledge Check

AIM

Review from pre-learning:

The AIM System is able to be used with which of the following Implants (multiple answer)?

a. HiRes Ultra 3D
b. HiRes Ultra
c. HiRes 90K
d. CII
e. C1

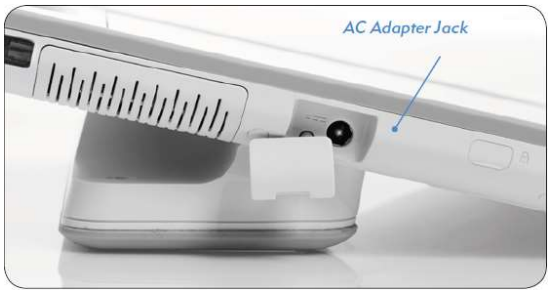


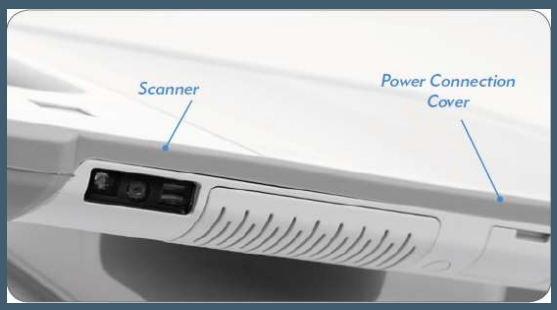
Table of Contents

- Getting Started
- ECochG Insertion
- Electrode Sweep
- ECochG Threshold
- Impedances
- NRI Measurements
- ESRT Measurements
- AIM to SoundWave Data Transfer
- Exporting Data




Power
Scanner On/Off
POWER
SCANNER


AC Adapter Jack


Scanner
Power Connection Cover


Power LED Indicator
Scanner Power LED Indicator


Connector cover


AC Adapter Connected to AIM System
Advanced Bionics


Micro HDMI
0.25" Audio Jack


Power Cord
AC Adapter

Default Login Information

Initial Password: Pass123!

Default answer to all security questions is: AB

9

Icons in the Navigation Panel



Home

ECochG Insertion

Electrode Sweep

ECochG Threshold

Impedances

NRI Measurements

ESRT Measurements

Summary

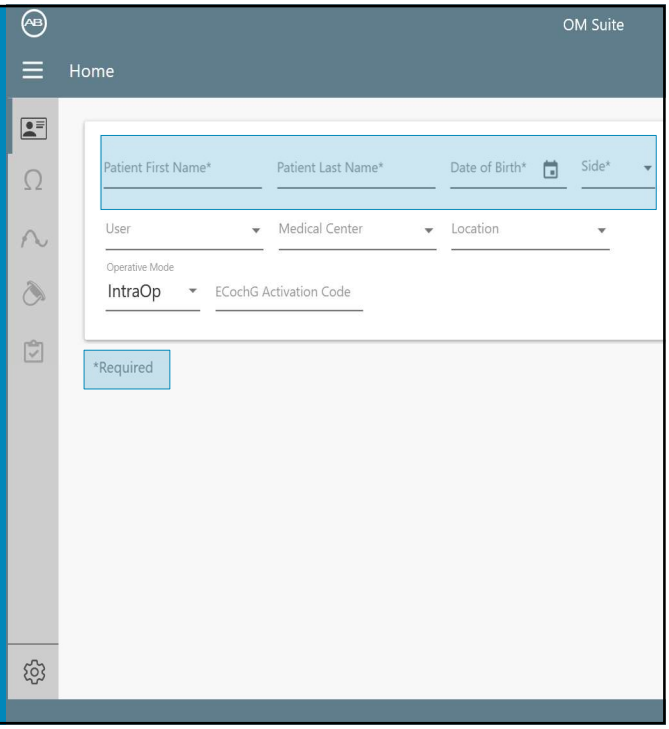
Settings

Only appear if an ECochG Activation Code is used

10

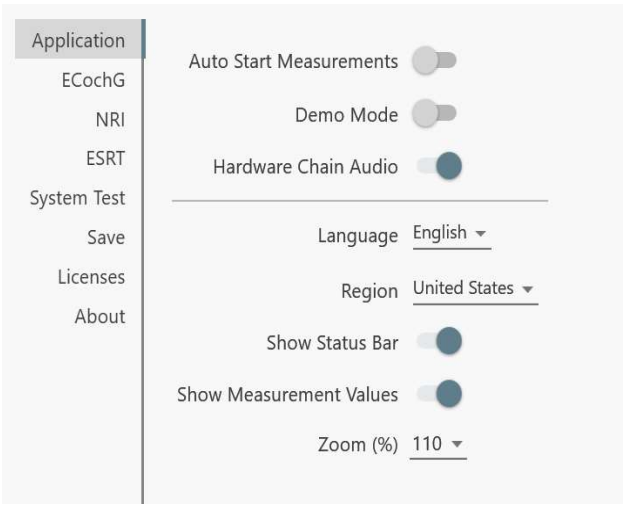
Startup

- Launch the application
- Enter demographic information on the “Home” Screen
- Select mode, Intra-Op for use during surgery and Post-Op for clinical use
- Enter ECochG activation code to enable electrocochleography measures, i.e., ECochG Insertion, Electrode Sweep, and ECochG Thresholds

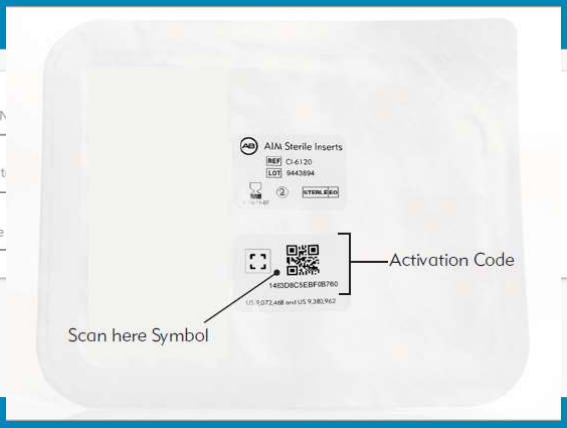


Application Settings

- Auto Start Measurements: Do you want AIM to run automated when you hit next?
- Demo Mode: Leave off ALWAYS. This can interfere with your ability to run ECochG and Save. Please contact your local Clinical Specialist if you have questions about Demo Mode
- Hardware Chain Audio: Do you want to be alerted if the headpiece isn’t in the perfect ICS site?



