

Made for  
iPhone | iPad | iPod

ReSound GN


## Confidence in the Finer Details: A Sound Story by ReSound

Brilliant sound experience now available in new discreet custom-crafted models

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Director, GN Hearing Global Audiology – Chicago

GN Making Life Sound Better FOR 150 YEARS

## Learning Outcomes



- Describe four main areas that provide greater usability, convenience and satisfaction for users of amplification.
- Determine what the user benefits can be achieved from ReSound LiNX Quattro hearing instruments.
- Identify the attributes of the new LiNX Quattro charger that contribute to greater usability and convenience for users.

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## CONFIDENCE IN THE FINER DETAILS - OVERVIEW

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*What attributes provide greater usability, convenience and satisfaction for users of hearing aids?*

Brilliant sound experience

Unrivalled full spectrum of streaming

Support and personalization

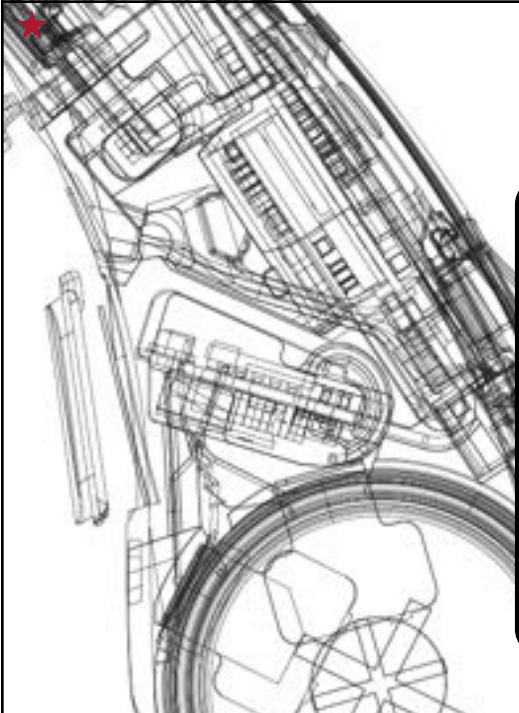
The world's most advanced rechargeable solution

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### Brilliant Sound Experience

Clearer Speech  
Fuller Sounds  
Richer Experience

**ReSound GN**




New chip platform enables real improvements in audio capabilities

**New Chip Platform**

- 30%** More Computing Power
- 100%** Increased Speed
- 100%** Increased Memory
- 20%** Reduced Power Consumption

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A strong foundation:  
Binaural Directionality III

**Binaural Directionality III** defines the **baseline** for ReSound's **audiological philosophy**

**Continuously** improved by ReSound R&D for **more than a decade**

The features introduced with **ReSound LINX Quattro** build on this **philosophy**, providing a **truly unique three-dimensional** listening experience

**Inspired by Nature – Tailored to individual needs**

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## Technology- Optimized as Nature Intended

**Processing sound** the way nature **intended** –  
**Respecting** the **design** of the **auditory system**:

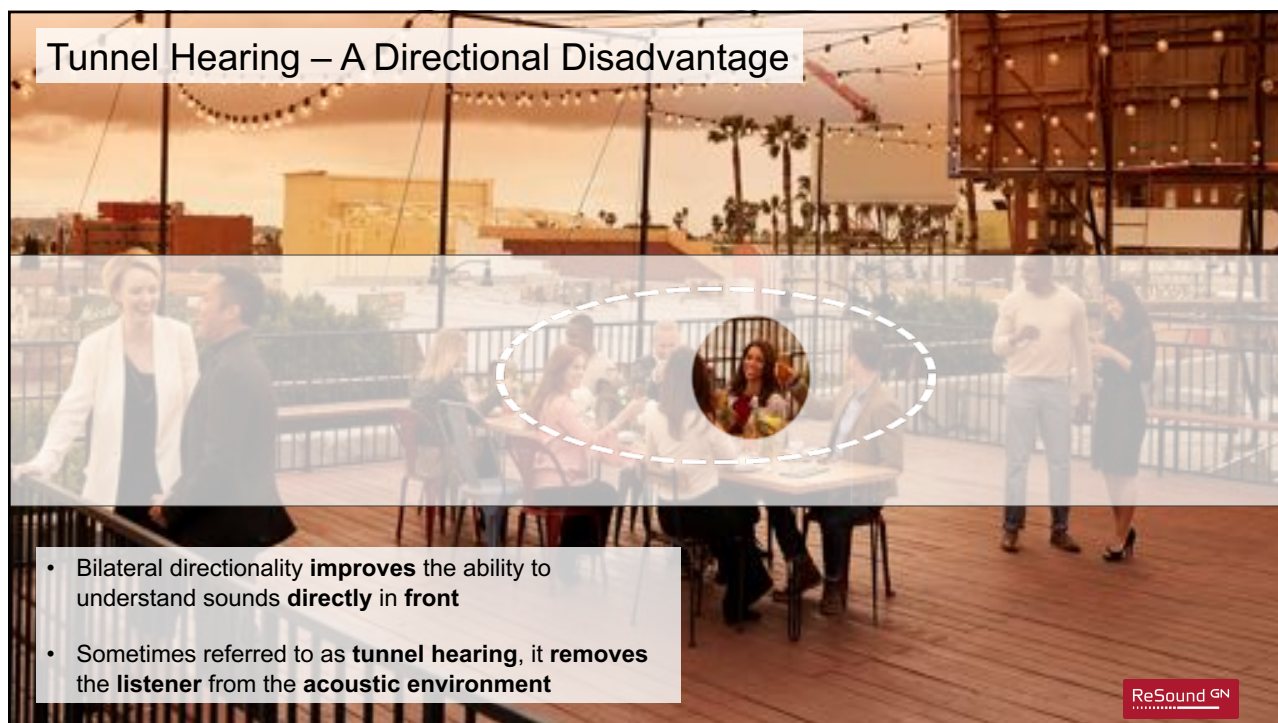
- Environments are **not predictable**
- Desired signals are **not predictable**

