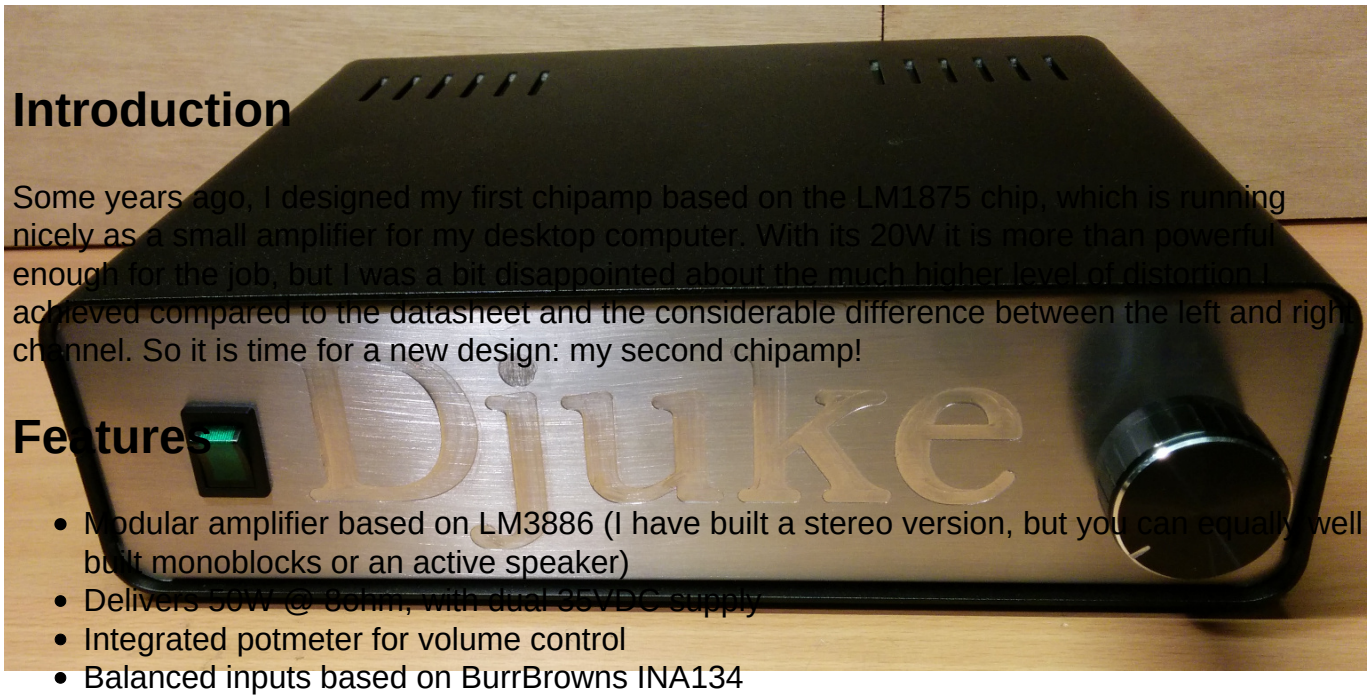


Introduction

Some years ago, I designed my first chipamp based on the LM1875 chip, which is running nicely as a small amplifier for my desktop computer. With its 20W it is more than powerful enough for the job, but I was a bit disappointed about the much higher level of distortion I achieved compared to the datasheet and the considerable difference between the left and right channel. So it is time for a new design: my second chipamp!

Features

- Modular amplifier based on LM3886 (I have built a stereo version, but you can equally well built monoblocks or an active speaker)
- Delivers 50W @ 8ohm, with dual 35VDC supply
- Integrated potmeter for volume control
- Balanced inputs based on BurrBrowns INA134

The amplifier uses some of my previous pcb designs. To build a complete stereo chipamp you need the following components:

- 2x BalancedReceiver
- 1x Poweramp supply (I used 16x4700uF/35V capacitors)
- 2x LM3886 Amplifier
- 1x Bridge rectifier
- 1x Supply connector
- 2x Insulated RCA connectors
- 2x XLR female connectors
- 1x Toroidal transformer 2x24VAC (I used 100VA for my stereo amp)
- 1x Cabinet
- Internal wiring

