Measurement Report: Power Amplifier
PRO-Q2

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EQ2.a
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May 29th, 2015

1 The objective of the measurement

The objective of the measurement is to get more insight in how the power amplifier functions and to determine whether the power amplifier meets the specifications. The measurement is also a preparation for the assessment of the project.

2 Measurement setup

Figure 1shows the schematic of the power amplifier.

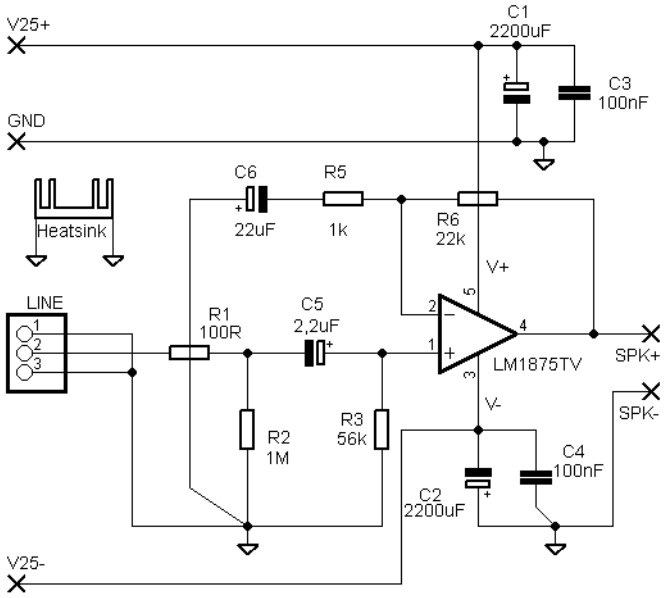

Figure 1: Power amplifier schematic

Figure 2: The built power amplifier

3 Results

3.1 Power amplifier specifications

- Input impedance of at least 50kΩ
- Output power: 15W sine in $R_{load} = 8\Omega$ at 1kHz

