Alpha Test Report

# Equalizer Data/Findings

For the Equalizer, I wanted to test 3 aspects of its functionality:

1. Processing Time
2. Magnitude adjustment
3. Audible sound quality

The Figure below shows the time it took to process one frequency band for the 7 band EQ.

Graphical user interface

Description automatically generated

**Figure 1: Timed by toggling a pin on the Launchpad, the recorded time shown is 6.24us for calculating the Biquad coefficients and processing audio sample**

At first glance, the fact that it took 6.24us seems to be fast enough as the rate at which we need to output audio is 48KHz or 20.83us. However, this was just 1 out of 7 frequency bands which we need to process. So while this may seem like we can’t run the audio through the EQ in time, the thing to note is that a majority of that time is spent calculating the coefficients of the Biquad. In an ideal scenario, only 1 Biquad is ever updated and its only updated as the user request. So realistically, since we can assume we would already have the coefficients for each Biquad we can safely assume that the full 7-band EQ would process the audio samples in time.

Graphical user interface, chart

Description automatically generated

Graphical user interface

Description automatically generated**Figure 2: Measured with spectrum analyzer, The peak gain of the 5.6KHz signal is -21.8 dB**

**Figure 3: Measured with Spectrum analyzer, the lowest attenuated gain of the 5.6KHz signal is -36.6 dB**

Figures 2 & 3 show the spectrum plot of a 5.6KHz signal and the magnitude of the signal after being adjusted by the equalizer. There is a note to make that the range of these 2 magnitudes does not equal the range that I have configured the equalizer to compute. The equalizer has a gain range of +/- 15dBs. So I find it odd that the equalizer only measured a range of 14.8, half of its intended functionality. The audio does sound to attenuate quite a bit when audio is playing. I will chalk up this measurement as a limitation of the DAD board.