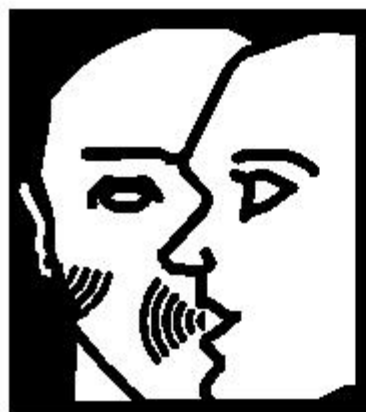


# assistive listening devices.





Hearing  
Systems



# When a Hearing Aid/CI Needs Help



# What is an Assistive Listening Device?

- Theory of Operation:
  - To overcome poor signal to noise ratio
  - Overcome effects related to distance from sound source
  - Poor listening environments (reverb/echo)
  - Time delay and noise



# Listening Devices

- Wired & Wireless –Personal & Large Area
  - Hardwired
  - FM
  - InfraRed
  - T-coil/Induction Loop
  - Soundfield
  - Amplified Stethoscope
  - Amplified Phone
  - Bluetooth Personal Area Network

# Cochlear Implants

**IDENTICAL AID BENEFITS AS HEARING AID USERS**



# Why Bother

- Hearing aids and Implants cannot do it all.
- ALD's complement hearing aids in environments where aids cannot provide a satisfactory listening experience.
- Proper use and understanding of ALD's fosters more realistic expectations from hearing aids users.
- ALD's and education in their proper use are an integral part of comprehensive hearing rehabilitation.

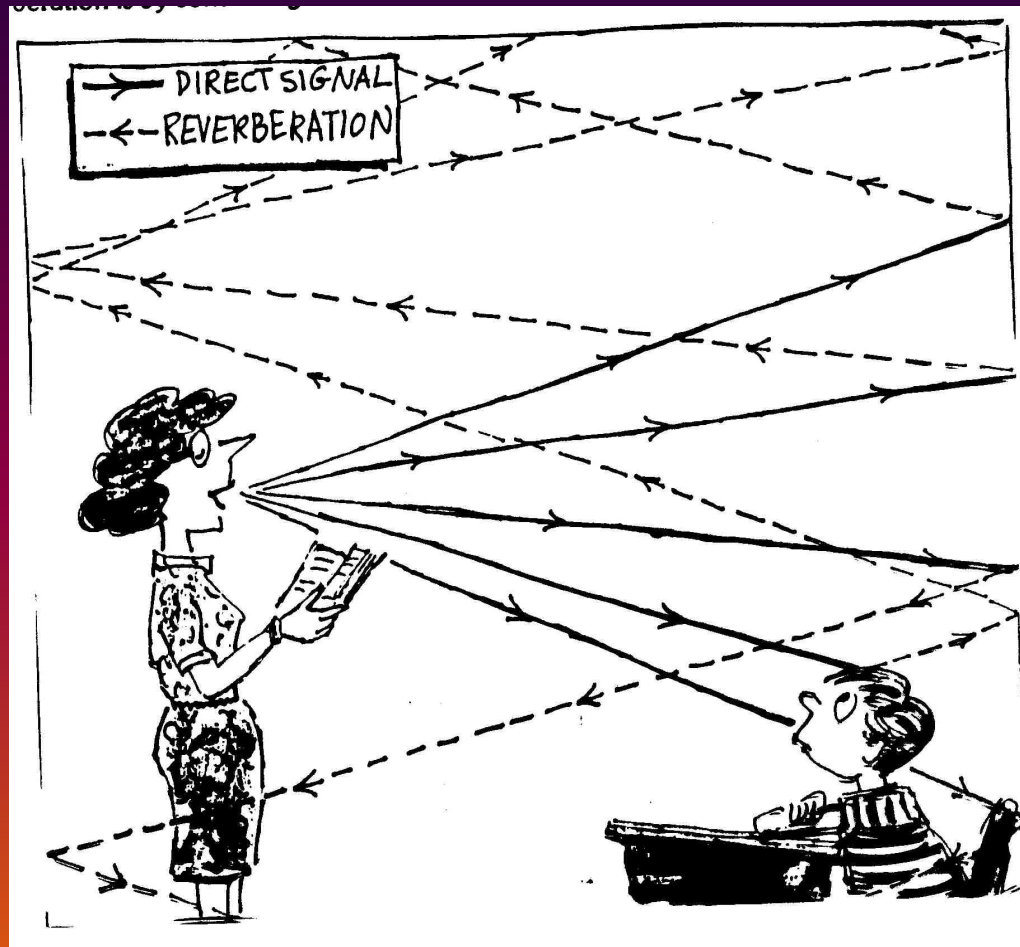


# DISTANCE

Energy of the sound wave is being distributed over a greater surface area, so it decreases as it travels

When the distance between speaker and listener is doubled, sound decreases by 6 decibels (dB).

