A Unique Custom Solution:
ReSound's Microphone In Helix (MIH)

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Learner Objectives

By the end of the talk, you will be able to:

- 1) Identify the patient benefits of the MIH hearing instrument style over traditional custom hearing instrument styles.
- 2) List the key actions to improve ear impression submissions to increase the success of MIH fittings.
- 3) Explain what features are available on MIH hearing instruments.

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Agenda

- Introduction
- Benefits of MIH
- Features of MIH
- Tips for a successful MIH fit
- Difficult to fit ears
- Conclusions
- Q&A

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Introduction to MIH

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What is MIH?

Custom hearing instrument with an external microphone that is placed in the cymba concha of the pinna

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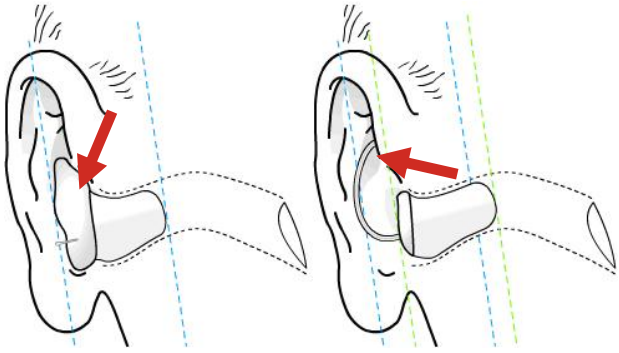
Microphone Moved



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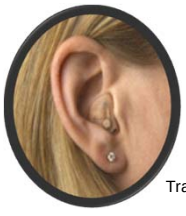
Why create MIH?

Best of custom
Smaller, cosmetically appealing size
Easy insertion

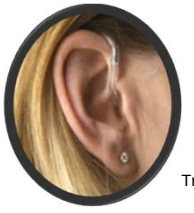


Traditional ITE

Custom Stereotype
Occlusion or Feedback
Reduced Fitting Range
Wind Noise

Microphone in Helix

Best of BTE
Open fit
Durable
More Gain Available



Traditional BTE

BTE Stereotype
Hair brushing against mic
Negative stigma
Wind Noise
Difficult to insert

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Benefits of MIH

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Benefits overview

- Smaller size
- Restoration of pinna effects
- Reduced wind noise
- More power
- Design flexibility

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Smaller size

- The size of MIH is reduced due to:
  - Moving the microphone outside the body of the instrument
  - Natural increase in gain from mic placement = more gain without need for larger amplifier
- Up to 40% smaller compared to conventional custom hearing instruments

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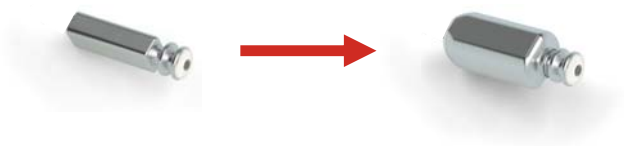
…and more room

Bigger vent



Bigger receiver

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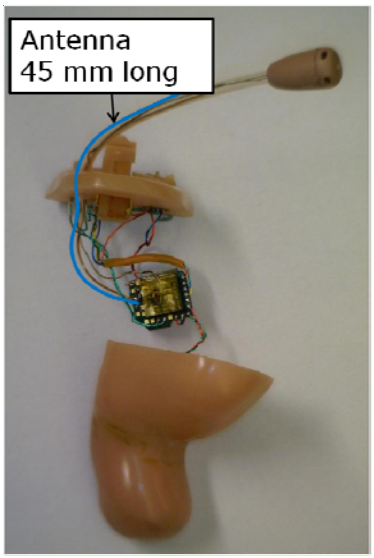
…and more room



- Removal of microphone allows for more space in the shell for the wireless radio
- Wireless transmission requires a radio antenna of a certain length
- Antenna is encased in the microphone tube
- Microphone in Helix is ReSound's smallest custom wireless solution

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Benefits overview

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The Pinna Effect

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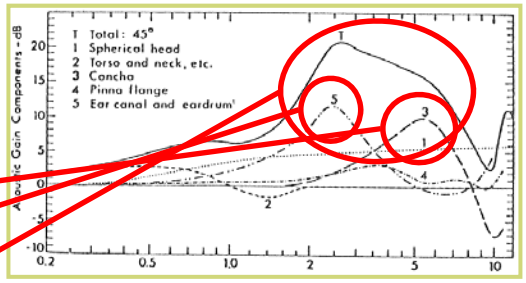
Outer ear resonance



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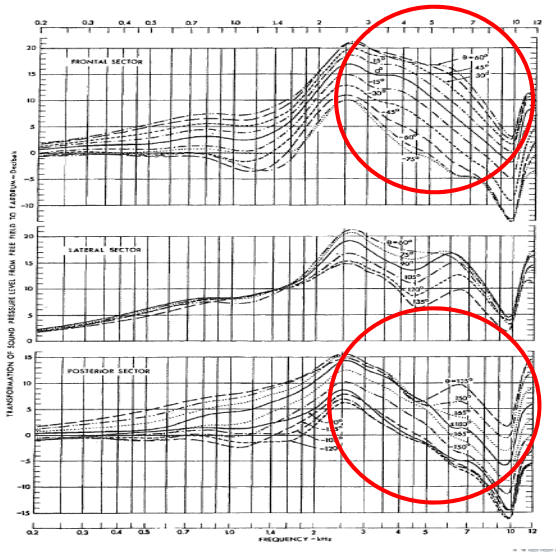
Outer ear directivity

