

# What Parents Should Know about Hearing Aids:

## What's Inside, How They Work, & What's Best for Kids

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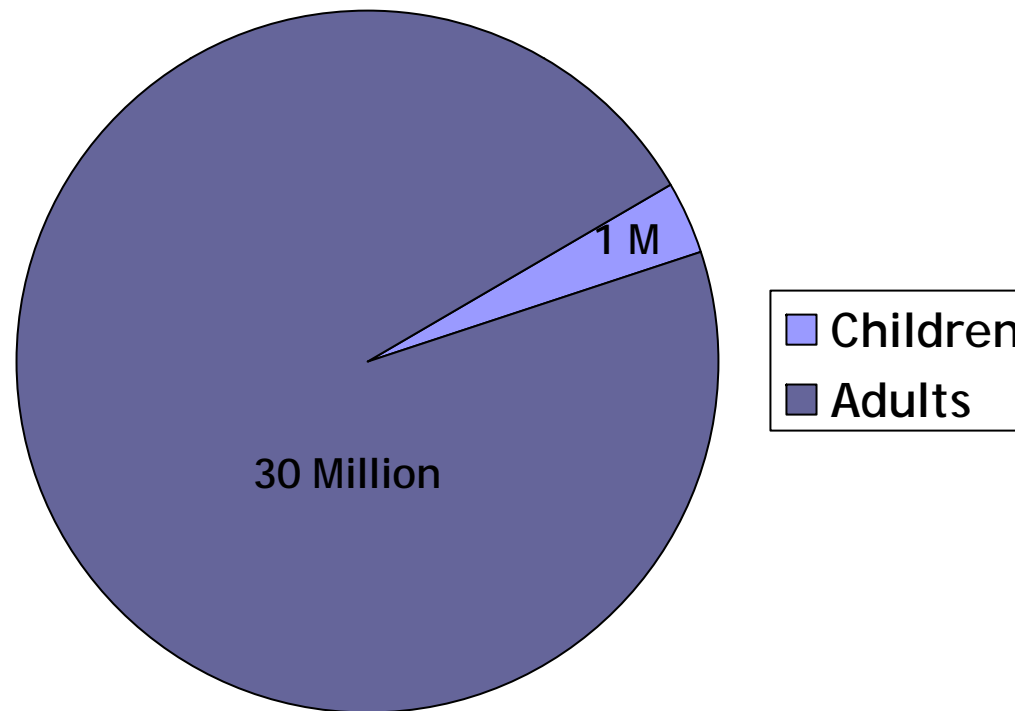


# Goals

- Characterize the unique needs of children with hearing loss.
- Describe some of the advanced signal processing features of hearing aids.
- List the hearing aid features that are helpful to children with hearing loss.