# Reverberation or Echo



# REVERB Problems

- Hard ceiling without acoustic tiles
- Room with ceiling height more than 10 feet. YOUR HOUSE???
- Acoustic ceiling tiles have been painted and lost effectiveness,  
Hard Surfaces – Windows/Mirrors
- Walls and floors of non-acoustic absorptive materials



# Signal to Noise Ratio

- The ratio of the magnitude of the wanted SIGNAL to that of the unwanted NOISE, expressed as a simple arithmetic ratio or in DECIBELS
- Also abbreviated S/N
- Sometimes MCR (message to competition ratio)
- Typical classroom = + 5 to -20dB SNR
- Normal hearing persons need about + 6dB SNR
- Hearing impaired persons need + 18dB SNR

# Hearing Aid-CI Technology

- Directional mics are awesome !!! “BEAM” Program
- Digital Noise Reduction – no proven improvement in speech understanding in noise BUT improved listening comfort is confirmed therefore, people will wear aid more, in quiet and noise, and may improve ability through natural training.
- What is Noise vs Speech, Number of Channels
- Personality Types –Accommodating, Persevering, Nervous, Irritable

# Discretion has it's place





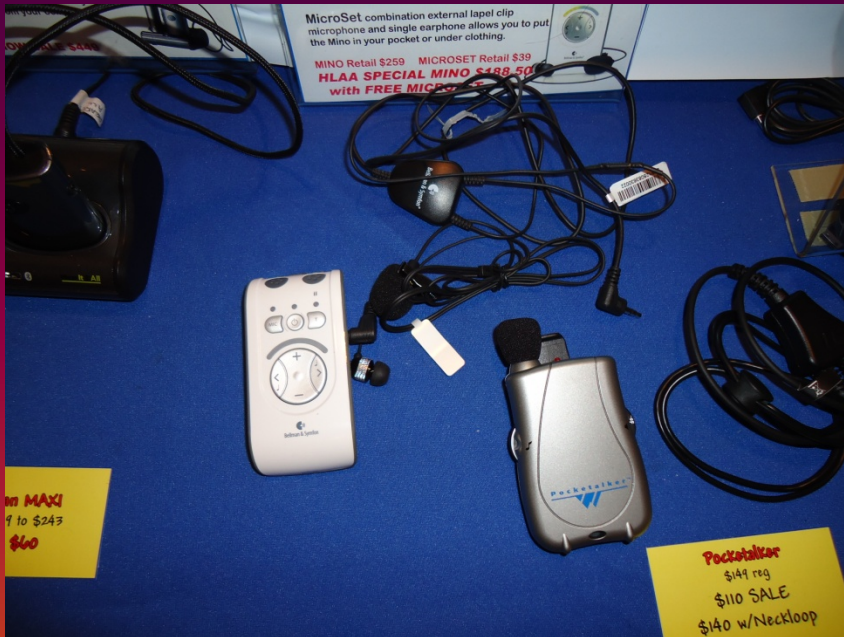
# Assistive Listening Devices = FM, IR, Personal units

- Improves signal to noise ratio
- Eliminates distance
- Decreases effects of reverberation
- Provides additional amplification
- Variety of transducers-
  - Teleloop, DAI, Boot Receiver, Headphone, Earbud, Bone Oscillator, etc.

# Hardwire Units – a 3<sup>rd</sup> Ear ?



# Mix and Match Accessories





# Versatile



# Auxiliary Microphones

- Uni-Directional vs. Omnidirectional
- Boom, noise cancelling mics
- Directional patterns –Cardoid, super cardoid, figure 8, shotgun, boundary/PZM
- Fixed vs bendable/pointable, lavalier-lapel
- Group Table mics
- Handling Noise can be an issue

