

“The Black Box”

Background:

This amplifier was built with the ‘TS-slotdag’ and the comparison session in mind, that is why it became a black box.

During the lessons, Menno led us through the development of this hybrid TRANS amplifier.

He also gave us the opportunity to listen to 2 different approaches in the design:

One with the driver stage based on the ECC83 triode and one with a second ‘Menno-cell’ (Cell).

After listening to both designs some students preferred the design with the second Cell and some, including me, preferred the design with the triode.

I wanted to know what would happen in a blind test: would the difference be more obvious?

So I started to think of building an amp where the driver section was hidden.

The end stage consists of a Cell as input section for a Pentode which could be chosen from several types. For me it was the KT150 because I was curious for the power it could deliver. As a result of this end stage design the amplifier could even do without a driver stage, which was proved by some students.

Construction:

To build this amp, the end stage was universal to everyone so there was no use for hiding it (which would be very nasty to do). Though for me the driver stage had to be hidden.

Under the hood of the Black Box, I placed a 12AX7 double triode, one half for each channel, on a sub-frame in a horizontal position. This sub-frame was also used for cooling the cathode resistors R10, because these become quite hot (dissipation is some 7-8 Watt).

The end stage Cells were mounted next to the base of the Pentodes and this caused some problems. The leads from the sub-frame to the Cells were quite long and the Cells turned out to be very sensitive for oscillation, especially on the input and feedback loop. It took several days, a lot of soldering, de-soldering and a consult from Menno to get rid of this oscillation.

It was also noticed that the idle current setting of both Pentodes fluctuates and is mutually influenced. Therefore the clamping circuit is a must have.

Referring to the design by Menno van der Veen dd. 2019-02-20, the following changes were implemented:

- in the anode leads to the 12AX7, a CCS based on a FET BSP135 was added
- capacitor C1 was exchanged for a small size MKP 1 μ F next to the potentiometer P0
- a ceramic capacitor 22pF was added parallel to R2 in the feedback loop to the grid of the triode
- shielded cable with the shield connected to the cabinet was used for the leads 1,2,4 to the Cells

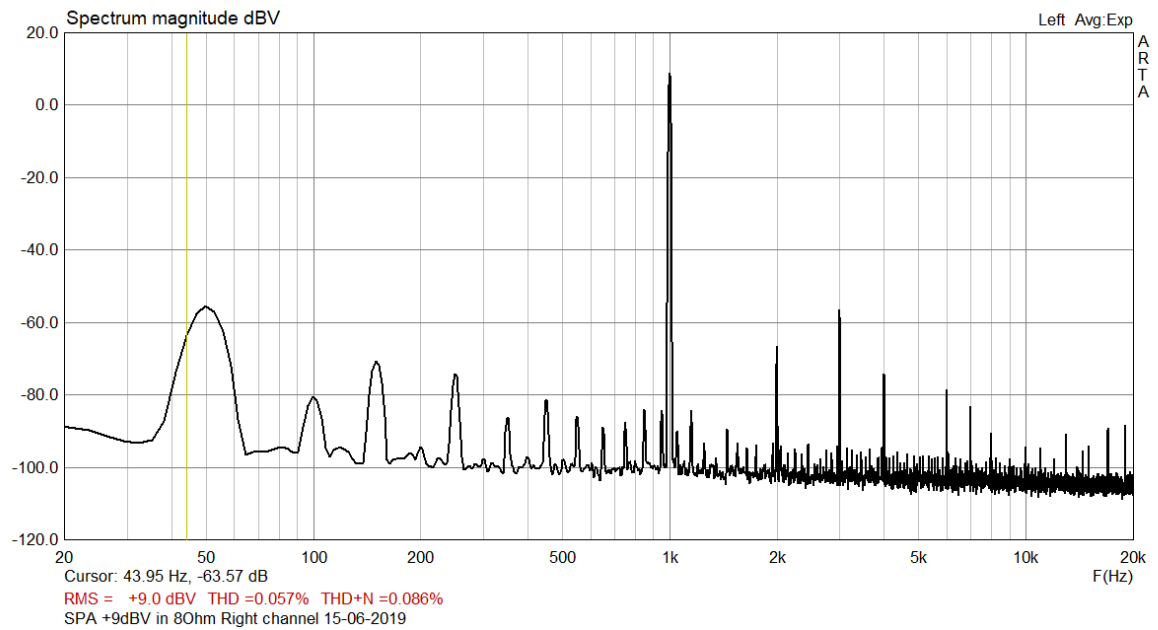
Future:

The following improvements can be applied:

