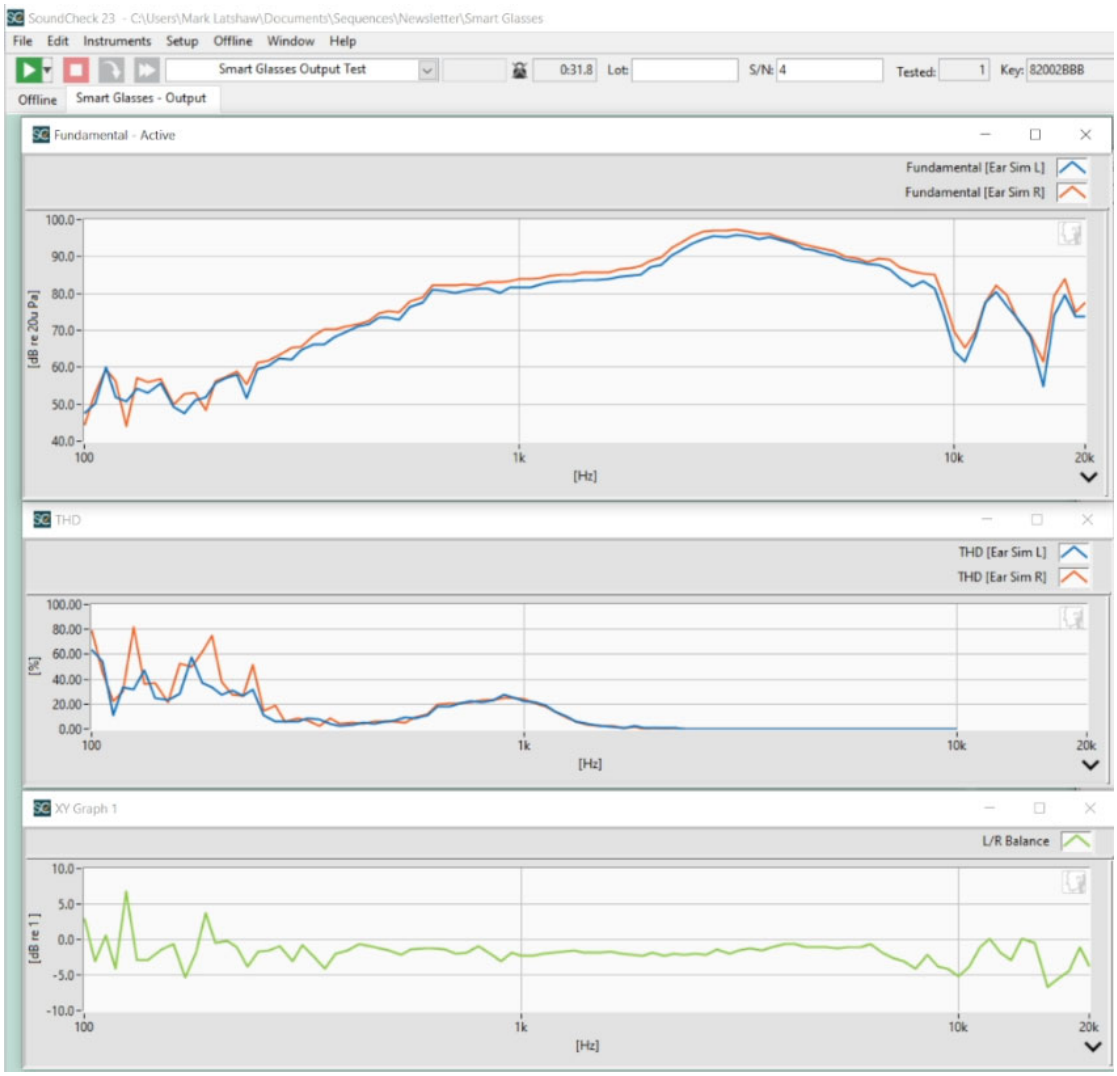
Smart Glasses – Speaker Output Test Sequence

Introduction

The purpose of this sequence is to test the speaker outputs of a pair of Bluetooth Smart glasses. The sequence uses a 1kHz pilot tone accompanied by a Stweep stimulus from 20kHz-100Hz as the stimulus. The sequence prompts the user to put the device in pairing mode, followed by a series of steps that establish connection with the BT interface, in this case the BQC-4149. This involves disconnecting any previously paired devices, fetching the BT address and connecting audio. Once the glasses are paired with the BQC, they are placed on the Head and Torso Simulator (HATS). The stimulus is then played and recorded simultaneously through the ear simulators.