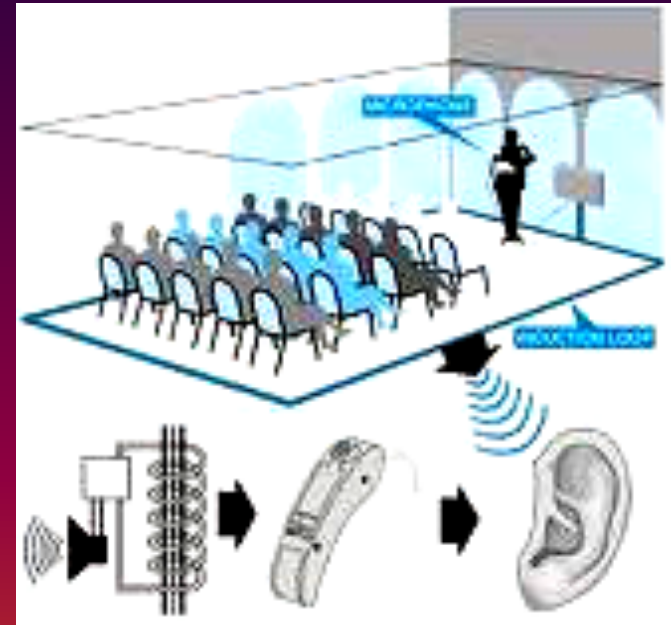
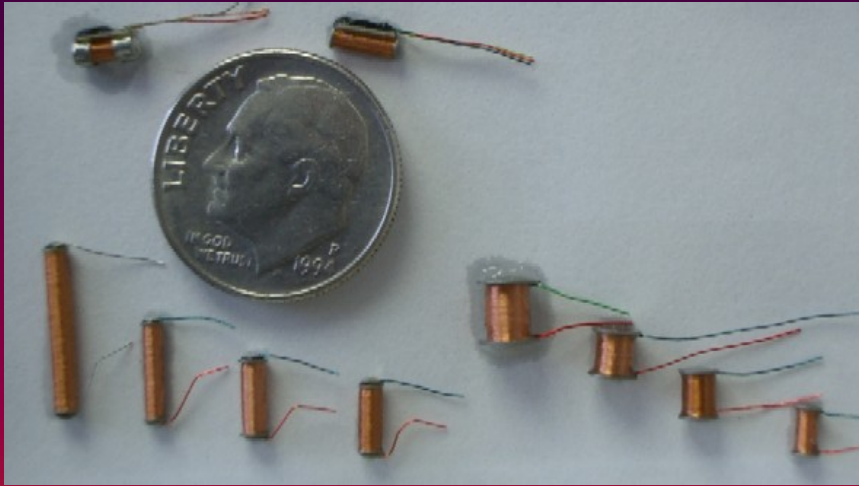
# Earphone Couplers



# Neckloop Inductive Coupling



# Telecoils in all aids-as possible

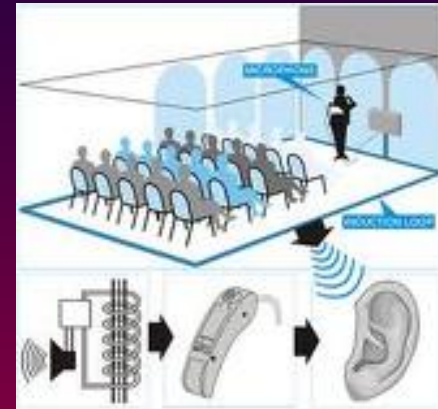


- Accessible T Coil via Push Button, Switch or Remote
  - Loops Not Accessible with Auto/EZ T



# Large Area ALD

- FM broadcast
- IR broadcast
- Induction Loop



# FM systems

- Frequency Modulation-standard radio technology
- Range-over 1000 ft, antennae dependent
- Subject to FCC guidelines
- Assistive Bands-72-76 MHz, 216-217 Mhz
- UHF – 600 -926 MHz
- May employ digital processing and/or encryption for secure, interference free reception
- BluetoothFM combo-Phonak Roger,WS Digiwave

# Personal FM-Indoors or Out



# Comfort Contego





# Large Area FM



# FM Boot receiver





## **FM Systems**

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- FM = Frequency Modulation
- Standard FM radio technology
- FCC approved frequencies 72-76 MHz, 216-217MHz
- Range 150-1,000 ft. depending on equipment and architectural design

## **Infrared (IR) Systems**

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- Invisible light carries the signal vs. a radio wave
- Frequency modulated (95kHz, 250kHz, 2.3MHz)
- Operating range: stated in sq. ft (usually between 3,000 & 10,000 sq. ft.)
- Recommended when security is an issue or RF interference

