

HLAA 2015

# Hearing Restoration Beyond Amplification

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EAR CARE &  
SKULL BASE SURGERY INC.

## Hearing Restoration

- Unilateral deafness
- Moderate to severe sensorineural hearing loss
- Severe to profound sensorineural hearing loss
- Bone anchored implants
- Middle ear implantable hearing devices
- Cochlear implants

## Hearing Restoration

- **Unilateral Deafness**
- **CROS Hearing Aids**
- **Bone anchored implants**
- **Magnet surgically implanted into skull**  
Sophono Implant  
BAHA, Cochlear Corporation

## Bone Anchored Hearing Aids

Sophono Medtronic      Cochlear BAHA



smallest implant  
smallest processor

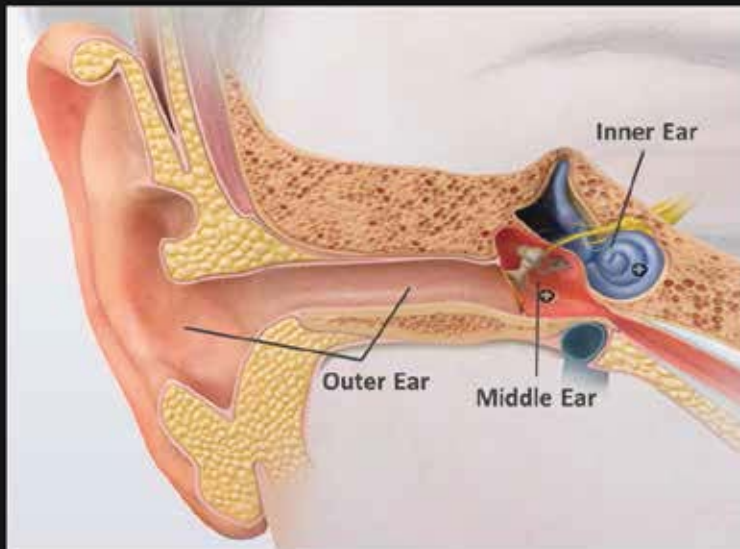


## Hearing Restoration

- **Moderate Severe Hearing Loss**
- **Middle Ear Implantable Hearing Devices**
- **Esteem, Soundbridge, Maxum**  
**Maxum**
- **Magnet surgically attached to ossicles,**  
Ear level device drives sound waves into  
the cochlea with electromagnetic impulse

