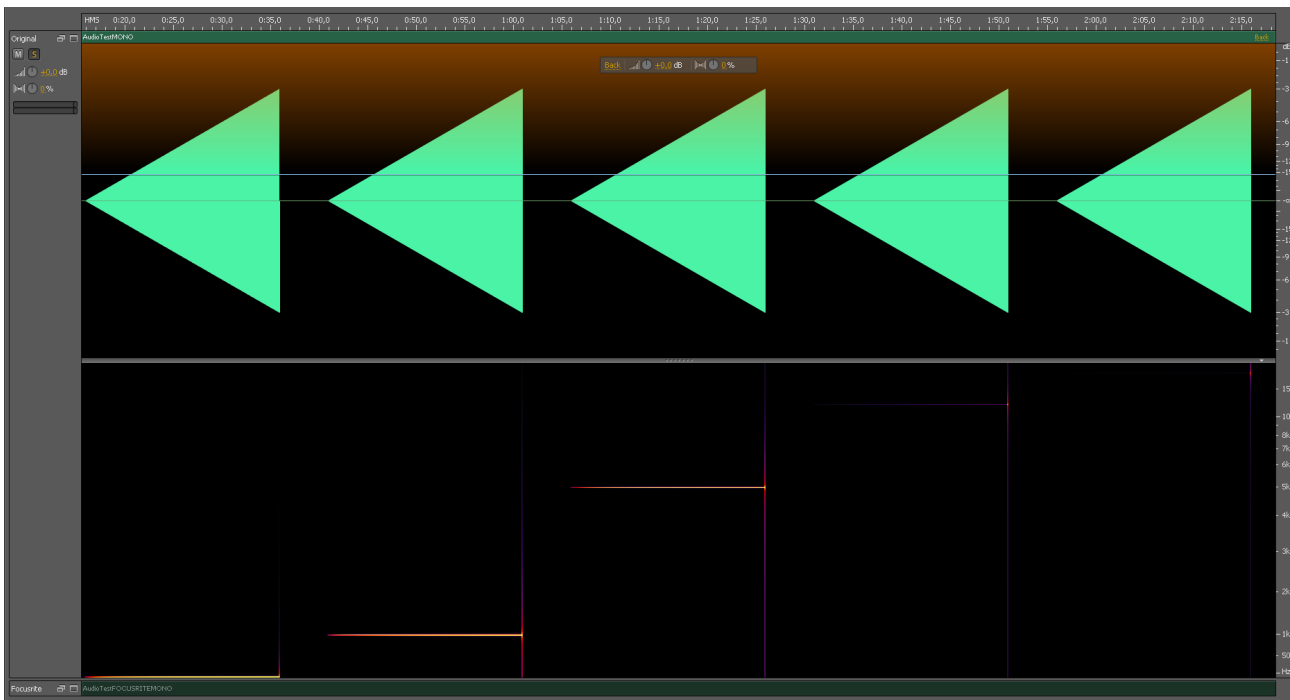


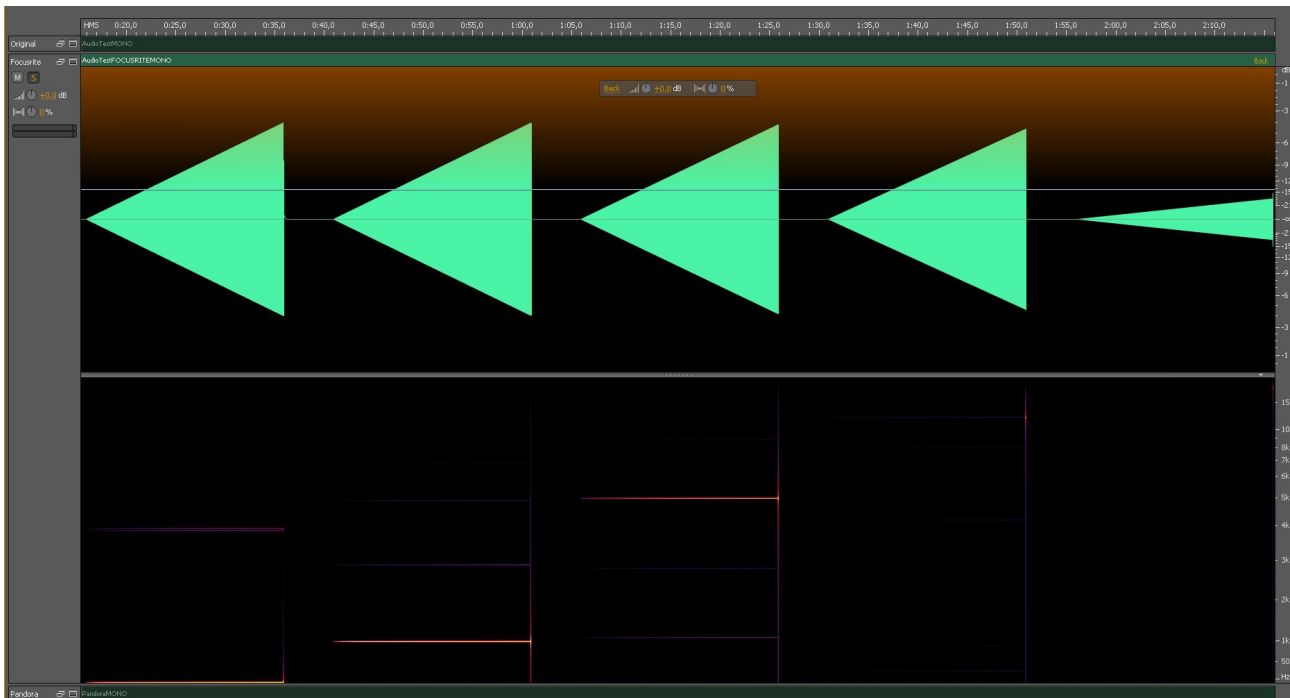
Audio Comparison:  
FocusRite Scarlett 2i4, OpenPandora Handheld, PandaBoard (TWL6040)