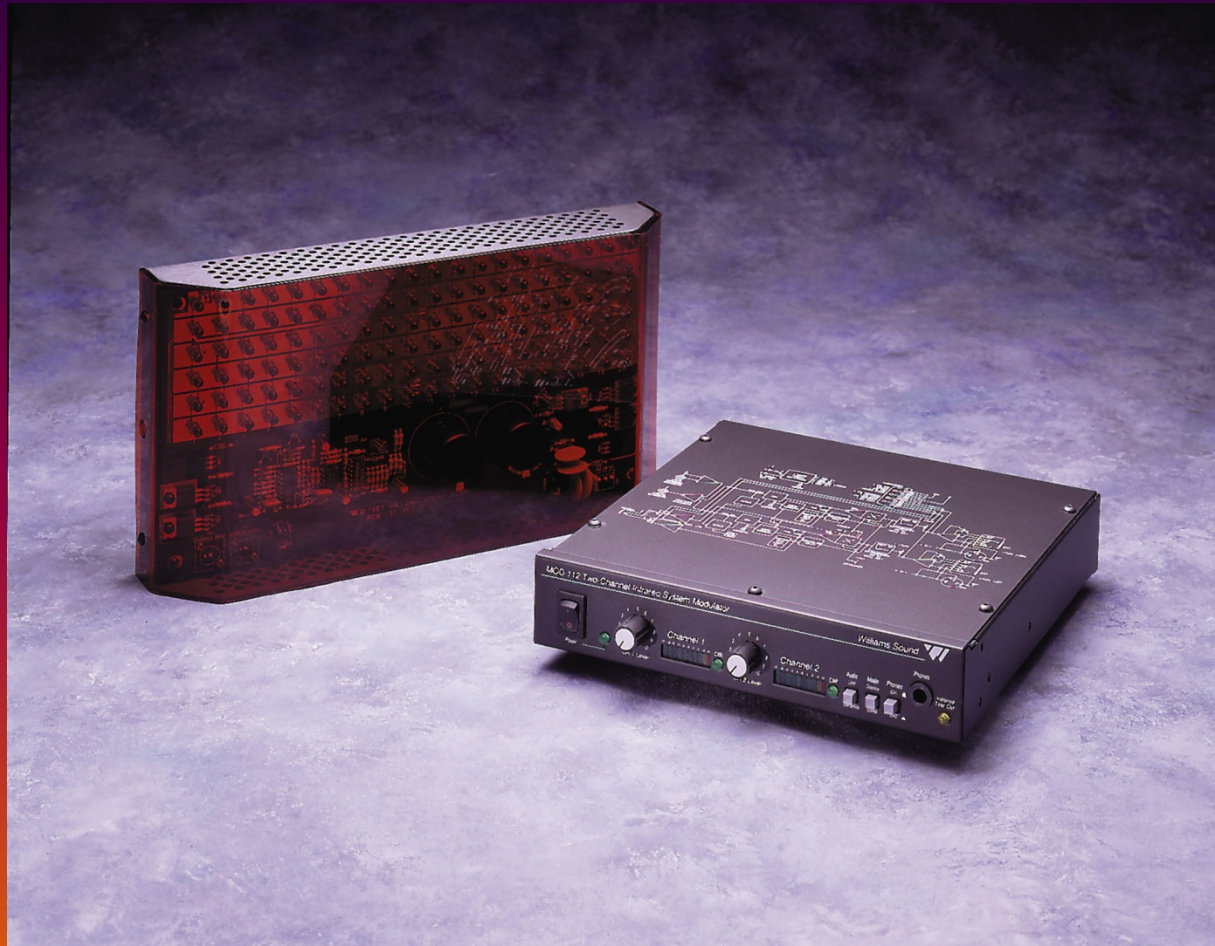
# Infrared Technologies

- Only Truly Secure Transmission
  - ❑ Cannot Penetrate Opaque Objects/Walls
  - ❑ Stays “In the Room”, Confidentiality
- Frequency options
  - ❑ 95 KHz
  - ❑ 250 HKz
  - ❑ 2.3 MHz
  - ❑ 2.8 MHz
  - ❑ Others

# Popular for Home/TV use



# Large Area Emitter and Modulator



# **Inductive Listening**

## **1. The 'T' Switch**

- Telephone Switch
- Telecoil Switch

## **2. Magnetic Induction**

- Room Loops
- Neckloops
- Silhouettes
- Telephones

# **Loop Systems**

- Electromagnetic signal
- Compatible with hearing aid "T" coils
- Range: within the looped area only
- Not commonly used in U.S.

# Silhoutte Transducers



# Neckloops in Abundance









# BlueTooth Neckloops

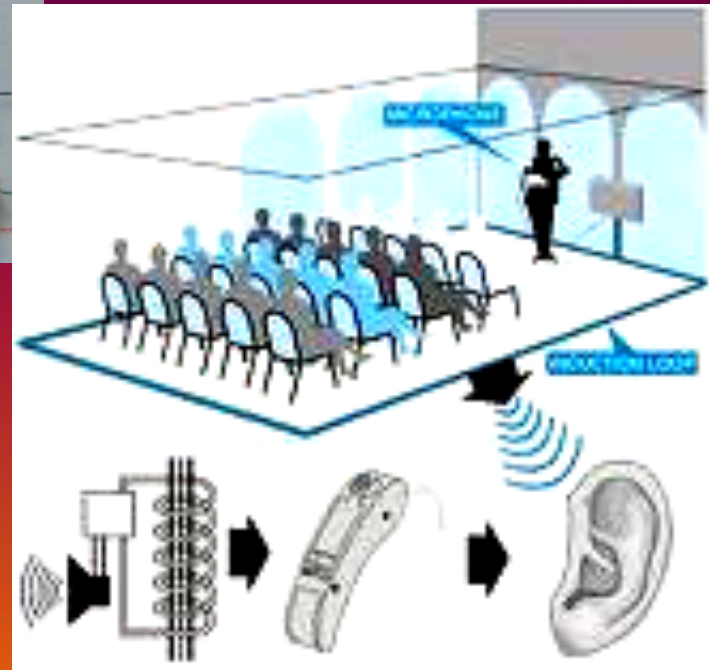
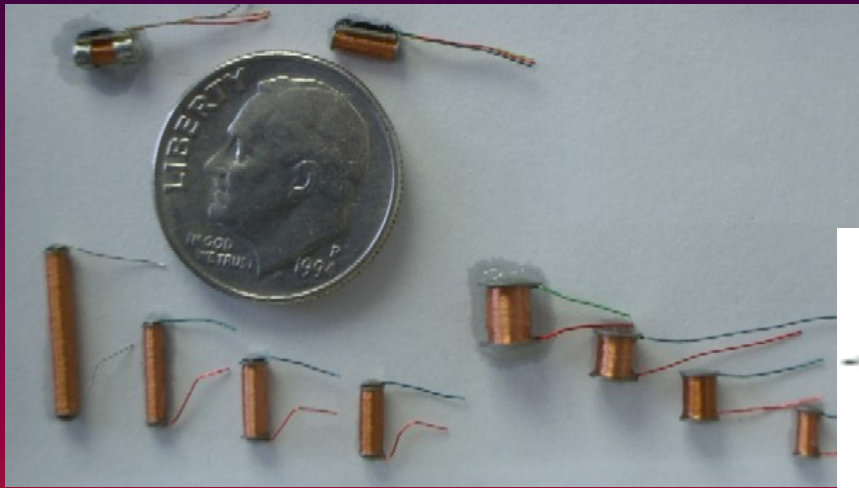