Final display showing Left and Right Frequency responses, THD and L/R Balance

Analysis requires that the stimulus and response waveforms be at the same sampling rate. Therefore, a resampling step is used as necessary. Furthermore, a frequency shift step is often required because there are different clocks on the input and output devices.

The analysis is then performed by comparing the original stimulus to the played back stimulus, using the HarmonicTrak algorithm that provides the Frequency Response and THD. Post processing is then used to calculate the L/R balance by subtracting the two responses.

Hardware Setup & Calibration

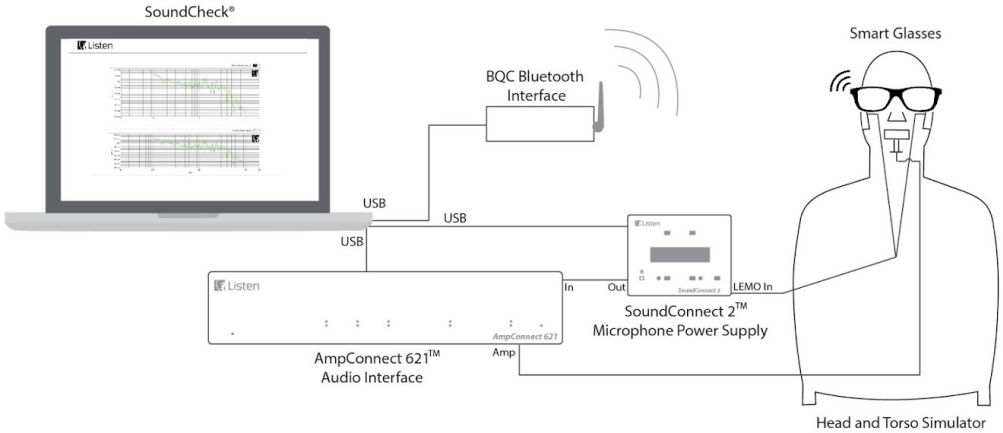
1. Setup the audio interface (AmpConnect 621), BQC 4149 BT Interface and SoundConnect 2 Mic power supply as shown in the system diagram below.

   Note: SoundConnect 2 may or may not be necessary depending on the HATS. If the ear simulators require polarization voltage of 200V, then SoundConnect 2 is needed. If they are pre-polarized, they can be directly connected to the AmpConnect 621 using IEPE.

2. Calibrated the ear simulators by following the Mic Calibration procedure.
3. Make sure the Digital Out 1 and 2 signal paths use Unity Digital Out (AES 17).dat and are mapped to the Outputs of the BQC-4149. The sequence uses BQC message steps to configure the Bluetooth interface. If BTC hardware is used instead of BQC, these can be changed and relinked by editing those steps.
4. Note: Post Processing Resampling assumes that converting to a 44.1kHz sampling rate is required. If both the input and the output audio interfaces are operating at the same sampling rate this step can be removed. If your hardware is configured for a different sampling rate, this step must be edited to match your configuration.

The sequence is ready for use.

System diagram



Further sequence development

This sequence has been designed for simplicity and has been written for a pair of smart glasses. Ways in which you could modify or further develop the sequence include:

- Combining this sequence with the Input Sequence to test both the send and receive of the smart glasses at once.
- If the same Bluetooth device is always being tested, the BQC Get Address step can be changed to Automatically Connect to the specific MAC address without requiring the user to select it from the list.
- More measurements can be added to create a more in-depth test.