Maximize **audibility** with situational **awareness**

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## Tunnel Hearing – A Directional Disadvantage



- Bilateral directionality **improves** the ability to understand sounds **directly** in front
- Sometimes referred to as **tunnel hearing**, it **removes** the **listener** from the **acoustic environment**

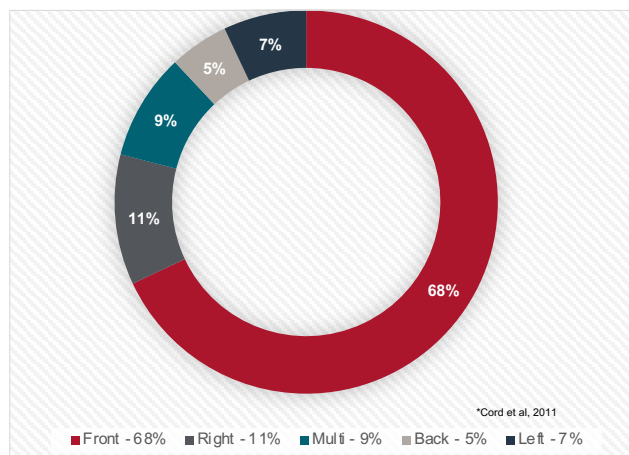
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## But people look at who they want to listen to, right... ?

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Figure: Distribution of Hearing Aid Use Log data by signal location. Multi indicates that the location of the sound source was not fixed (e.g.; participant's spouse was moving around the kitchen while talking to him).



A significant portion of active listening is not from in the front (Cord et al, 2011)

Hearing aid signal processing cannot predict the signal the listener desires to hear

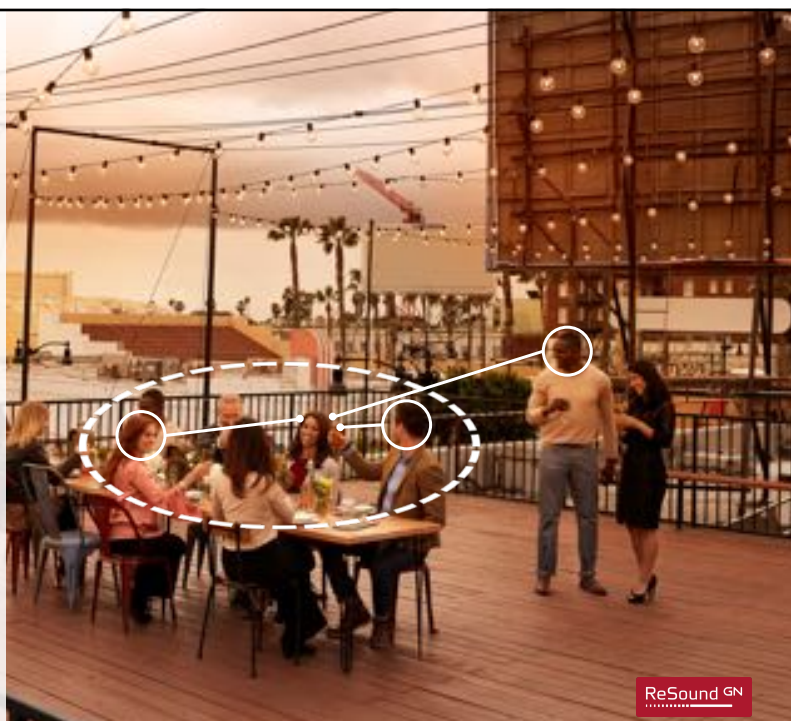
Microphone configuration should provide directional benefit while still hearing all around

A hearing aid cannot determine what a hearing aid user would like to listen to

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## Binaural Auditory System: Awareness Strategy

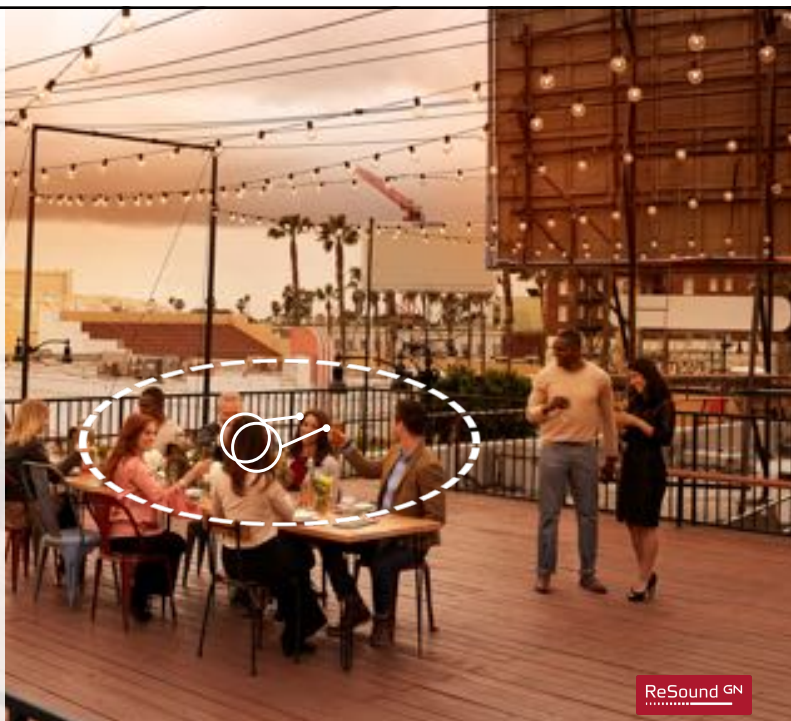
- The normal **auditory system** uses **processing strategies** for full-surround **awareness**
- The auditory cortex needs input from **both** ears to be able to create a detailed **three-dimensional** picture of the **environment**



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## Binaural Auditory System: Better ear strategy

- The **binaural** auditory system can also use the **different** inputs from the two ears to **focus** on desired signals
- The **geometric** location of the **ears** on the **head** **allows** the **brain** to **compare** and **contrast** the sound coming from **each ear** to provide a better SNR for a particular sound