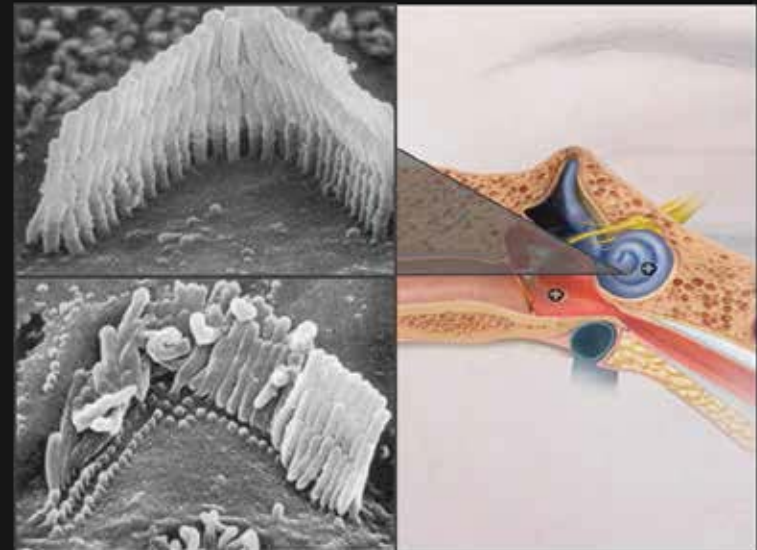


## How we hear...

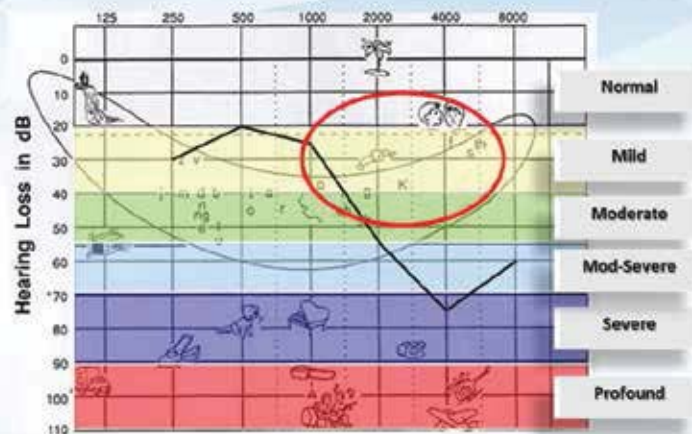


Sound wave transmission to inner ear

## What is Sensorineural Hearing Loss?



## The Audiogram



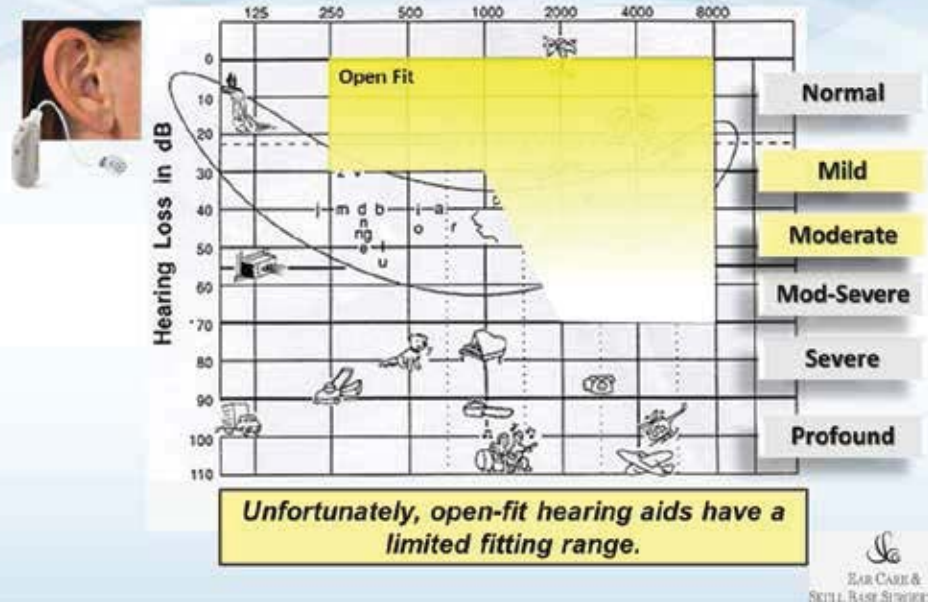
## Typical Comments with HAs

- I can hear...but I can't understand.
- I can't understand in restaurants or noisy places.
- Sounds and voices are distorted.
- I feel like I'm talking underwater.
- I can't understand my grandchildren.
- I don't like the squealing (feedback).
- I can't wear them outside because of windnoise.