Sound recorded from front →

Sound recorded from back →



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Microphone Location Effect

- **Natural high frequency gain:** Additional high frequency gain made possible through optimal positioning of microphone
- **Natural directionality:** Similar response pattern to a directional microphone by using an omnidirectional microphone and natural pinna cues

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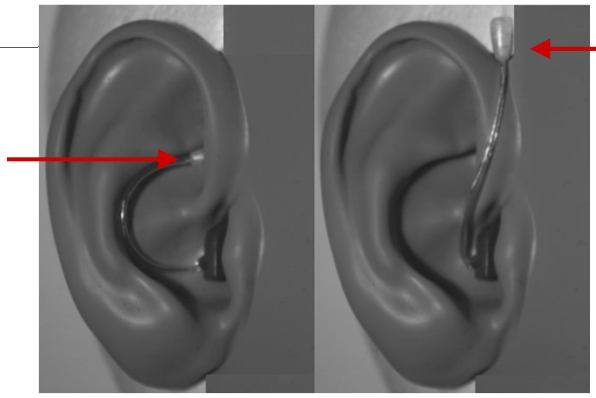
High frequency gain boost

(DiCo-LIM, Milan, Italy)



Aim: to compare the differences in **placement of the microphone** inside versus outside of the pinna, not between different instruments.

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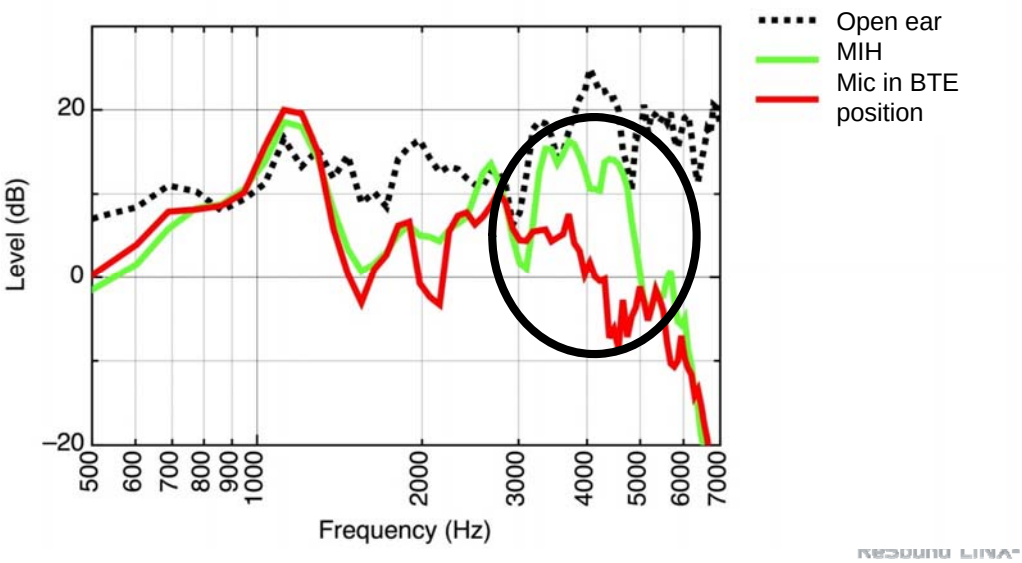
High frequency gain boost

(DiCo-LIM, Milan, Italy)



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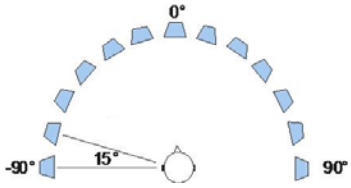
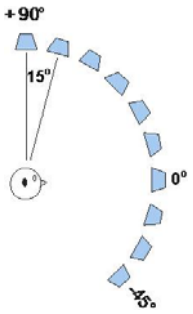
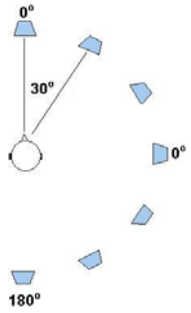
Localization ability
(ExpORL, K.U. Leuven, Belgium)



Left-Right measurement scheme.



.Elevation measurement scheme



Front-Back measurement scheme.

Aim: to compare localization ability using different styles of hearing aids.