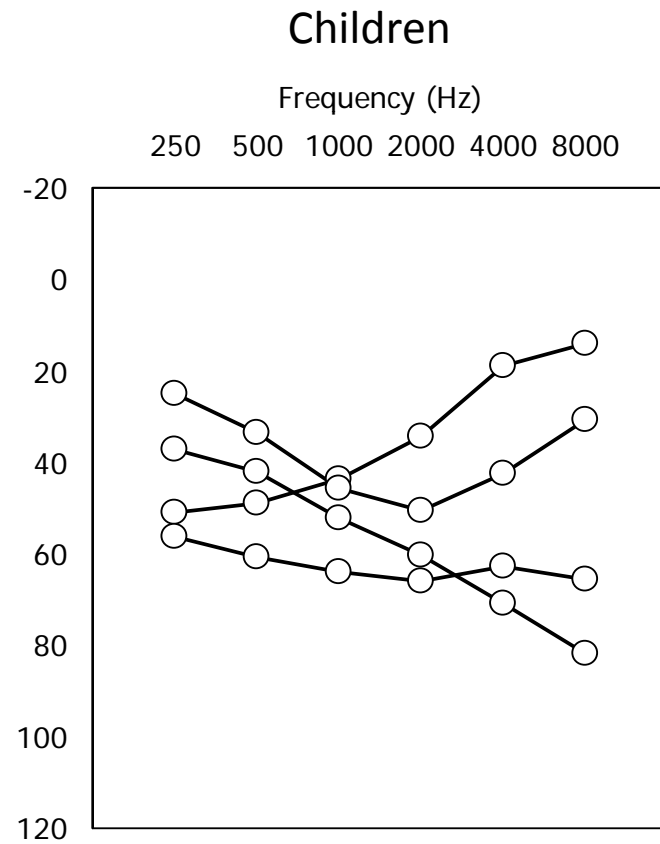
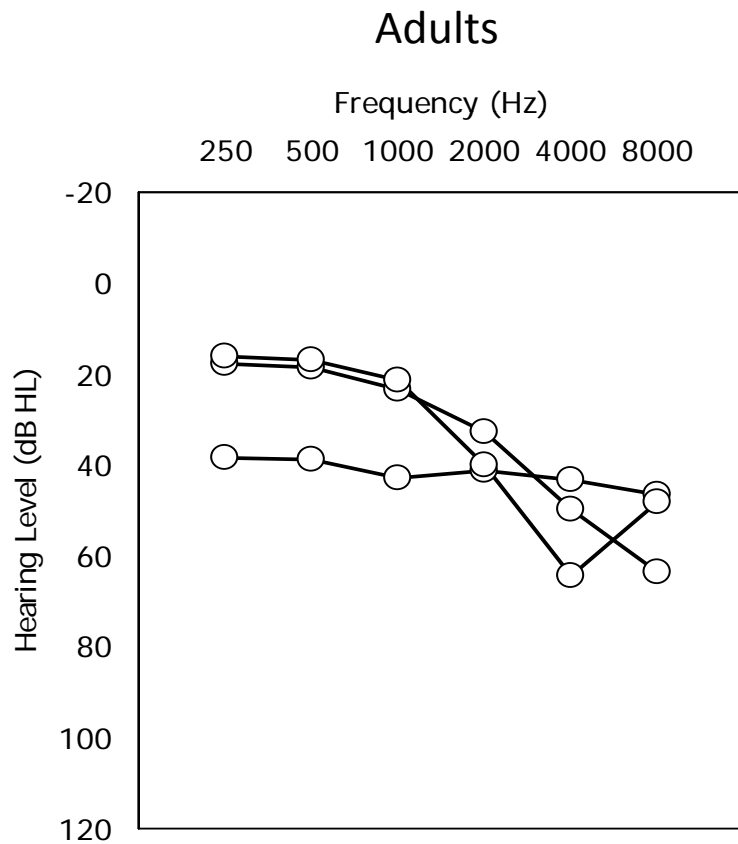
# Children with Hearing Loss are Unique

1. There aren't as many of them.



# Children with Hearing Loss are Unique

## 2. Their hearing losses are different.





# Children with Hearing Loss are Unique

## 3. Their needs are different.

Adults use their residual hearing to *continue* to communicate,

Children use their residual hearing to *learn* to communicate.

# Styles

- In-the-canal
- In-the-ear
- Behind-the-ear



## On The Outside

- Earmold
- On/off switch (maybe)
- Volume control (maybe)
- Battery compartment



## On The Inside

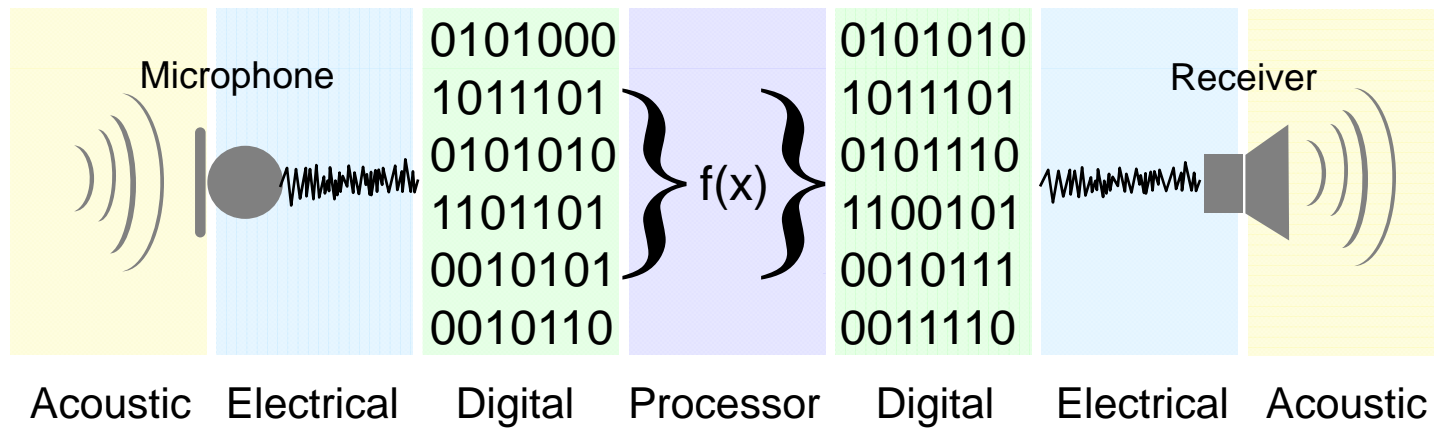
- Microphone
- A/D converter
- Signal Processor
- D/A converter
- Receiver