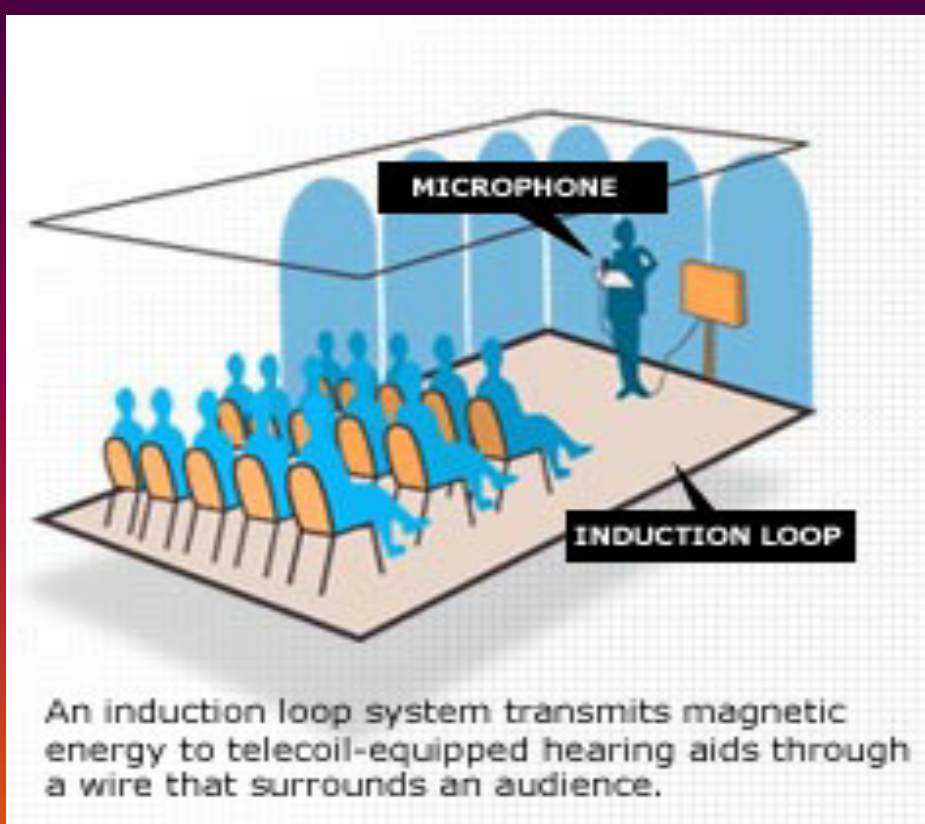




# Induction Loops/AFILS







# Subject to Interference

- EMF
- Users must have accessible T-coil
- Can get Induction Loop Receivers with Various Headphones
- If T-Coil in aid – no receiver necessary therefore most inconspicuous
- Typically spill over into halls, adjacent rooms, rooms above and below loop