Entering Patient Data



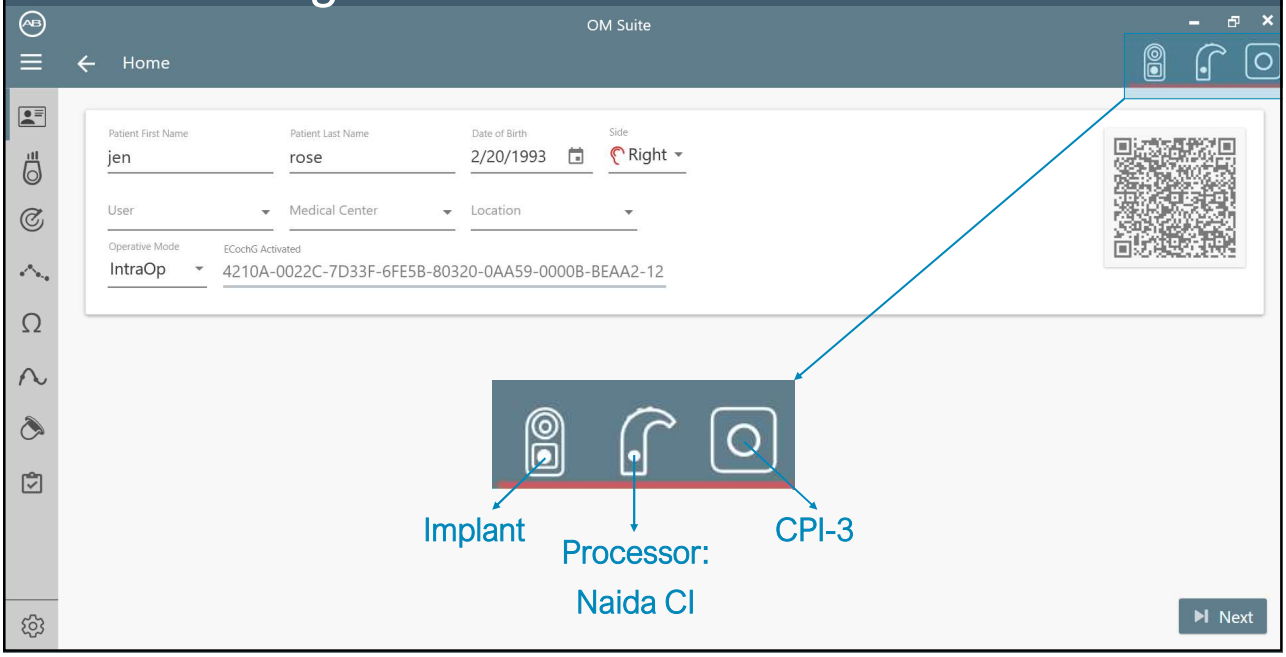
Now Scan the ECochG Activation Code

(If you are running an ECochG measurement. If not, hit next on the bottom right)

13

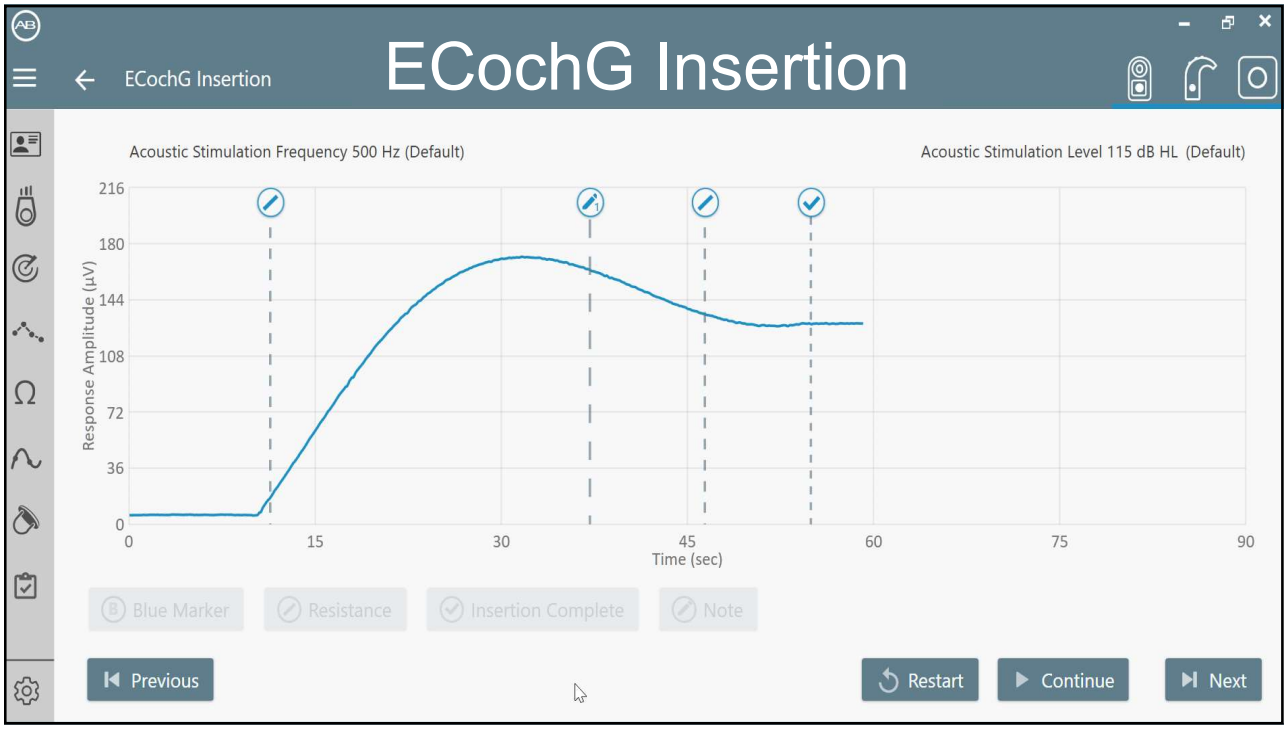
JS2

After entering data on the “Home” screen click “Next”