## **1. Single Frequencies, increasing volume**



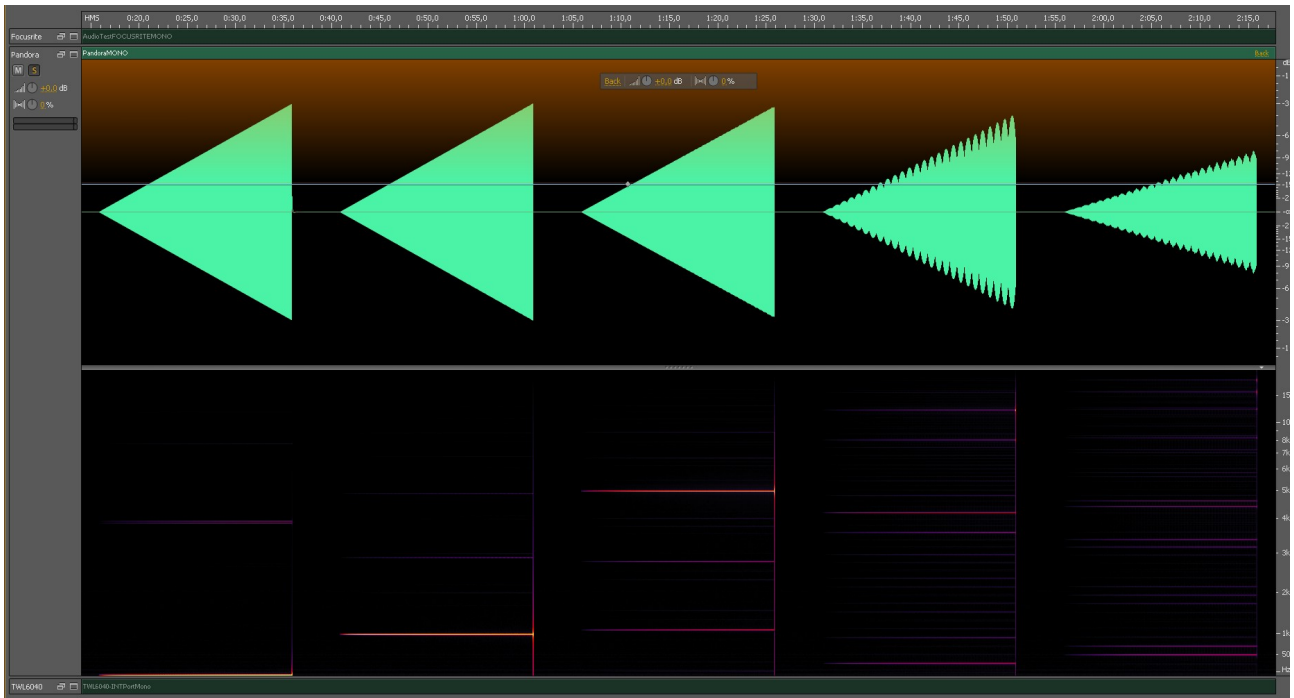
Original file. Clean frequencies, no interferences, linear volume increase.  
Frequencies are (from left to right): 30Hz, 1000Hz, 5000Hz, 12000Hz, 22000Hz.

A) FocusRite Scarlett:



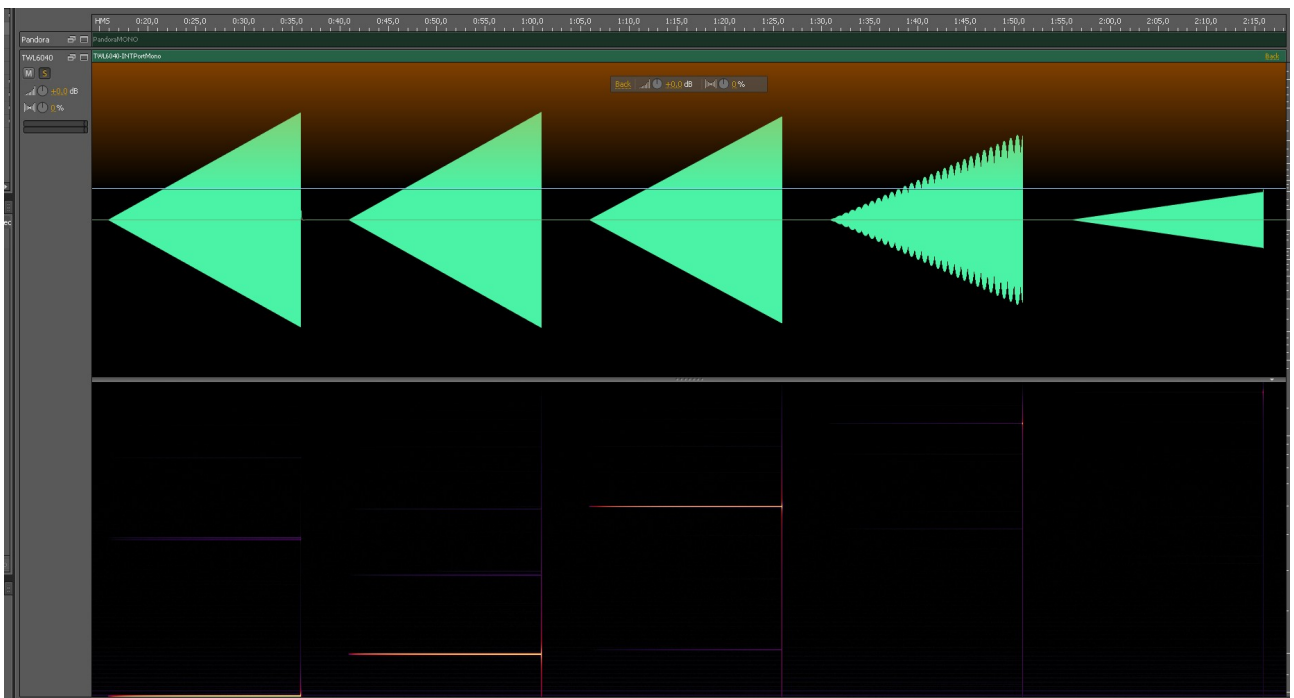
Frequencies have few interferences. Volume of 22000Hz is too low.

