Tonochi's Audio Room – Supplemental Info

Review of HDD Player HAP-Z1ES

2021/07/30

Review of HDD Player, SONY HAP-Z1ES

HAP-Z1ES is a product in the SONY ES series. I bought it with high expectations. However, I discovered some problems while I was using it. This document describes the details of my evaluation of HAP-Z1ES based on measurements.

Contents:

Summery

In the early stage of the system design of Gaudi II (Ver.2.0), a DAP (digital audio player) like HAP-Z1ES (called HAP hereafter) was employed. I selected HAP because I couldn't find any other good competitor. Its list price was 210,000 JPY, and I bought it for about 170,000 JPY online.

I expected high sound quality and user-friendliness, because HAP is a product in SONY ES series, and I had been happy with four ES components before.

As soon as I began using HAP, I faced a serious problem. To my surprise, mechanical noises of the built-in HDD and the cooling fan were heard from HAP. There were so loud they could be heard on the other end of the room.
In spite of this fault, I kept using HAP for six years (2015-2021), since it was an expensive component.

I've revised the system design of Gaudi II (Ver.2.1), and employed PC audio instead of HAP.
Before I sell HAP, I evaluated it once more for comparison with PC audio in sound quality.

This document describes the evaluation of HAP only. For comparison with PC audio, see the following document "Introduction of PC Audio":
https://nobody-audio.com/English/posts/topics_en8.html

Measurement

The test signals are saved in 192kHz/24bit WAV files and played by HAP. The dummy load is 22 kohm.

Frequency Response

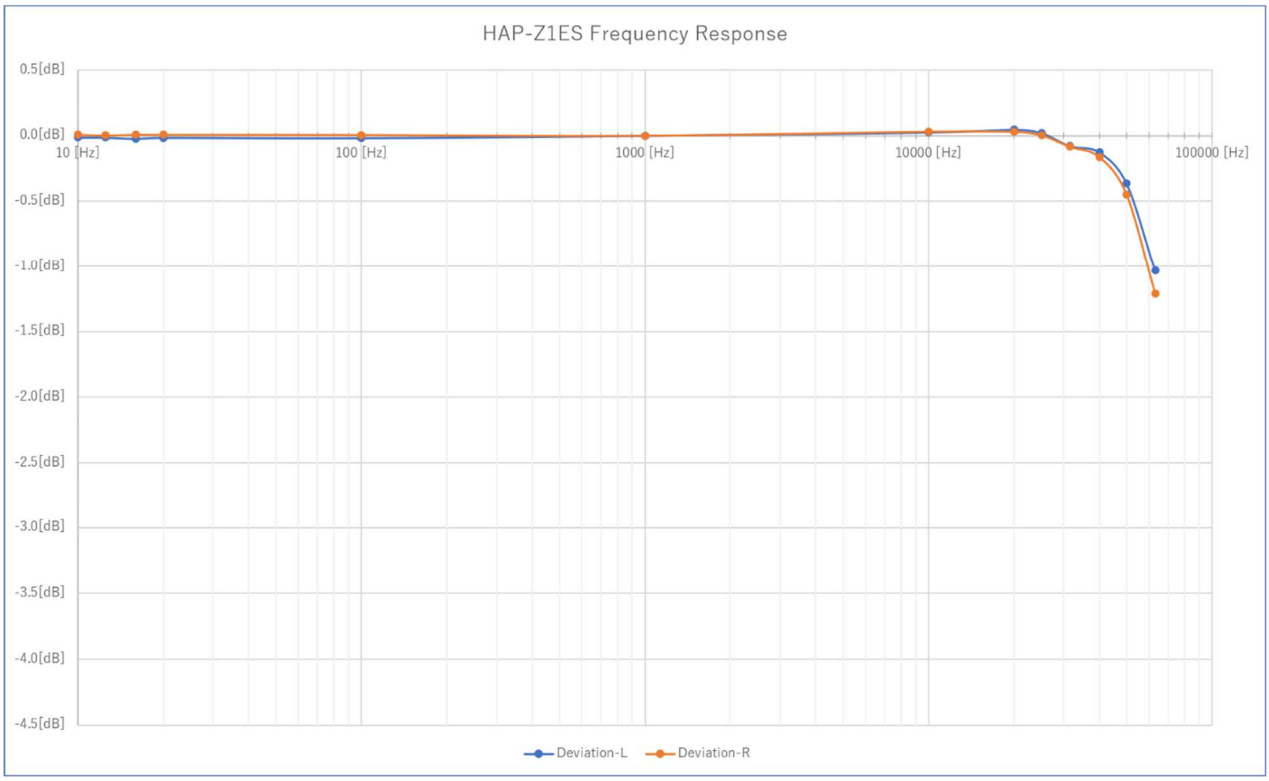
The chart below shows the frequency response of HAP. The curves represent deviation from the output voltage at 1kHz, which is 0dB level.