Slide 14

JS2 Look up camera sleeve- Rachel's quick tips
Johnson, Stephanie, 5/21/2021



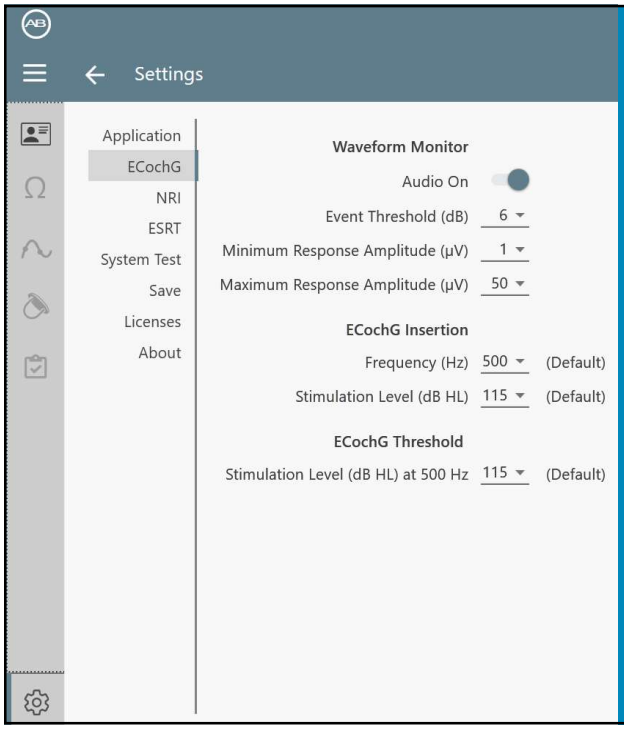
ECochG Insertion

- Only available when using Intra-op mode
- With the system fully assembled, the sound processor locked to the implant, and the sterile insert placed in the ear canal, click “Start” to begin the ECochG measurement
- Acoustic stimulation parameters are displayed on the ECochG Insertion screen. These values can be modified in settings when not making an ECochG measurement

- Use the blue markers at the bottom of the screen to annotate the measurements as desired
- Note can be clicked on to add a custom note
- Click “Stop” to end the ECochG Insertion Measurement
- Click “Next” to advance to the Electrode Sweep or use the navigation panel to select the desired measurement
- *Note: AIM has a “stud finder” feature that helps to find the best communication between UHP and ICS, indicated by the ICS icon. If you see a cross hatch icon acr ICS, you are also n the measurement*



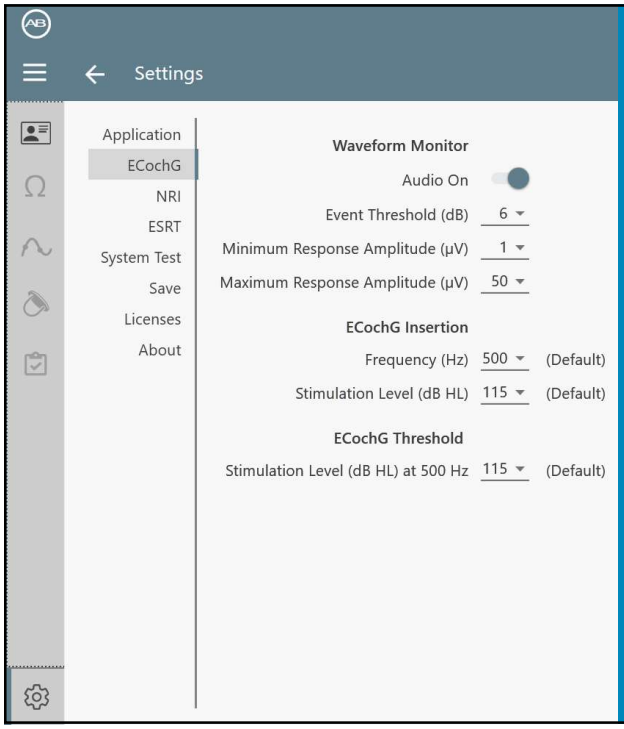




ECochG Insertion Settings

- Audio On: Auditory feedback for surgeon on cochlear microphonic feedback during insertion
- Event Threshold: The change in amplitude of the cochlear microphonic; when the Event Threshold is exceeded, a “knocking” sound will be played
- Minimum Response Amplitude: Below this value, a steady low-pitched noise indicates the system is operating, but the amplitude has not been exceeded
- Maximum Response Amplitude: Above this value, a steady high-pitched noise indicates the system is operating and the amplitude is above the specified maximum

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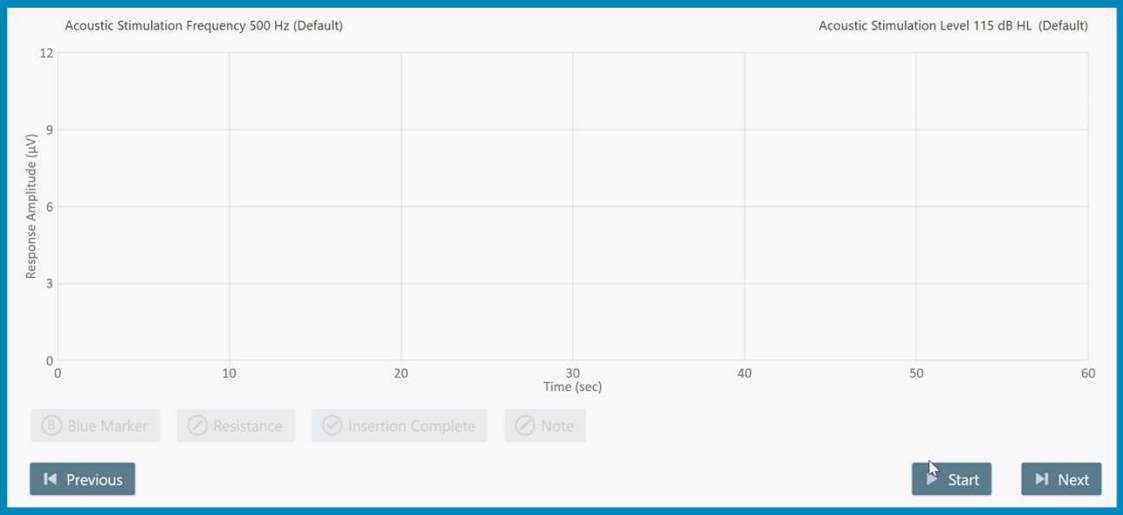


ECochG Insertion Settings

- Between the minimum and maximum response amplitude, the system plays a sound of increasing pitch to indicate the amplitude of the cochlear microphonic
- The waveform monitor will play sounds going up a musical scale if the cochlear microphonic amplitude increases and down a musical scale if the amplitude decreases
- If the Event Threshold is exceeded, the system will immediately play the “knocking” sound to alert the user