## As Nature Intended: Spatial Sense

### **Spatial** hearing ...

Respects how the auditory system was designed

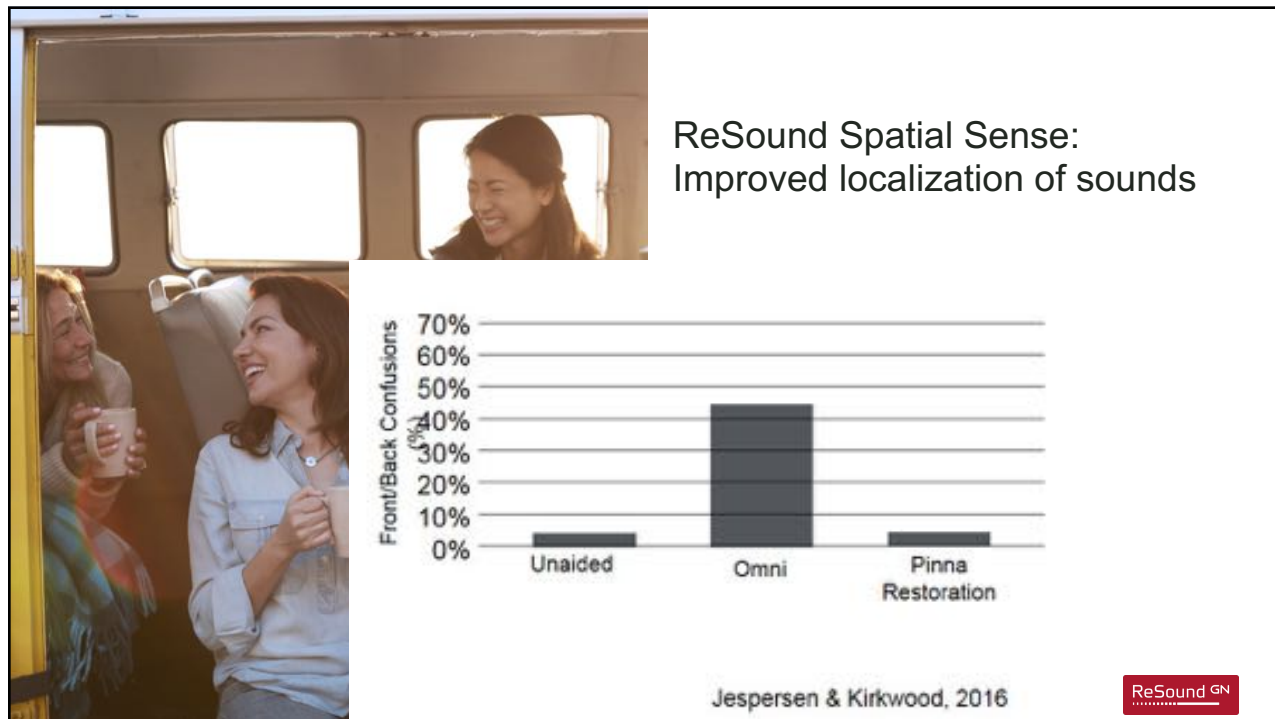
Forms an **auditory** image of the **environment**

**Creates** a **sense** of natural **sound quality**

- **Pinna restoration, accommodating** for lost **spectral characteristics** due to microphone **placement**
- Compression compensation, **preserving** the **ILD**

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## Binaural Directionality III: Summary

Provides **Spatial Cues** for a **3D** environment and **localization**

Provides a **better-ear strategy** for **understanding** sounds from the **front**

Provides an **awareness strategy** for sounds coming from the **sides** and **back**

Provides **maximum** speech **understanding** from the **front** in **difficult** listening situations

With **high** sound quality in **all situations**

## Best in Class Audio Capabilities



### 116 dB SPL

Improved A/D conversion enables the industry's highest input dynamic range

### 9.5 kHz

50% faster sampling rate supports the new extended bandwidth

### Higher Resolution

Better Resolution (A/D conversion bit rate) provides a more accurate reproduction of sound

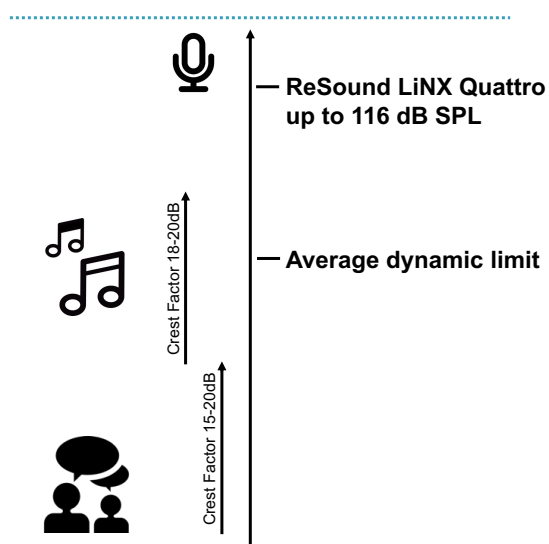
Micro-electric-mechanical systems (MEMS) Microphone



Source: Infineon Technologies, AG,  
"The Infineon Silicon MEMS Microphone", DOI:10.5162/sensor2013/A4.3

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## Enhanced Input Dynamic Range



ReSound LiNX Quattro is setting a new exceptional standard for the **input dynamic range** of hearing aids

Increasing the input dynamic range **enhances** the ability of a hearing aid to process sound at all input levels in even finer detail





## Enhanced Input Dynamic Range



*“Only when the front end has been configured to be distortion free can a hearing aid be optimized for listening to and the playing of music.” – Chasin, 2012*