It is good characteristics.

-0.3dB cutoff: 45kHz

-1dB cutoff: 60kHz

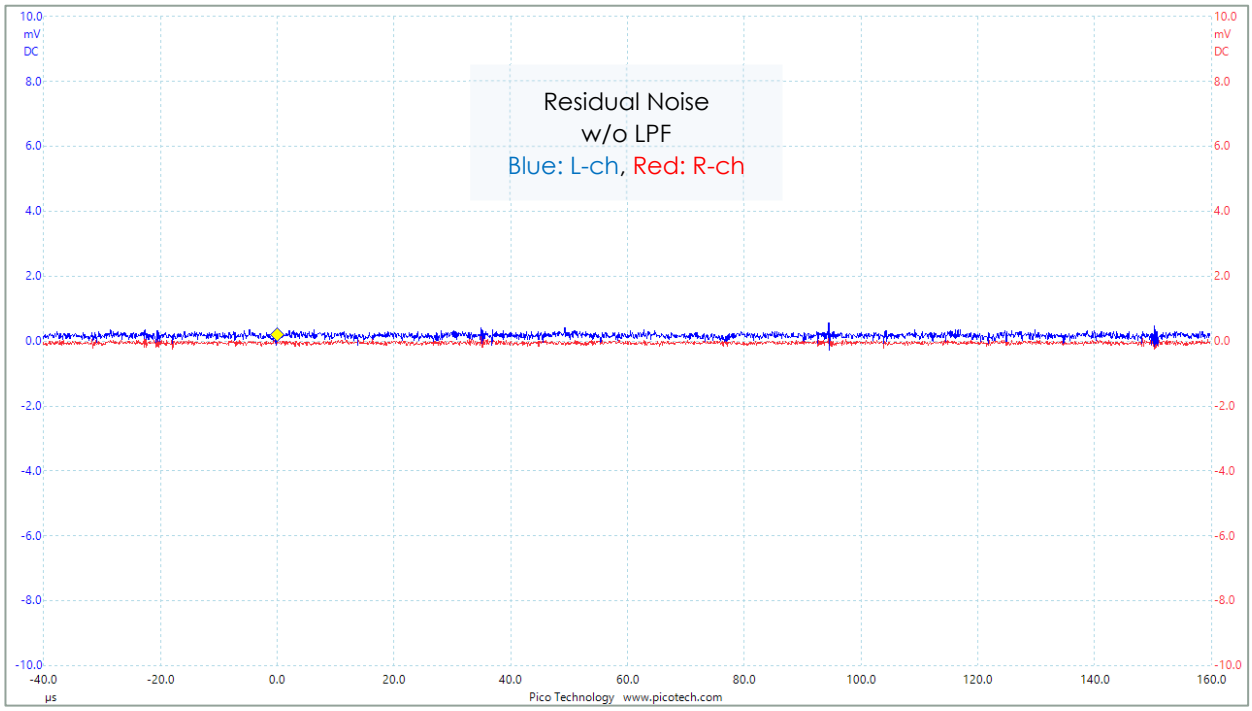
There is little difference between the channels.



Residual Noise

Excellent!