## B) Pandora:



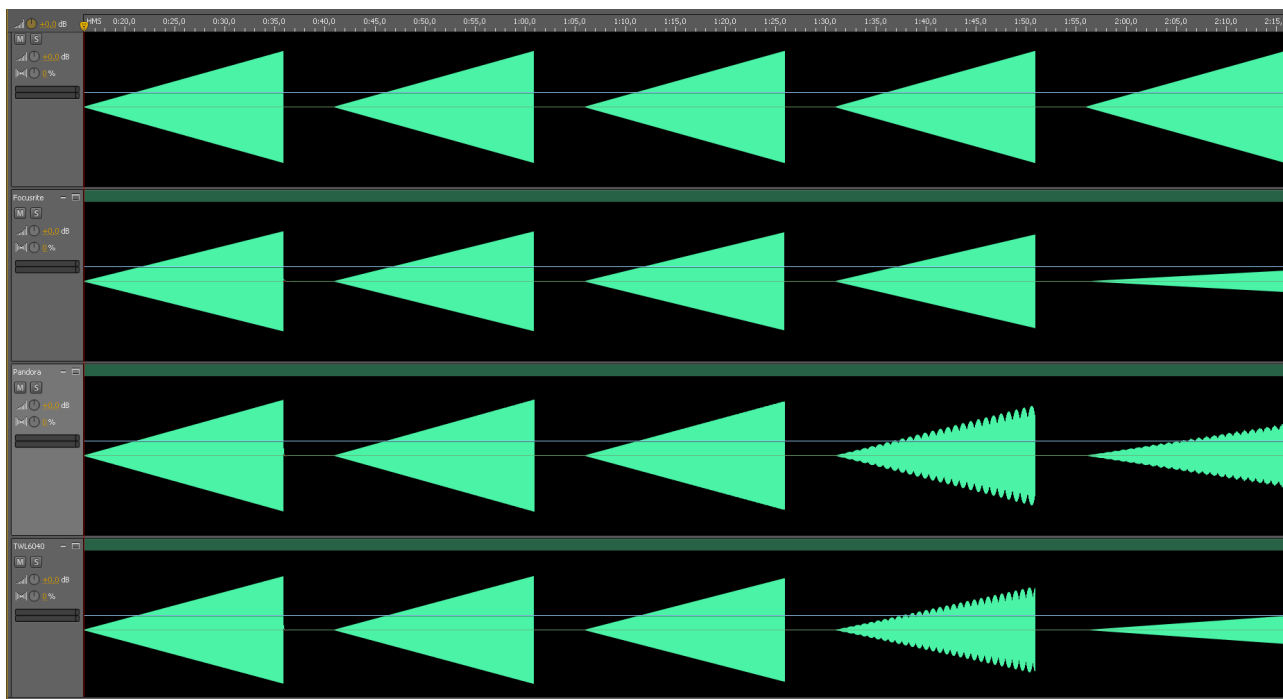
Few interferences in the lower frequency areas, more interferences in the higher ones. Volume of 22000Hz is a bit lower than the original

## C) PandaBoard TWL6040



Few interferences at the lower frequencies, some interferences at 12000Hz, almost no interference at 22000Hz, but lower volume.