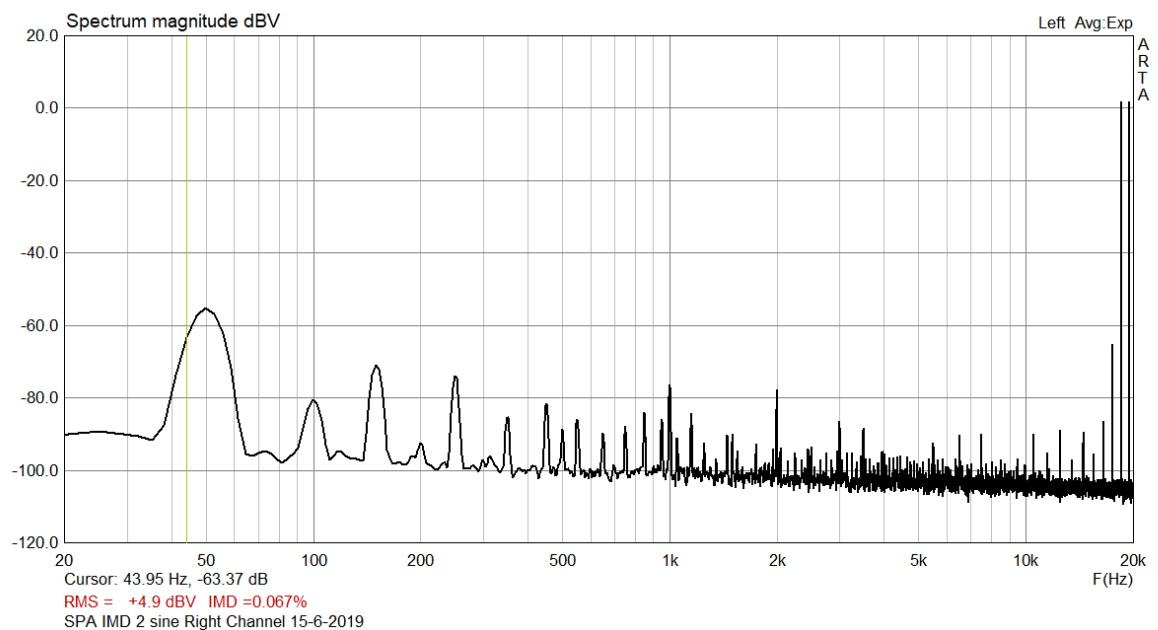
1. Change the layout with as short as possible leads
2. Apply separate triodes for the driver stage and place them on top of the cabinet
3. Separate HT power supply for both channels
4. Negative bias for the grid to get rid of the hot cathode resistors R10
5. Dual mono setup

Measurements:

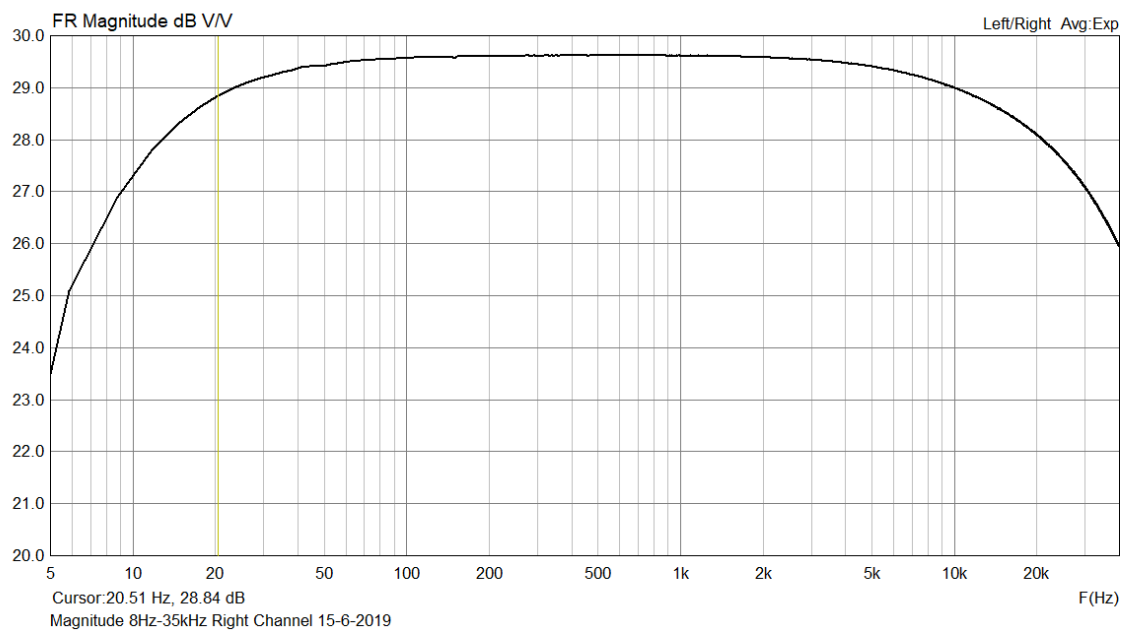
1. Spectrum analysis @ 1W in 8 Ω / 1kHz



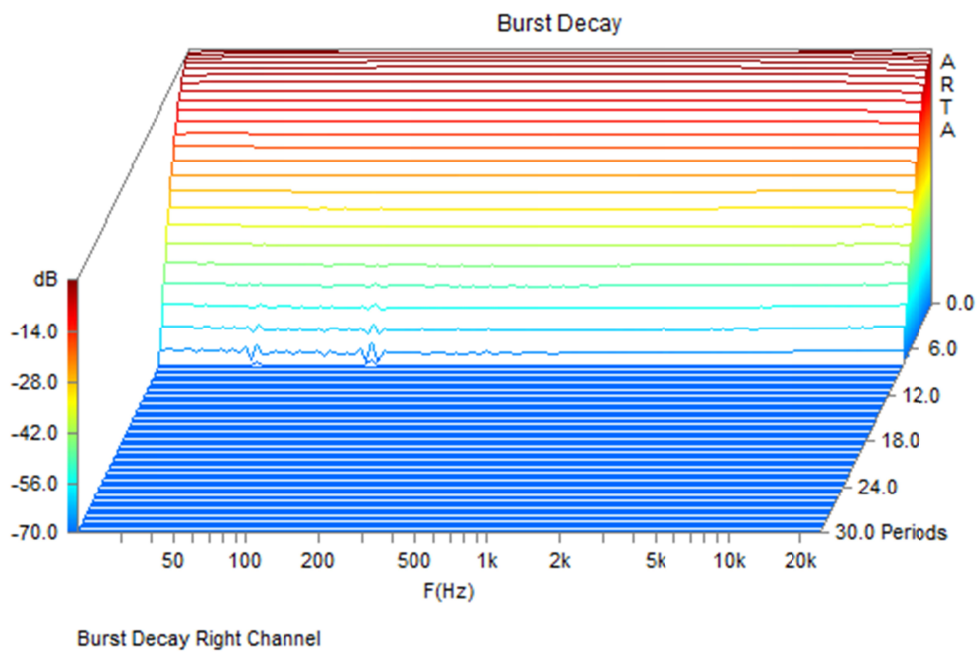
2. IMD @ 18.5kHz / 19.5kHz



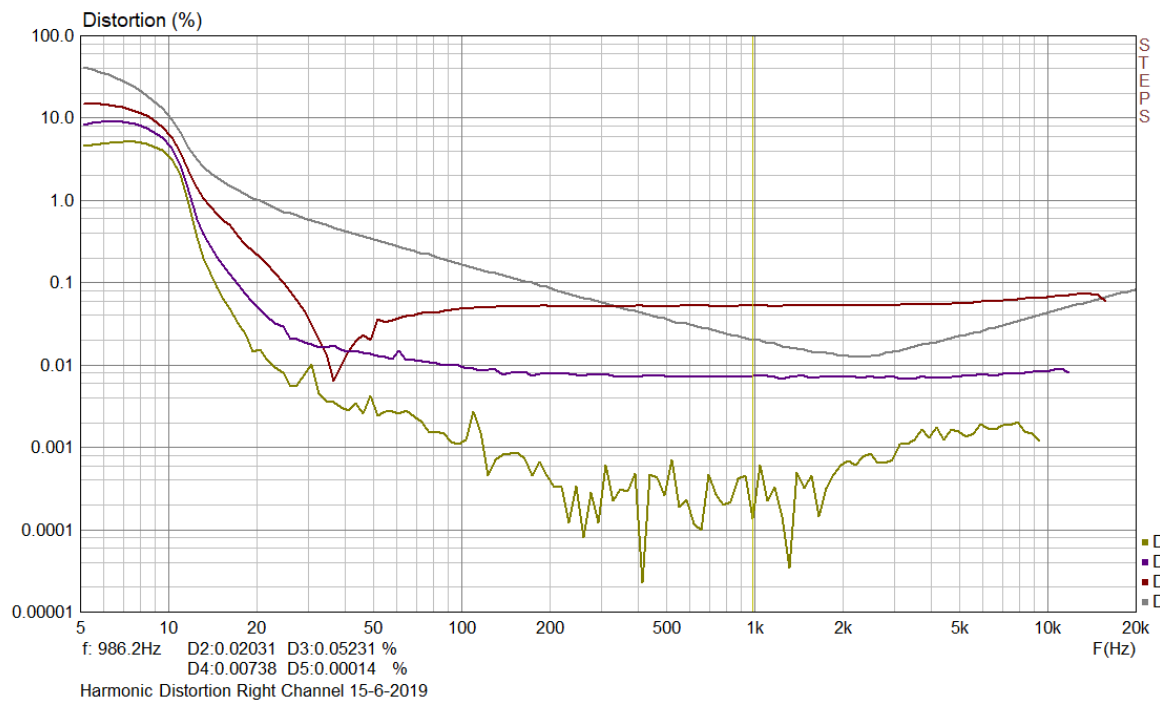
3. Magnitude 5Hz-35kHz



4. Burst Decay



5. Distortion



6. Z_{out} and Phase