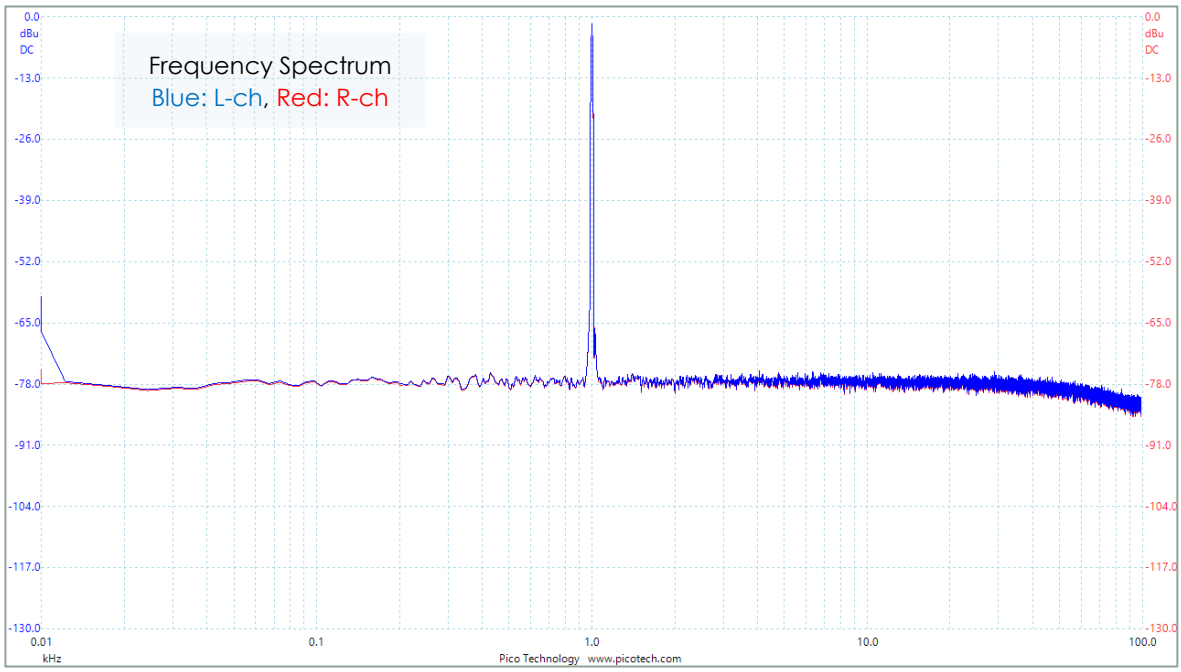
Condition	Left channel		Right channel	
	AC (rms)	DC	AC (rms)	DC
Without filter	81[uV]	177[uV]	46[uV]	-57[uV]
With 40kHz LPF	12[uV]	168[uV]	8[uV]	-65[uV]



FFT Analysis

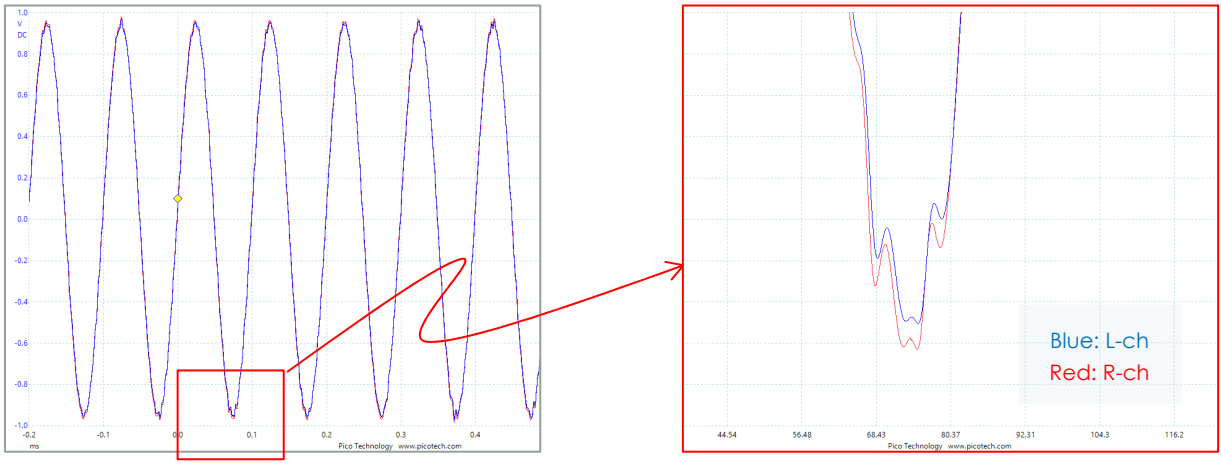
Very bad result! I was surprised when I saw it for the first time.
Uniform level (-78dB) of noise appears at all the frequencies. It is so-called white noise.
When THD (total harmonic distortion) and SNR (signal to noise ratio) are calculated by FFT, the voltages other than the test signal (1kHz) are integrated as noise. It's because the THD and SNR are so bad they can't be accepted in Hi-Fi systems.

