



LIVED EXPERIENCE OF USING BLUETOOTH WITH A COCHLEAR IMPLANT

ABSTRACT:

Bluetooth is a short-range communications protocol, which is becoming widely adopted and set to replace the need for a radio-aid transmitter. Setting up involves a two-stage process: first pair the hearing device with the Bluetooth transmitting device, then connect to it. The paper describes a device to turn an audio signal into a Bluetooth transmission, as well as generic and specific examples of connecting a mobile phone and smart TV to a Bluetooth-enabled CI.

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The author is a cochlear implant and hearing aid user who regularly used radio aids before converting to Bluetooth, where he finds the advantages for mobile phone communications particularly dramatic.

Background

Radio aids work by transmitting sound information by radio waves to a radio receiver worn by the listener. By doing so, corruption from external sounds is avoided, as is weakening of the sound wave over distance. When installed in a classroom, a child once summed their impact as: “They let you hear better.”

Hearing aids and cochlear implants (CI’s) have long made use of radio aids with devices such as an FM Genie transmitter/receiver system, or TV-Link/ComPilot system. These generally use proprietary communications methods, known as protocols. Bluetooth is a standard communications protocol with a line-of sight range of about 10m, which is now being fitted to mobile phones, televisions, sat-navs, car stereos, computers and many other electronic devices that need to transmit sound to a user. If a hearing aid or CI is Bluetooth-enabled, it can connect with the native Bluetooth of any Bluetooth device, thereby removing the need for a separate transmitter, such as a TV-link. Sound quality with Bluetooth is usually superb, which is one reason the author uses it with his CI.

If the history of radio aids ever gets written, there are likely to be at least two eras, BB (before Bluetooth) and AB (after Bluetooth and its descendants). Samples of BB radio aids are described in an earlier document entitled “Personal experiences of Radio Aids.” The present document offers an outline of Bluetooth and experiences of using it.

General Principles

Before first use, a Bluetooth-enabled CI needs to be registered (paired) with the transmitting device. This means the CI needs to be “discoverable” to the transmitting device. In the case of my CI it is “discoverable” for a short time after switching on. When pairing is successful, there is an indication of some sort, such as a blue light, or a message on a smart TV screen, to confirm the pairing. Hopefully the degree of automation of this process will increase over time.

Once transmitting and receiving devices are paired, they need to connect. In the case of my CI, it can only connect with one Bluetooth device at a time, meaning that it needs to be disconnected from (say) a mobile phone before it can be connected to another device, like a Roger Select. If it fails to pair or connect it is usually because it is connected to another device. A simple solution is to switch Bluetooth off on the other device; which in the case of a mobile phone is done from the “Settings” menu, usually accessed via a “cog” icon.

The main thing to remember is that Bluetooth is a two-stage process, first pair, then connect.

Mobile (or Cell) Phone

A common problem with a mobile phone is external noise entering the CI’s microphone and corrupting the sound delivered by the phone’s speaker. With Bluetooth, external noise is eliminated and only the phone’s transmission delivered to the CI. Recently, I needed to call the AA following a breakdown on a busy road. CI to mobile phone communication would not have been possible without Bluetooth, or a radio aid like a Roger Pen.

I previously dreaded using a mobile phone. Bluetooth has made it usable.

Pairing of Bluetooth to my Android mobile phone means going into the “Settings” menu, turning Bluetooth on and making my CI discoverable by switching it on and waiting for the device to “pair”. Unlike some other devices, pairing is easy and brings very real benefits in terms of understanding speech from a mobile phone.

Connecting to a Windows Computer

The following are the recommended instructions for connecting to a Windows computer.

“Select Start > type Bluetooth > select Bluetooth settings from the list. Turn on Bluetooth > select the device > Pair. Follow any instructions if they appear. Otherwise, you're done and connected.”

Bluetooth-delivered sound is usually much clearer than the computer loudspeaker’s, so it is worth trying, not least for music but especially for video meetings.

Bluetooth Connectivity for Non-Bluetooth Devices

There is a remarkable device called a Roger Select. Among its many capabilities (some of which will be described later) it can be connected via a docking station and audio cable to the audio headphone socket of a device such as a computer or TV, and transmit sound output as a Bluetooth signal.

A guide to pairing a Roger Select to a Bluetooth hearing device can be found at <https://www.youtube.com/watch?v=jSY1yKu8deg>.

Once paired, put the Roger Select in the docking station then connect the docking station’s audio cable to the sound source (e.g. TV). Switch the Roger Select on and listen to the output.

When I first used a Roger Select with a TV, I did so without a docking Station (which was not initially supplied) but with a special audio-jack/micro-USB cable connecting to the Roger Select’s charging socket. The base station is recommended, not least because a permanent power connection should reduce the number of charging cycles and prolong the Roger Select’s battery life.