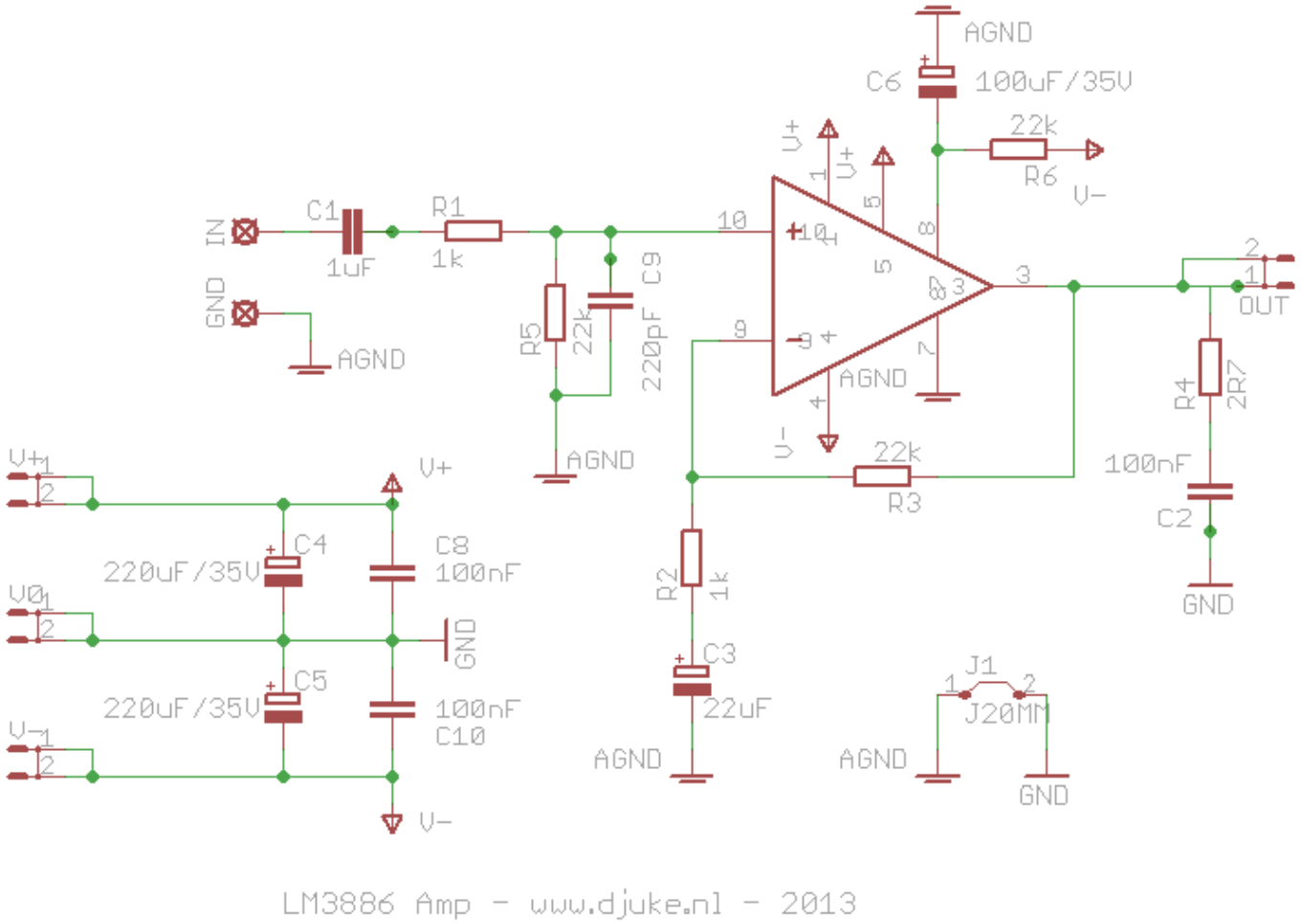
Design

A schematic of the amplifier pcb is shown next, which is quite straightforward and has only some minor differences from the LM3886 datasheet:

- slightly different gain (27dB),
- extra low pass filter (crossover at 100 kHz) at the input
- extra high pass filter (crossover at about 3Hz) at the input

The supply is quite conventional with a bridge rectifier, 2x37600uF capacitors (I know that is overkill!) and delivers about 2x34 Volt (slightly lower under load)

The signal flow is from the input connectors to the BalancedReceiver pcb, then to the 10k Log potmeter, then to the LM3886Amp pcb and to the output connectors.