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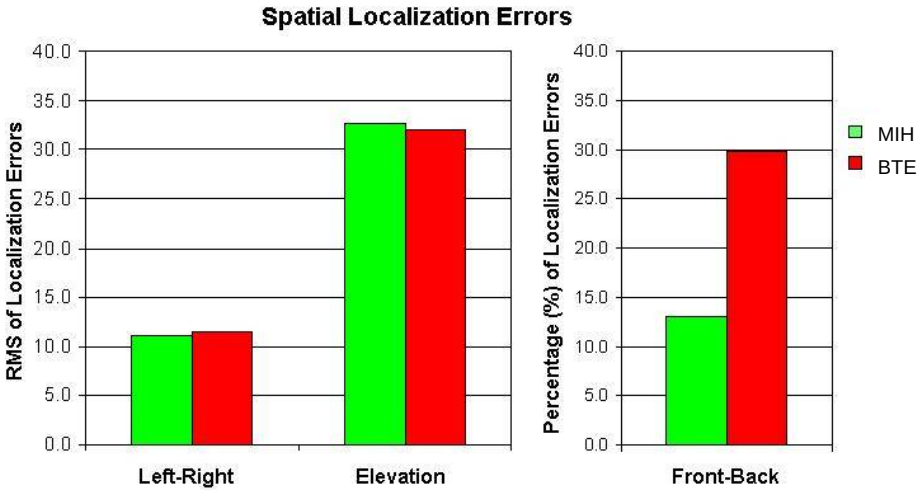
Localization ability
(ExpORL, K.U. Leuven, Belgium)



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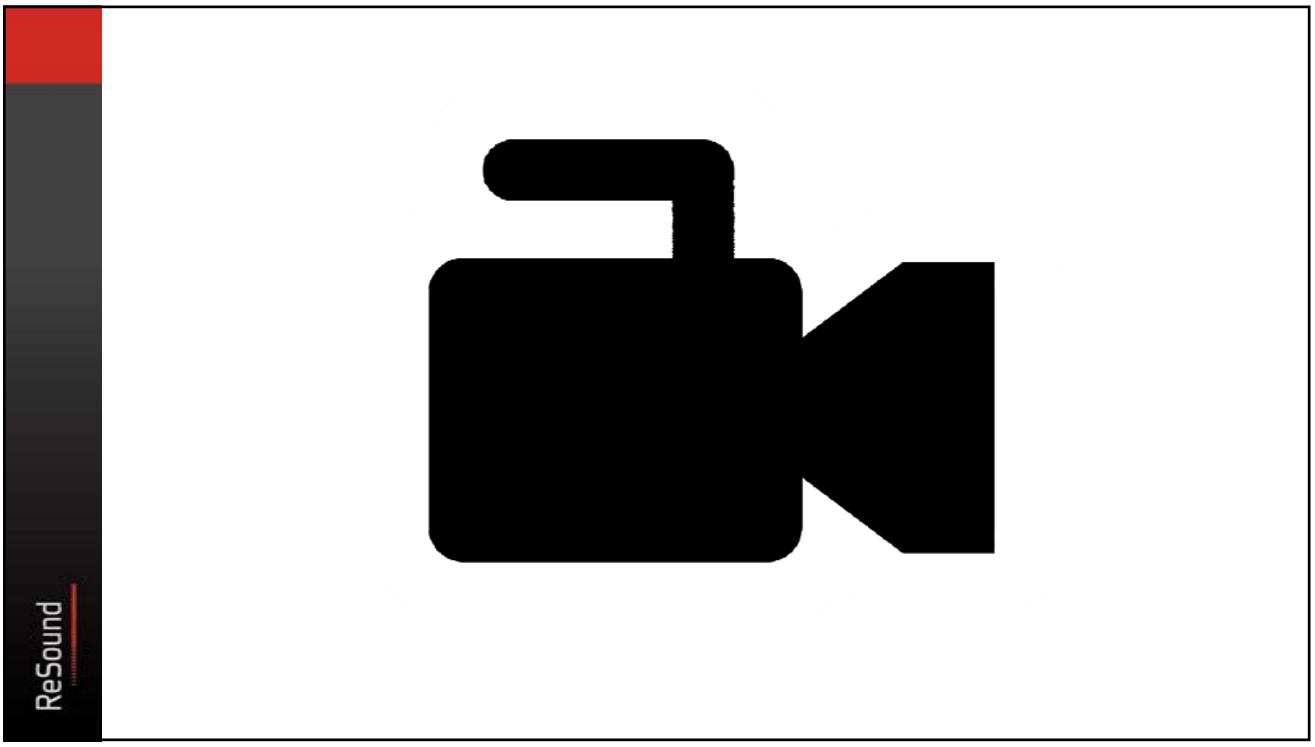

Benefits overview

- Smaller size
- Restoration of pinna effects
- Reduced wind noise
- More power
- Design flexibility

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Wind Noise Reduction

- Turbulent airflow over an object
- The placement of the microphone in the cymba concha protects the mic from wind and provides natural wind reduction

