

# How to Test Bluetooth Devices

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Bluetooth is the standard interface for wireless transmission of music and speech. It connects speakers, headphones, headsets and earphones to devices such as mobile phones, computers, entertainment systems and car radios. But how can the audio quality of devices with a Bluetooth interface be tested? What does one have to consider?

The Bluetooth standard defines different types of communication for different applications. These are called Bluetooth profiles. There are three relevant profiles for the transmission of audio signals:

## **A2DP**

The **A**dvanced **A**udio **D**istribution **P**rofile is used to stream stereo signals in HiFi quality. The standard SBC Codec allows sampling rates up to 48 kHz. AAC or APTx codecs are used optionally.

There is an A2DP Source and an A2DP Sink profile.

- Typical A2DP Source devices are mobile phones, tablets or TVs.
- Typical A2DP Sink devices are loudspeakers, headsets, earbuds or a car radio.

## **HSP**

The **H**ead**S**et **P**rofile is used for bi-directional voice transmission. The SCO Codec provides a sampling rate of 8 kHz. This corresponds to the bandwidth of a conventional telephone connection. There is a HSP Gateway and a HSP Client profile.

- The typical HSP Gateway device is a mobile phone.
- Typical HSP Client devices are headsets or earbuds.

## **HFP**

The **H**ands**F**ree **P**rofile is also used for bi-directional voice transmission, but offers some extended properties over the HSP profile. As examples, there is the possibility to transfer the address book of the gateway device to the client, and the MSBC codec provides a 16kHz sampling rate for improved speech quality (e.g. for Skype calls).

A HFP Gateway and HFP Client is identified.

- Typical HFP Gateway devices are mobile phones or computers.
- Typical HFP Client devices are car radios, headsets or earbuds.

Many devices support all three of these profiles. The appropriate profile is selected automatically depending on the application.

## **Pairing**

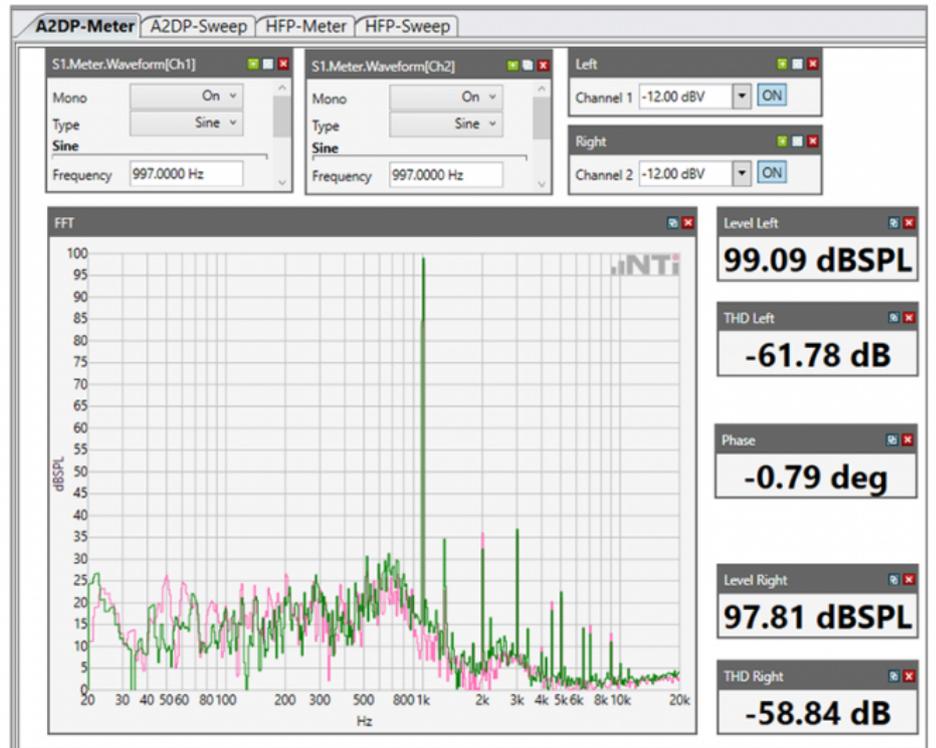
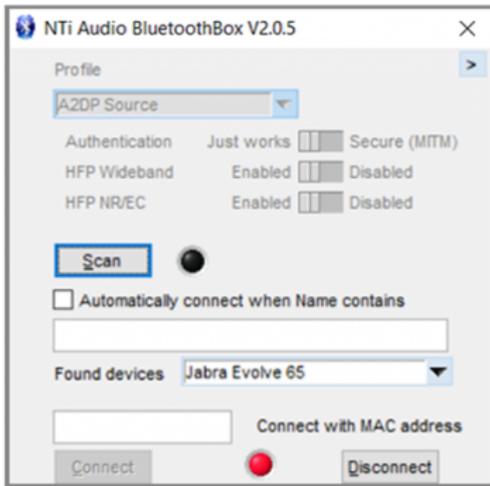
The currently-used Bluetooth 5.1 standard only supports connections between 2 devices (source with sink, or gateway with client). The process of connecting two Bluetooth devices is called pairing.

Only devices that support compatible profiles can be connected to each other, such as A2DP Source with A2DP Sink, or HSP Gateway with HSP Client. To do this, both devices are put into “pairing mode”. A2DP Source or HSP / HFP Gateway devices usually scan for available A2DP Sink or HSP / HFP Client devices and show them in a list on a display. The user then selects the desired device. With car radios (HFP Client) it is also common that the pairing process is additionally secured by comparing and confirming a PIN code displayed on both devices.

Scanning for available devices can be time-consuming, especially when many Bluetooth devices are found in pairing mode. A faster method of pairing is to skip the search process and call the desired device directly with its MAC (Media Access Control) address. This method is mainly used in production testing of Bluetooth devices.

## **The NTi Audio Bluetooth Box**

The NTi Audio Bluetooth Box connected to the FX100 Audio Analyzer allow simple and convenient testing of the Bluetooth interface of audio devices. The received and sent audio signals are converted to analog signals and provided on XLR connectors. All profiles described above are supported. The pairing process can be done manually or automatically. When the pairing process is completed, a trigger signal is sent to the FX100 Audio Analyzer to start the measurement.



*Bluetooth Headset connection and FFT measurements  
(Click image to enlarge)*

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