Plan view of a Roger Select



Roger Select in its base station with micro USB charger (white cable), connected to headphone socket of black computer (black cable)

Video Conferencing with a Roger Select and Computer

One of the problems of video conferencing (such as Zoom) is the need to select an output channel. If the headpiece option is selected and the audio cable connected between it and the Roger Select's docking station (with the Roger select in place), clear sound is delivered. Unfortunately I have not found a Zoom sound output option for a direct Bluetooth connection to the computer.

Using a Roger Select when Sound Arrives through its Microphones

Previous comments about the Roger select have been about experience with externally-supplied electrical signals that do not use the Roger Select's six microphones. I preface my forthcoming remarks with the observation that everybody is different and what one person dislikes another person may like. I do not like the sound delivered through the Roger Select's microphones. Typically with this kind of device, sound waves picked up by microphones are decomposed into their constituent sinusoidal frequencies and volumes (which is similar to what a healthy cochlea does) after which their volumes are either suppressed or amplified according to the designer's understanding of the listener's needs. I suspect in the case of the Roger Select, low frequencies are suppressed and high amplified; to aid clarity in understanding consonants. I also suspect the overall volume is increased. Before using a Roger Select via its microphones I first try increasing the volume of my CI to see if that provides the clarity I need without the Roger Select's distortions.

Using the Roger Select in Meetings

In the Roger-select web site <https://www.phonak.com/nz/en/hearing-aids/accessories/roger-select.html> a "meeting" is four people around a table in a large room. With my AB Marvel CI I would not expect to need help from a Roger Select in this situation but acknowledge that with my previous CI or earlier hearing aids it could have been helpful. To a degree, the Roger Select's capabilities have become partially overlapped by improvements in CI's. Where it is helpful, one useful feature is a one-touch ability to focus microphones towards a particular speaker. In large meetings most hearing devices are challenged. With a long rectangular table, a situation can occur where a quiet side-conversation takes place between the Roger Select user and the speaker the CI listener is trying to hear. The quiet side-conversation usually wrecks the chances of hearing what a CI listener seeks. In meetings I usually switch the Roger Select off until I think it absolutely necessary. It is my "last ditch" option

Using the Roger Select in Restaurants

When restaurants get busy, people often raise their voices so their dining companions can hear them. When everybody does this, it can become a difficult hearing situation for all, especially with the added noise of clattering plates. For the CI user hearing via a Roger Select, it can amount to audio torture. In fairness to the Roger Select in this situation, hearing ability is better with it than without it but the auditory torture is something to forget. For this reason, I try to avoid restaurants, but when I cannot, try to go at quiet times. These problems are not the Roger Select's fault but potential users and buyers should be aware of them. There is a claim that the Roger Select reduces noise. My experiences in restaurants are that it does not do so noticeably.

Bluetooth, Non-Bluetooth and Smart TV's

Following valued feedback, this section is divided into Generic and TV-Specific sections, where the TV-Specific part is intended to be an example of the generic.

Generic:

Recall from the "Background" section that there is a simple option of connecting a Roger Select's base station (with Roger Select installed) to a TV's audio socket and letting it deliver the Bluetooth sound signal to a paired CI or hearing aid. Sound should be clear. It is a simple and very useful option for any TV, and an obvious option for any non-Bluetooth TV with an audio socket.

Any newcomer to a smart TV is likely to be as confused as the author was initially. New concepts have to be learned, not least a need to wave a remote in the air in order to bring up a screen cursor to operate screen menus; and then moving the remote through the air to move the screen cursor to choose an item on a screen menu. Smart TV's incorporate features that non-smart TV's do not, and are generally more energy efficient than older TV technologies such as plasma screens. Any purchase decision is likely to involve factors other than an in-built Bluetooth facility.

When I bought my first smart TV I confess to being totally baffled by it. For any newcomer to smart TV's I would strongly recommend spending time playing with the controls getting to know the menu structure. In this process, one of the most useful buttons on the remote is the one to undo the last command, an example of which is indicated in fig 1 below. When you need to return the TV to a previous state, it can be pressed repeatedly (as necessary) to get back to it. During this familiarisation exercise, the route to the "Sound Output" options should be found and noted for future use.

Generically, the steps to register a Bluetooth device with a TV are typically:

1. Find the sound output menu
2. Select the Bluetooth option
3. Make the CI discoverable. Typically, CI's are discoverable for a brief period after switching them on.
4. When discovered, the name of the CI should appear in the TV screen in a highlighted box, which needs to be clicked with the screen cursor to register it with the TV.
5. After registration, a confirmatory message should be received.
6. To remove registration dialogue, move the screen cursor to an empty part of the screen and click.

To use a Bluetooth device registered with a TV:

1. Bring up the sound output menu
2. Select the Bluetooth option
3. The registered Bluetooth device should be highlighted. Click on it.
4. After, and only after, you receive a message that the device is connected, move the screen cursor to an empty part of the screen and click to remove Bluetooth dialogue.

