

**Measurement of THD with the soundcard JULI@ and an external 1 kHz sine wave generator with a very low distortion.**

***Preamplifier DPA 111 made by Upupa Epops***

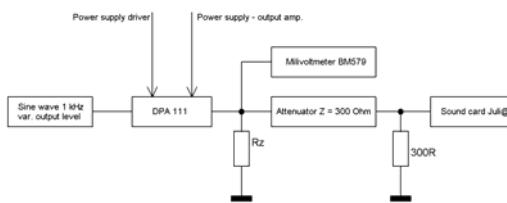
### Measurement conditions

- Measuring instruments used at this THD measurement: 1 kHz sine wave generator, millivoltmeter TESLA BM 579, soundcard JULI@, attenuator TESLA, impedance  $Z = 300 \Omega$ .
- All instruments were supplied from the same mains outlet
- Output level: **0 dB means 775 mV eff.**
- Load of DPA 111: resistor  $100 \Omega$ ,  $150 \Omega$  resp.  $600 \Omega$  (in this case the load was only the attenuator).

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### Schematics of measurement



I was changing the value of  $R_z$ . The combination of attenuator and  $R_z$  should create the required load of the DPA111 output.

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### Picture of measurement (I)



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### Picture of measurement (II) - attenuator



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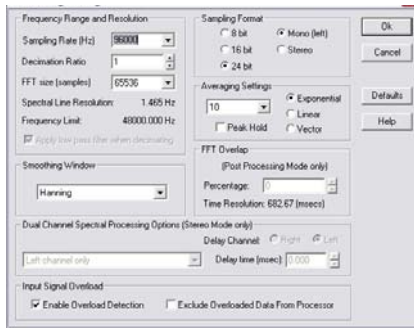
### Description of measurement

- The output level of the sine wave generator was adjusted so high so that there was the required output level on the output of DPA 111. The voltage gain of DPA 111 was stable -  $A_u = +12 \text{ dB}$ .
- The attenuator was adjusted so that there was an optimal input level at the input of the soundcard JULI@ to be sure, that the soundcard worked under optimal distortion conditions.
- I repeated the THD measurement with several output levels, load values and power supply values of DPA 111 (driver  $\pm 24 \text{ V DC}$  or  $\pm 30 \text{ V DC}$ , output always  $\pm 24 \text{ V DC}$ ). I also adjusted 2 values of idle current of the output amplifier:  $I = 30 \text{ mA}$  and  $I = 120 \text{ mA}$ .

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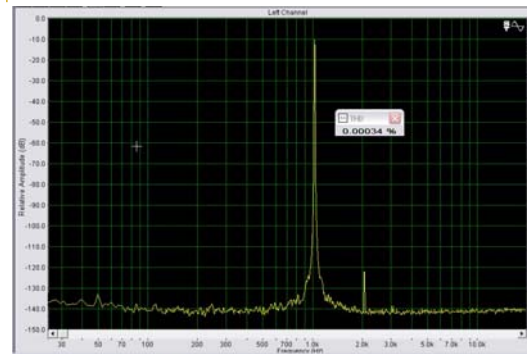
## Settings of SW



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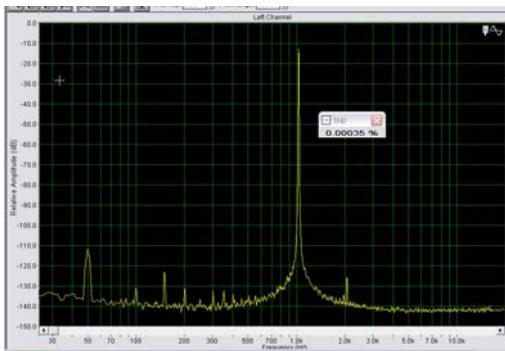
## THD meas., only the generator, load 10 kΩ (sound card input)