- Frequency range: 10Hz to 100kHz (-3 dB) at $P_{load} = 0.5$W in 8Ω

3.2 Simulations

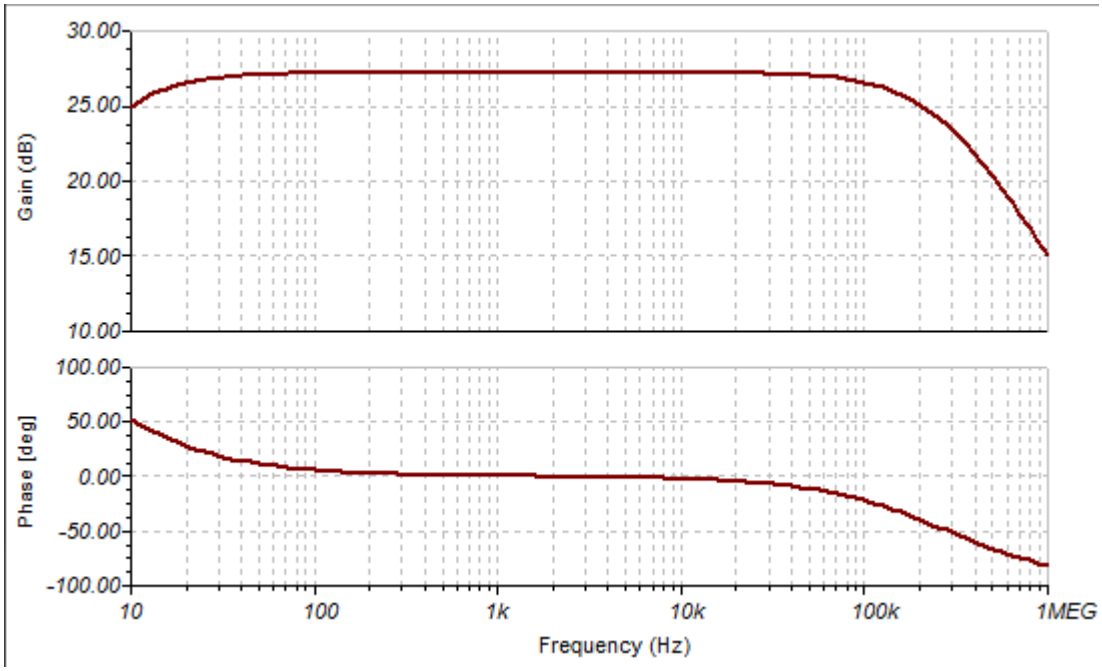

Figure 3: Simulation of the power amplifier

3.3 Measurements

3.3.1 Frequency response no load

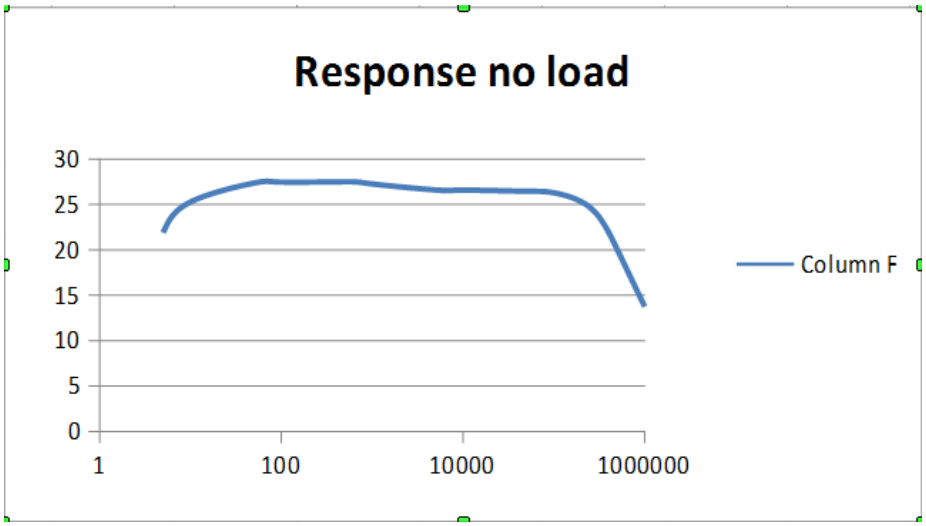

Figure 4: Frequency response of power amplifier without load

3.3.2 Frequency response 0.5W

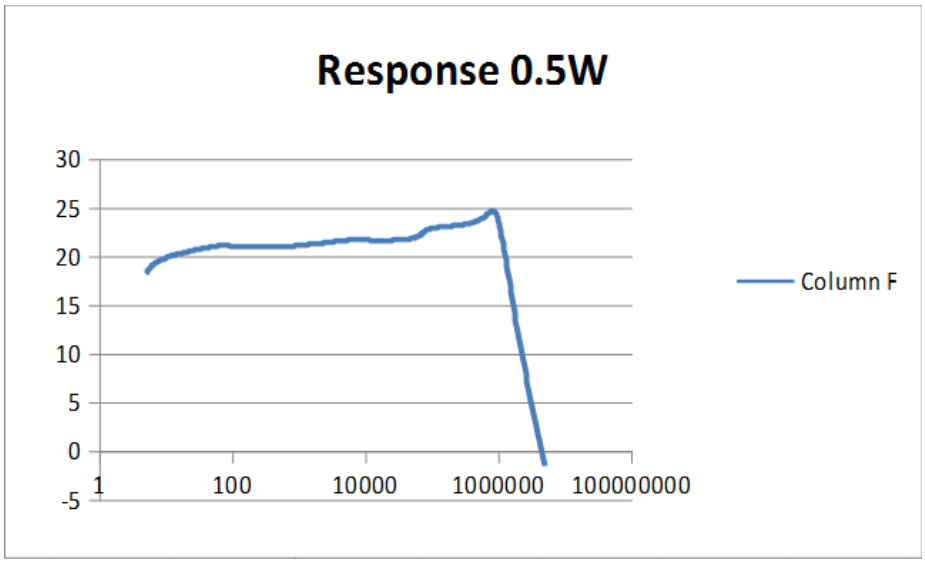

Figure 5: Frequency response of power amplifier with 8Ω, 0.5W load

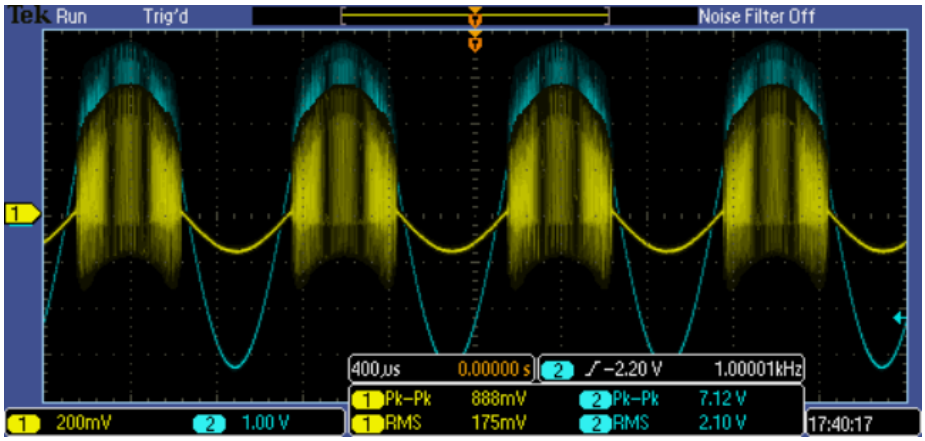

Figure 6: Oscillope capture of power amplifier output with 8Ω, 0.5W load

3.3.3 Full power test

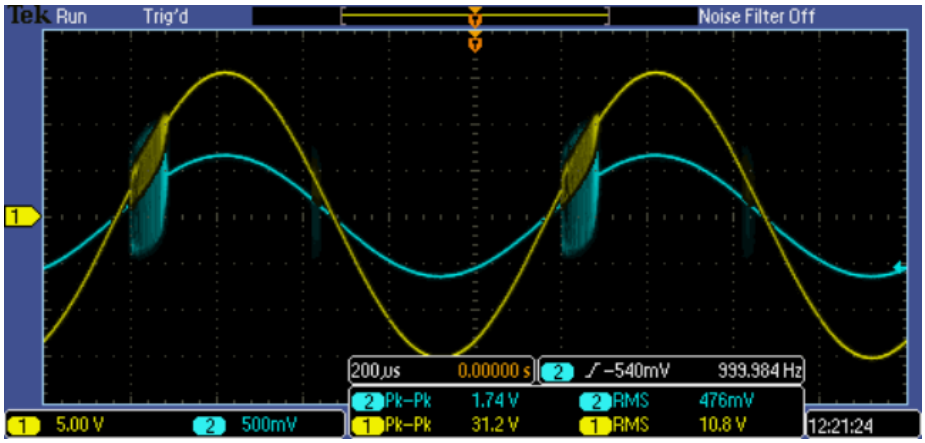

Figure 7: Oscillope capture of power amplifier output with 8Ω, 15W load

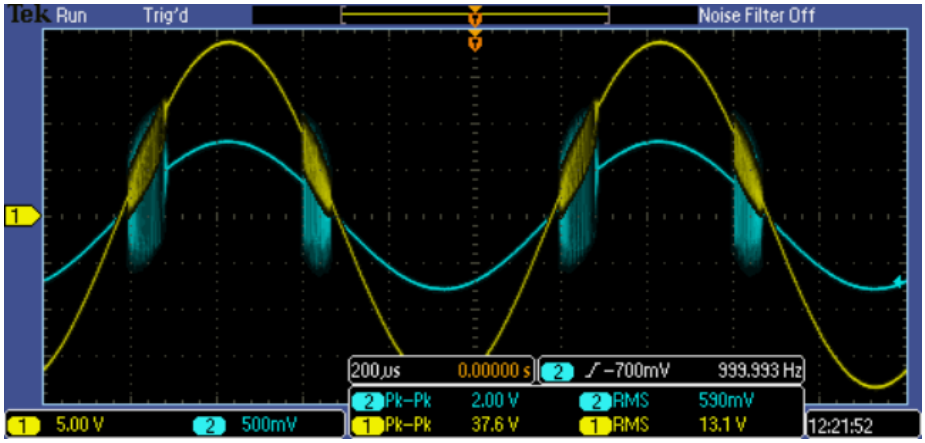

Figure 8: Another oscillope capture of power amplifier output with 8Ω, 15W load

4 Conclusion

The power amplifier's gain decreases when there is a low impedance load on the output. The test setup had long wires to wirewound resistors which resulted in parasitic inductance on the