Specific:

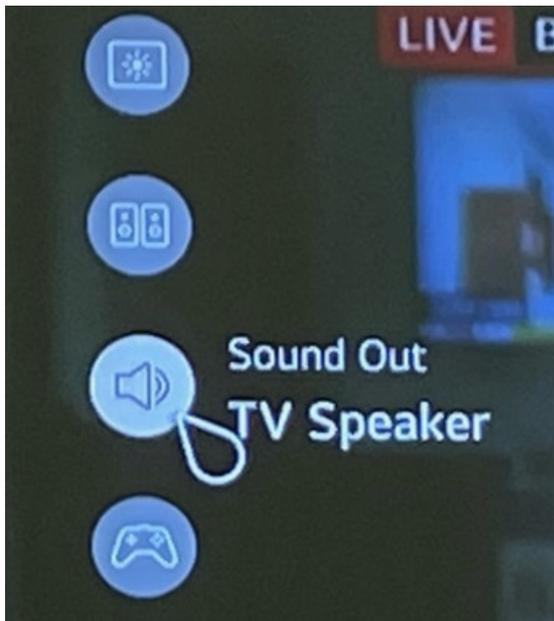
Instructions for Bluetooth CI pairing and connecting are given below as an indicative example of what needs to be done for one LG smart TV model.

In the diagram of part of the remote below (Fig 1), the “select” and “settings/cog” buttons are shown. The cog icon is widely used for a button to access settings and likely to be similar on other remotes.



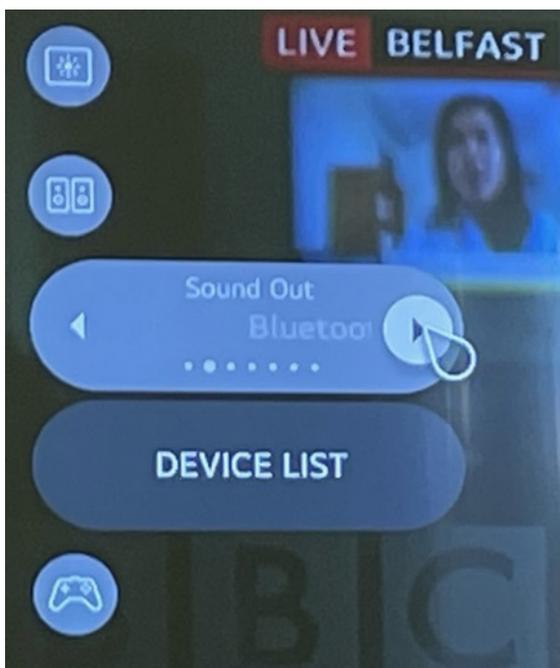
Fig 1: Part of remote controller

1. To begin pairing, switch the TV on then press the “cog” or “Settings” button, illustrated above.
2. A menu appears on the left hand side of the screen together with a screen cursor controlled by movement of the remote through the air (see Fig 2 below). If the screen cursor does not appear, wave the remote around until it does. Move the screen cursor to the “Sound Out” icon shown below.
3. Click the remote’s select button (see illustration above)



Clicking on the loudspeaker icon in Fig 2 produces the display on the left, which indicates the current sound output is the TV speaker, Clicking again opens up a sub menu with dots for each output option as shown in the Fig 3 below. Among the alternative sound outputs are “Bluetooth” and “Bluetooth and Speaker”. After registering and connecting a CI, the latter option allows the CI user and a person with normal hearing to watch TV together.

Fig 2 Sound Output options “Sound Out” icon



Move the pointer to the right to the position shown and a bright circle should appear as shown. With the cursor in this position, each time the select button is clicked the active sound option moves to the right of the previous one, illustrated in this case by the larger second dot and the title “Bluetooth” as the “Sound Out” option.

If you get it wrong, keep clicking the select button, with the cursor in the position shown, until the large dot cycles round to the Bluetooth option.

Click on “DEVICE LIST” when the image is as shown left,

Fig 3 Selection of Sound Output options



At this point, the device to be registered needs to be discoverable (which usually means switching it on, after which there is a brief interval when it is discoverable). In this case the device is “Cam’s Airpods 3”. Click the select button (shown in Fig 1) to register the new device shown in the highlighted box.

Fig 4 Registering the new Bluetooth device



After registration, a confirmatory connection message is received. Move the pointer into a non-menu region of the screen and press the select button. The menu areas should clear.

Fig 5 Confirmatory Message That the New Device is Registered

To connect to a registered device, repeat the steps to get to “DEVICE LIST” (Fig 3) click on it, move the cursor to the device needed and click the “select” button on the remote. Wait for a message to say the device is connected. Only after receiving that message, move the pointer into a non-menu area of the screen and press the select button to clear the menu from the screen. If you leave the room, the Bluetooth connection may be lost and you may need to re-connect on your return. In the

case of my LG TV, on my return, it occasionally pops up a screen display with an option to reconnect, but it is not reliable.

Overall: this painful initially, not difficult when you know how, but irritating having to reconnect after returning to the room. Good luck!