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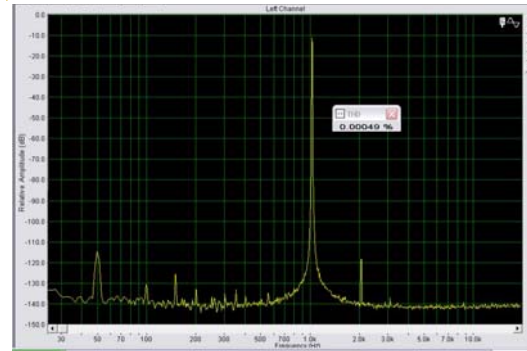
## THD meas., I=30 mA, 0 dB, load 150Ω, ± 30V/±24V



DPA111\_Jul @ 1kHz

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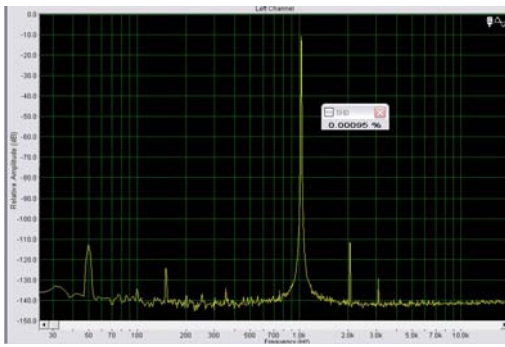
## THD meas., I=30 mA, +5 dB, load 150Ω, ± 30V/±24V



DPA111\_Jul @ 1kHz

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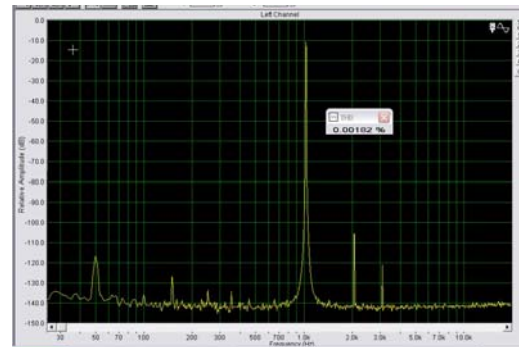
## THD meas., I=30 mA, +10 dB, load 150Ω, ± 30V/±24V



DPA111\_Jul @ 1kHz

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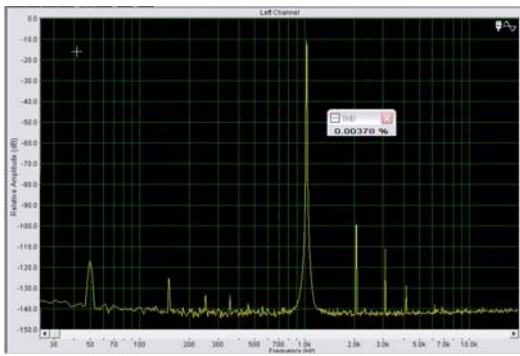
## THD meas., I=30 mA, +15 dB, load 150Ω, ± 30V/±24V



DPA111\_Jul @ 1kHz

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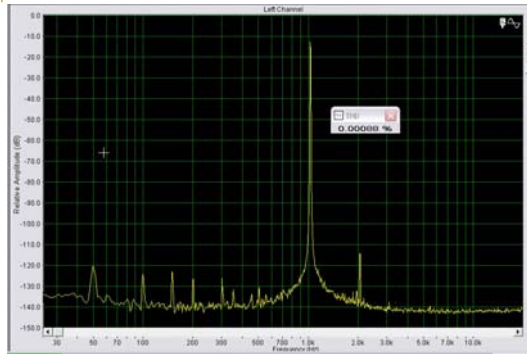
THD meas., I=30 mA, +20 dB, load 150Ω, ± 30V/±24V



DPA111\_Jul@ 1kHz

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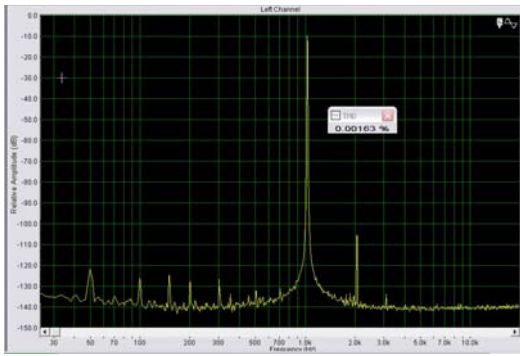
THD meas., I=30 mA, 0 dB, load 150Ω, ± 24V/±24V