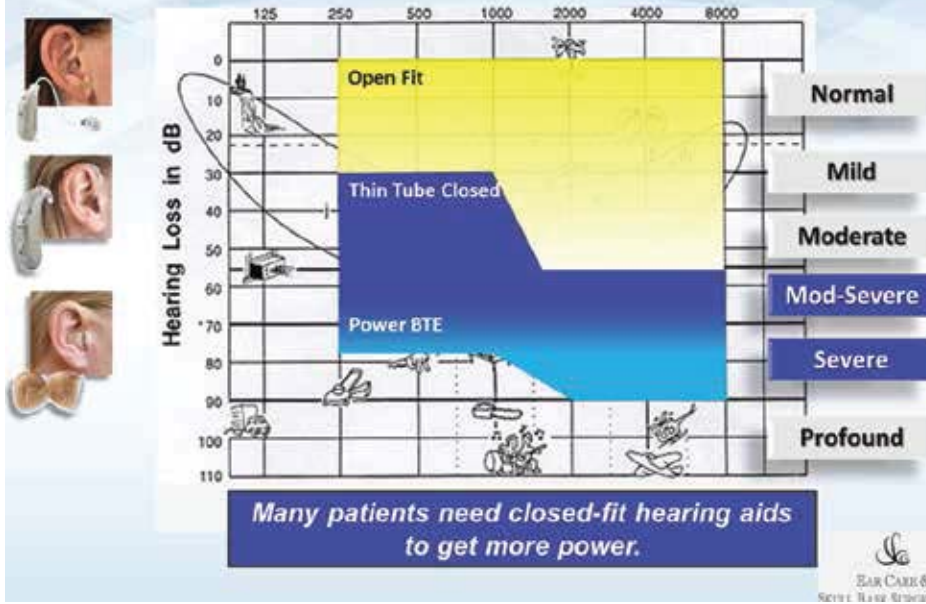
# Conventional Hearing Aids



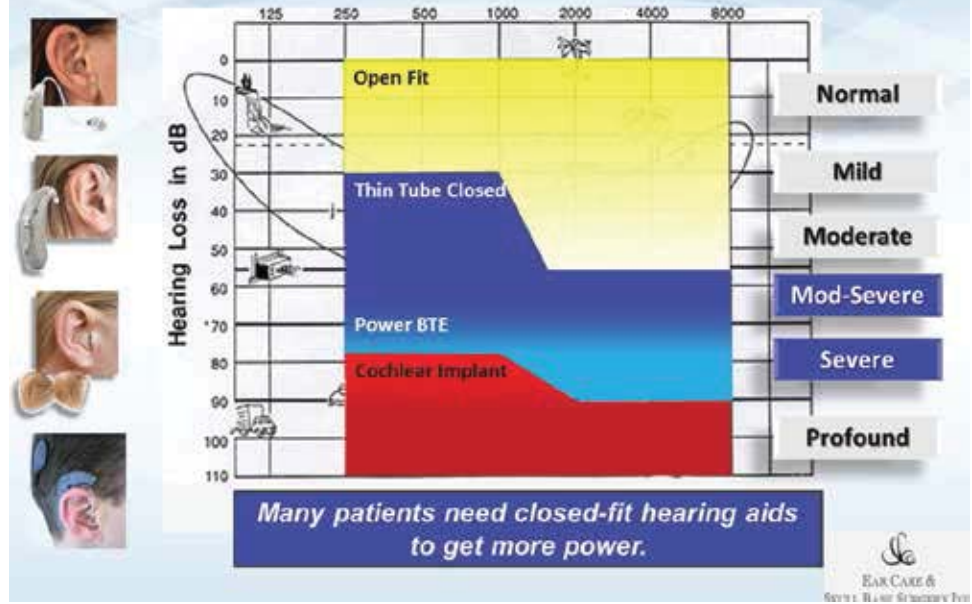
# HA Fitting Profiles



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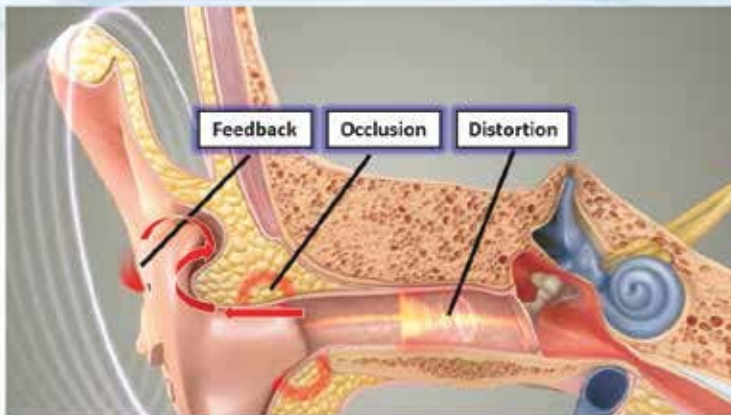