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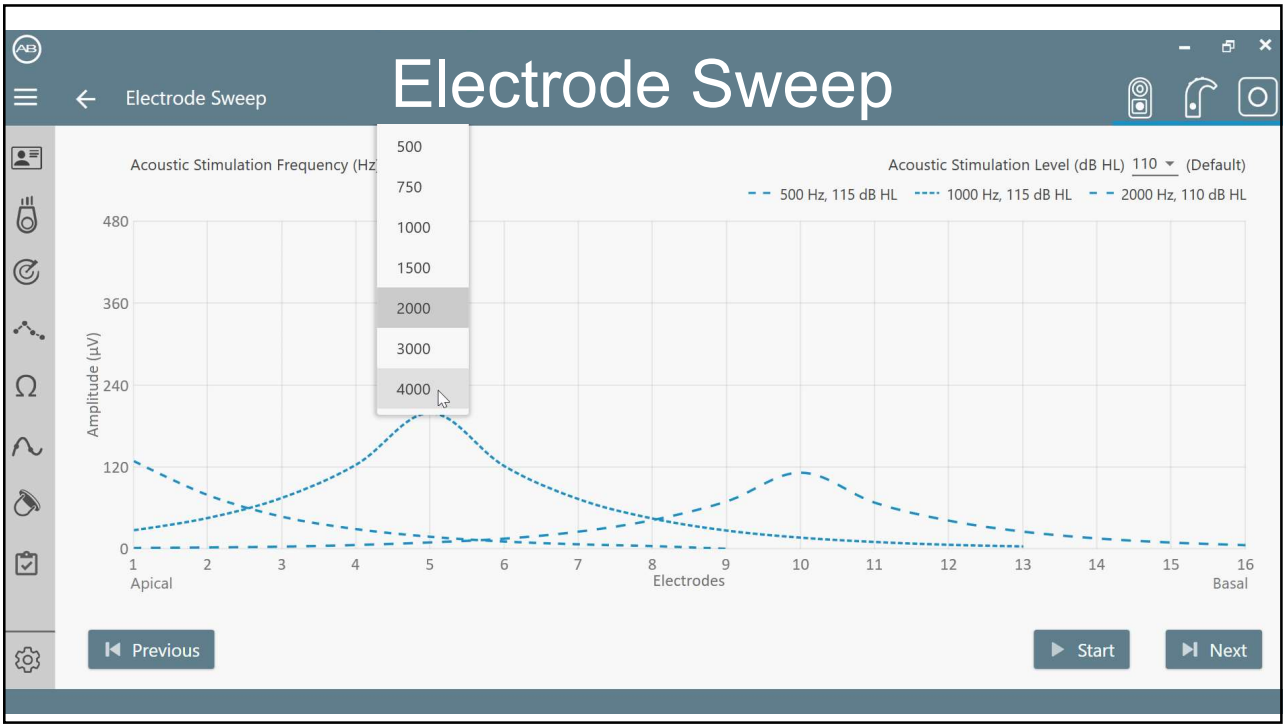
ECochG Insertion



(Remember: You can adjust the acoustic stimulation frequency and stimulation level in settings)