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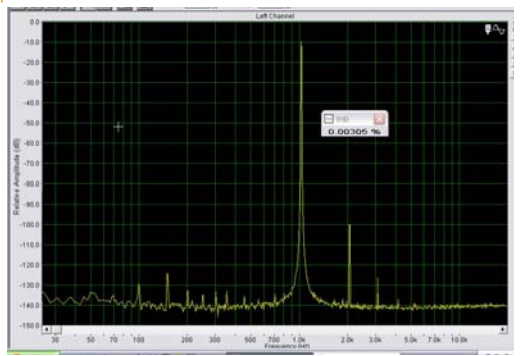
THD meas., I=30 mA, +5 dB, load 150Ω, ± 24V/±24V



DPA111\_Jul@ 1kHz

15

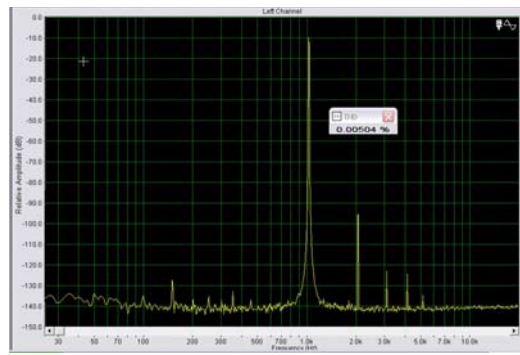
THD meas., I=30 mA, +10 dB, load 150Ω, ± 24V/±24V



DPA111\_Jul@ 1kHz

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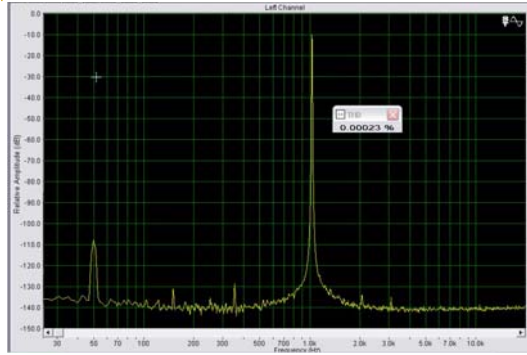
THD meas., I=30 mA, +15 dB, load 150Ω, ± 24V/±24V



DPA111\_Jul@ 1kHz

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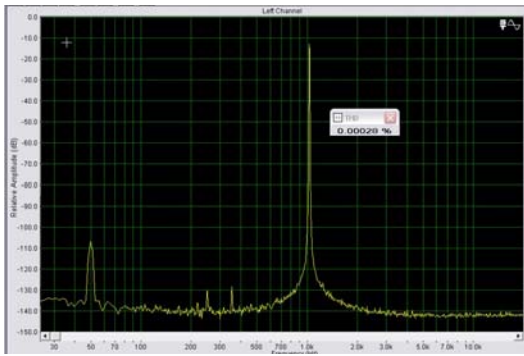
THD meas., I=120 mA, 0 dB, load 100Ω, ± 24V/±24V



DPA111\_Jul@ 1kHz

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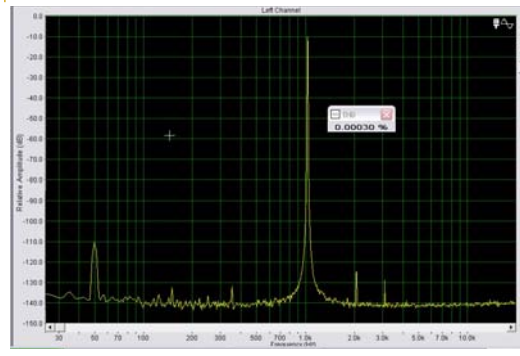
THD meas., I=120 mA, +5 dB, load 100Ω, ± 24V/±24V



