



WiFi – a new assistive listening technology. Better than hearing loops and with no latency – or is it?*

Although Hearing Access Solutions LLC sells WiFi audio systems we do not recommend for use as an assistive listening system (ALS). This purpose of this paper is to provide information to help customers understand the problem with WiFi audio and why it is not a very good choice for an ALS.

How a WiFi assistive listening system works:

It is important to be clear on how a WiFi assistive listening system works. It consists of several components, each playing a crucial role in the overall performance of the system. If any of these components is not optimally compatible there will be a critical impact on the way the system performs for the user:

- a. A sound source is connected to the “WiFi transmitter”. This may be a device incorporating WiFi hardware and an antenna, or it may simply make the program content available on a connected LAN (network) using pre-existing LAN WiFi access points to ‘air’ the transmission.
- b. Unlike hearing loop technology, with WiFi, each user wanting to access the system requires a personal receiver (which can be the user’s hearing instrument). Unlike wireless RF systems, which come pre-programmed from the factory to ensure a connection between the transmitter and receiver, with a WiFi system the personal receiver is the user’s smartphone or tablet device. To hear the sound from this device a headset or earphones of some sort are required.
- c. Each smartphone that is used on a WiFi systems must have an operating system with a registered and active account (Google Android, Apple iOS, Microsoft Windows). A registered account is needed to be able to download the app of the WiFi provider onto the device. **The device is the interface that enables the user to access the WiFi system.**
- d. Once the app has been installed and programmed, the user will require the WiFi network credentials to log in. Users will need to have their Bluetooth on and connected to their Bluetooth hearing aids or headset they will be using. Users can also connect a wired headset or earphones, in which case Bluetooth does not have to be used. **The quality of headset or hearing aids is critical. It plays a big part in the quality of sound the user will experience.**

Critical things to know and consider about WiFi technology:

A regular user of assistive listening technology who attends a cinema, a theatre, a lecture hall, a church or a transport hub will need to have an app for every WiFi provider which may operate a WiFi system in one of these venues. There is no common platform. **A user would need an app for each manufacturer and will have to remember which app to use, and the login details for the WiFi networks in the venues they attend.**

Users will need to create an Android, Apple or Microsoft account, surrender their personal details in the process in order to be able to download the WiFi apps.

Not all apps are compatible with all smartphone or devices! Depending on the device the user has, they may need to open several accounts and remember when and where to use each of the apps. Users must ensure that they have sufficient battery charge in their smartphone as constant usage of Bluetooth transmission increases battery consumption.

In some smartphones, users must ensure the device is unmuted for the duration of the event they attend, to allow the sound transmission. This may be problematic if calls, messages or emails come in during quieter times.

Depending on the network traffic there can be a 2 – 3 second delay in audio. A demo can be setup which will have no noticeable latency, however, as multiple users login to network the latency can become very noticeable.

To summarise – I may install a WiFi system in my church, but chances are that many of my patrons will have incompatible smartphones, incompatible accounts to the one required for the app of my system, and possibly old or poorly performing headsets. There also may be a noticeable lip sync problem.



Bluetooth and Latency - what is latency?

In simple words, latency is a time delay between the cause and the effect of a physical act being viewed. Also known as a lag, it is the difference between the image we see and the sound we hear. It often occurs due to a network delay either online or during broadcasting of data.

The extent of latency depends on what we are watching, it can be less noticeable when watching a musical play and more noticeable when watching speeches, lectures, or movies

Up to the point of receiving the sound signal from the WiFi system on the device used as a receiver, we would normally have minimal latency as we rely on fast RF network transmission which reaches our smartphone.

From hereon however, **we rely on Bluetooth technology to deliver the sound signal from the receiver (our smartphone) to our ears unless a wired headphones or earphones are used.**

Bluetooth and Latency – the sound transmission

Now comes the tricky part. So far, all Bluetooth protocols including the very latest ones still have a noticeable level of latency. Therefore, unless a wired headphone is connected to their smartphone, users will use the Bluetooth chip that is included in their device, so will experience latency.

In reality, the performance of a Wi-Fi system depends on the quality, specification, age and performance of the smartphone we'd be using. **Remember, this is the receiver that determines the sound quality and the level of latency we will experience.**

The impact on latency is caused not only by the Bluetooth version I have in my smartphone, but also by the way the manufacturer of my smartphone configured the Bluetooth to work on my device. Manufacturers configure their Bluetooth performance in different ways, often aimed at conserving battery.

Consequently, if two people use two different smartphones, both having the same Bluetooth version, each person could experience a different performance and different latency.

This is an interesting article that explains this important point in a clear way: <https://www.soundguys.com/android-bluetooth-latency-22732/>.

Conclusion

In our opinion the main issue with current WiFi systems is that the sound quality and the quality of the delivery of the sound signal to each user is not in the control of the venue, the installer or even the manufacturer of the equipment. There is no common ground, each user will have a different experience on site and some people will not be able to access the system.

The variables in the flow of how a WiFi system works impact the consistency of its performance. Each of these variables is a crucial element as it determines whether users with hearing loss will get a real benefit from the system!

To be clear: A WiFi system can be a good solution in some scenarios where an assistive listening system is required and other technologies may not be feasible to install, for example, on aircrafts, ferries or in large walk-through transport hubs. However, in reality, the performance of current WiFi systems do not depend on the quality of their own performance only but on a number of external factors as well.