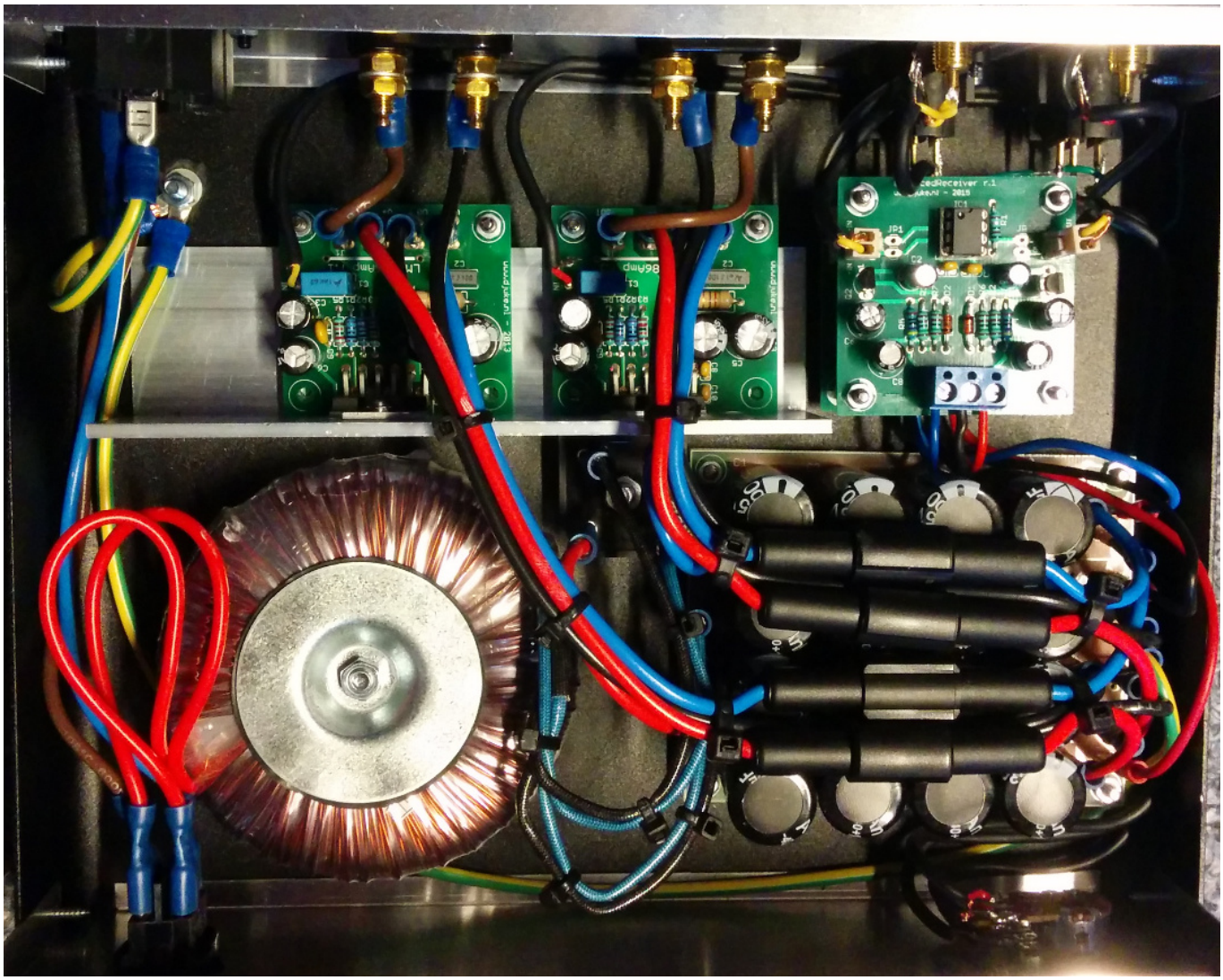


I added a stereo 10k logarithmic potmeter between the BalancedReceiver and the Chipamp pcb to control the volume.

Layout

A photo shows the physical layout.