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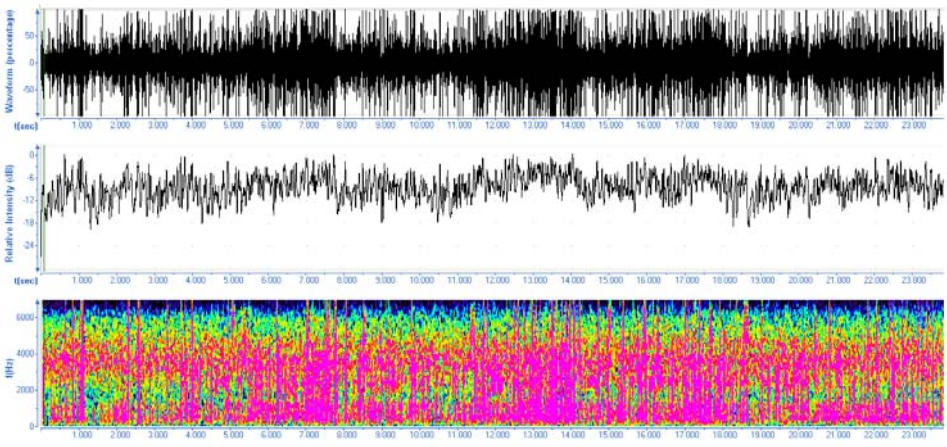
Wind Effect (180°)
BTE Microphone Placement

Waveform

Relative Intensity (dBfs)

Spectrogram



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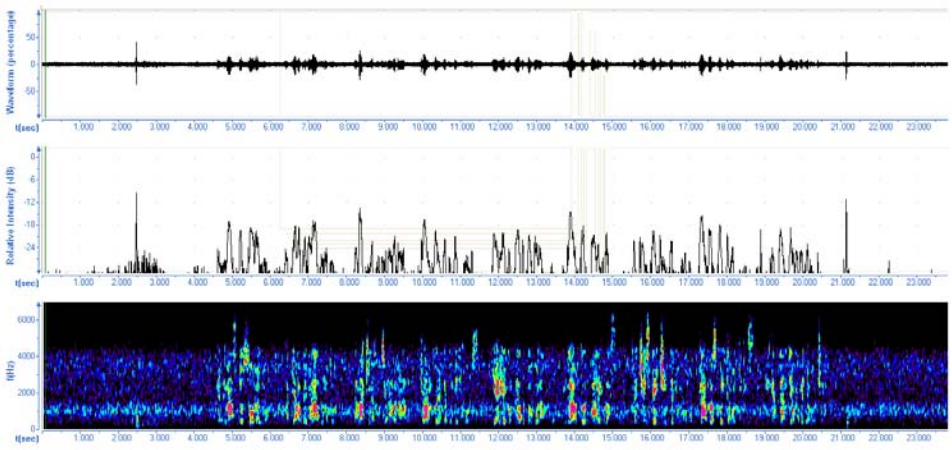
Wind Effect (180°)
Remote Microphone

Waveform

Relative Intensity (dBfs)

Spectrogram



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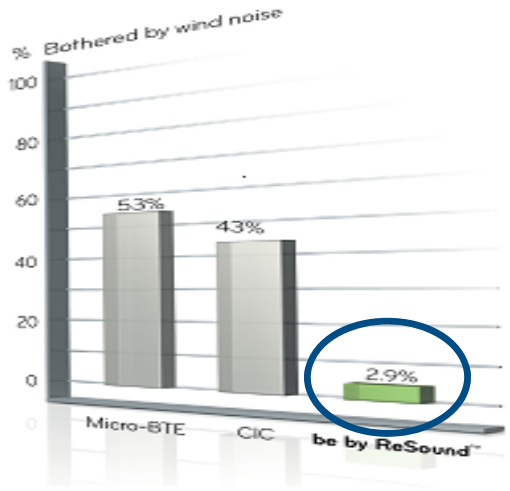
Exploiting Nature's Design (cont.)



Natural Wind Protection

Placement of the microphone within the contours of the cymba concha means that wind noise is minimized naturally by design

Only 2.9% of trial patients were bothered by wind noise

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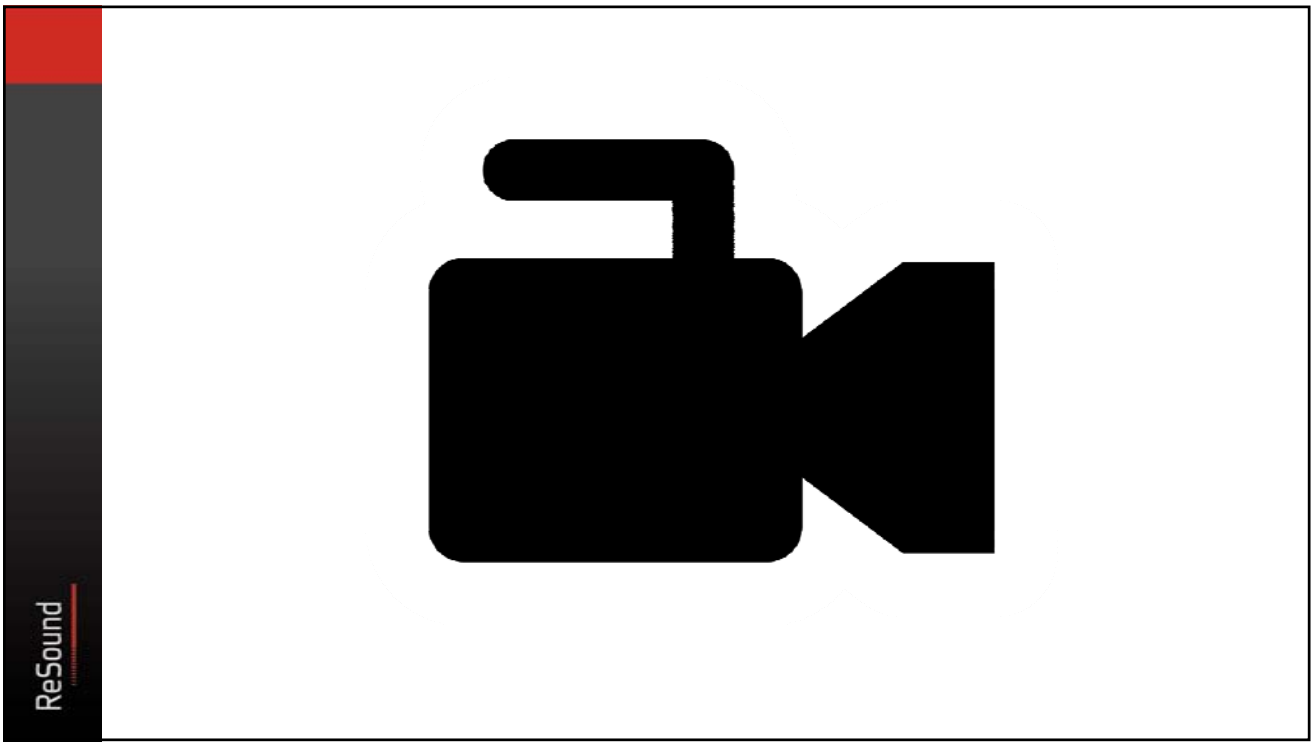

