Present and Future Wireless Hearing Aid Technology

Jason A. Galster, Ph.D., CCC-A, FAAA
• We are surrounded by wireless technology

• Wireless communication requires specific components
  ○ Radio or transmitter
  ○ Antenna or receiver

• Clock radios, car radios, televisions, and hearing aids
  ○ All have transmitters and receivers
Bluetooh

- Bluetooth cannot be used ‘in’ hearing aids
  - Hardware can be managed
  - Power consumption is too high

- Hearing aids will continue to interface with Bluetooth technology
  - The cell phone industry has selected Bluetooth as their wireless standard

- Hearing aids will not talk to Bluetooth directly
  - A method of ‘translation’ is and will be required
Telecoils

- Magnetic induction allows easy data transfer to the hearing aids
- Telecoil use is well standardized
- Strong initiatives globally improve access to assistive listening via telecoil
- Telecoil optimization is difficult, the coil must be oriented for telephone use or loop use
• As with all technology, wireless is advancing at a rapid pace
  ○ Telecoils are (generally) unchanged
• Telecoils remain the only standard solution for wireless audio transmission
  ○ FM technology is an exception
• Modern hearing aids offer advanced wireless capabilities that offer improved audio quality and consistency over the telecoil
• What does the future hold?
Wireless Technology in Hearing Aids

- **Two types of technology**
- **Near Field**
  - Using magnetic induction, similar to Telecoils
- **Far Field**
  - Using radio frequencies
  - 900 MHz or 2.4 GHz
Signal Strength

Figure 1:

- **Far Field Signal Strength**
- **Near Field Magnetic Induction Signal Strength**

Distance from Source (Inches) vs. Relative Field Strength (dB)
Near-Field Magnetic Induction (NFMI)

- **Magnetic wireless technology**
  - Similar to a telecoil
  - Uses a simple antenna

- **Uses a low frequency signal**
  - Limited range (.5 meter)

- **Requires a Streamer or Relay for all media connectivity**

- **Uses Bluetooth for most long-distance connections**
  - Bluetooth requires pairing

- **Simplifies ear-to-ear communication**
Near-Field Magnetic Induction

• **Pros**
  - Ease of implementation, existing RF chips, simple antenna design
  - Low frequency means easier ear-to-ear communication
  - Low power consumption

• **Cons**
  - Short transmission distance
  - Requires a streaming device for all media, phone, and programming connectivity
  - May encounter interference with magnetic sources (cochlear implants)
NFMI Antenna
NFMI for Assisted Listening

Bluetooth or 2.4 GHz

Near-field wireless hearing aids

Transmitter

Television

Relay

Hearing Aids
2.4 GHz

• **Pros**
  ○ Ease of implementation, existing RF chips
  ○ Long distance signal transmission
  ○ Does not require a streamer for media connectivity
  ○ Completely wireless programming

• **Cons**
  ○ May limit ear-to-ear communication
  ○ Requires a specially designed antenna
  ○ Requires a streaming device for Bluetooth connectivity
Wireless Antenna
2.4 GHz for Assisted Listening

900 MHz or 2.4 GHz

Far-field wireless hearing aids

Transmitter

Television

Hearing Aids
900 MHz

• Pros
  ○ Long distance signal transmission
  ○ Appropriate for ear-to-ear communication
  ○ Does not require a streamer for media connectivity
  ○ Relatively low power consumption
  ○ Completely wireless programming

• Cons
  ○ Requires a specially designed antenna
  ○ Requires a streaming device for Bluetooth connectivity
Wireless Antenna
900 MHz for Assisted Listening

900 MHz or 2.4 GHz

Far-field wireless hearing aids

Transmitter

Television

Hearing Aids
Future Wireless Solutions

• Wireless solutions exist that are superior to Telecoils
  ○ Improved sound quality
  ○ Improved consistency of connectivity

• These solutions are not standardized

• Telecoils remain the only standard option for wireless audio transmission to hearing aids

• Telecoil is ‘our’ future
  ○ Years will pass before we find opportunity for a new standardized solution for wireless audio transmission to hearing aids