Index	Left channel	Right channel
THD	0.241%	0.234%
THD+N	-35.63[dBc]	-36.81[dBc]
SFDR	72.76[dBc]	73.02[dBc]
SNR	36.65[dBc]	36.92[dBc]
IMD	0.072%	0.072%



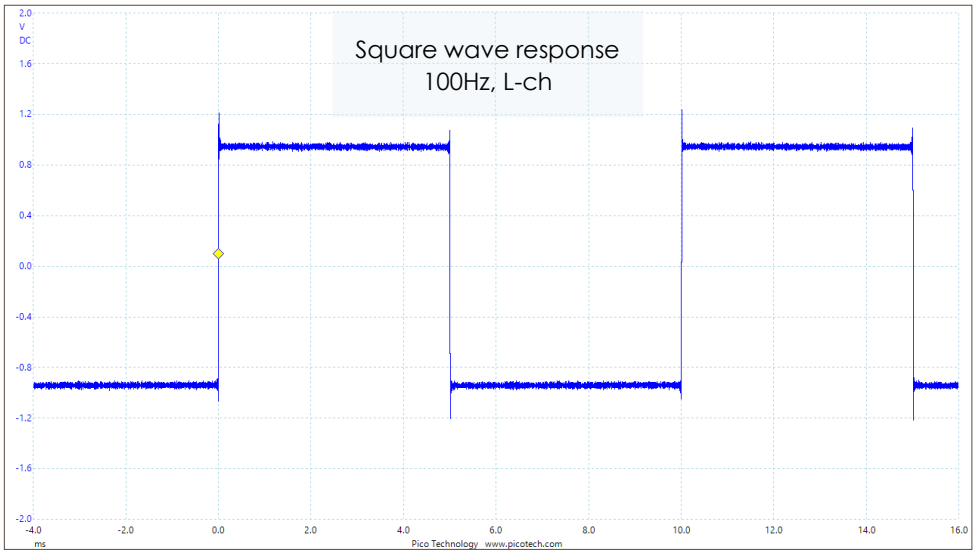
I was puzzled at first, since the residual noise was nearly zero.

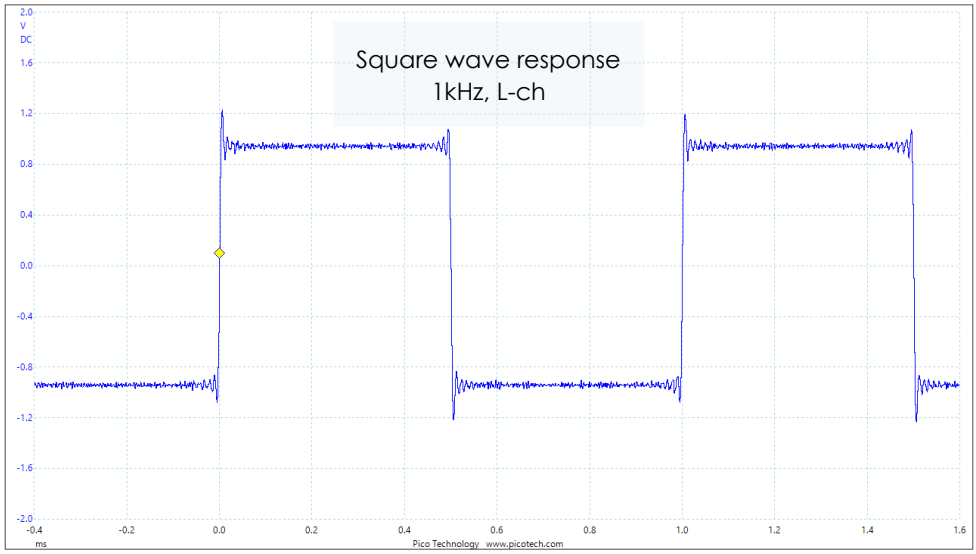
I found the cause when I had a close look at the waveforms. The white noise is generated only when a sound file is being played. There is one noise source, and the noise intrudes into both channels in the same magnitude and phase.
The figure below illustrates the noise intrusion.