Benefits overview

- Smaller size
- Restoration of pinna effects
- Reduced wind noise
- More power
- Design flexibility

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More power

Bigger receiver

…and reduced feedback

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Feedback Pathways

- Feedback can travel via several pathways
- Acoustic pathway
  - Slit leaks
  - Venting
- Mechanical Pathway
  - Structural transmission

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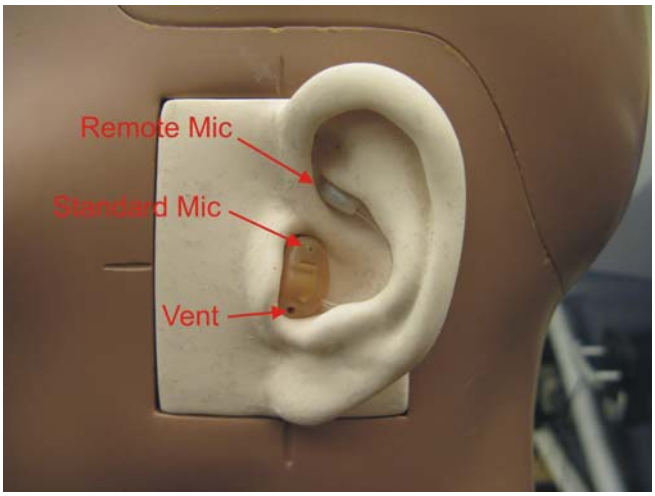
KEMAR Lab test



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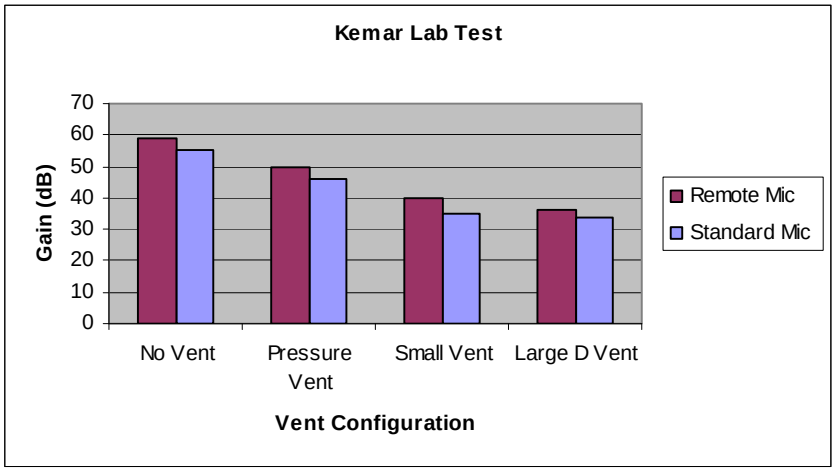
KEMAR Lab Test Results



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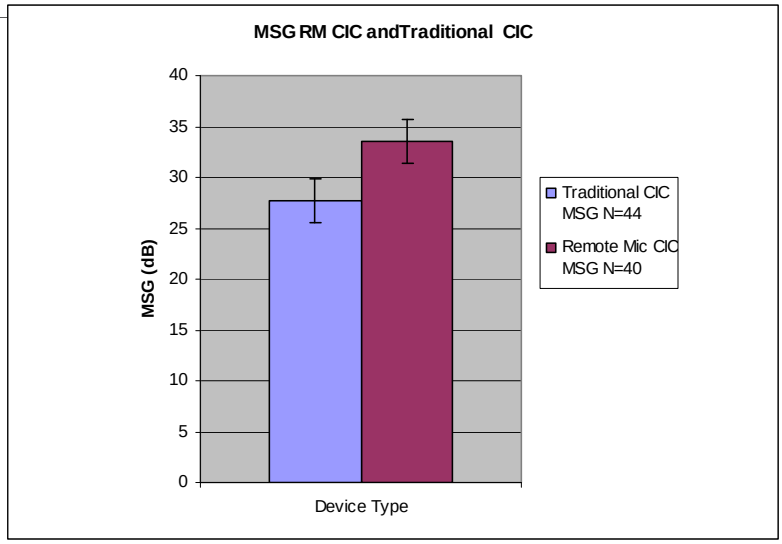
Results: Clinical Test 1