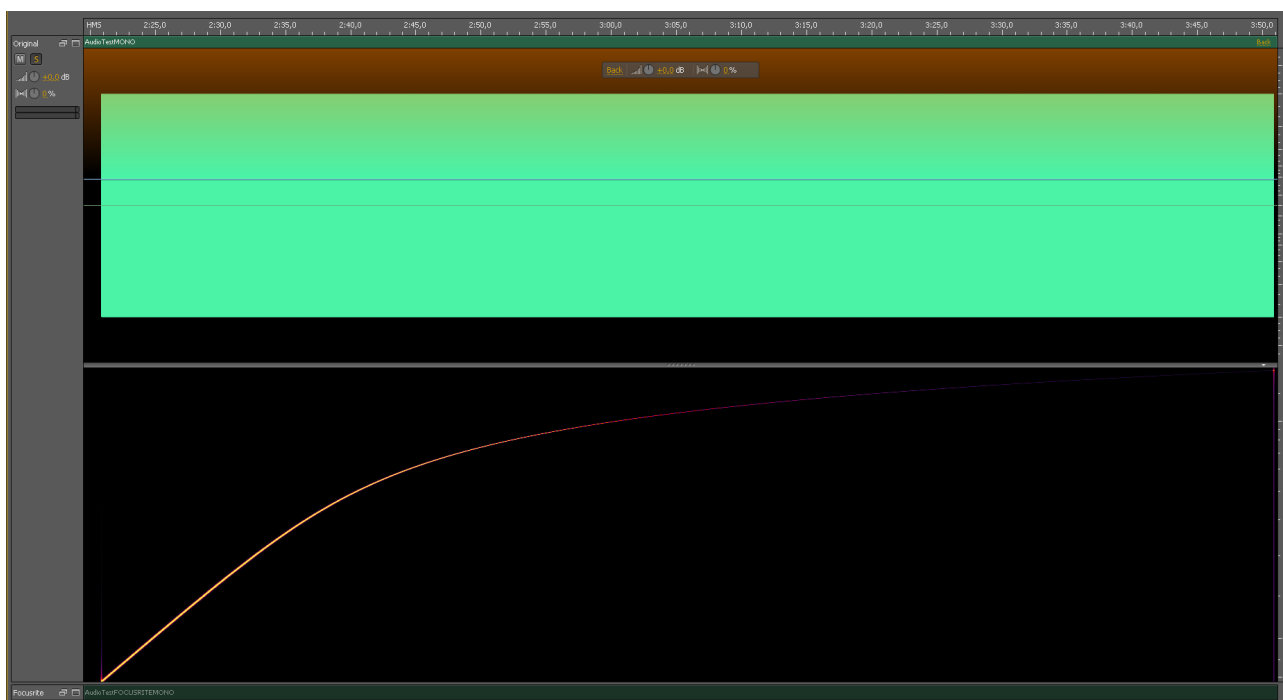
### Summary of Single Frequency Test



From top to bottom: Original file, FocusRite Scarlett, Pandora, TWL6040.

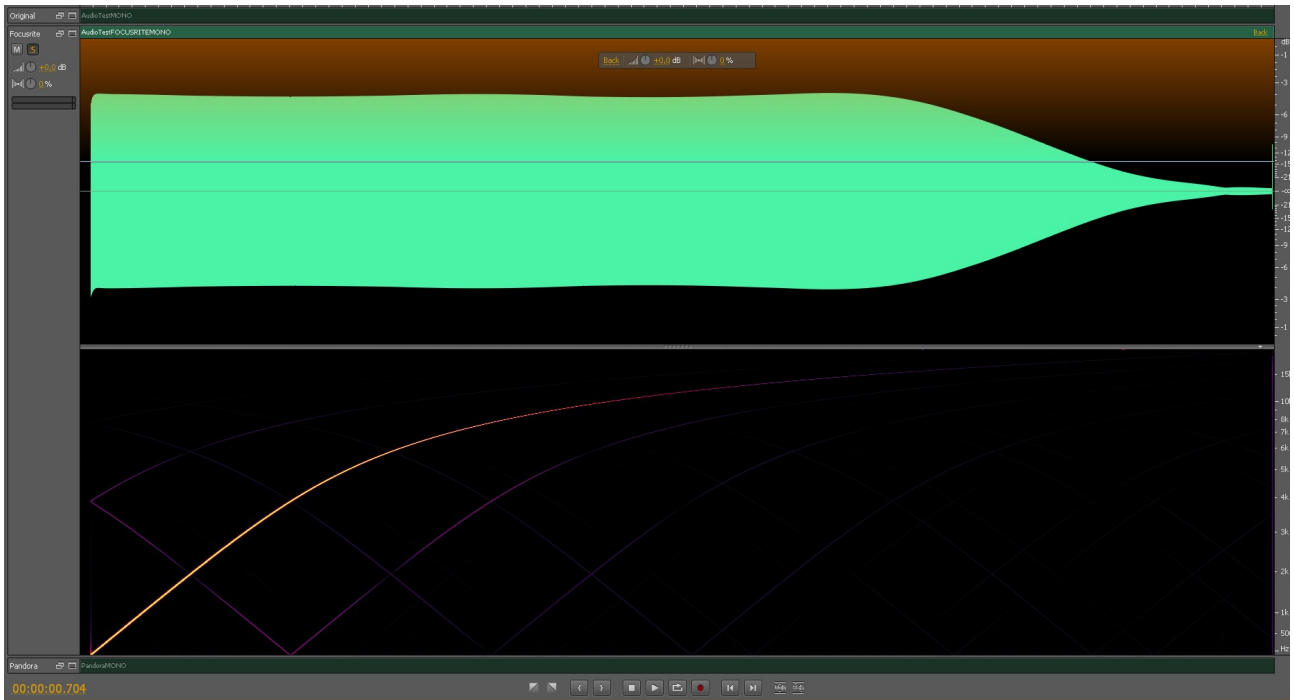
The sound quality of the FocusRite is almost as good as the original file, except at the area of 22000Hz (which is outside of the human hearing area anyways). The TWL6040 comes close (except for some issues at 12000Hz), the Pandora has a bit more interferences.