DPA111\_Jul@ 1kHz

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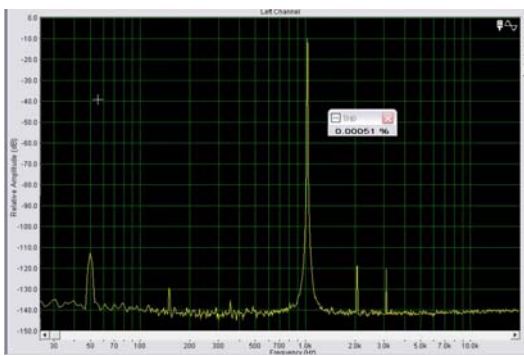
THD meas., I=120 mA, +10 dB, load 100Ω, ± 24V/±24V



DPA111\_Jul@ 1kHz

20

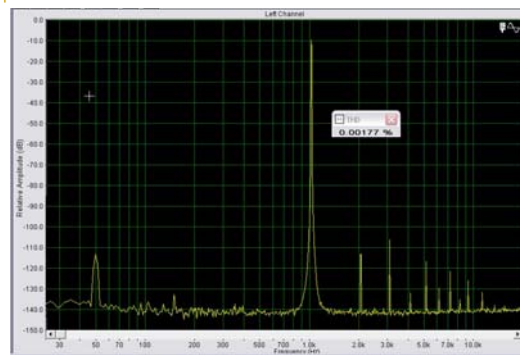
THD meas., I=120 mA, +15 dB, load 100Ω, ± 24V/±24V



DPA111\_Jul@ 1kHz

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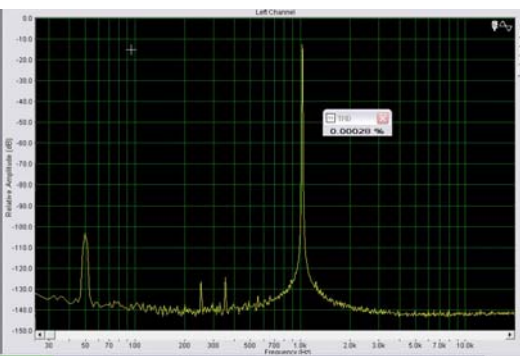
THD meas., I=120 mA, +20 dB, load 100Ω, ± 24V/±24V



DPA111\_Jul@ 1kHz

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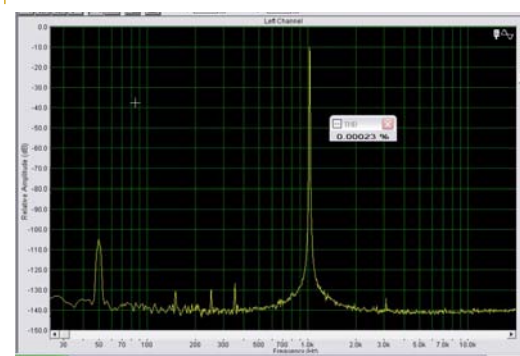
THD meas., I=120 mA, 0 dB, load 100Ω, ± 30V/±24V



DPA111\_Jul@ 1kHz

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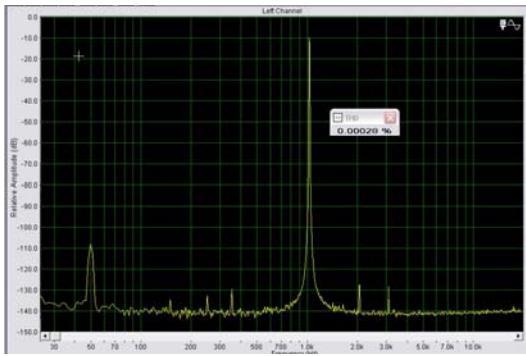
THD meas., I=120 mA, +5 dB, load 100Ω, ± 30V/±24V