output. This is why the gain increases as the frequency increases. The impedance at high frequencies is higher because of the series inductance in the load decreases. The power amplifier meets the specifications under all test conditions.

5 Appendix

Table 1: Test results without load

f (Hz)	V_{in}	V_{out}	Gain (dB)
5	0.4	4.97	21.88593
10	0.4	7.34	25.27272
50	0.4	9.33	27.35643
100	0.4	9.44	27.45824
500	0.4	9.48	27.49497
1,000	0.41	9.46	27.26215
5,000	0.44	9.4	26.5935
10,000	0.44	9.38	26.575
50,000	0.44	9.25	26.45378
100,000	0.44	9.07	26.28309
250,000	0.45	7.7	24.66556
500,000	0.45	4.5	20
1,000,000	0.45	2.19	13.74463

Table 2: Test results with 8Ω, 0.5W load

f (Hz)	V_{in}	V_{out}	Gain (dB)
5	0.17	1.38	18.1886
10	0.18	1.77	19.85402
50	0.18	2.02	21.00158
100	0.18	2.04	21.08715
500	0.18	2.04	21.08715
1,000	0.18	2.05	21.12963
5,000	0.18	2.18	21.66368
10,000	0.18	2.19	21.70343
50,000	0.18	2.23	21.86065
100,000	0.17	2.37	22.88599
500,000	0.12	1.84	23.71273
1,000,000	0.12	1.84	23.71273
2,000,000	0.12	0.48	12.0412
5,000,000	0.12	0.1	-1.583625