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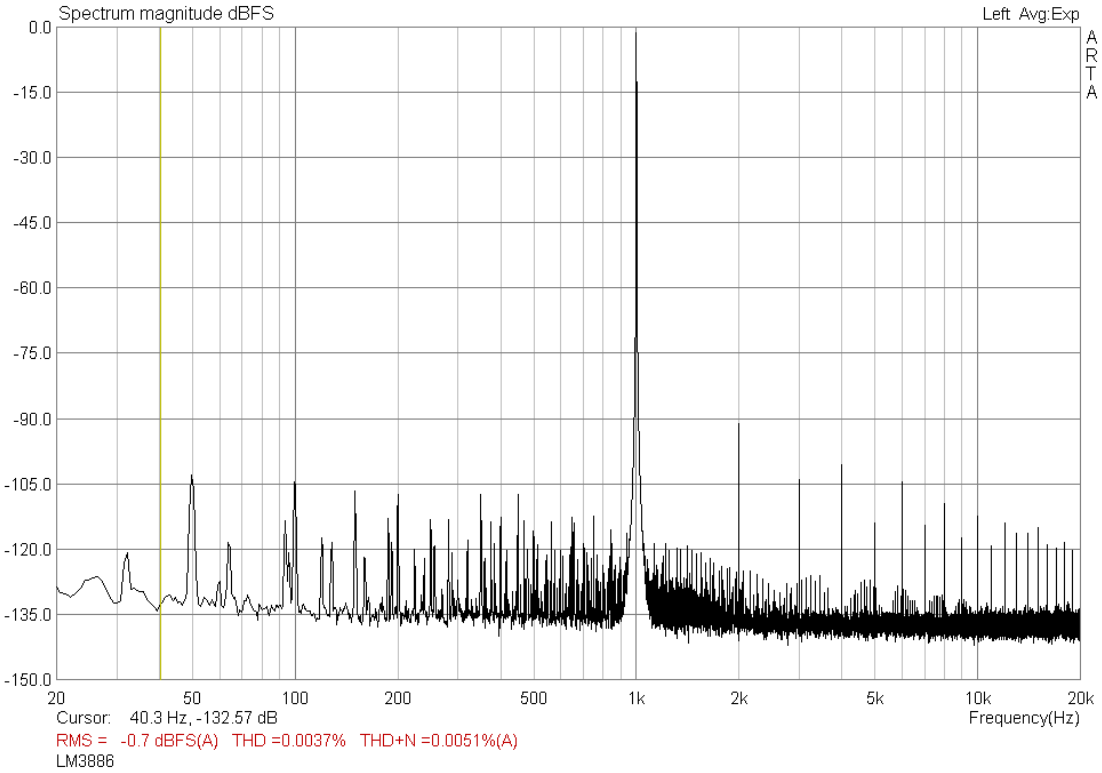


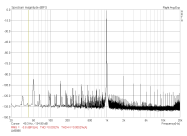
Measurements

Now, the following question remains: how close to the datasheet can we get this time if we measure the distortion of the LM3886. Measurements are done with my EMU1212m sound card. To reduce the high output levels of the amp, a -16.5dB voltage divider was used at the output of the amplifier. All measurements where done with an 8 ohm load. This time I used ARTA instead of Rightmark Audio Analyzer as it allows to measure distortion vs frequency and distortion vs amplitude revealing more clearly how the amp behaves over the audio spectrum and with different input levels.

Spectrum

First, lets look at the spectrum, when a 1kHz signal just below the clipping level is used.