**Table 1.** Sound Levels of Some Musical Instruments Measured on the Horizontal Plane From a Distance of 3 Meters

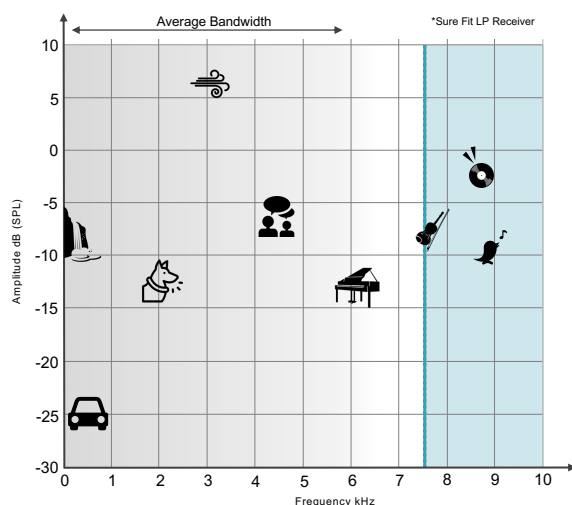
Musical instrument	dBA ranges measured from 3 meters
Cello	80-104
Clarinet	68-82
Flute	92-105
Trombone	90-106
Violin	80-90
Violin (near left ear)	85-105
Trumpet	88-108

Note: The table shows that higher levels would be measured if the assessment was measured at a different location, such as the violin player's left ear.  
Source: Adapted from Chasin (2006); courtesy of Hearing Review, used with permission.

Source: Chasin, 2012

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## A richer sound experience



The **extension** of the upper frequency limit in **ReSound LiNX Quattro** up to **9.5 kHz** provides the user with a **richer sound experience**.

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## Environmental Classifiers: Critical starting point

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ReSound LiNX 3D and 5 other premium HIs

Evaluated in a test box with looped sound files which included:

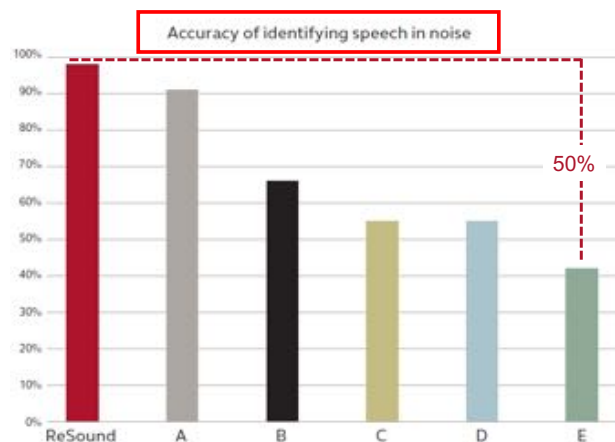
- Quiet
- Speech babble
- Conversation with various background noises and levels (e.g., part, train station, grocery store)
- Noises (e.g., hand mixer)

All manufacturers have classification environments that include speech-in-noise

Datalogging was read from the hearing aids

Results:

- ReSound LiNX 3D showed the greatest accuracy at 98% when identifying speech in noise
- The least accurate hearing aid classified only 42% of hours as speech-in-noise



Groth (2016)

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## ReSound Environmental Classifier Demo

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## ReSound LiNX Quattro Proof of Benefit Test (Jespersen & Kirkwood, 2017)



Test participants compared the music programs of ReSound LiNX Quattro and the latest RIE instruments from two competing manufacturers:

- LiNX Quattro
- Manufacturer 1
- Manufacturer 2

Test participants chose their preferred hearing instruments when listening to the instruments in pairs.

The comparisons were made for pop music.

## Methods: Test Participants and Hearing Instrument Fittings



### Methodology

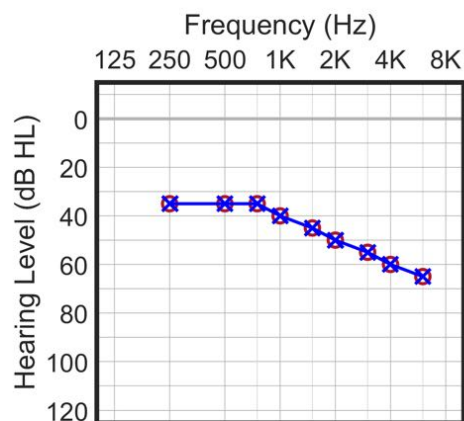
- Two-alternative forced choice.
- Double-blinded.

### Hearing instruments

- Fit to the N3 standard audiogram
- Music program default settings
- Low power receivers
- Closed fittings

### Test participants

- Ten hearing-impaired test participants trained for listening to hearing instruments
- Test participants with hearing losses similar to the N3 standard audiogram were chosen.



(Jespersen & Kirkwood, 2017)

## Methods: Recorded Test Stimuli



An acoustic manikin was used to make binaural recordings of music for each pair of hearing instruments.

Pop music was played from stereo loudspeakers placed in front of the manikin ( $L_{Aeq} = 99$  dB SPL).

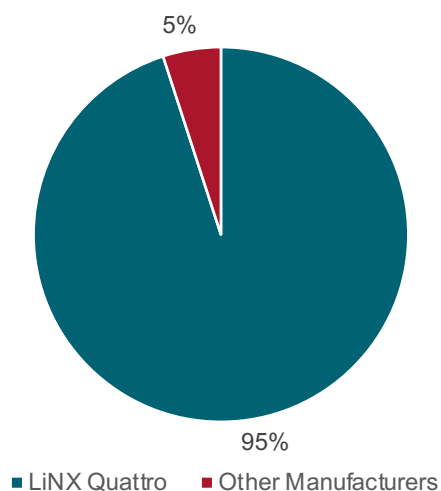
The recordings were compensated to remove the influence of the acoustic manikin's ears and the frequency response of the headphones used for listening.

(Jespersen & Kirkwood, 2017)

## Results



Listeners preferred the sound quality for music with ReSound LiNX Quattro 95% of the time compared to other premium hearing aids.