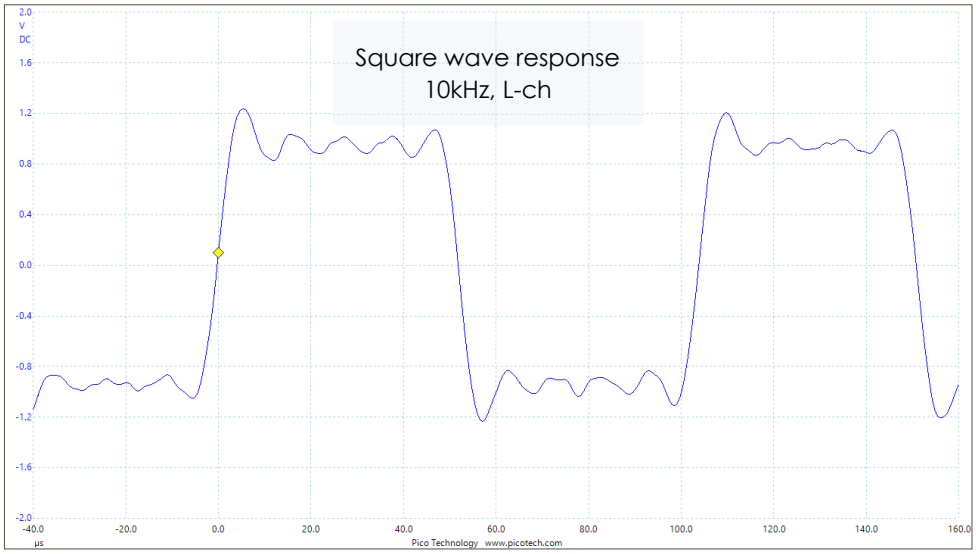


Square Wave Response

Square waves of 100Hz, 1kHz and 10kHz were used. The waveforms are exactly the same between the channels, so only the left channel's results are shown here.
Noise is seen also in the square wave response.



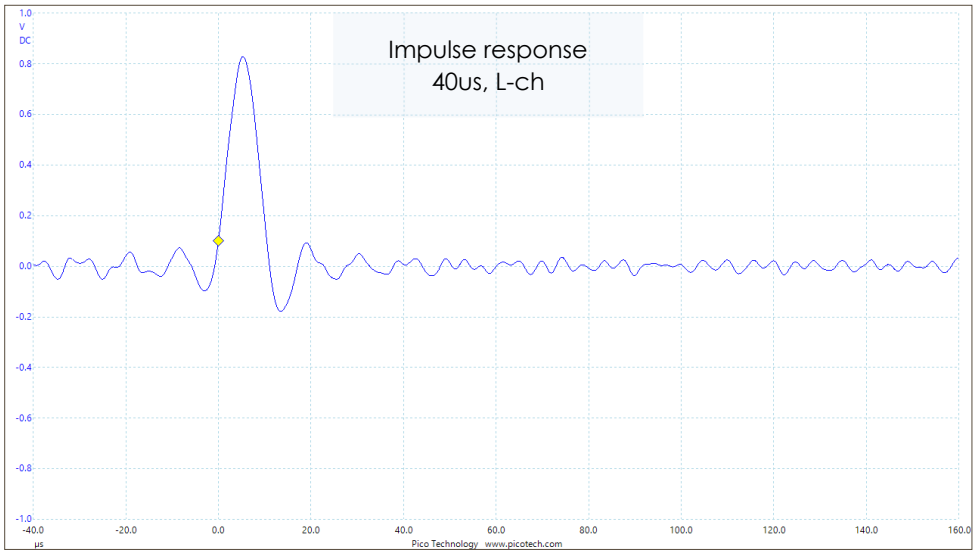




The white noise appears. It's hard to tell whether ringing occurs, because of the white noise, but there seems to be some. The waveform that looks like overshoot/undershoot is caused by lack of very high frequency component in the test signal file.