## 2. Linear frequency sweep (15Hz to 22000Hz), constant volume



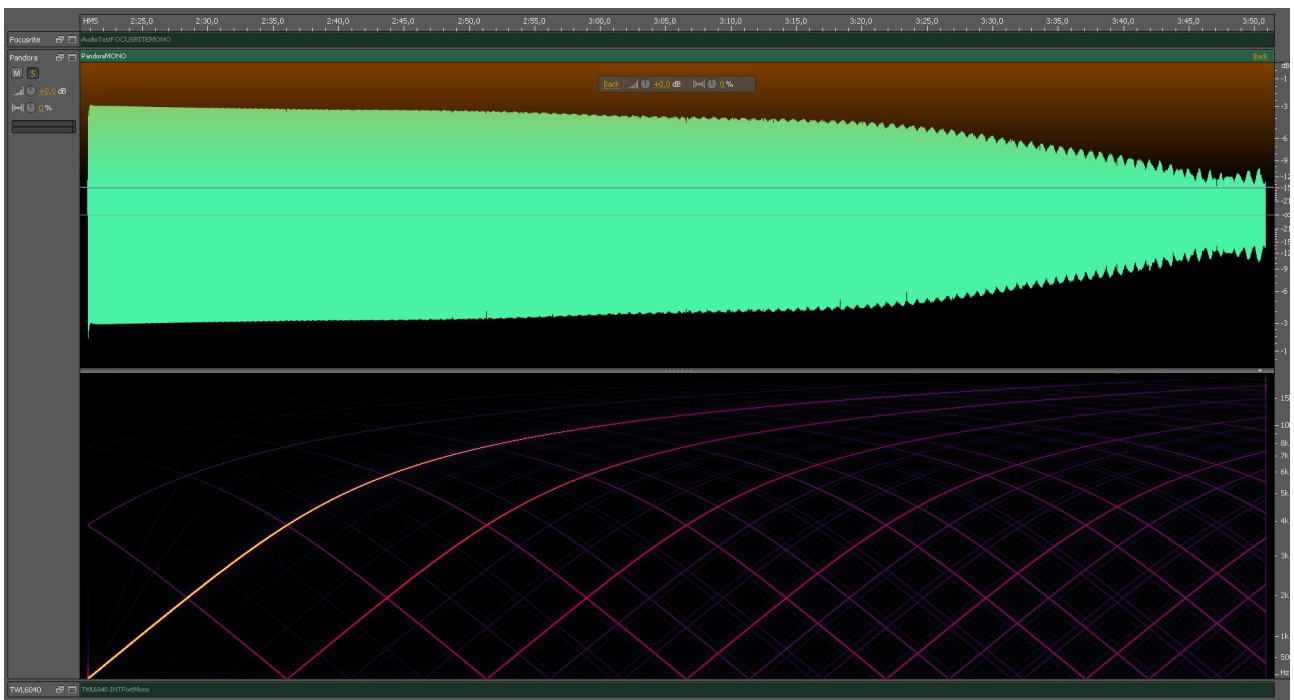
A clean sweep, no interferences, constant volume.

## A) FocusRite Scarlett



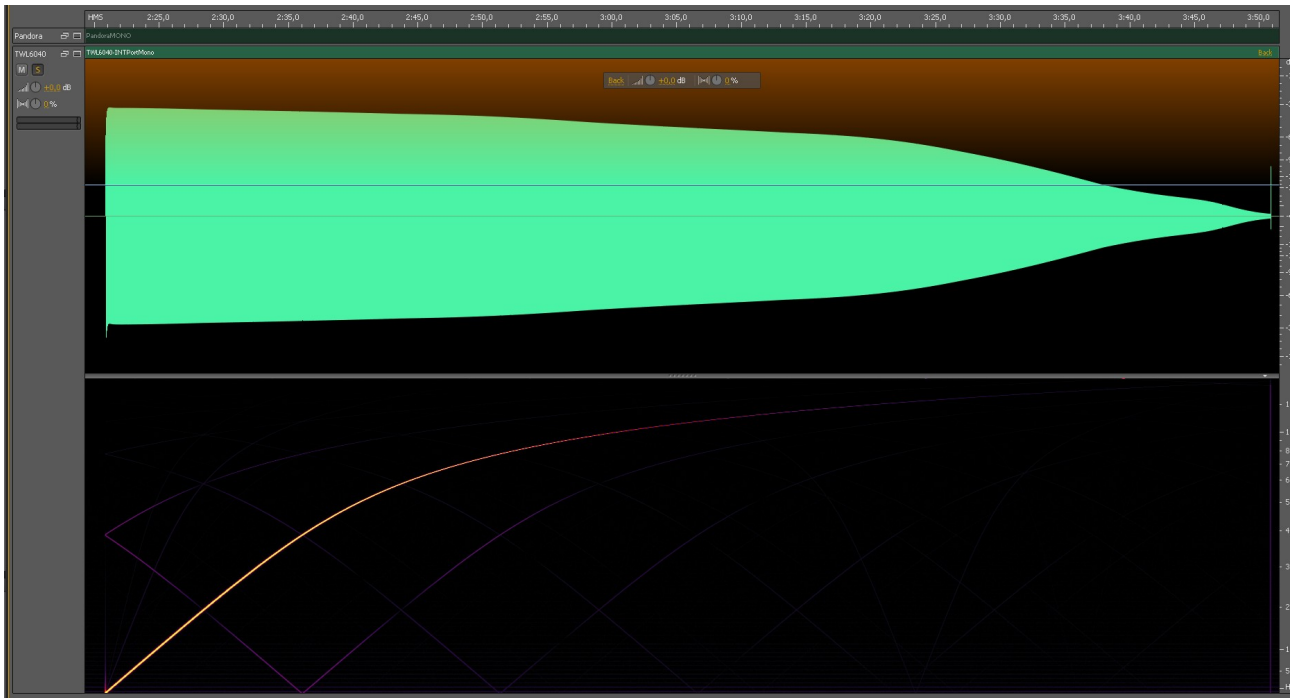
Similar result to the first test: Few interferences (which lets the volume vary a bit), decreasing volume from 18000Hz and higher.