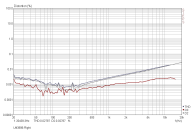


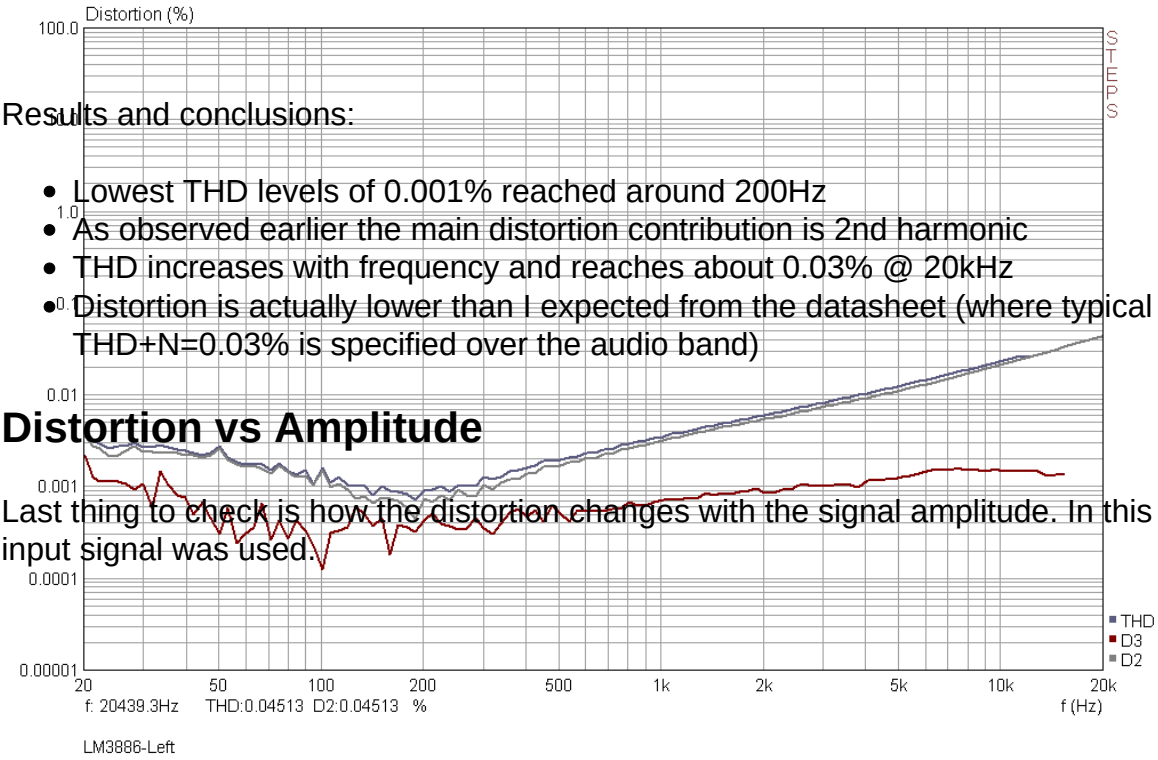
Results and conclusions:

- Most of the peaks are below -100dB with the largest contribution being 2nd harmonic.
- Left: THD=0.0037%, THD+N=0.0051% (A weighted)
- Right: THD=0.0032%, THD+N=0.0052% (A weighted)
- Difference between left and right channels is quite small

Distortion vs Frequency

Next thing is to look at how distortion changes with frequency.





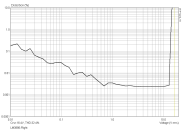
Results and conclusions:

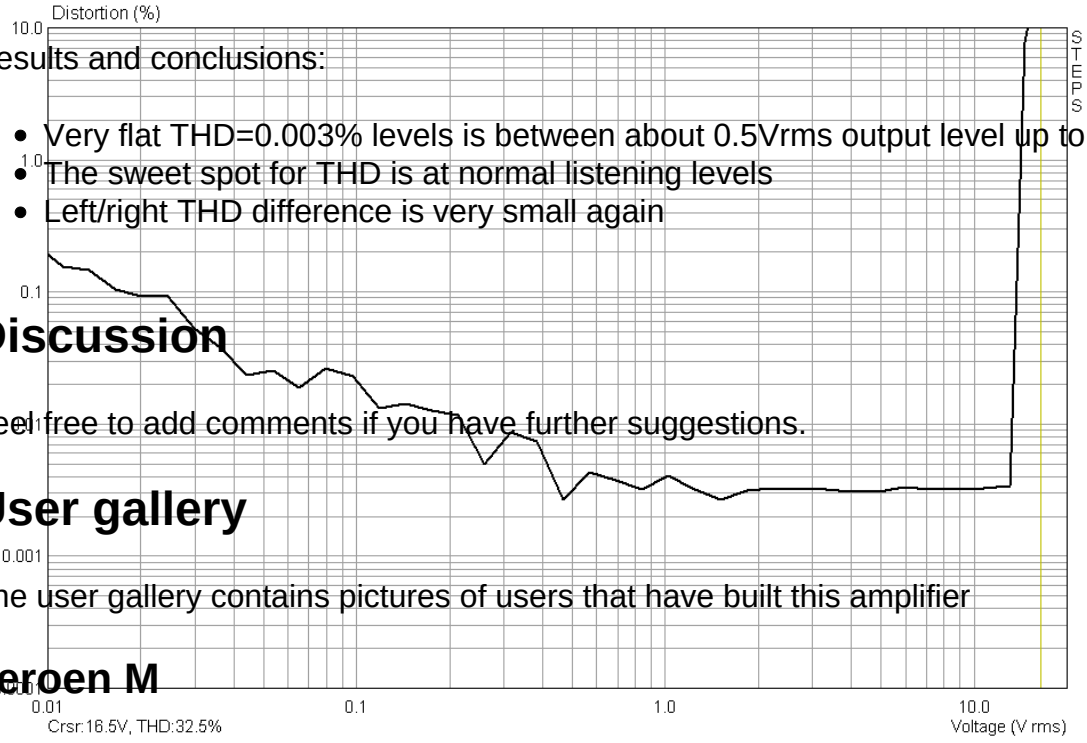
- Lowest THD levels of 0.001% reached around 200Hz
- As observed earlier the main distortion contribution is 2nd harmonic
- THD increases with frequency and reaches about 0.03% @ 20kHz
- Distortion is actually lower than I expected from the datasheet (where typical THD+N=0.03% is specified over the audio band)

Distortion vs Amplitude

Last thing to check is how the distortion changes with the signal amplitude. In this test, a 1kHz input signal was used.

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Results and conclusions:

- Very flat THD=0.003% levels is between about 0.5Vrms output level up to the clipping limit
- The sweet spot for THD is at normal listening levels
- Left/right THD difference is very small again

Discussion

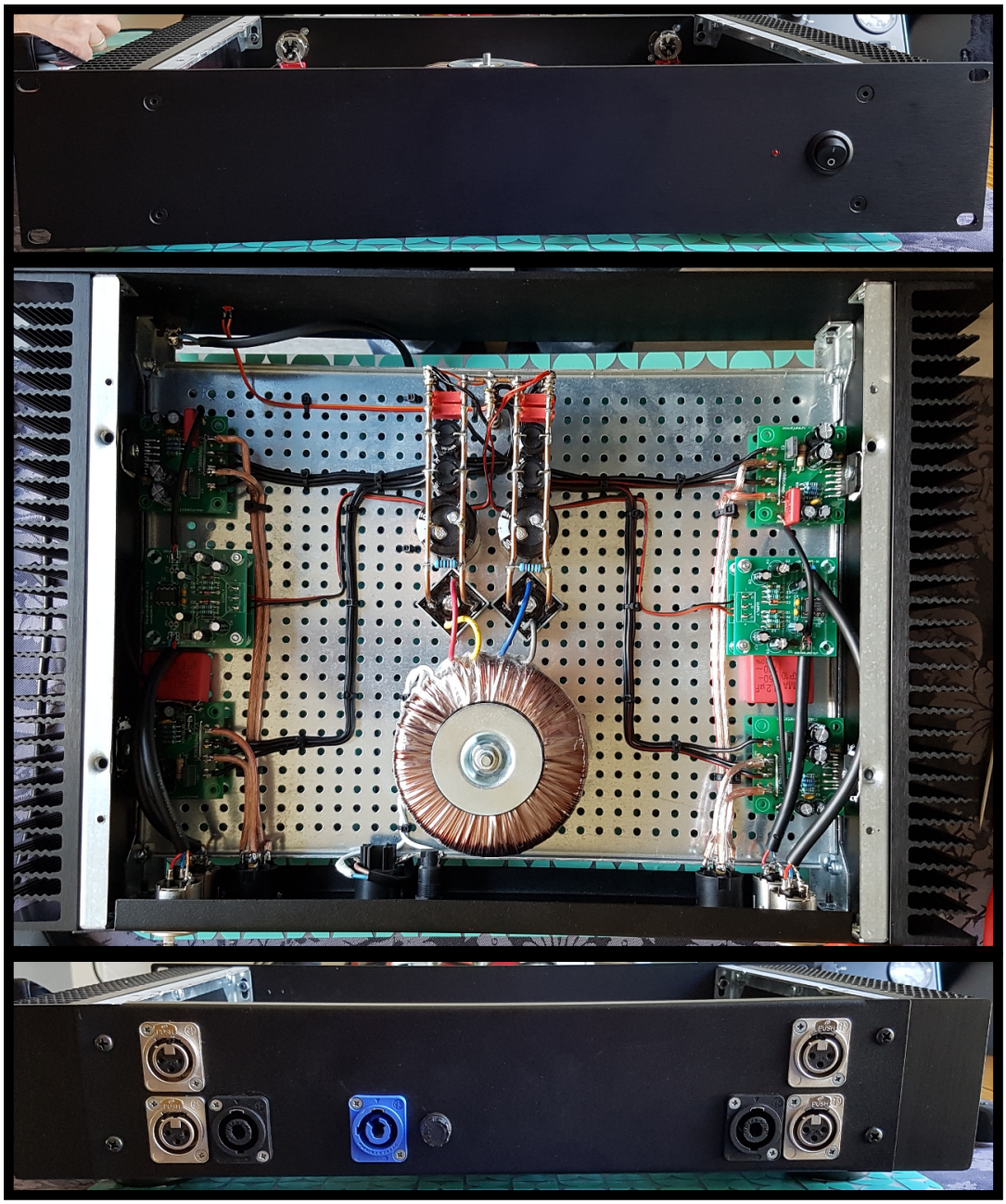
Feel free to add comments if you have further suggestions.