Impulse Response

Impulse of 40us was used. The waveform of the test signal is not exactly the impulse because it is saved in 192kHz/24bit format. The waveforms are exactly the same between channels, so only the left channel's result is shown here.

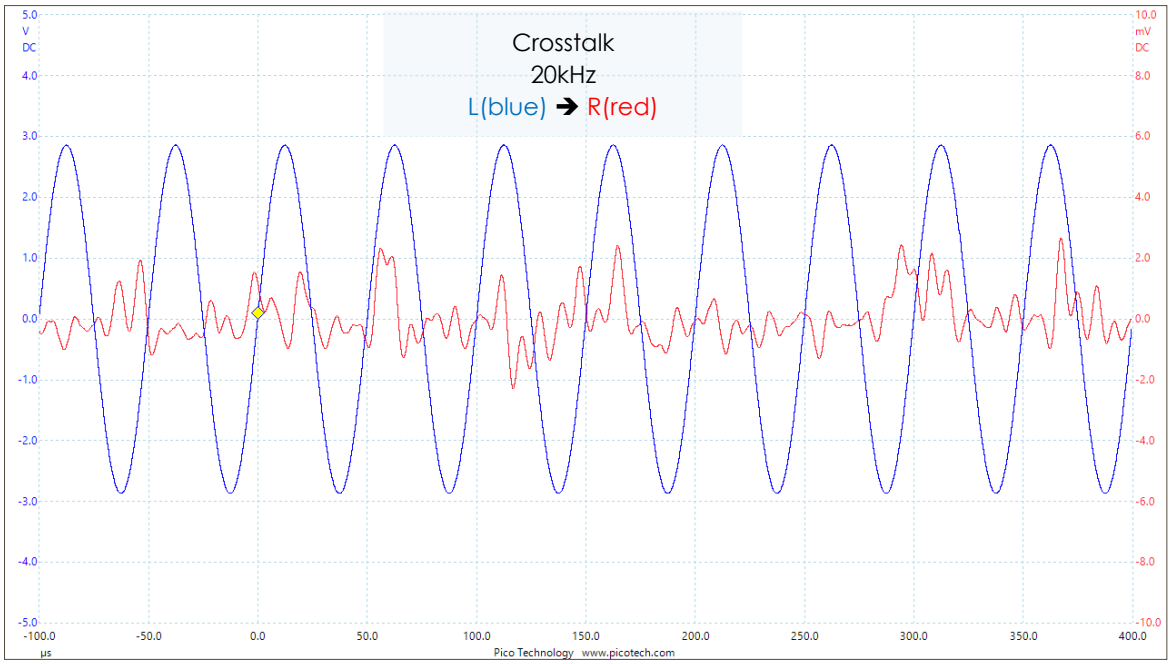


Small ringing can be seen.

Channel Separation

The white noise masked the crosstalk, so this result is not exact.

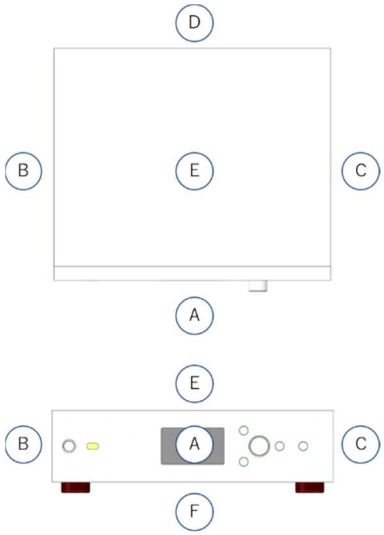
Frequency	Direction	Separation
20 [Hz]	L ➔ R	70.5 [dB]
	R ➔ L	70.3 [dB]
1 [kHz]	L ➔ R	70.9 [dB]
	R ➔ L	70.5 [dB]
20 [kHz]	L ➔ R	70.4 [dB]
	R ➔ L	70.6 [dB]



EMI (Radiated EMI)

Since I don't have an instrument for EMI (electromagnetic interference) measurement, I used a radio/recorder to measure radiated EMI.