# HA Fitting Profiles





## Hearing Aid Limitations

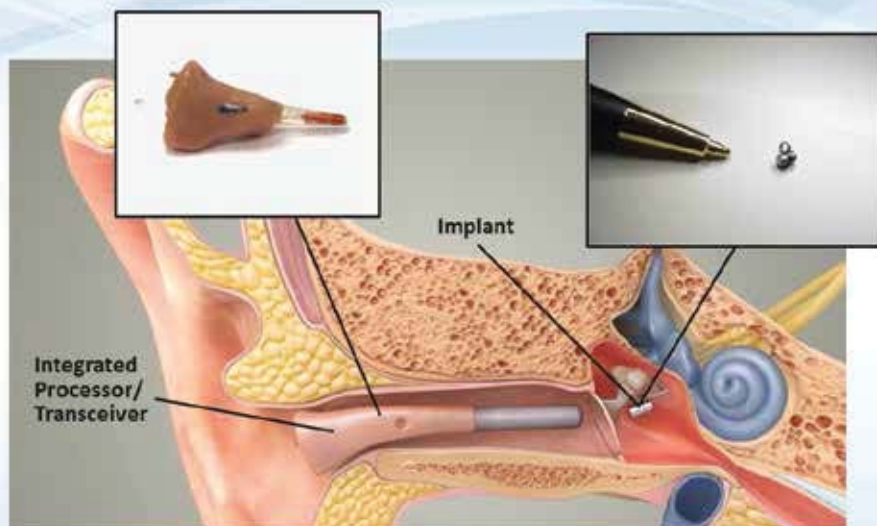


The acoustic speaker is the root cause problem with all of these!

## MAXUM is “speakerless”

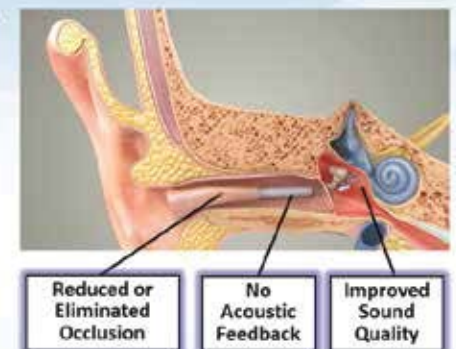
- Hearing aids use *acoustic* energy to vibrate the eardrum and the ossicular chain
- MAXUM uses *electromechanical* energy to directly vibrate the ossicular chain

## MAXUM IPC Configuration



## MAXUM Benefits

- Improved fidelity and quality of sound
  - Direct stimulation of ossicles
    - Elimination of speaker
    - Elimination of acoustic distortion
- Avoidance of feedback
  - No acoustic energy
- Improved gain
  - Gain not hindered by feedback
- Reduced or eliminated occlusion effect



*Minimally invasive procedure...*

## MAXUM Procedure

- Minimally invasive procedure
  - Transcanal approach
- Surgery performed under local anesthetic
  - In-office procedure room or surgical center
- Surgical procedure: ~30 - 40 min.



## MAXUM Procedure

- Microscopic view of tympanic membrane
  - Transcanal approach



## MAXUM Procedure

- Tympanic membrane elevated to expose the ossicular chain and incudostapedial joint



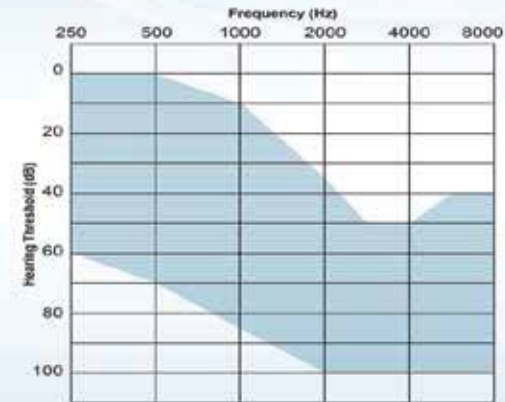
## MAXUM Procedure

- Attachment of magnet to the incudostapedial joint
- Biological cement applied to anchor the magnet
- Tympanic membrane replaced and covered with ointment



## MAXUM

- FDA Approved
  - Adults 18 years and older
  - Mild to Severe Sensorineural Hearing Loss

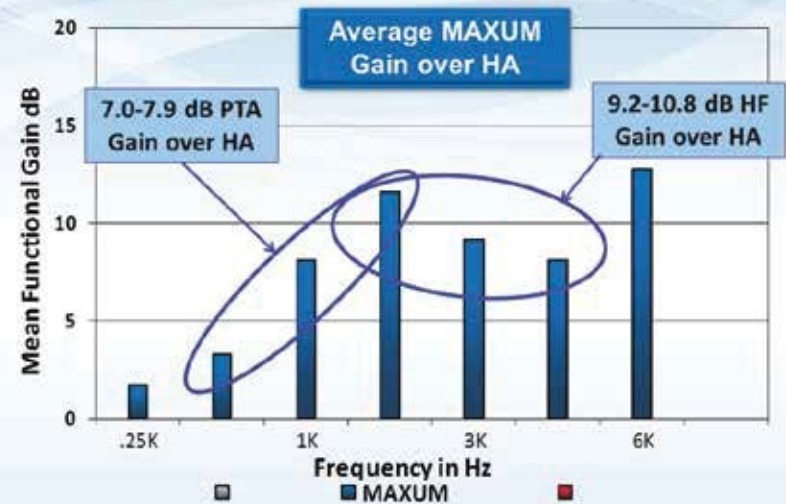


## MAXUM Processor

- Advanced Digital Processing Technology
- 3 Multiple Listening Environments
- Easily Upgradable