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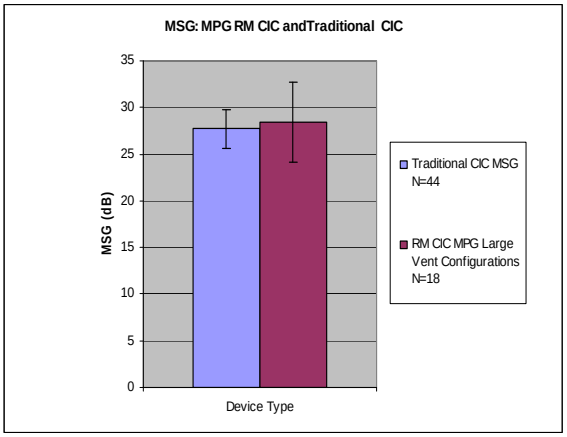
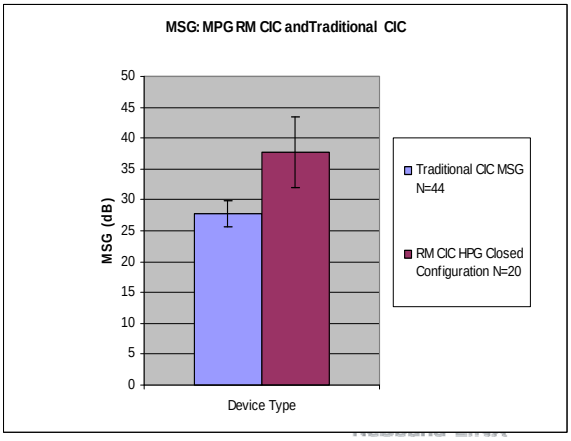
Results: Clinical Test 1

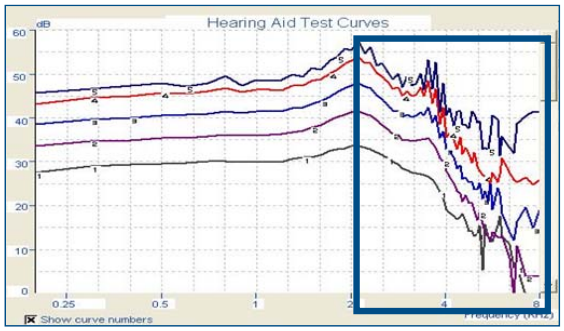
Large Vent



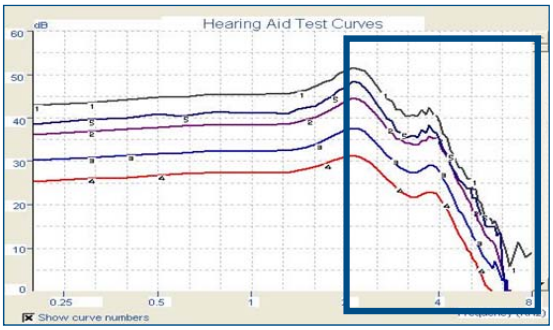
Pressure or No Vent



Reduction of inter-modulation distortion



Traditional custom



Mic in Helix

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Benefits overview

- Smaller size
- Restoration of pinna effects
- Reduced wind noise
- More power
- Design flexibility

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Features of MIH

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MIH Models- Linx²

MIH 13
ITC size
Size 13 battery

MIH 312
ITC half shell size
Size 312 battery

MIH-S
CIC size
Size 10 battery

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MIH Features

- Four power levels
  - LP (low), MP (medium), HP (high), UP (ultra)
- Three technology levels
  - 9 (Ultimate), 7 (Advanced), 5 (Basic)
- Four available programs with push button and volume control
- Color options:

Light Beige Medium Dark Espresso

Faceplate

Clear Blue (left) Red (right)

Additional options for shell

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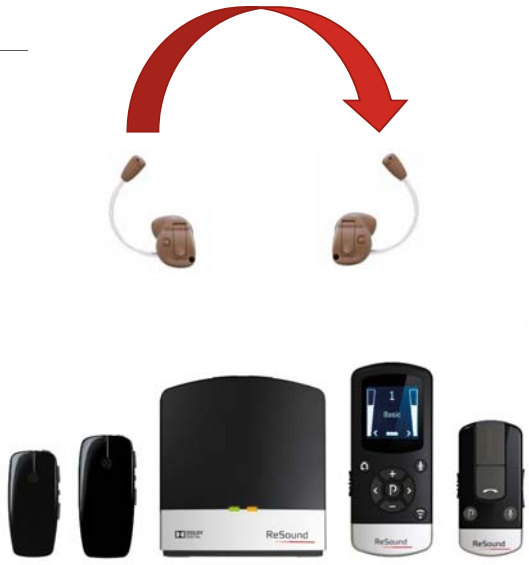
Wireless connectivity