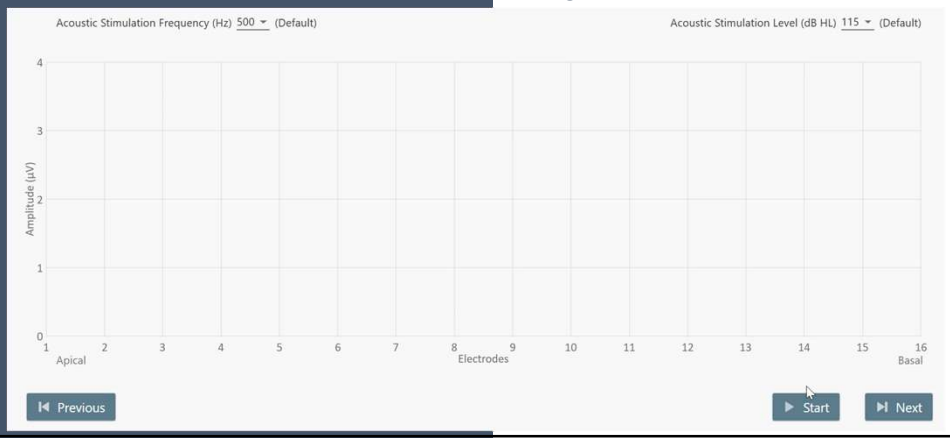
19

Electrode Sweep

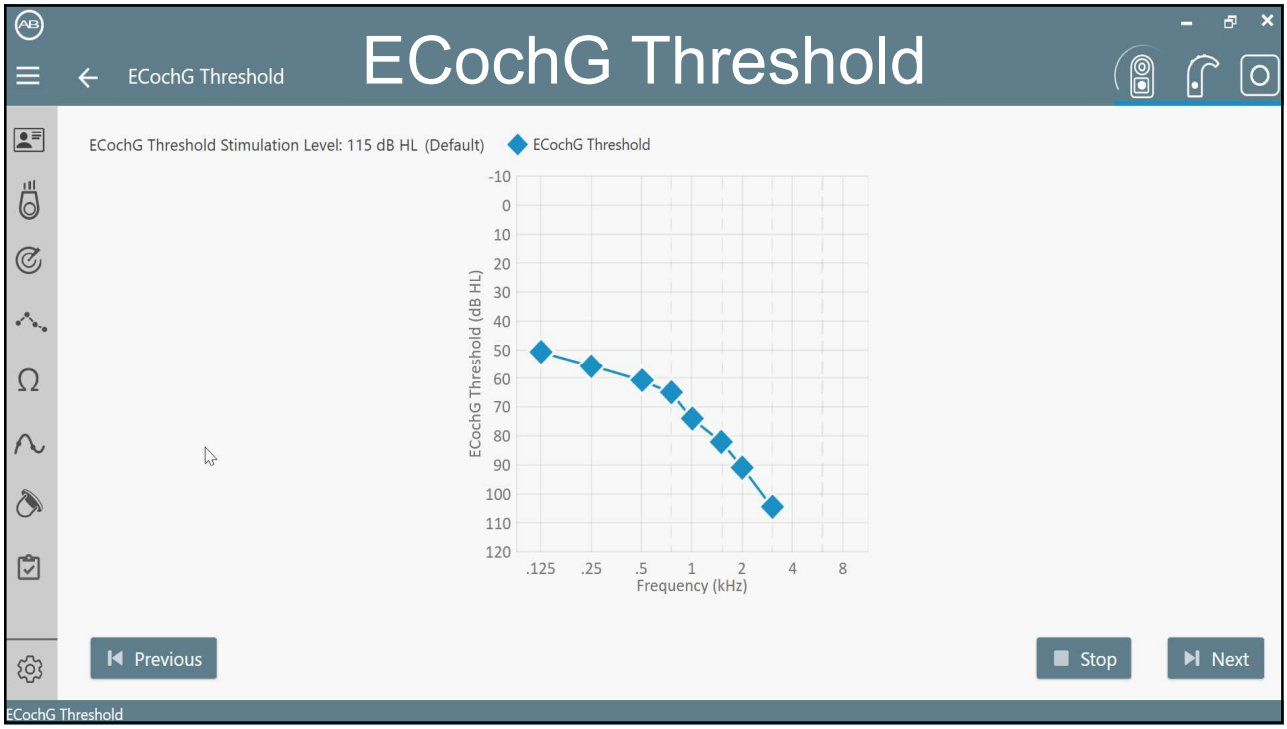


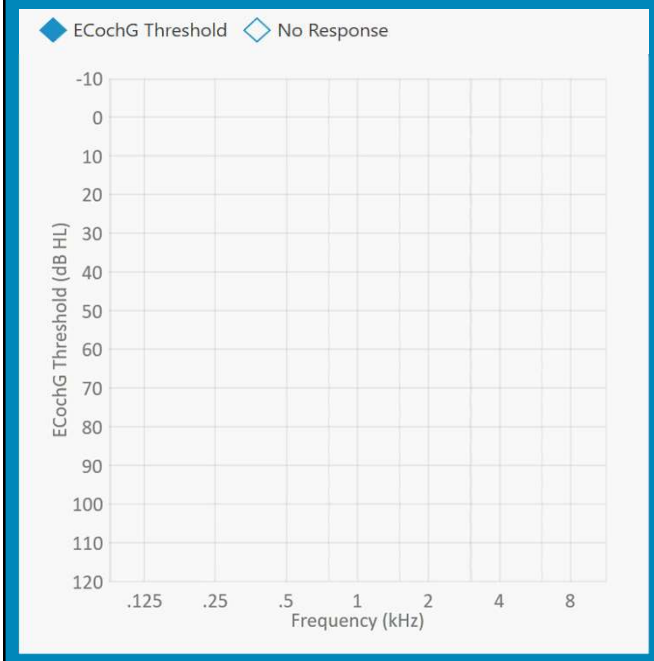
Electrode Sweep

- *Ensure sound processor is locked to implant and the sterile insert is placed in the ear canal*
- *User can make as many measurements as desired, but only the last 4 will be displayed on the graph*
- Acoustic stimulation parameters can be adjusted on this screen
- Click “Start” to begin and “Stop” to abort the measurement
- Open Symbols: measurements not significant, relative to the noise floor



ECochG Threshold



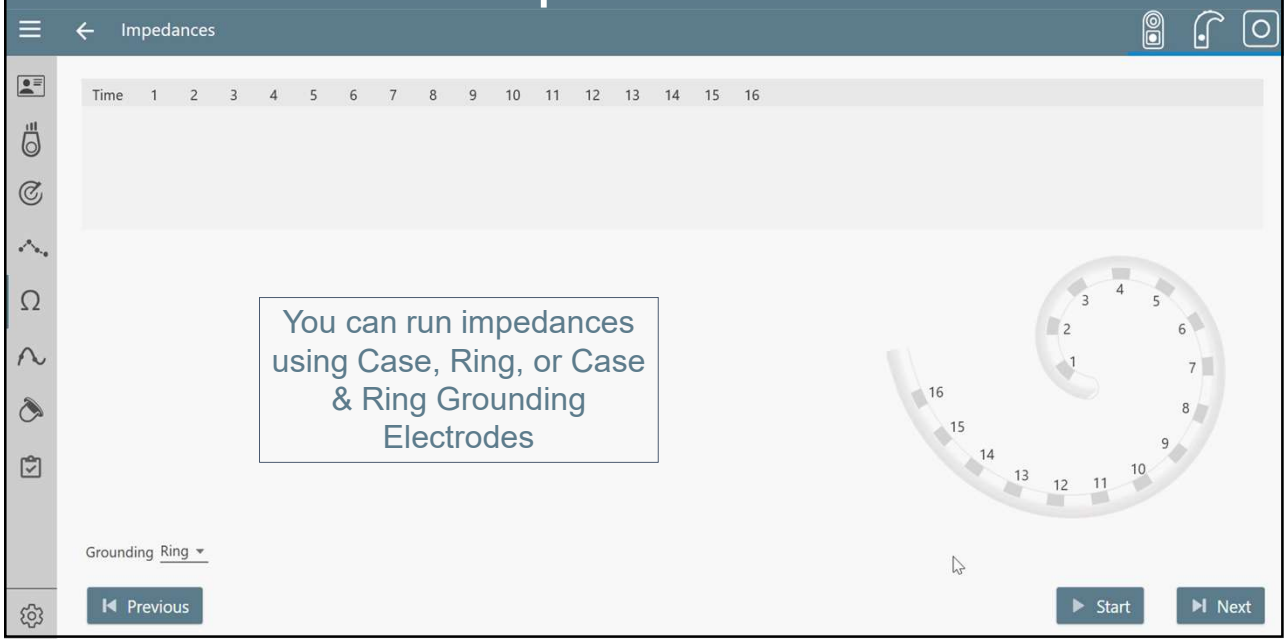


ECochG Threshold

- *Ensure sound processor is locked to implant and the sterile insert is placed in the ear canal*
- Click “Start” to begin the ECochG Threshold measurement, “Stop” to abort the measurement
- Acoustic stimulation level is displayed on the ECochG Threshold screen- can be adjusted in settings
- Open Symbols: measurements not significant, relative to the noise floor

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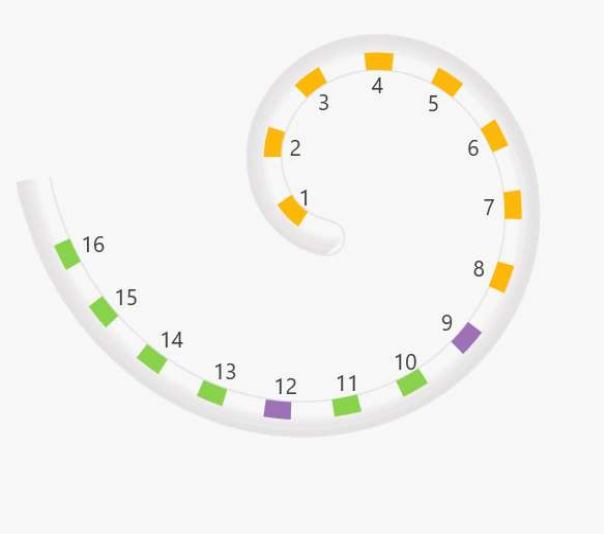
Impedances