Jespersen & Kirkwood, 2017



## ReSound LiNX Quattro: Unrivalled full spectrum of streaming

More sound, action  
and rhythm



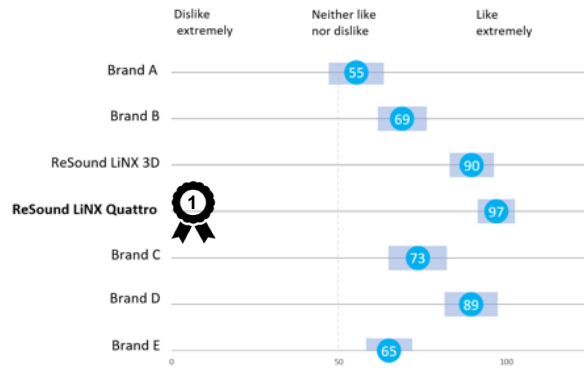
Streaming with no compromises up to 9.5 KHz



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# Preference for Sound Quality when Streaming Music and Speech

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# Exceptional sound quality when streaming from audio sources

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Utilize the high frequency range in wireless accessories and smart phones for a more natural and fuller sound when streaming



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## ReSound Multi Mic Demo



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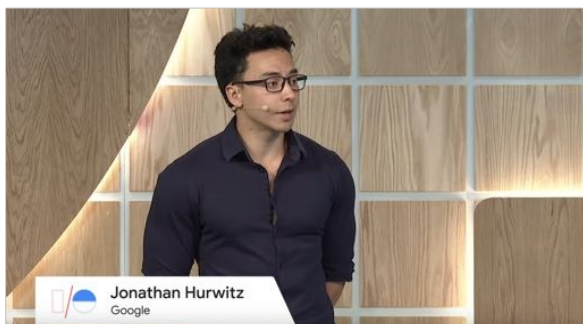


## Android Direct Streaming for ReSound Hearing Instruments

GN Hearing & Google Partnership

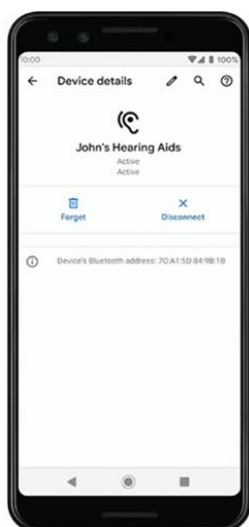
## GN and Google Partnership

### The full spectrum of direct streaming






- New Bluetooth Low Energy protocol
- GN Hearing and Cochlear will support this new technology
- Available for the Google Pixel 3 with the Android v.10 operating system
- In the future, more Android devices on Android v.10 will be available

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## GN and Google Partnership

### The full spectrum of direct streaming

-  Stream phone calls
-  Stream music & videos
-  No accessory necessary

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## GN and Google Partnership: A Complete Ecosystem



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## Android Direct Streaming Bluetooth LE vs. Bluetooth Classic



### Bluetooth LE:

- Low power consumption
- Operates on the 2.4 GHz ISM band
- Stereo signal to both ears

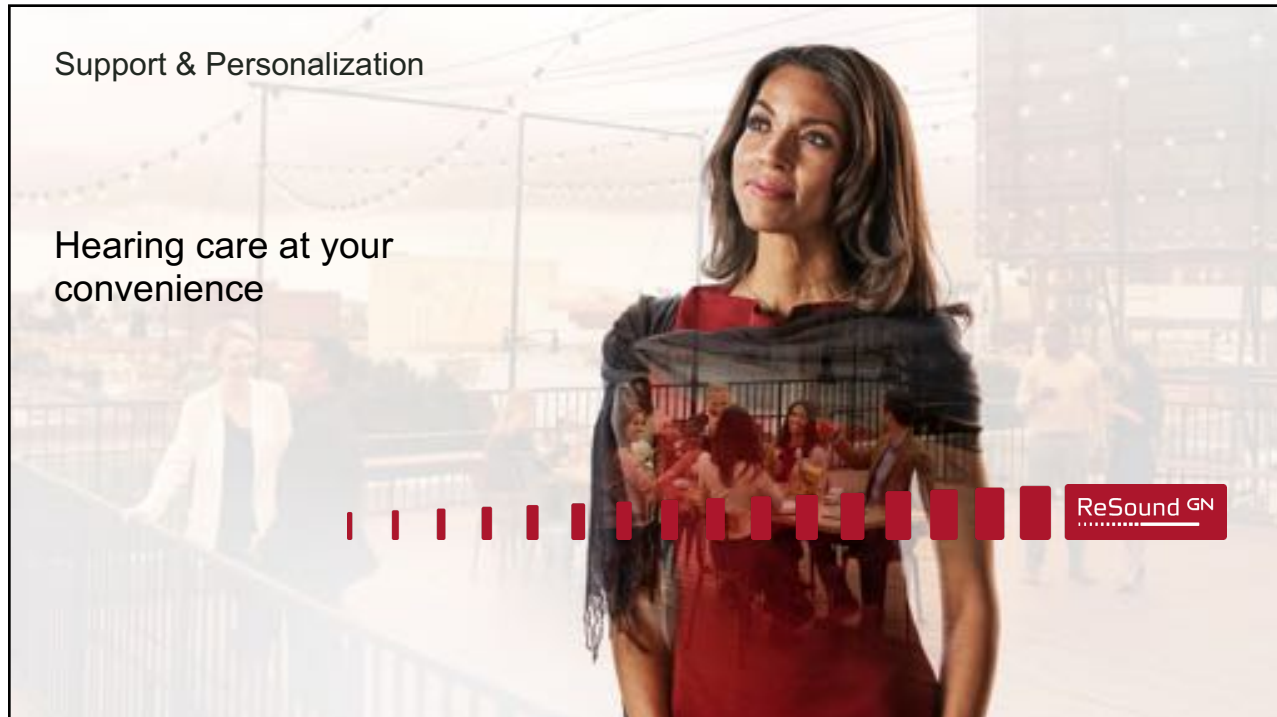
### Bluetooth Classic:

- High power consumption
- Operates on the 2.4 GHz ISM band
- Stereo signal to one ear and split into left and right