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Fit tips for MIH

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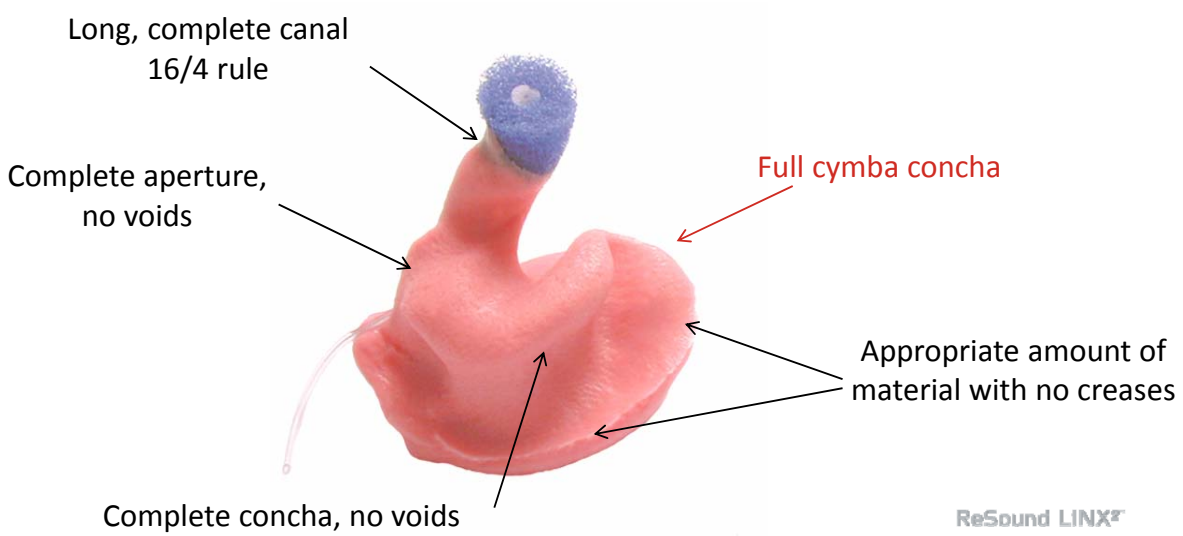
A good fit starts with a good EMI



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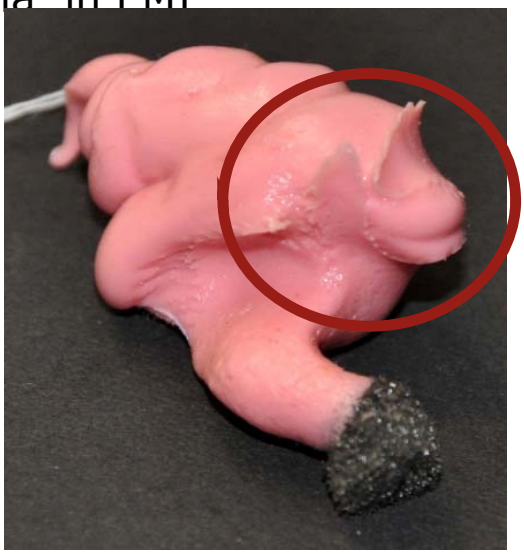
Under filled cymba concha in EMI

Without a properly filled cymba concha , MIH product will:

- The microphone may not be the correct size for the ear
- Not protect against wind as effectively
- Poorer cosmetics



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Critiquing Impressions

Post-Impression 10 Point Impression Checklist

1. Is the impression complete, smooth and without weld marks?
2. Does it conform to the TruFit 16/4 Rule? – 16 mm canal length and 4 mm beyond the second turn
3. Is the concha complete?
4. Is the intertragal notch filled?
5. Is the helix clearly defined?
6. Is the tragus covered?
7. Is the impression free from streaks or inconsistent color?
8. Was the impression fully cured to avoid distortion during removal?
9. Are" intentional" voids in the impression marked and explained on the order form?
10. Does the recommended hearing instrument appear appropriate based on the size of the ear/impression?

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Difficult to fit ears

Design flexibility for everyone

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Examples of when to fit MIH

- Patients with moderate–moderately severe hearing loss that need power but want a smaller, more cosmetic solution
- Patients wanting CIC cosmetics but with occlusion problems
  - MIH with large vent
- Wind noise reduction without gain reduction
- Power solutions for small ears or without interference from glasses
- Cases of outer ear malformations or special needs

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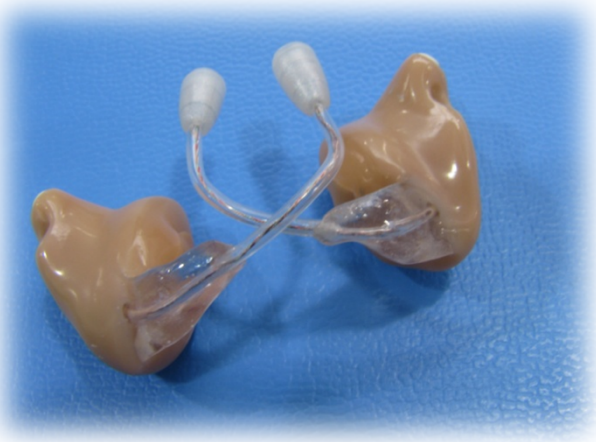
Microphone in Helix – Flexibility of design



Situation:

Difficulty removing MIH device due to poor dexterity.