Impedances

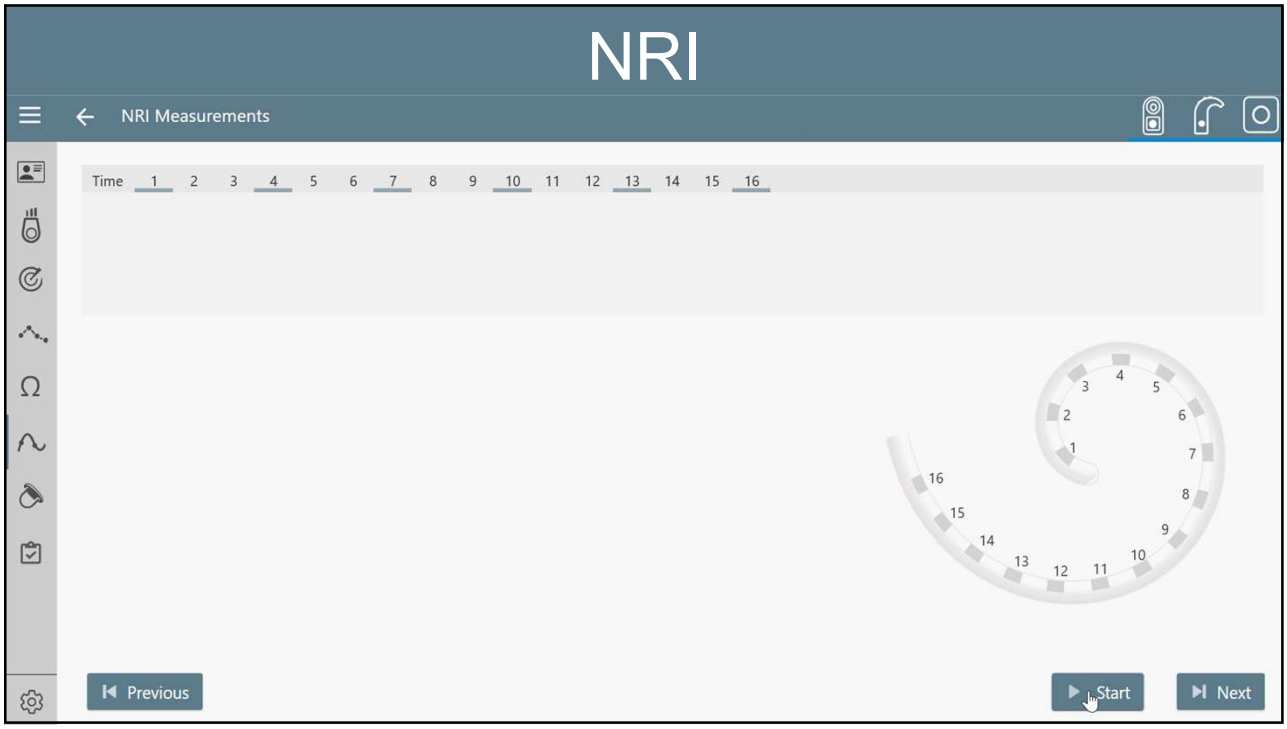
- Click “Start” to measure impedances
- *Conditioning will be performed prior to the first impedance measurement by default*
- Click “Conditioning” to rerun conditioning and measure impedances
- Click “Start” to only remeasure impedances
- Grounding electrode can be Case, Ring, or Case & Ring
- *Table of impedances shows the last three measurements only*

Legend same as Soundwave:
Valid Shorted Open



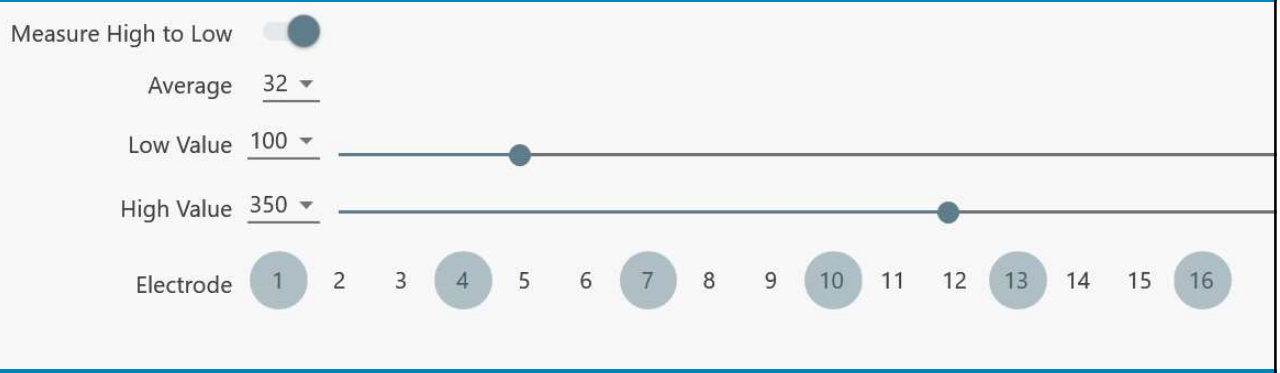
25

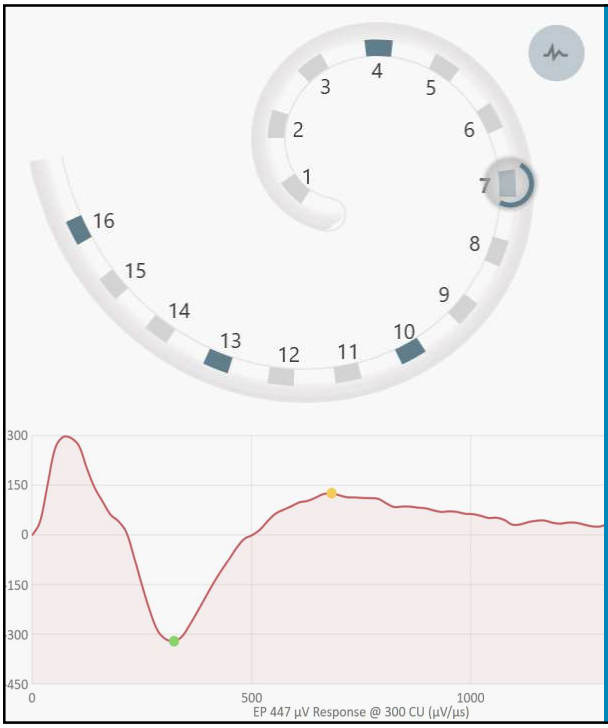
NRI



NRI Settings

- Measure High to Low: For Intraoperative testing, measuring High to Low is appropriate. Consider switching to Low to High for post operative testing
- Consider increasing averages if measurements are noisy
- Adjustments for Low Value can be made down to 0 and High Value up to 800 CUs
- A grey circle around the electrode means the given electrode is selected for NRI Measurements