## B) Pandora



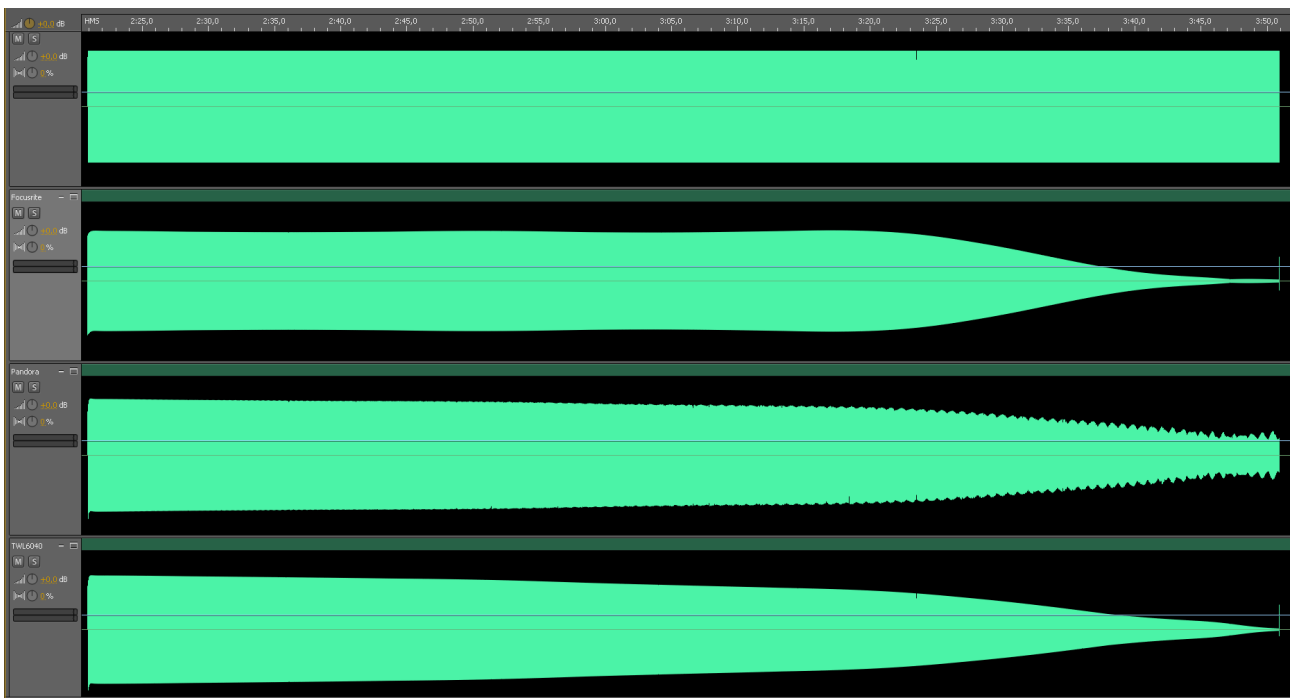
More interferences than the FocusRite, volume decrease at higher frequencies not as strong.

### C) PandoraBoard (TWL6040)



Similar to the Pandora in regards of volume loss, but less interferences. The higher the frequency, the more the volume decreases compared to the original file.

### D) Summary



From top to bottom: Original file, FocusRite, Pandora, PandaBoard (TWL6040)

Both TWL6040 and Pandora have an issue that the volume is not constant. Pandora keeps the volume a bit better, but has more frequency interferences. FocusRite is best here, but has a heavily decreasing volume at 18000Hz and

higher (which can't really be heard by a human).

When it comes to music, both the TWL6040 and the Pandora should sound a bit more present due to the lower frequencies having a higher volume than the higher ones.

### **3. White noise, red noise, pink noise**

Was fine on all three devices, therefore, I didn't make any graphics.

### **4. Noise in silent areas**

*Original File: -77,01dB*

*FocusRite: -74,75dB*

*Pandora: -76,33dB*

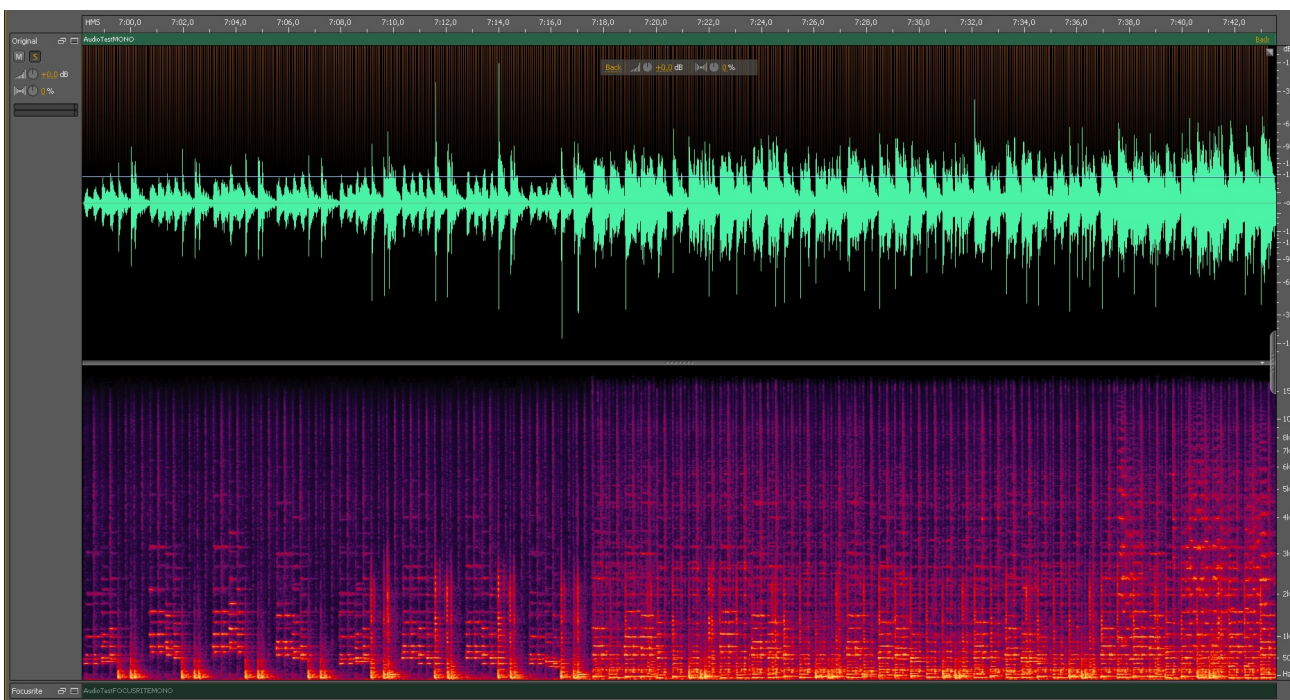
*TWL6040: -66,69dB*

The Pandora is VERY good when it comes to noise.