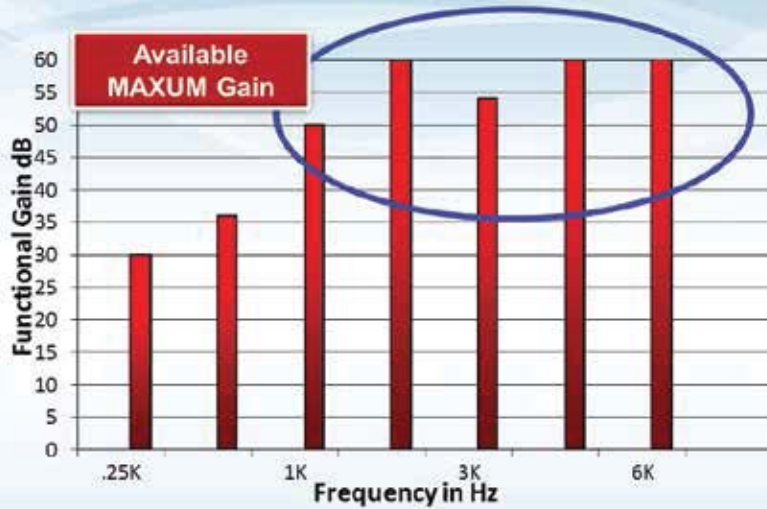
## Functional Gain



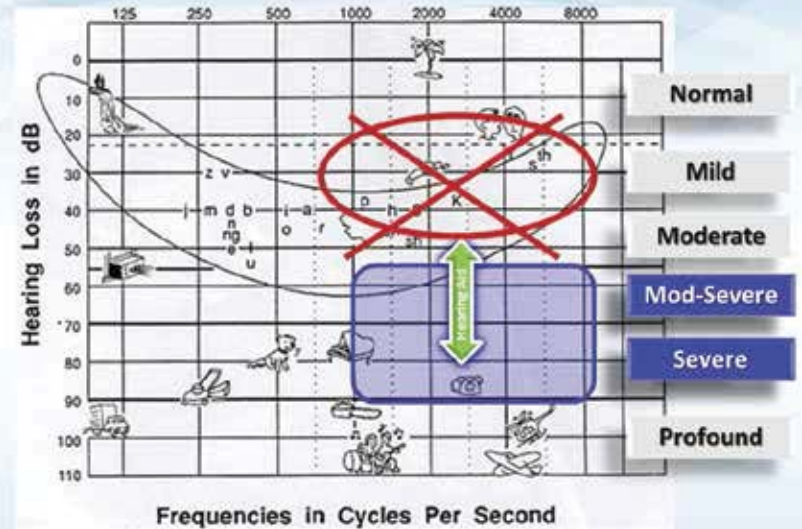
\*FDA PMA Phase II Clinical Study



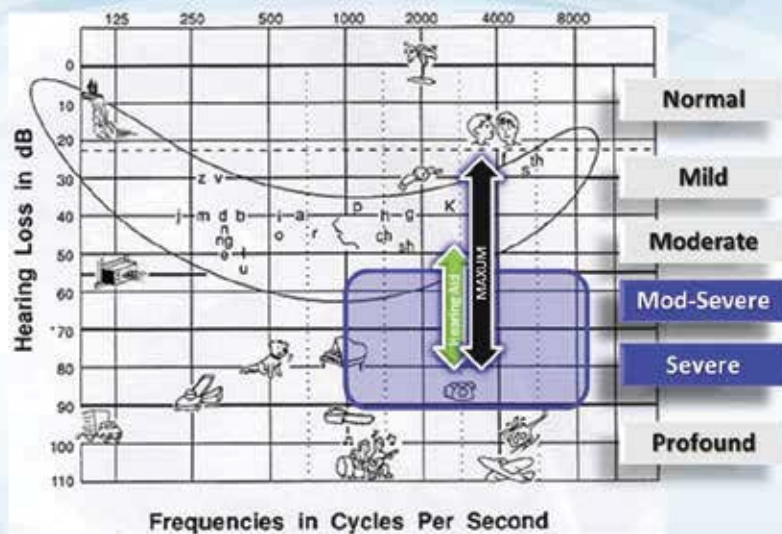
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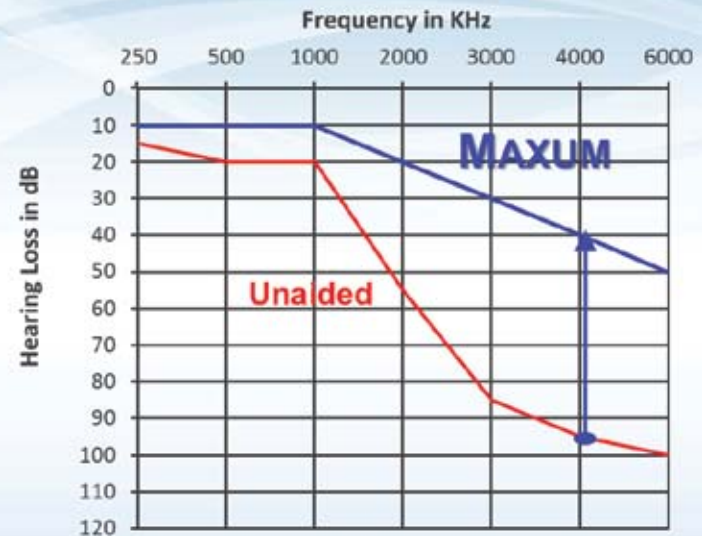
# Importance of Functional Gain



# Importance of Functional Gain



# Patient JS





# Articulation Index

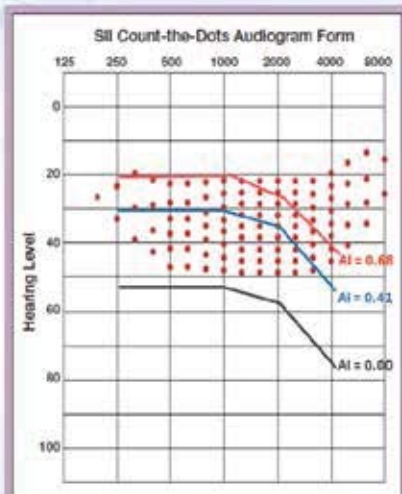