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Support & Personalization

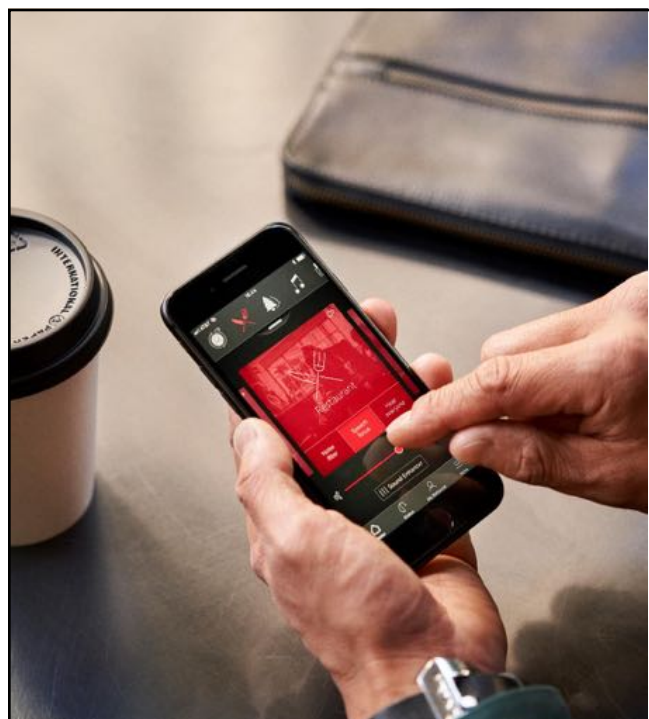
Hearing care at your convenience



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Support and Personalization

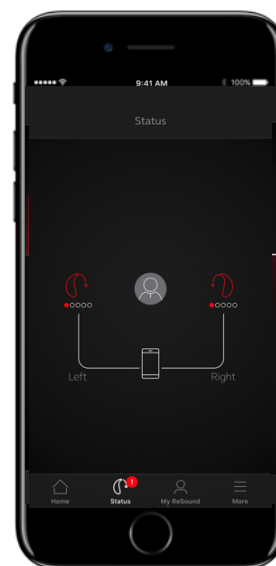
Adjustments can be made **anytime**  
**ReSound Smart 3D App** now offers even **more** control for the patient  
 Patients can request HCP assistance anytime, with **ReSound Assist**  
 The power to be in the moment – with a **flexible** app, **quick buttons** or **precise** adjustments... **tailored** to any lifestyle



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## Smart 3D app with ReSound LiNX Quattro

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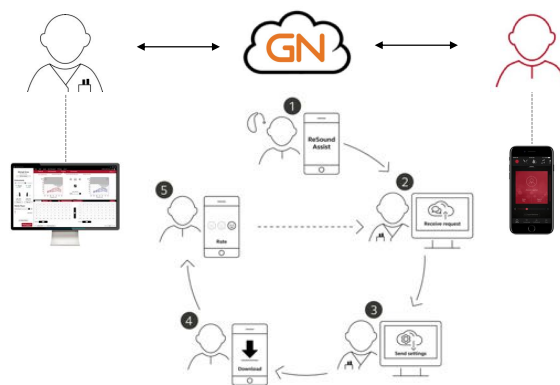
### Benefits for Patients

- **Convenience**
- Real-time **feedback** to HCP
- Adjustments based on **real world** patient **experience**
- The **confidence** that hearing care is right at your fingertips

### Benefits for HCP's

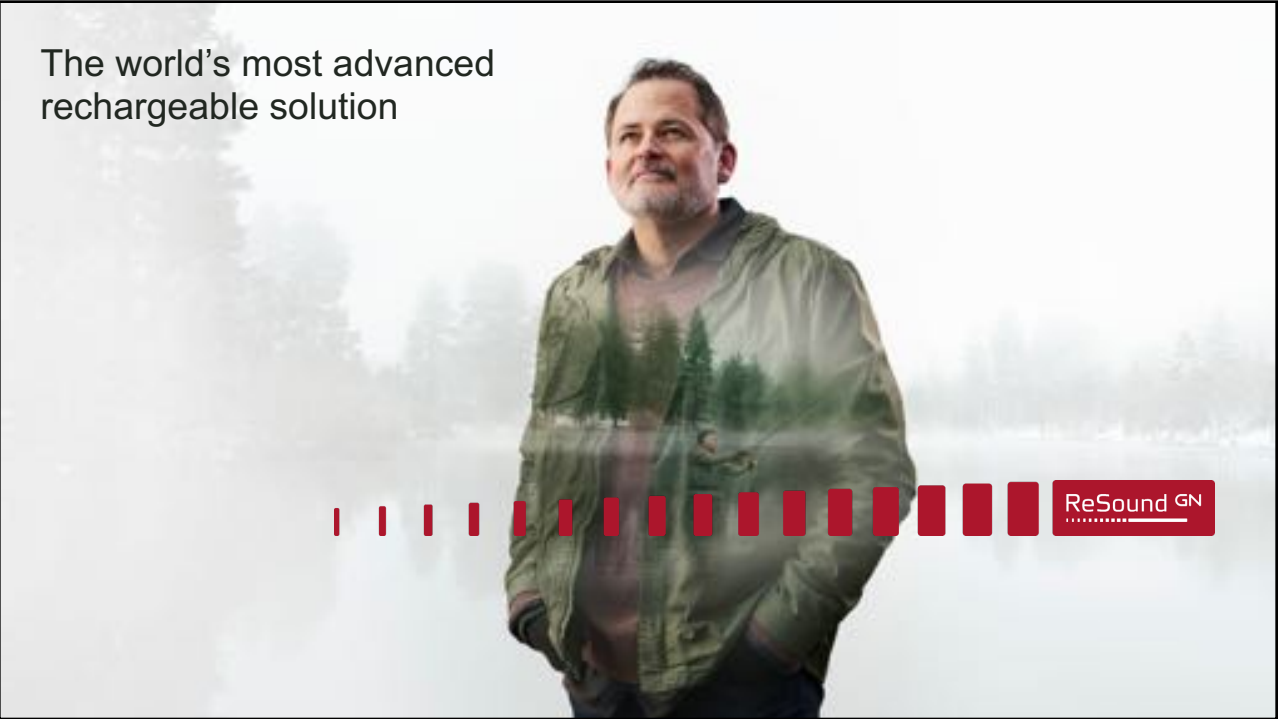
- **Improved** patient **engagement**
- **Enhanced** level of care
- **Reduced** number of necessary fine-tuning **adjustments**
- **More efficient** fittings through **direct** feedback from **patients**