# Large Area Amplifier/Driver Needs Professional Installation



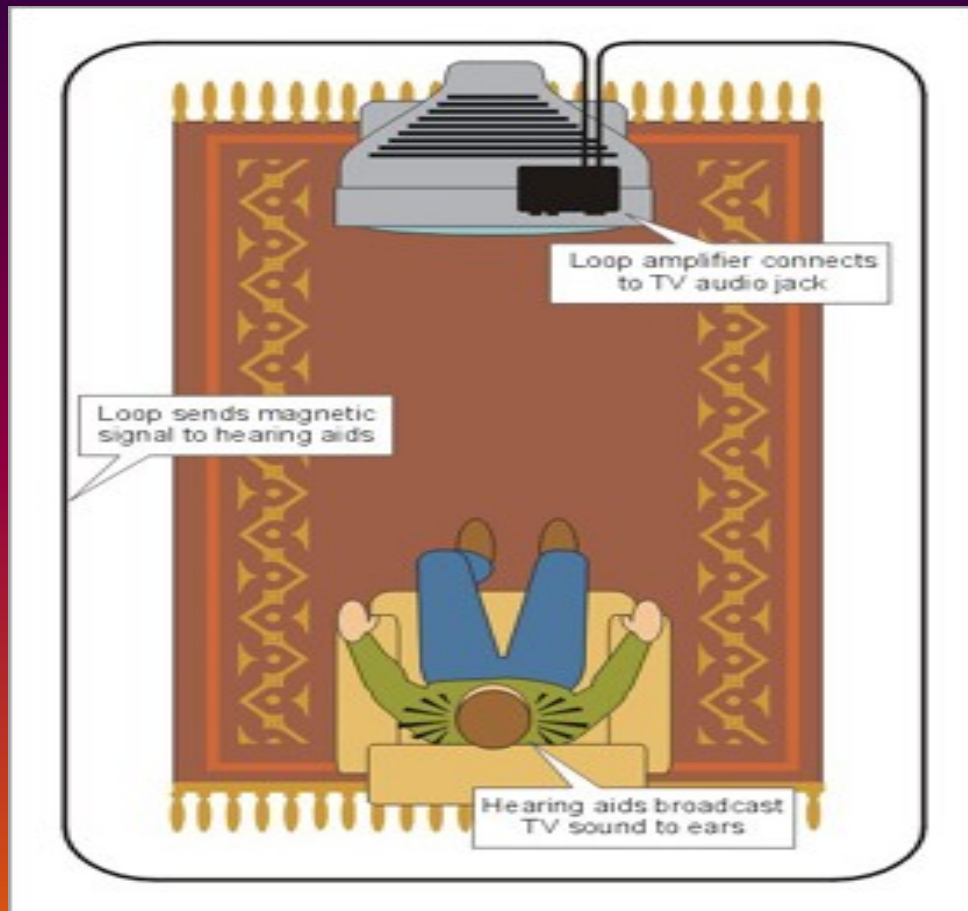
# Once Installed – Signage Critical



# Home/Small room Loop

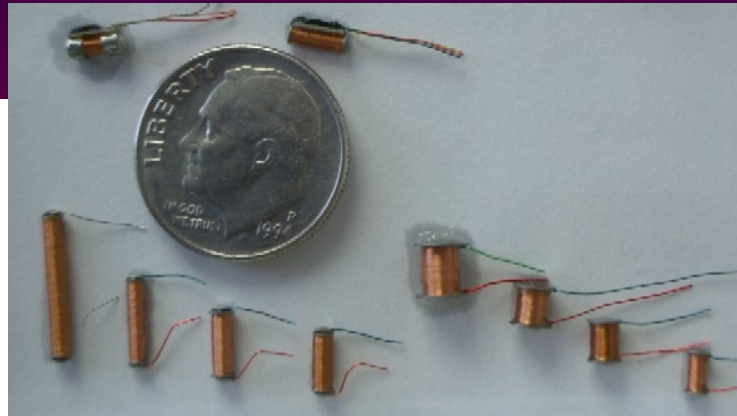


# Room or TV Loop





# Clipboard and Pad Configurations





# Bluetooth transmission

- Wireless FM Broadcast on 2.4 GHZ
  - ❑ Power Use can be Excessive
    - Personal Area Network
    - Not in Excess of 30- 40'
    - No Large Area Solutions
    - Secure –Pairing Required
    - Up to 8 devices paired per source
    - Class V 2.1-A2DP to 33'

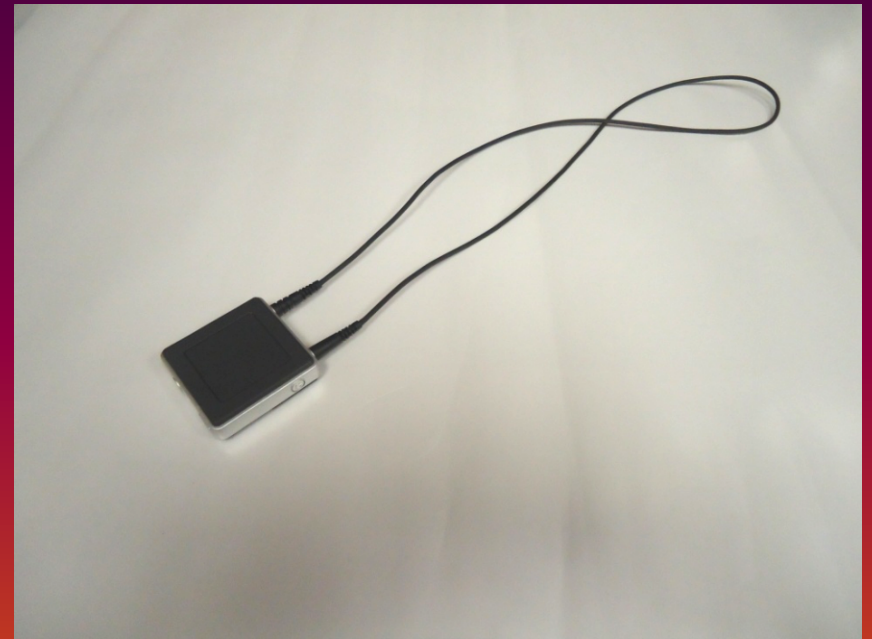


# 2.4 GHz-BT by another name



# Built In Inductive Neckloop

- BT Profiles and Versions
- V 1.2 ,V 2.0, V 2.1
- Profiles  
A2DP,AVRCP,HFP,HSP
- Classes vary range
  - Class 3 -1 meter
  - Class 2 -10 m
  - Class 1 -100 m