Picture courtesy of  
Sonic Innovations



# On The Inside





# Signal Processing Technology

- Advanced signal processing solved a number of problems common to hearing aids
  - Improved fitting precision
  - Accommodate loud and soft sounds
  - Listening in different environments
  - Limiting acoustic feedback
  - Listening in noise

# MAXX™ 211 D

PHONAK

Compact BTE hearing instrument with switchable directional microphone, 6-channel digital Wide Dynamic Range Compression (dWDRC), digital Noise Canceler (dNC) for comfort and ease of listening in noisy environments, plus additional features for convenient and successful operation.

Key data	Ear Simulator
Max. gain	63 dB
Max. power output	130 dB SPL
Frequency range	<100-4700 Hz

- General features**
- Directional miniature electret dual microphone; directional or omnidirectional function can be set with mech. switch
  - Compact, digital Phonak BTE
  - Battery size 13
  - Telecoil
  - Automatic and manual volume adjustment
  - Manual volume adjustment with programmable digital volume control (Range  $\pm 6$  dB,  $\pm 10$  dB or deactivated)
  - O-T-M manual switch
  - Audio input, MicroLink compatible
  - Individual acoustic signals for start up, maximum/minimum volume and low battery warning

- Accessories/Options**
- FM receiver: MicroLink MLx, MLxS or ML5
  - Audio shoe ASS or ASS-MLx
  - Ear hook HE2 1000
  - Mini ear hooks HE2, HE2 1000
  - Tamperproof system KSS
  - CROS/BCROS
  - Cover for volume control
  - Choice of 11 ColorLine colors

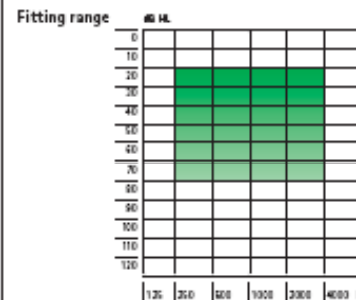
- Processing features**
- 6-channel digital Wide Dynamic Range Compression
  - Feedback Manager
  - MAXX noise suppression technologies:
    - 6-channel digital Noise Canceler (dNC)
    - Soft squelch

- Software**
- PRG software version 8.3 or later

- Hardware**
- Programmable with PC (IBM compatible), and HI-PRO interface



- ① Hook HE2
- ② Broadband receiver
- ③ Directional miniature electret microphone (protected inputs)
- ④ Manual volume adjustment
- ⑤ Opening for programming connector
- ⑥ O-T-M switch
- ⑦ Battery drawer
- ⑧ Serial number
- ⑨ Audio input