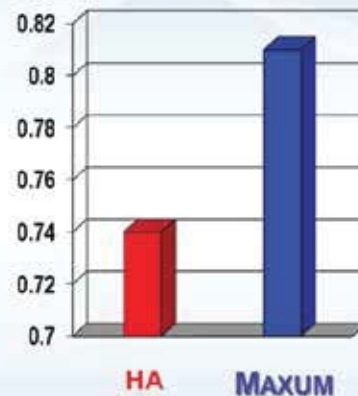


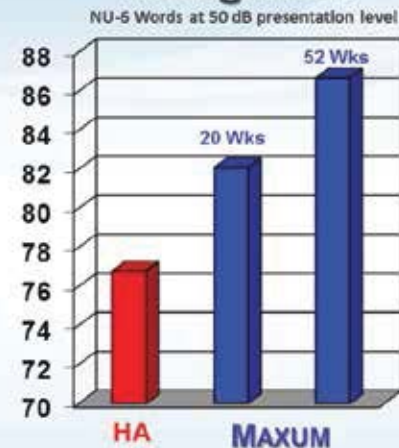
Figure 2. The new Killion and Mueller SII Count-The-Dots audiogram for assessing the articulation index. The distribution of the 100 dots represents a speech level of 60 dB SPL (-45 dB HL).

Even small improvements in gain can have significant improvements in audibility.

