Cochlear™ Baha®

Wireless Accessory Selection Guide

Use this guide to help you select Cochlear™ Wireless accessories

Cochlear Wireless Mini Microphone 2+

- To hear better in noisy listening situations:
  — In a meeting, riding in a car, dining at a restaurant, or participating in a class at the gym
- A portable streamer for watching TV at a friend's house
- To stream music from any device with a headphone jack

The Mini Microphone can be clipped onto clothing and will transmit speech wirelessly over a distance up to 83 feet. Multiple users can be connected to the same Mini Microphone.

Cochlear Wireless TV Streamer

- Enjoy TV viewing without turning up the volume and disturbing others
- Listen to TV, stereo, or other audio source
- Move around freely while listening to the TV

The TV Streamer allows multiple users to connect to the same device, bringing together entire families of users. 2.4 GHz technology means there is little chance of delay between what you see and what you hear.

Cochlear Wireless Phone Clip

- Hands-free calling directly to the Baha® 4 Sound Processor
- Use as a wireless headset to make phone calls with a Bluetooth® enabled phone
- Hear Bluetooth enabled navigation system directly in the Baha 4 Sound Processor
- Discreetly control their Baha 4 Sound Processor with the Baha Control App
- Stream music from a Bluetooth enabled device

Attach the Phone Clip onto clothing allowing the built-in microphone to pick up the Baha user's voice, while the phone can be several meters away.

Cochlear Baha Remote Control 2

- Discreetly control the Baha 4 Sound Processor
- Large buttons for simple volume or program changes
- Check the sound processor status
- Control streaming to other wireless accessories

The Baha Remote Control can be paired to two Baha 4 Sound Processors for those with a bilateral fitting.

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Cochlear®

Product Information

Cochlear™ 2.4 GHz Wireless Accessories

Wireless technologies have been utilized to connect air conduction hearing aids to various accessories for a number of years. Such accessories have been shown to provide significant user benefits such as improved signal-to-noise ratio in challenging situations.[1] When developing the first wireless capabilities for hearing implant recipients, Cochlear aimed to provide an easy to use system that would enable long range high quality sound without the need for intermediate devices. This resulted in the Cochlear 2.4 GHz wireless accessories — based on a well established wireless technology that has been proven in hearing aids, cordless telephones and Wi-Fi routers. The most widespread alternative wireless technology, Near Field Magnetic Induction *(NFMI)*, on the other hand introduces several challenges to the user, including the need for an intermediate neck worn device and inadequate sound quality.[2] This paper provides an overview of the advantages of the Cochlear 2.4 GHz technology and wireless accessories.

Cochlear 2.4 GHz Technology

Discreet and Easy to Use

The Cochlear 2.4 GHz technology enables a direct connection to the wireless signal. There is no need for the user to wear bulky or uncomfortable neck-worn units, and the user retains complete freedom of movement. With the Cochlear 2.4 GHz system, the user may connect directly to three streaming accessories, such as the TV Streamer, and/or the Mini Microphone, plus a Phone Clip. In addition, several users may share the signal transmitted from one wireless accessory. This would allow, for example, several family members using different sound processors to use a single wireless device to listen to a television, which would not be possible with an NFMI based system.

The Cochlear 2.4 GHz system can be paired through the fitting software or by the user, who may pair the processor to a compatible accessory at any time through a simple button pressing sequence. Once the wireless connection has been established, the user can easily access the wireless benefits directly from the sound processor.

High Quality Sound

One of the key requirements of a wireless system is its ability to transmit with good sound quality and with the smallest possible delay *(latency)*. A latency of 35ms or more is enough to cause the perception of echoes or even lip sync issues due to a mismatch between sound and visual information. Even when the delay is too small to be consciously perceived, there may be a significant negative impact on the television viewing experience. The Cochlear 2.4 GHz technology is associated with a very minor latency *(less than 18ms)* well below the threshold for lip sync issues and echo effects. However, other wireless technologies, such as NFMI, transmit with latency *(delay)* from 40 up to 125 milliseconds, which can provide significant issues for the user.

In addition, the Cochlear 2.4 GHz system uses high-density audio compression, resulting in superior audio quality transmitted directly to the sound processor, while other wireless technologies such as Bluetooth® and NFMI may use a so-called "low density" solution for audio compression.

Robust Connections

To ensure a robust connection without interference with other devices transmitting in the 2.4 GHz frequency band, such as wireless keyboards and mouses, the Cochlear system uses two innovative technologies: time division and frequency hopping *(Figure 1)*. First, the system divides data into packets *(small portions of digitally coded information)*. The packets are sent using time division; information is only transmitted for 0.4 seconds at a time.

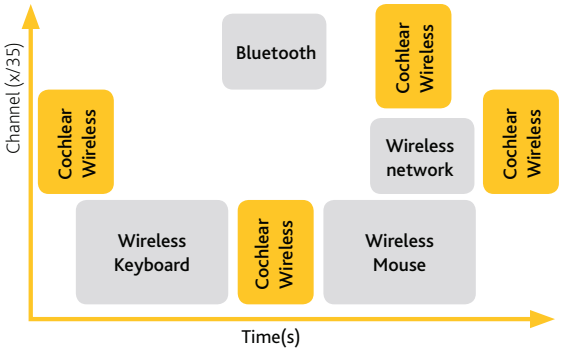

***Figure 1**. The Cochlear 2.4 GHz wireless technology uses data distribution in packets and frequency hopping to secure a robust connection without interference from other devices transmitting in the 2.4 GHz band.*

Additionally, each time a packet is sent, it is sent in a new channel picked out of the 35 channels that make up the 2.4 GHz band. Because the sound processor and the wireless accessory have established a unique connection in the pairing process, the two products will mutually agree which channel to send the next data packet in. As all devices using the 2.4 GHz band will have their own individual strategy to randomly select what channels to transmit in, they will virtually always avoid interfering with each other.

1. Jespersen, C T, Laureyns M. ReSound Unite™ Mini Microphone: Minimizing noise for maximum understanding. erup, Denmark: GN ReSound A/S; 2011.

2. Groth, J, Pedersen, B D. How user requirements affect technology choice for wireless hearing instruments. Ballerup, Denmark: GN ReSound A/S; 2010.