Solution:

Integrated MIH tube and canal lock. Provides robust method of extraction and additional retention.

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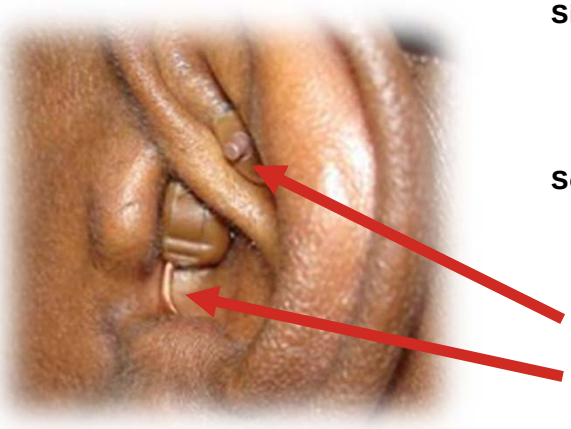
Microphone in Helix – Flexibility of design(cont.)



Situation:

Request for cosmetically appealing MIH device with push button, telecoil, and tinted microphone tubing.

Solution:

To maintain aesthetics the microphone, push button, and telecoil are place in a tinted, customized cymba concha housing. Also, the microphone tube is tinted to match skin-tone.

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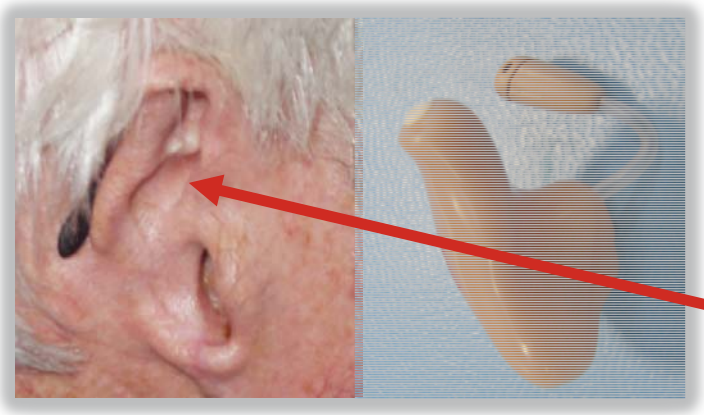
Microphone in Helix – Flexibility of design (cont.)



Situation:

Patient unable to wear traditional hearing device due to outer ear trauma.

Solution:

MIH with tube routed over crus to provide added retention and aesthetics.

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Microphone in Helix – Flexibility of design(cont.)

Situation:

Medical professional with high frequency loss requiring the ability to aid hearing while wearing stethoscope.

Solution:

Microphone, push button, hybrid, and battery assembled in a customized cymba concha housing. Separately, the receiver is housed in a custom shell with a Maximum Open Vent (MOV).

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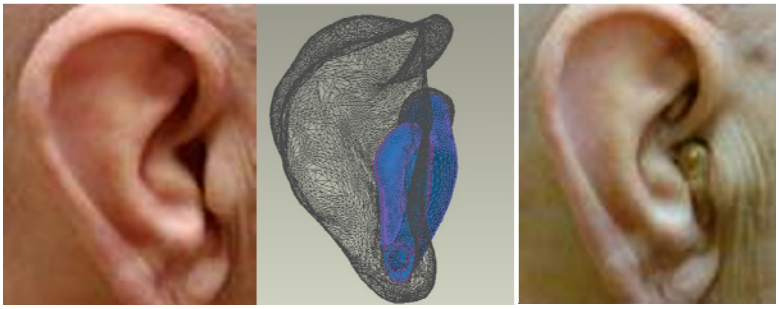
Microphone in Helix – Flexibility of design(cont.)



Situation:

- Patient has microtia, 70 dB flat loss. Fitting challenges: Size constraints and comfort due to narrow ear canal, gain and acoustic feedback
- Solution: MIH allowed for a smaller shell. Sufficient separation between microphone and receiver allows for adequate gain before feedback

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Have a difficult to fit ear?

ReSound's TruFit Technical Support can help!

- Team responsible for ensuring best fit for custom products
- They can assist in creating unique solutions for difficult-to-fit ears

Contact TruFit:
800-248-4327

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Conclusions

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Microphone in helix

- ReSound's Microphone in Helix (MIH) provides the power of a BTE instrument with the ease of insertion of a custom aid
- The external mic placement in the cymba concha allows for:
  - Smaller size
  - More open fit
  - Restoration of pinna cues
  - Wind noise reduction
  - More gain before feedback
- More flexibility in design for patients, including those with unique needs

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Thank you!

jschumacher@gnresound.com

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