# Articulation Index

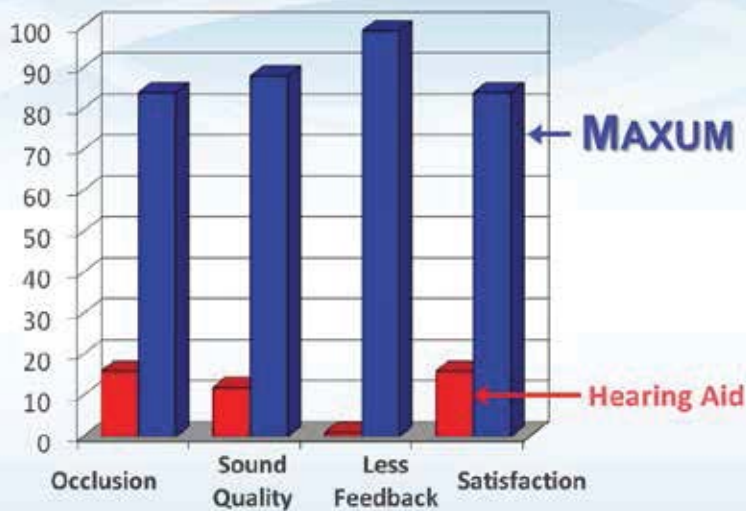


# Word Recognition



\*FDA PMA Phase II Clinical Study

# Device Preference



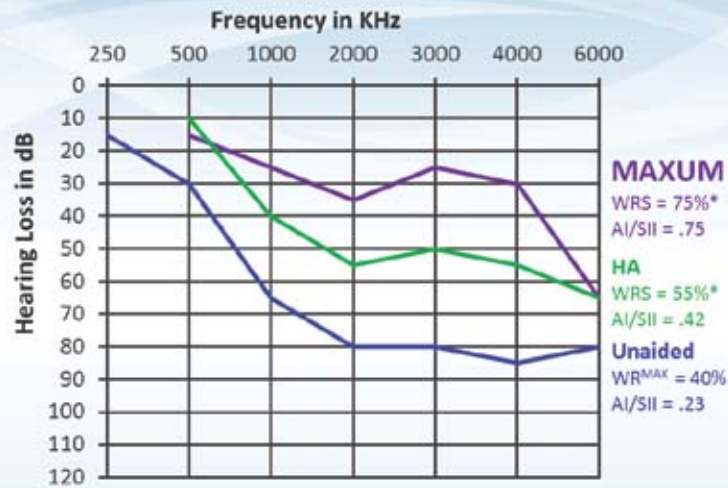
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# FG (L)

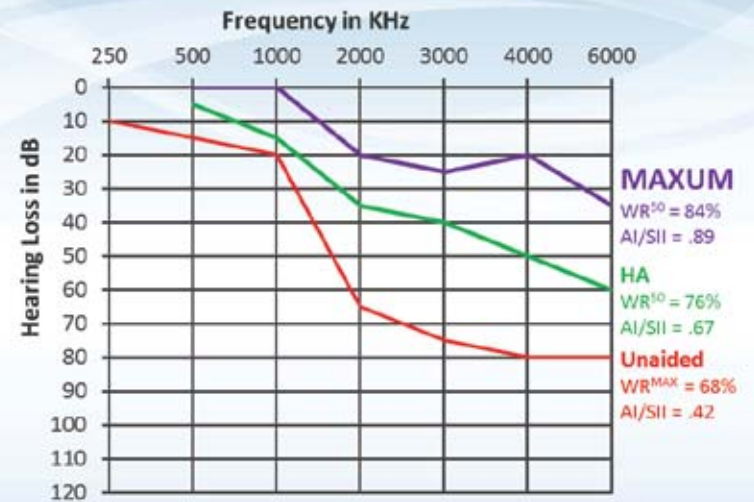


MAXUM: 2 mo.  
WRS = 65%  
AI/SII = .53  
MAXUM: act.  
HA  
WRS = 48%  
AI/SII = .34  
Unaided  
SD = 67%  
AI/SII = .20

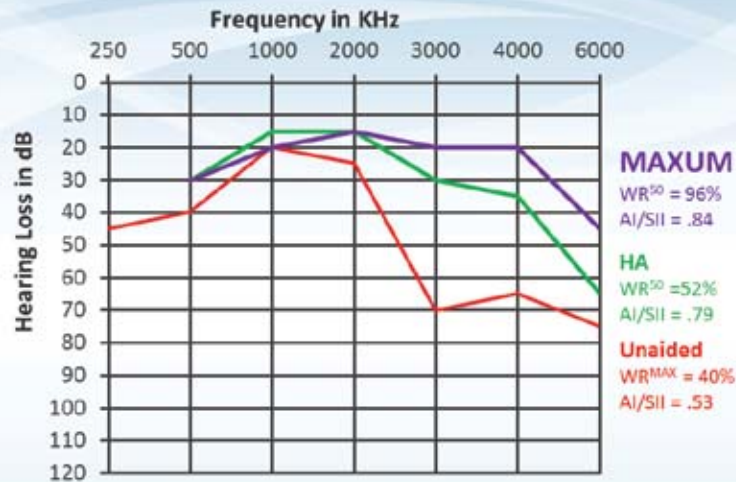
# IG (L)