DPA111\_Jul@ 1kHz

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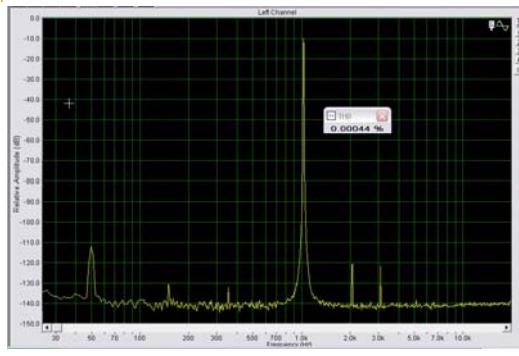
THD meas., I=120 mA, +10 dB, load 100Ω, ± 30V/±24V



DPA111\_Jul@ 1kHz

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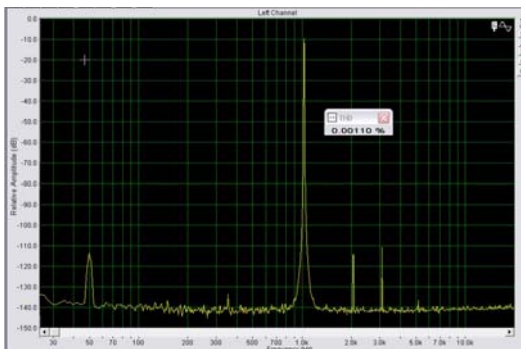
THD meas., I=120 mA, +15 dB, load 100Ω, ± 30V/±24V



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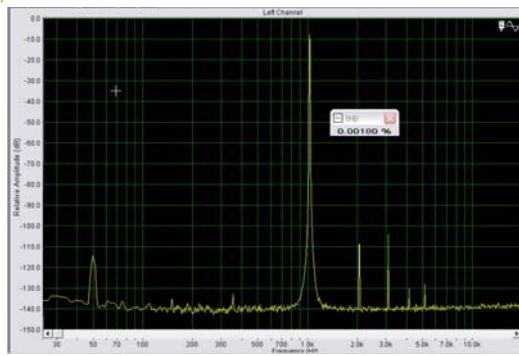
THD meas., I=120 mA, +20 dB, load 100Ω, ± 30V/±24V



DPA111\_Jul@ 1kHz

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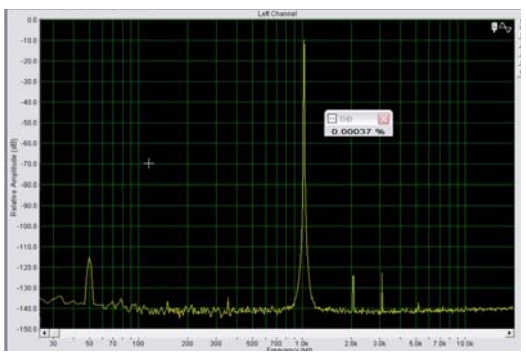
THD meas., I=120 mA, +22 dB, load 100Ω, ± 30V/±24V



DPA111\_Jul@ 1kHz

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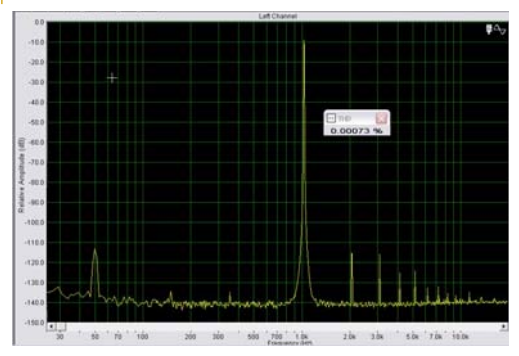
THD meas., I=120 mA, +22 dB, load 600Ω, ± 30V/±24V



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THD meas., I=120 mA, +23 dB, load 600Ω, ± 30V/±24V



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### Results of measurement

- DPA 111 has a very low THD distortion, typically  $\leq 0,001\%$  at 1 kHz with a low content of higher harmonic components.
- The distortion practically does not depend on their load (compare the values for the load of  $100\Omega$  vs.  $600\Omega$ ).
- If the driver has the power supply value  $\pm 30V$ , DPA 111 is able to work with the load of  $100\Omega$  and the output swing of 28V p-p with a very low distortion. The idle current of the output amplifier must be sufficient (120 mA).
- A power supply filtering should be applied in order to minimize the penetration of the switched PC power supply into measured component and instruments.