U-Direct/iCom Bluetooth Interface



# Phonak ComPilot/Unitron UDirect



# BT TV transmtr



# BT Mic

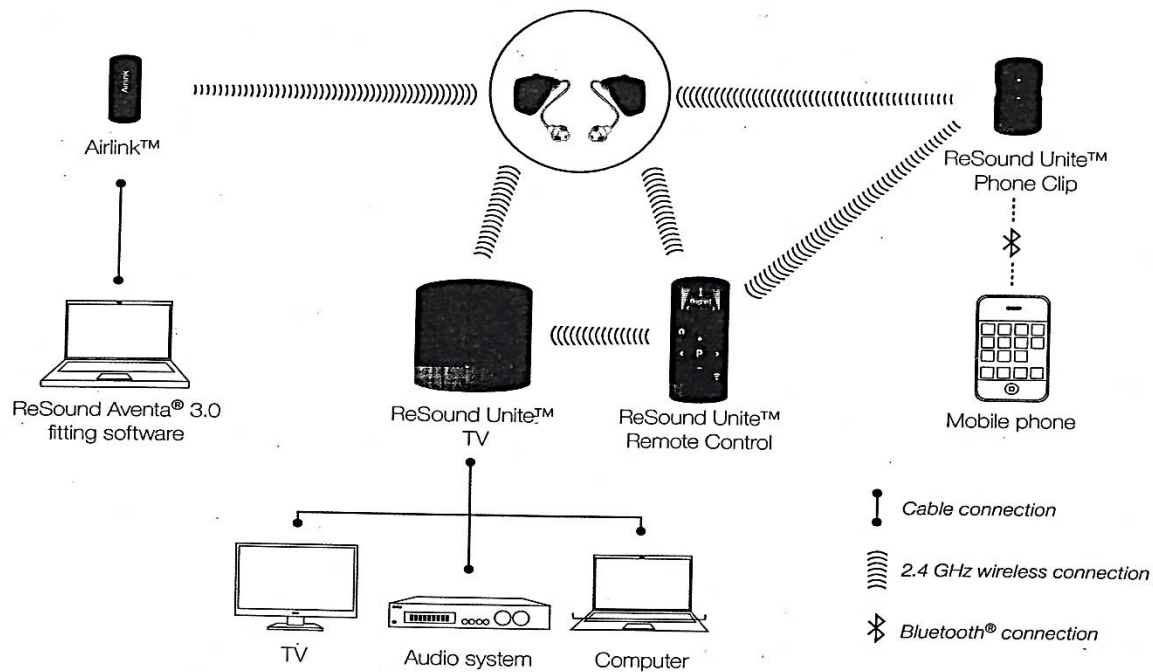




# Cochlear/Resound Phone Clip and MiniMic



# Wireless Bluetooth CI and HA





# Access BT and T coil with Remote



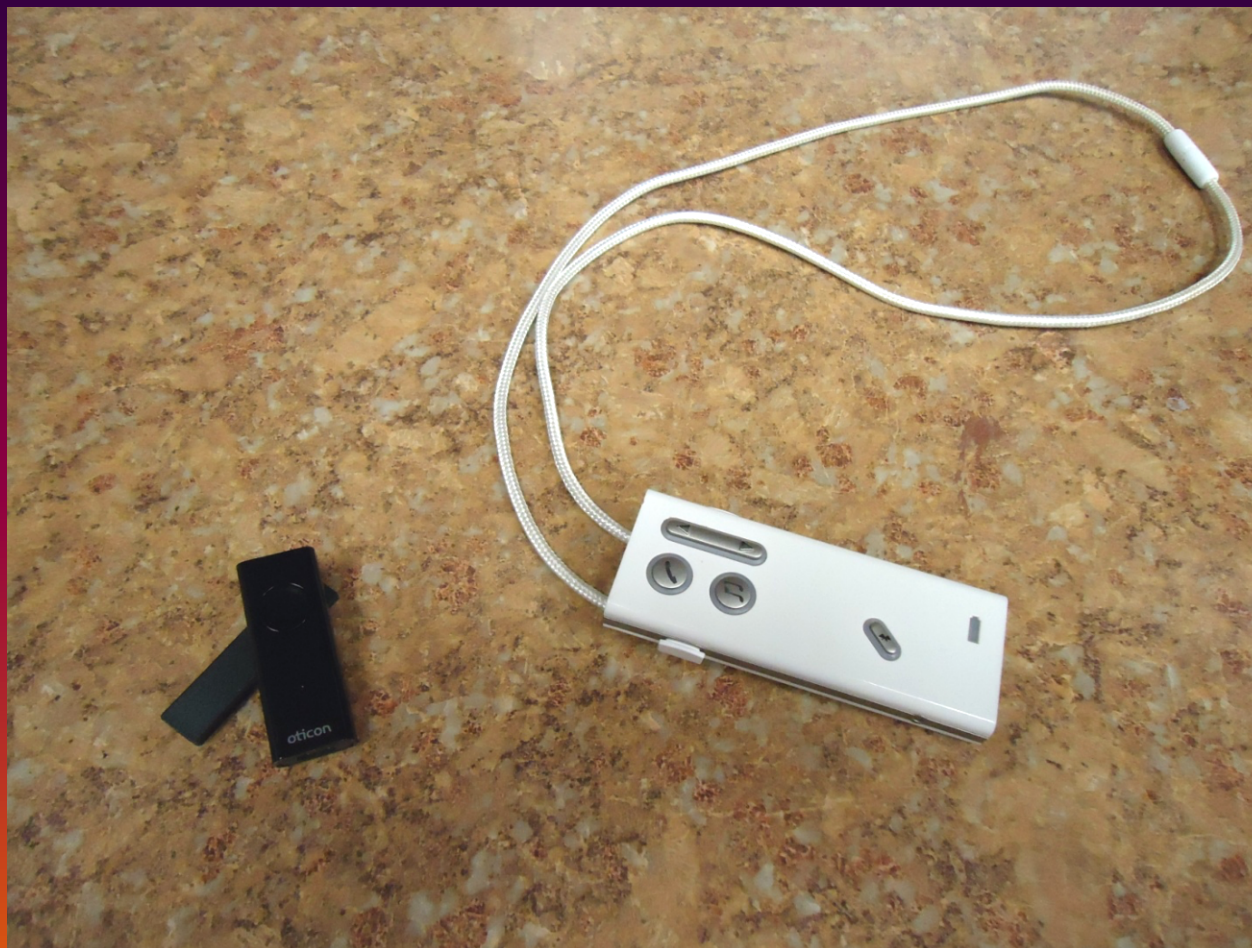
# BT Cochlear Implant & Hearing Aid Mix

- With BlueTooth and implant and aid, there is a very interesting conglomeration of Personal Choice (complicated and confusing) going on and being “inflicted” upon occasion by BT.
- If no choice, you may at times be “inflicted” by BT sound (music/phone call).
- It is a complicated MIX, and it can be too complicated- with several variables.
- ENVIRONMENT- Noise
- Level of Alertness- Stress, Age, Awake
- Situational (Driving vs Intentional BT)
- You May NEED a Helper to call you and help in the experiment to find the right “MIX”
- Can You Chose Wireless Input to BOTH Ears with CI/HA Combination?

# Landline Phone and TV transmitters



# Connect Mic & Original Streamer





# Mdex BT Reciever & TV Dex



# Widex CallDex

## CALL-DEX

### WIDEX CALL-DEX EASY PLUG AND PLAY



#### MAIN FEATURES

- Discreet and compact design
- Direct streaming via WidexLink™
- Superior sound quality
- Plug and play in most phones (3.5 mm jack)