I placed the radio/recorder 5cm away from each side of HAP (the figure below illustrates the positions, A-F), and recorded the noise. The radio was tuned at 837kHz (AM). There isn't any broadcaster that uses this frequency in the region I live.



I replayed the recordings with an audio editor app, Audacity, and read the level of noise. The table below shows the result.

Note that these values are not exact because the recorder automatically adjust the recording level according to the level of the input.

Position	Power off	Power on	Playing
A	-15[dB]	-12[dB]	-16[dB]
B	-16[dB]	-16[dB]	-19[dB]
C	-12[dB]	-16[dB]	-18[dB]
D	-26[dB]	-33[dB]	-32[dB]
E	-24[dB]	-25[dB]	-28[dB]
F	-23[dB]	-28[dB]	-29[dB]

Obviously, HAP doesn't radiate electromagnetic noise.

You can hear a radio program without any noise, even when the radio is placed on HAP.

Sound Quality

I have some complaints about HAP, but I realized the quality of its output is good.
Though white noise intrudes into the output signal, the level of the noise is as low as -78dB. The noise is inaudible, and doesn't affect the following amplifying stages unlike RF noise.

The DSEE improves sound quality.
I keep DSEE enabled, since I often replay CD quality files.
However, stereo image positioning sometimes becomes unsteady according the type of the musical instrument.

I have been saying with certainty that the mechanical noises caused by the 2.5" HDD and the cooling fan in HAP were a critical defect.
However, I noticed the mechanical noises were not so loud when I placed it on the work table in my study/lab and made measurement. The loud noises hadn't come from the chassis of HAP but the audio rack (AR-416 Air).
Vibration from HAP propagates to the whole audio rack, and the rack radiates sound waves like the diaphragm of an LS unit.
When I bought HAP, it was before I built AR-416, I used a cheap steel rack for the audio rack. The steel rack radiated noise as loud as it reached all the corners of the room. That's because I got the impression, "HAP is so loud."

A table cloth and a 2mm-thick transparent vinyl sheet were on the work table. I think this vinyl sheet prevents propagation of vibration and resonance of the table top. It is so interesting if it's true that a vinyl sheet functions as high-performance insulator. I'd like to confirm it someday.

By the way, the feet of HAP look like an insulator, but they are mere feet. They don't absorb vibration.

Vinyl sheet on work table

Feet of HAP

User-friendliness

I'm not satisfied with the user interface of HAP.
Though a smartphone or a PC can be used as the remote control (control by the PC isn't open to the public), what the user can do with the remote is the same as what he/she can do with the front panel. The remote control doesn't have Explorer-like feature. It is troublesome to move from folder to folder and find a particular piece of music in the collection. I want a word search feature.

With PC audio, you can use Explorer or a player app that has good user interface. You can find one particular song among tens of thousands of songs in a several seconds, and play it. I am irritated by the user interface of HAP, since I am used to the user interface of PC audio.

I suggest some improvements:

- The Enter button should be combined with the jog dial (SCD-555ES has this kind of jog dial)
- A button is necessary which changes the current folder to the higher folder
- The current folder should be saved in memory when power gets off, and the folder is resumed when power gets back on

Wrap-up

The sound quality of HAP is so good, though it generates white noise.

The mechanical noises, which is the most serious defect, can be lessened by using a good insulator or a resonance-free audio rack. Even with such measures, the mechanical noise would still remain. The best remedy is to replace the HDD with an SSD and remove the internal cable to the cooling fan so that it won't rotate.

I seriously considered the remedy, but I've decided to employ PC audio at last.
I don't like the user interface of HAP. It can hold tens of thousands of songs in it. It needs better user interface with which the user can select songs quickly.

[END OF DOCUMENT]

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