CE  
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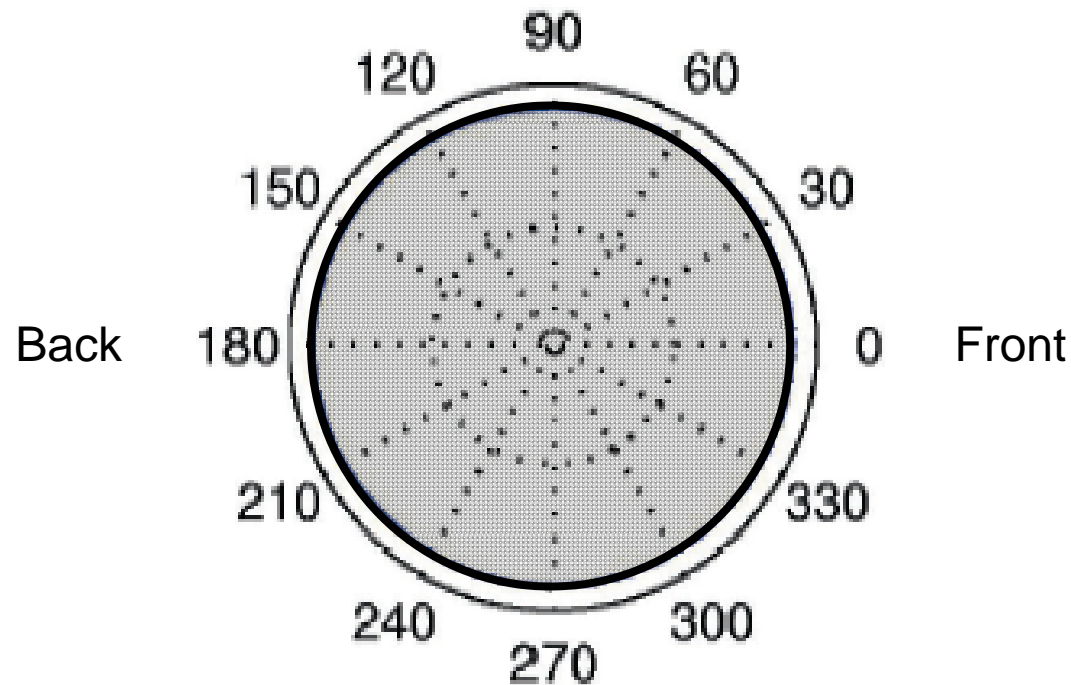


FM

Product information MAXX 211 D

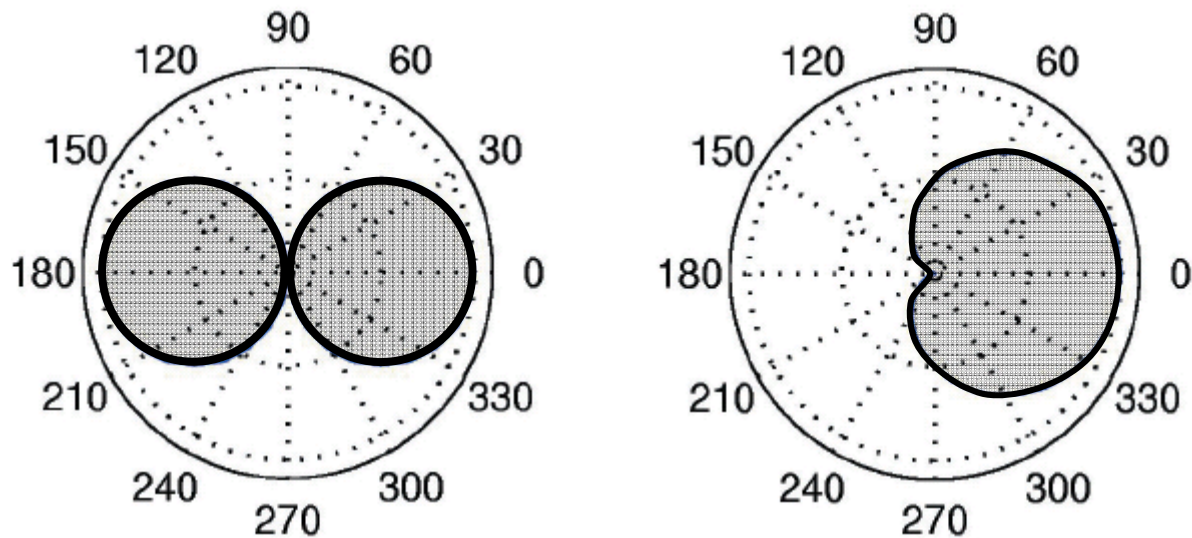
# Microphone Technology

- Omni-Directional Microphone



# Microphone Technology

- Directional Microphone





# Microphone Technology

- Advantages

- Adjustable
- Adaptive

- Disadvantages

- Can be noisy
- Requires sophisticated listener
- Not all noise is always noise



# Challenges for the Pediatric Audiologist

- Hearing aids are complex
- There are thousands of different hearing aids to choose from
- Children are not able to participate in the hearing aid fitting process
- Children's needs change as they grow and mature



# Hearing Aid Features for Children

- Durability
  - Wear and tear
  - Growth
- Auditory Access
  - Bandwidth
  - Gain
- Connectivity
  - Telephone
  - Classroom
  - Personal Audio Device



Questions?