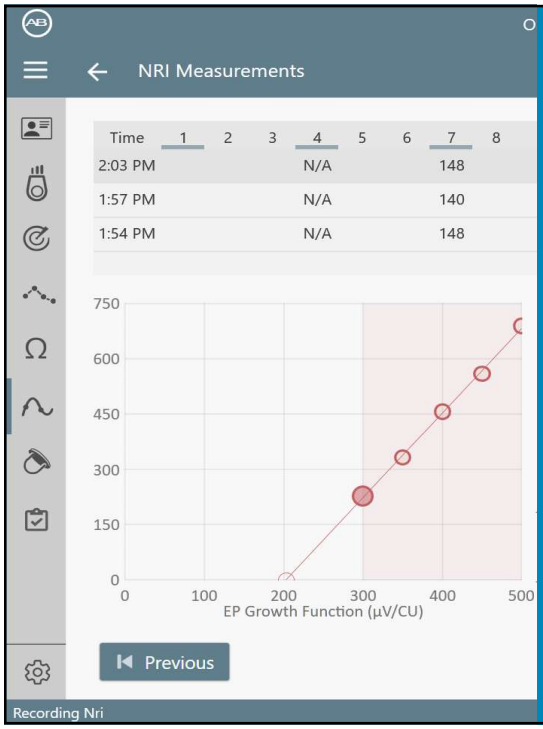




NRI

- *Impedances must be measured prior to the start of NRI*
- Select contacts and low/high values to be measured in the settings tab
- Click “Start” to measure NRI responses and estimate tNRI
- User may “Skip Electrode” during a measurement
- NRI Settings cannot be adjusted while a measurement is running, however they can be adjusted when the measurement is complete or stopped

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NRI

- Table will show tNRI values for the 3 most recent measurements. These are time stamped
- Compliance limit is represented with a yellow vertical line in the EP Growth Function graph
- The user can switch between looking at the electrode array image and the individual response curves
- User can click on the electrode contacts in the electrode array image or the tNRI value in the table to display EP Growth Function
- Prior measurements can be reviewed while measurements are ongoing. To resume displaying the ongoing measurement, click on the contact currently being measured

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ESRT



ESRT Settings

- Include ESRT: If you want ESRT to appear in the Navigation Panel, choose to include ESRT
- Audio On: Recommended, due to ease of use
- Stimulation Cycles: How many pulses you want to present to capture the measurement on the Tympanometer
- Step Size: How large of a jump you want between presentation values (option of 10, 15, 20, 25, 30)



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ESRT

- *User must enable ESRT measurements in the settings to make ESRT measurements*
- On the ESRT page the user may select high to low or low to high
- Pulse Width is user adjustable on the ESRT page and the corresponding rate is displayed adjacent to this
- Can be measured with electrode groupings of 16, 4, or 1 contact
  - When channels are not selected or have invalid impedances, these channels will be omitted from the electrode grouping of 16
  - For electrode groupings of 4, 4 contacts will always be stimulated and individual electrodes may be included in more than one electrode grouping to enable this
- To make a measurement, all electrodes must be in compliance. This can be managed by reducing the Pulse Width, decreasing the Pulse Amplitude, or deselecting electrodes with low compliance levels
- The pulse amplitude may be adjusted by using the “+” and “-” buttons
- Pause Duration, Stimulation Cycles, and Step Size (CU) can be adjusted in Settings

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ESRT Automatic Measurements

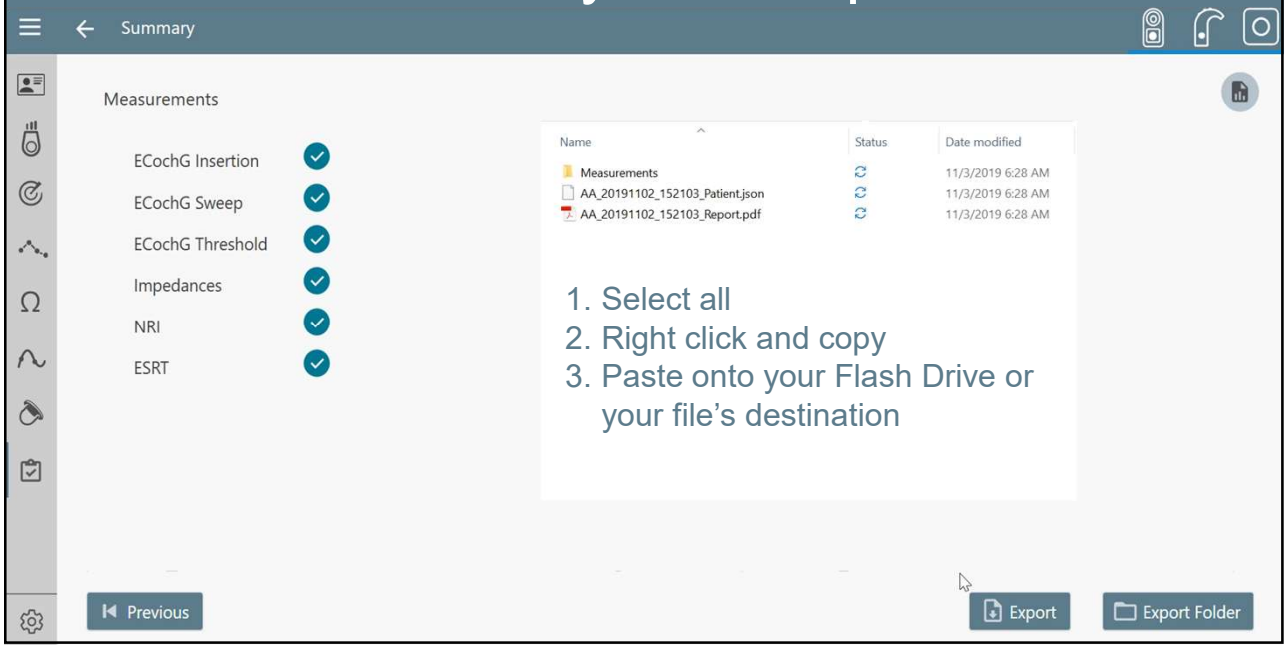
- With “Auto” enabled, clicking “Start” will begin the measurement
- The specified number of stimulation cycles will be presented
  - Audio feedback to indicate stimulation ca be enabled/disabled in settings. Visual indicator is a vertical bar on the graph
- User will click “Response” or “No Response” to indicate what was observed during stimulation, however selecting either is not required
- High to Low: stimulation stops when the first “No Response” is recorded
- Low to High: Stimulation stops when the first “Response” is recorded

ESRT Manual Measurements

- With “Manual” enabled, clicking “Start” will begin the measurement
- The specified number of stimulation cycles will be presented
  - Audio feedback to indicate stimulation ca be enabled/disabled in settings. Visual indicator is a vertical bar on the graph
- User will click “Response” or “No Response” to indicate what was observed during stimulation, or click “Start” to present stimulation an additional time
- User may change stimulation parameters, e.g., increase or decrease pulse amplitude
- User may change electrode groupings and delete responses by clicking the “trash” icon