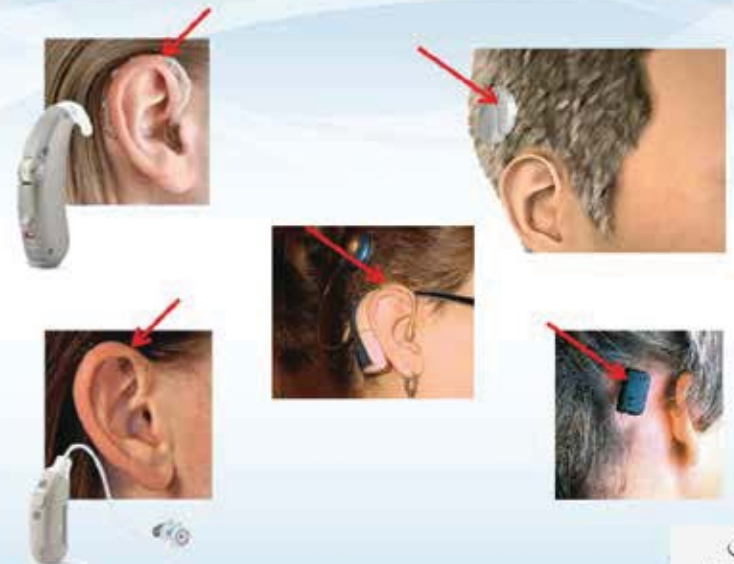
# DE (R)



# JG (R)



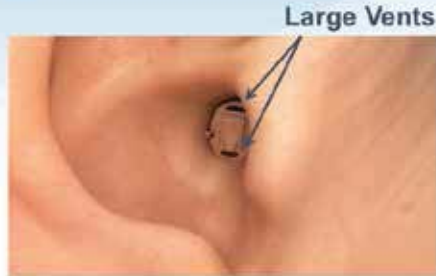
# Microphone Placement





# Maxum IPC Configuration

- Microphone in canal
  - Best placement location
  - Natural hearing effect
    - Use outer ear (pinna) to collect sounds and focus into ear canal
- Cosmetically discreet



# Difficult Hearing Situations



Restaurants



Meetings



Driving



Telephone



Outdoor Activities



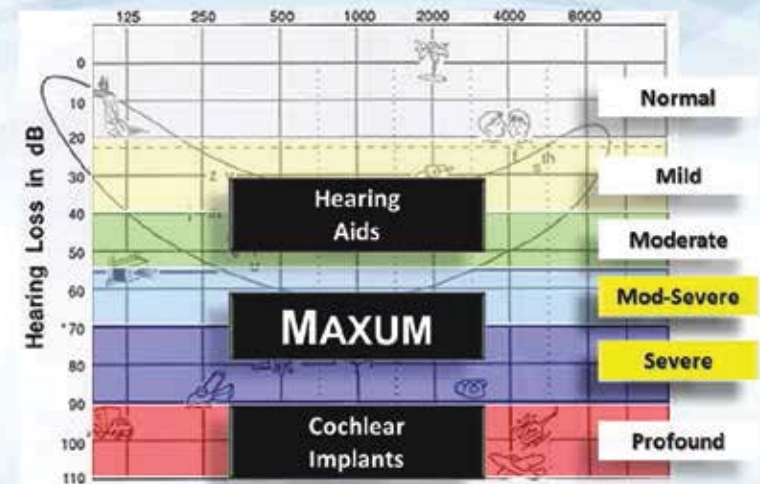
Children

# HA Patients who can benefit...

- Mod-severe to Severe high frequency SNHL
- Custom molds
  - BTE or In-the-Ear
  - Desire open-fit experience
- Open fit
  - Needing more gain



# Middle Ear Implant Positioning



**Beyond open-fit hearing aids...  
...before cochlear implants.™**

Determining if I am a candidate...

**EAR CARE & SKULL BASE SURGERY  
ST. LOUIS, MO**

**G. ROBERT KLETZKER, MD, FACS  
&**

**RICHARD M HOGAN, MS, CCC-A  
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