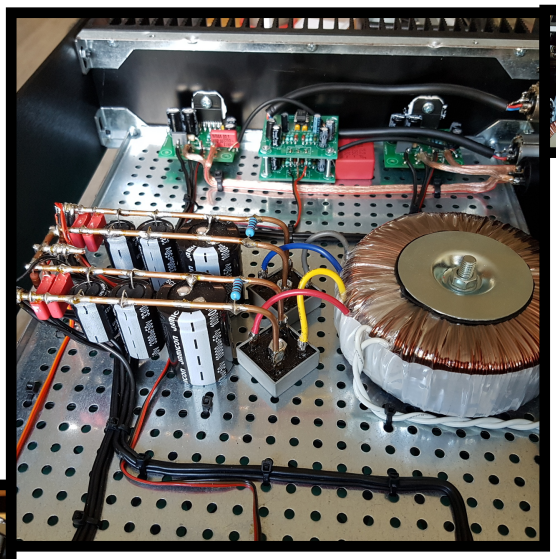
User gallery

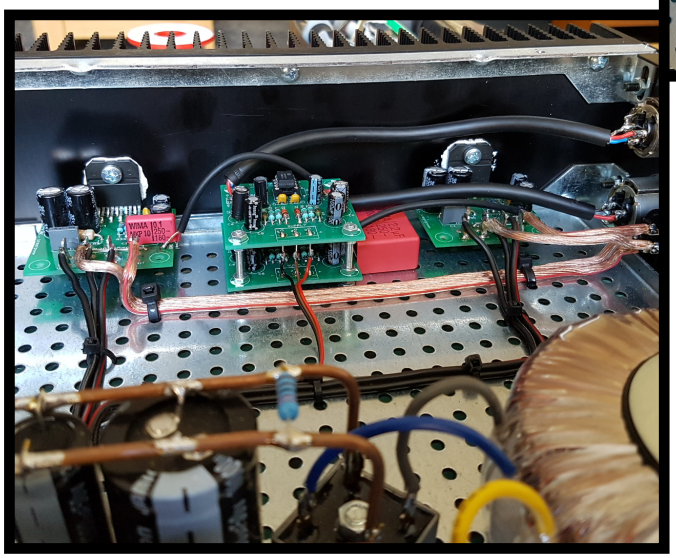
The user gallery contains pictures of users that have built this amplifier

Jeroen M

Father and son both built a 3-way speaker set and amplifier using LM3886Amps and BalancedReceivers for the mid and high range, so using a total of 4x LM3886 and 4x BalancedReceiver for a stereo version. A DSP is used as a crossover for the low, mid and high regions. Everything is nicely built inside a Hifi2000 dissipante housing.







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