## ReSound Assist: How it works


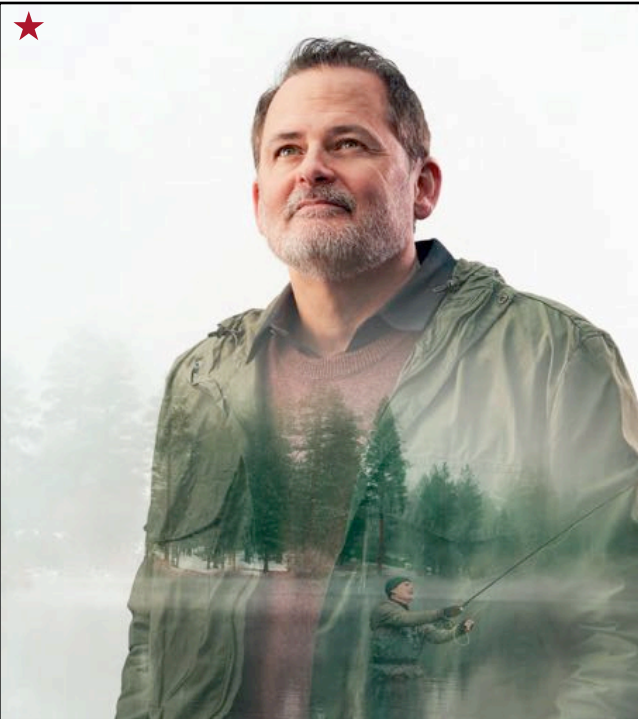


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The world's most advanced rechargeable solution








The world's most advanced rechargeable solution

ReSound LiNX Quattro now introduces the most advanced rechargeable hearing aid with a lithium-ion battery that is completely sealed for protection and has an easy-to-use charging case

**Quick and long-lasting power - full confidence**

CHARGING TIME	HOURS OF BATTERY LIFE
3 hours =	30
	24 <small>With 50% of streaming time</small>
1 hour =	16
30 minutes =	8







# Pushing the limits

ReSound LiNX Quattro is **pushing** the **limits** with the **lowest** battery drain in the industry, all made possible by the new **ReSound** chip platform.

Fast! 30 minutes of charge equals 8 hours of use

Easy-to-use, on-the-go portable charger

4+ years lifetime of battery

Reliable charging with inductive charging

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# Easy and intuitive hearing aid charger



Upon insertion or removal of hearing aids, the current battery status is indicated for 10 seconds

- 0 - 20% charged
- 20 - 40% charged
- 40 - 60% charged
- 60 - 80% charged
- 80 - 100% charged



- 66% - 100% full
- 33% - 66% 2 full
- 10% - 33% full
- <10% left

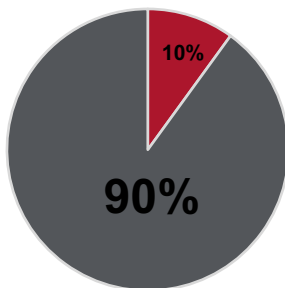


Upon insertion or removal of hearing aids and/or charging cable, the battery status is indicated for 10 seconds

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## Proven Ease of Use for Patients

Designed for **user convenience**, patients rated the ReSound LiNX Quattro rechargeable system as one of the **easiest to use** in the industry.



(Groth, 2018)

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**90%** of users can set up and use the rechargeable system without instructions



## An Even MORE Complete Solution with ReSound LiNX Quattro Customs!

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*New!!*

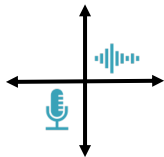


RIE 61  
Lithium-ion

RIE 62  
Zinc-air 13



Brilliant sound experience

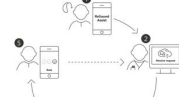


Unrivaled full spectrum of streaming



Made for  
iPhone | iPad | iPod

Support and personalization



The world's most advanced rechargeable solution



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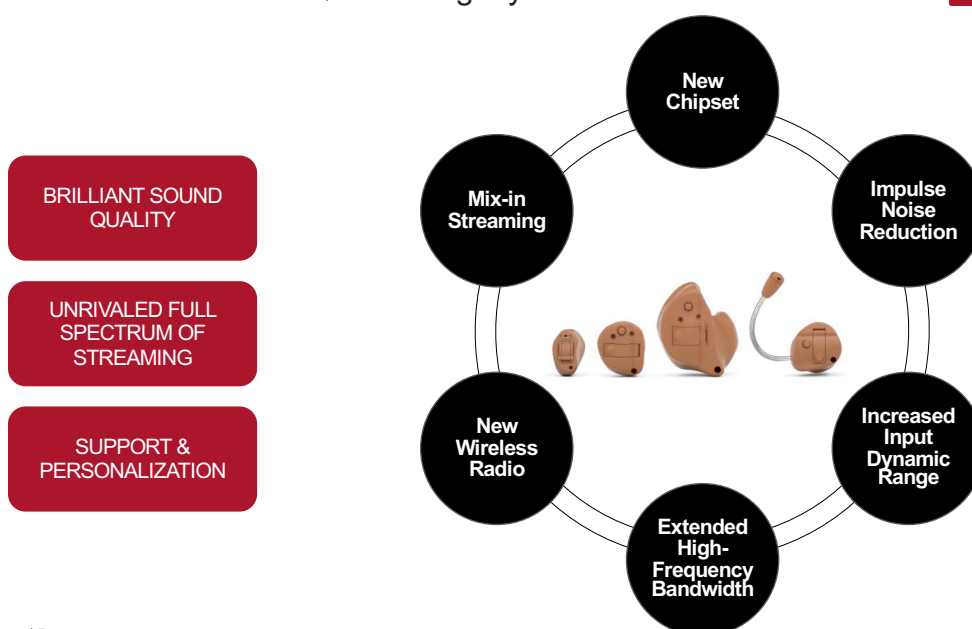
Brilliant sound experience offered in four discreet custom-crafted models



All with 2.4 GHz wireless technology

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Building on the ReSound LiNX Quattro Legacy



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## New options

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- Binaural Directionality III\*



- Directional mic only  
(No single-mic option)



- Same great product!
- No size 10 battery option

ALL NEW!