When a file is silent, it's almost as silent on the Pandora than on the original.  
The Pandora even was better than the FocusRite here.

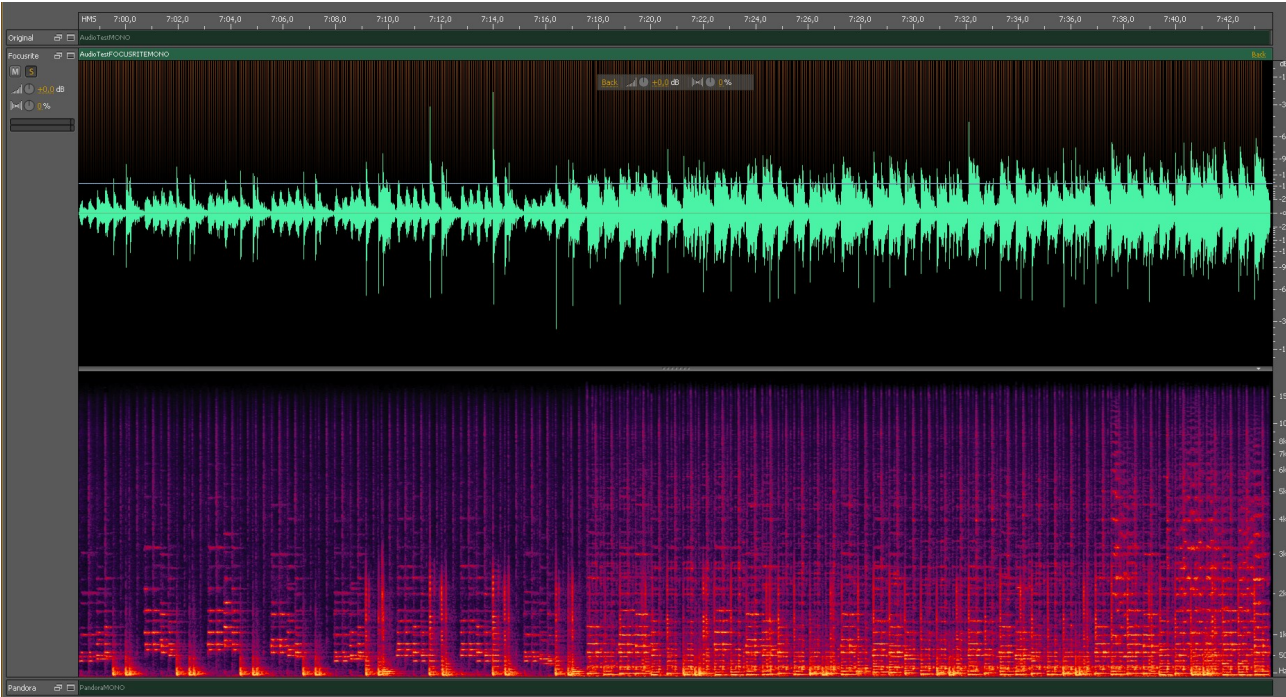
The TWL6040 had quite a bit of noise (10dB higher) in the silent areas, which is probably caused by a cheap amp.

