

Keysight Technologies

Bluetooth® Audio Test and BLE

Technical Overview

Introduction

We often receive questions on BLE testing with the Keysight audio analyzer's *Bluetooth* option. The short answer is: BLE was introduced for non-audio applications, such as heart monitoring, and does not require any special audio tests. However, if the BLE device (iPhone) has phone call or music playback, these features require the same audio tests as any other classic *Bluetooth* device.

Please read the following questions & answers for more details.

1. What is BLE?

BLE (also known as "BT Smart") was introduced in version BT4.0. BLE enables new use-cases which were not served by previous *Bluetooth* versions. BLE is a "low-energy" subset of *Bluetooth* that is predominantly used with sensor-like devices, such as heart-rate monitors, as well as keyboards and mouse options. The advantage of BLE is its low-energy, low-throughput system.

BLE was introduced to respond to other competing standards such as ZigBee. ZigBee targets low power, short distance, slow data stream use cases. But it started to interfere with some *Bluetooth* personal network applications. BLE is the response to that market challenge.

2. What is the relation between classic BT and BLE?

Classic *Bluetooth* (classic *Bluetooth* refers to BT without BLE) and BLE are two different systems in the *Bluetooth* family. Classic BT is still relevant for all of the use-cases it enables, for example, audio.

Classic *Bluetooth* enables use-cases that typically have much higher demands than BLE, such as audio. If you try to use BLE for higher-throughput applications, you lose its "low-power" advantage. Please read question #5 for details on the BLE introduction.

3. What are the audio tests for *Bluetooth* devices?

Bluetooth audio tests are supported by audio-related profiles, such as A2DP, HSP, and HFP. All of these profiles run only on classic *Bluetooth*. A2DP is the most important profile, specifically designed for stereo audio. The A2DP specification allows you to stream your audio over any codec, but it requires the SBC codec as a minimum requirement to make sure that all A2DP devices work correctly.

AptX, mSBC (WBS), and CVSD are other codecs typically found in *Bluetooth* audio devices. AptX is probably the most common and is generally regarded as the best quality codec. If you have aptX support on both ends of a link, then you will get better audio quality over aptX compared to SBC.

The *Bluetooth* audio test measures the whole audio link from one end to the other. To test a BT device's receiver, you need a BT RF source to generate a high-quality audio test signal. In order to test a BT device's transmitter, you need a high-performance audio analyzer to test the audio signal directly from BT RF signal. This is how the Keysight U8903B BT option works.



Unlocking Measurement Insights

4. I have heard some mobile phone and *Bluetooth* headset customers have their products marked with *Bluetooth* 4.0 BLE. Will they need BLE audio test?

NO. BLE is not intended for audio applications. Therefore, there are no audio tests for BLE cases/applications.

Some customers may have both BLE and classic BT on the same device. For example, a mobile phone may have both BLE and classic BT, so that it can connect to a BLE heart-rate monitor for healthcare and an A2DP BT headset for listening to music. The BLE features of the mobile phone may need LE testing (non-audio test) to evaluate BLE functioning; however, there is currently no tester specifically for "LE test". The phone call and music playback features of the mobile phone require the same audio tests as any other classic *Bluetooth* audio device.

Bluetooth and the *Bluetooth* logos are trademarks owned by *Bluetooth* SIG, Inc., U.S.A. and licensed to Keysight Technologies, Inc.

www.keysight.com/find/U8903B

5. Why is BLE not adopted for audio cases/applications?

BLE is NOT SUITABLE for low- to medium-bandwidth data streaming (audio or video), because it was designed for transferring very low-speed data packets with lots of sleeping time in between to save battery power. This is why BLE is called low energy and not low power. BLE doesn't magically improve power consumption of the transceivers when they are active. When doing audio or video transfers, the transceivers are constantly powered up, so you lose the biggest advantage of BLE.

BLE design reduces overhead to as little as possible, which means it does not have any streaming facilities built in, such as packet recombination, delayed acknowledgment, and asynchronous transfers. You actually don't have anything built in which keeps BLE data as raw as possible. A lot of features need to be implemented by additional software.

BLE is simple in data structure. The idea of BLE is that it provides just enough data transaction capability to deal with low-speed data or non-continuous data. It reduces nonspecific overhead. BLE is not efficient at dealing with continuous data streams, so, BLE does not support audio profiles, such as A2DP.