- 2.4 GHz!
- e2e
- MFi
- Remote Fine Tuning

**\*Binaural Directionality III is only available in 9-level devices with e2e and dual microphones**

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## World's first 2.4 GHz CIC

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### MADE POSSIBLE BY

- New pull-out antenna
- Increased efficiency of the new chipset

### NEW PULL-OUT ANTENNA

- Antenna is built into the faceplate
- Doubles as the removal cord
- Same wireless performance expectations

Antenna



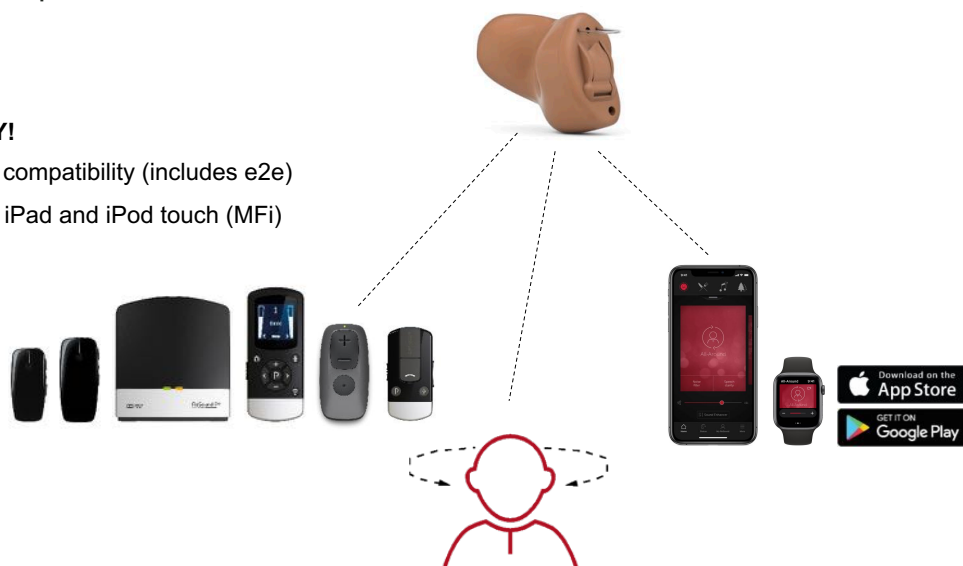
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More connectivity & personalization offered in a discreet package



#### NEW FUNCTIONALITY!

- 2.4 GHz wireless compatibility (includes e2e)
- Made for iPhone, iPad and iPod touch (MFi)



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## ReSound LiNX Quattro – Confidence in the finer details



Brilliant sound  
experience

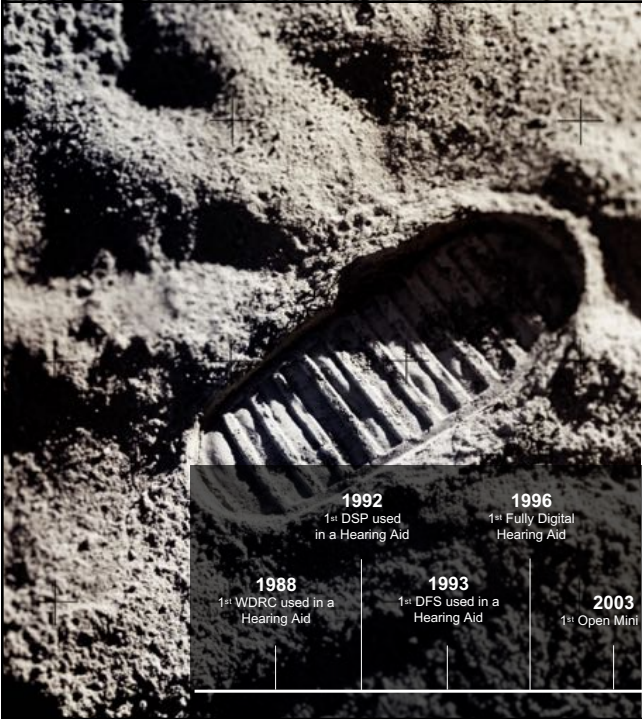
Unrivalled full  
spectrum of streaming

Support and  
personalization

The world's most  
advanced  
rechargeable solution

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## Future-proof Technology

***“We choose to go to the moon in this decade and do the other things, not because they are easy, but because they are hard, because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one which we intend to win.”***

**- John F. Kennedy**

<b>1988</b> 1 <sup>st</sup> WDRC used in a Hearing Aid	<b>1992</b> 1 <sup>st</sup> DSP used in a Hearing Aid	<b>1996</b> 1 <sup>st</sup> Fully Digital Hearing Aid	<b>2003</b> 1 <sup>st</sup> Open Mini BTE	<b>2008</b> 1 <sup>st</sup> Asymmetric Directionality	<b>2010</b> 1 <sup>st</sup> 2.4 GHz Hearing Aid	<b>2013</b> 1 <sup>st</sup> MFI Hearing Aid	<b>2017</b> 1 <sup>st</sup> RFT Hearing Aid	<b>2019</b> 1 <sup>st</sup> BLE direct streaming Hearing Aid
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## Thank you!





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