### **5. Comparison of a short piece of music**

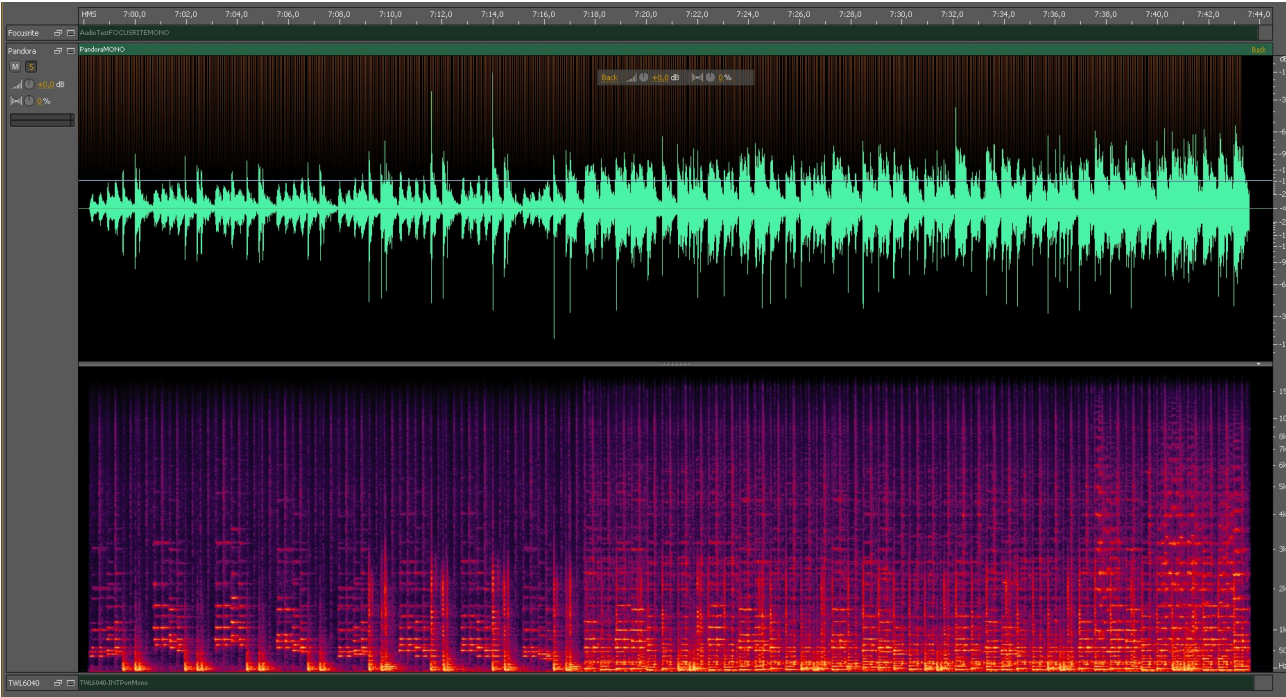


The original file.

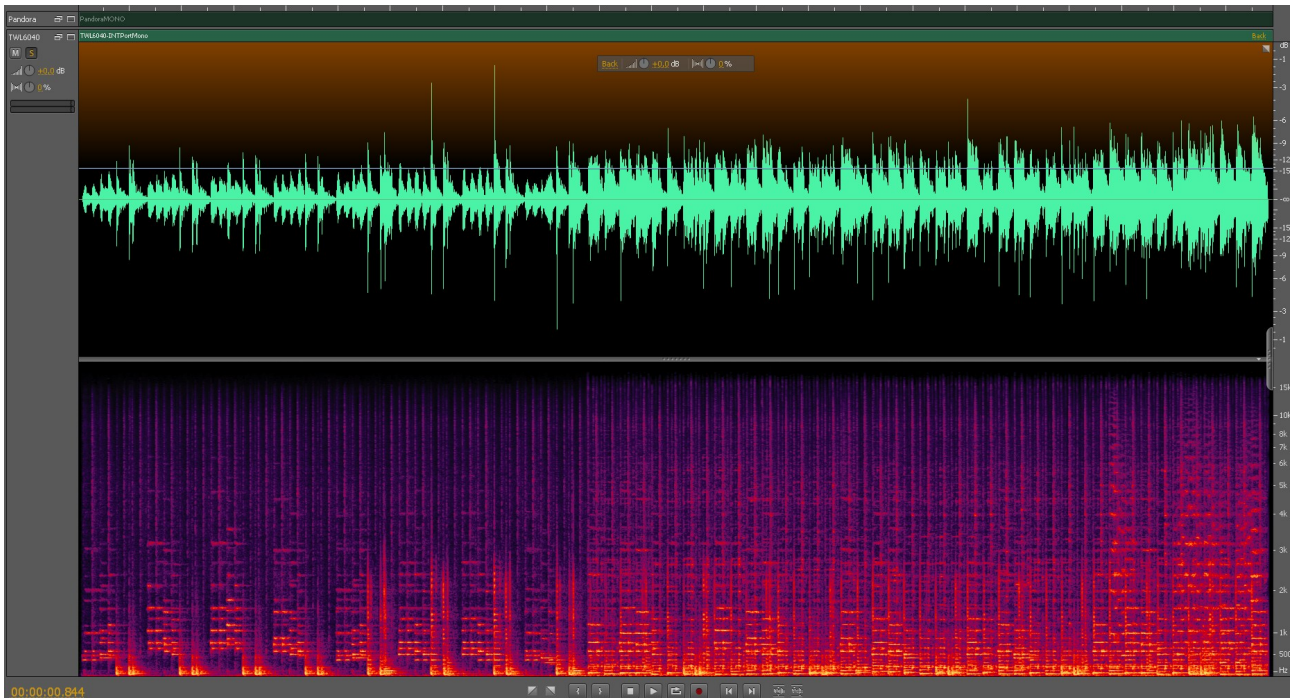
A) FocusRite



B) Pandora



### C) TWL6040 (PandaBoard)



#### Summary:

Even when overlaying all three frequency analysis details, there's not really much difference.

All three devices are pretty faithful when it comes to audio reproduction.

To find the exact differences, a more in-depth analysis would need to be done.

These measurements did NOT use the amplifier a lot. The focus was to first find out how well the audio codec is. Testing the amplifier (for speakers and headphones) will follow.

### **6. Listening test**

I have to admit, I haven't heard any difference in most of the different music pieces I tried.

I even created some short WAVs from the recordings where I switch from one device to the other and I was not able to hear much difference.

The only difference I heard was with MegaMan (NES version):  
The Pandora sounds less crisp than the rest.

You can test that as well. The files are available for download.  
Here is in what areas the output of which device is heard:

#### **MegaMan (NES):**

0 – 9,5s: Original File

9,5s – 19,5s: FocusRite

19,5s – 30s: Pandora

30s – 42s: PandaBoard (TWL6040)

**Sonic the Hedgehog 2 (MegaDrive):**

0 – 9s: Original File

9s – 23,5s: FocusRite

23,5s – 35,5s: Pandora

35,5s – 56s: PandaBoard (TWL6040)

**Turrican 2 (Anthology CD):**

0 – 5s: Original File

5s – 12s: FocusRite

12s – 17s: Pandora

17s – 24s: PandaBoard (TWL6040)

**That Happy Feeling:**

0s – 8s: Original File

7s – 20s: FocusRite

20s – 30s: Pandora

30s – 36s: PandaBoard (TWL6040)

36s – 40s: Original File

40s – 45s: PandaBoard (TWL6040)