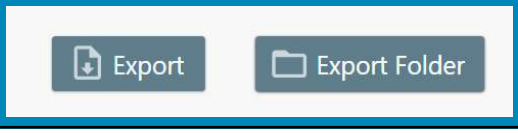
33

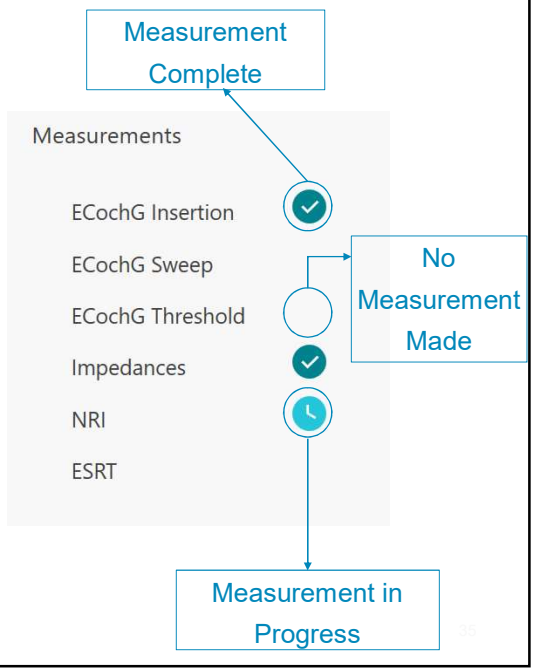
Summary and Report

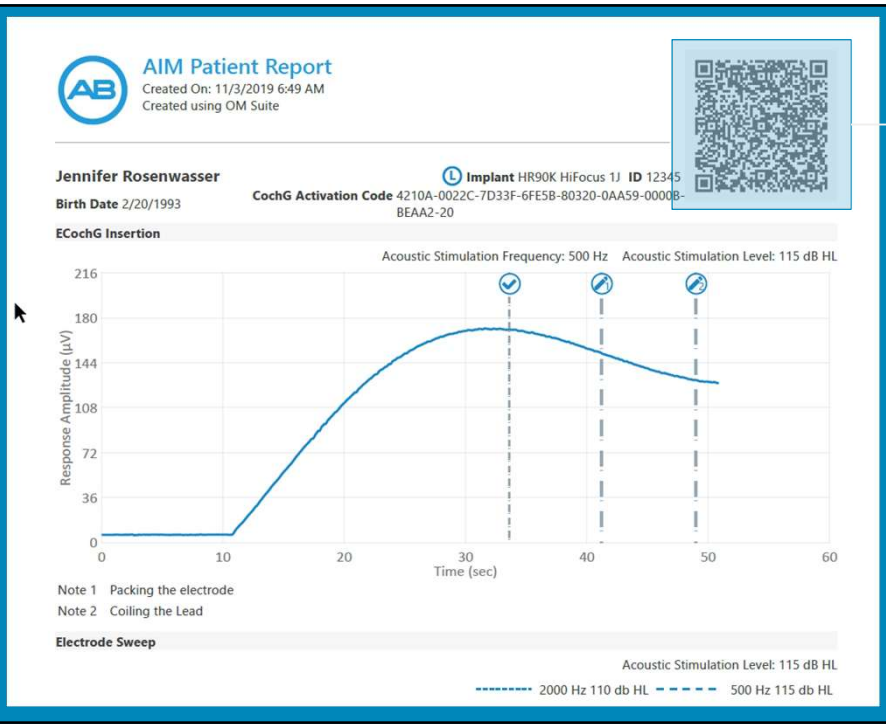


Summary and Report

- Summary page contains a list of measurements that can be made from OM Suite
- The report/summary button shows a report of the measurements that were taken which may be saved or printed
- Export: Exports a SoundWave compatible .json file and measurement data files to the specified saved directory.
  - Save location may be changed in the settings
- Export Folder: Opens the folder where the exported files are saved







The QR Code is associated with your patient's name forever. You can scan the code the next time the patient is in to unlock the ECochG measurements.



AIM™ to SoundWave™ 3.2 Data Transfer

Enter the license key

- Open the SoundWave 3.2 application
- Click on the application menu in the top left corner of the SoundWave interface
- Select the configuration submenu
- Choose licenses
- The license manager will open; select new license from the left-side navigation panel
- Enter the below license key. If a valid key is entered, the OK button will enable. Click on OK.

4A32A-021D6-05E5F-8FA1E-17250-03C06-02B82-6830C

Enable the import preference

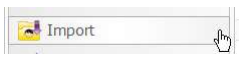
- Open the SoundWave 3.2 application and navigate to Configuration ▸ Preferences
- Check the box for “Use Experimental data” in general preferences



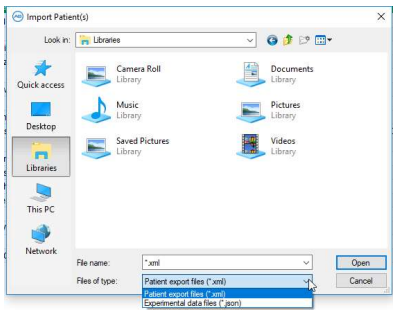
Note: While the option says “experimental,” the AIM system and its output data are commercially approved by the FDA, Health Canada and TUV and no longer considered experimental.

Import AIM Data

- Select to import a patient to your database

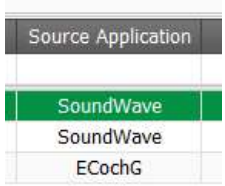


- The dialog box will default to the “.xml” file type. You will need set the file type to Experimental data files: the “.json” file type *(see right)*
- Open the preferred patient .json file from this dialog
- If the patient IntelliLink ID does not already exist in the database, a new patient will be created and a note will be placed in the patient that it was Imported from ECochG.
- If the IntelliLink ID exists in the database, the results will be imported into the existing patient file.



Working with AIM Data

- Impedances and NRI will be imported into the respective tabs within the software
- The source application for the measurement will be listed in a new column so it is transparent to the user which application generated the result



- Data that is not already supported by SoundWave (ie: ECochG thresholds) will not be available in the SoundWave application and the AIM report should be considered the standard for accessing this data.

NOTE: If the ground electrode column is exposed in the SoundWave interface for impedances, you will see N/A appear for AIM results in this column. This detail is not included in the AIM export. SoundWave recognizes only Case ground for this measurement while AIM supports additional grounding choices.

Questions?



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