- Up to 80 hours of constant streaming
- Fully automatic (no buttons)

#### RADIO SPECIFICATIONS

The CALL-DEX contains a radio transmitter	
Radio transmitter parameters:	WidexLink™
Frequency (range)	10.6 MHz (10.2-11.0 MHz)
Bandwidth (-15 dB)	660 kHz (15 dB)
Channel	Single channel radio
Modulation	FSK
Radiated output power	7 pW (< -81.0 dBm)
Magnetic field strength	<45 dBµA/m @ 10 m
Duty cycle	100%
Conforms to the following standards/approvals	EN/IEC 60950-1 EN 62479 EN 300 330-2 EN 301 489-1 EN 301 489-3 EN/IEC 60601-1-2 FCC Part 15 C IC RSS-210 CE mark

#### PHYSICAL PROPERTIES

Dimensions:	0.87/0.35/0.47 inch. (l/w/h)
Weight:	0.31 oz
Battery type:	ZA10



# TV Streamer





# Connectivity



# Sennheiser Phone Connect & Oticon Streamer



# Oticon BT Streamer/Remote





# Remote Controls Everywhere



# Sophisticated Remote Controls





# Widex Mdex Remote





# Cochlear/Resound Phone Clip and MiniMic



# Micro FM/BT and Roger PenMic



- New Digital FM can Have Multiple Transmitter/Mics-
  - Usually Up to 4 mics and simultaneous transmission
  - Phonak Roger, WS DigiWave



# HEARING SYSTEMS AUDIOLOGIST

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*Office Hours*  
Mon - Fri  
9:00AM - 12:00PM  
1:30PM - 4:30PM

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