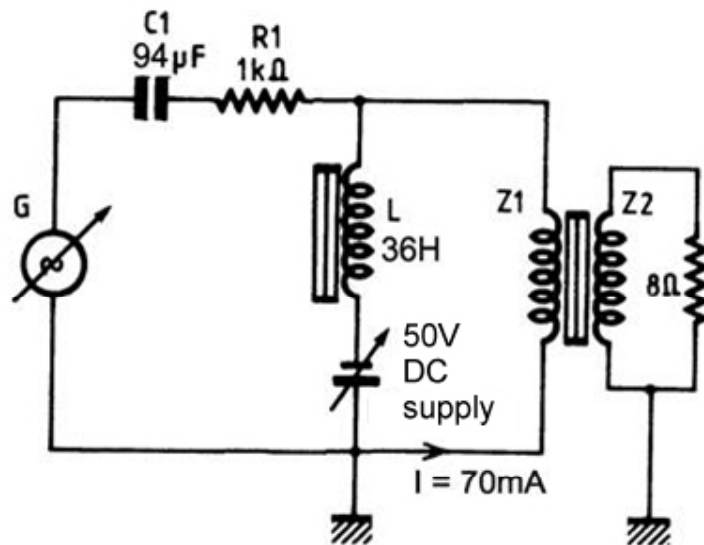


Measurements of Output Transformers for 300B Single End amplifiers

Unofficial measurements performed at ETF2009
by Jean-Michel Le Cléac'h
aside the shoot-out of OPTs for SE 300B amplifiers



Schematic of the measurement set up

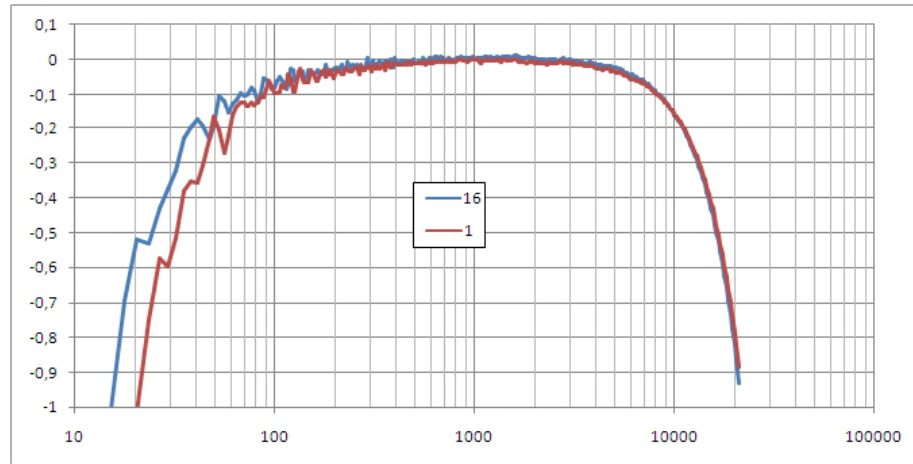


Modified by Jérôme Falampin after a schematic
by William Walther

- All measurements were performed after calibration of the output level at 2volts RMS on 8 ohms at 1000Hz ($P = 0,5$ watt)
- Please note the 1.1dB vertical scale used for the frequency response curves in order to amplify the difference between transformers.
- Due to the unavailability of an oscilloscope the first day of the measurement, several OPTs could not be tested under 10kHz square waves.
- For frequency response and distortion measurement a sound card at $F_s = 96\text{kHz}$ was used. (Pulse response retrieved from logsweep + convolution: Angelo Farina's method.)
- Frequency response spectrums were truncated before the frequency at which the antialiasing low-pass filter of the soundcard begins to operate.
- (please note: coma replacing decimal point in tables)

Transformer N°1 , Højbjerg Karsten , toroidal transformer in cardbox

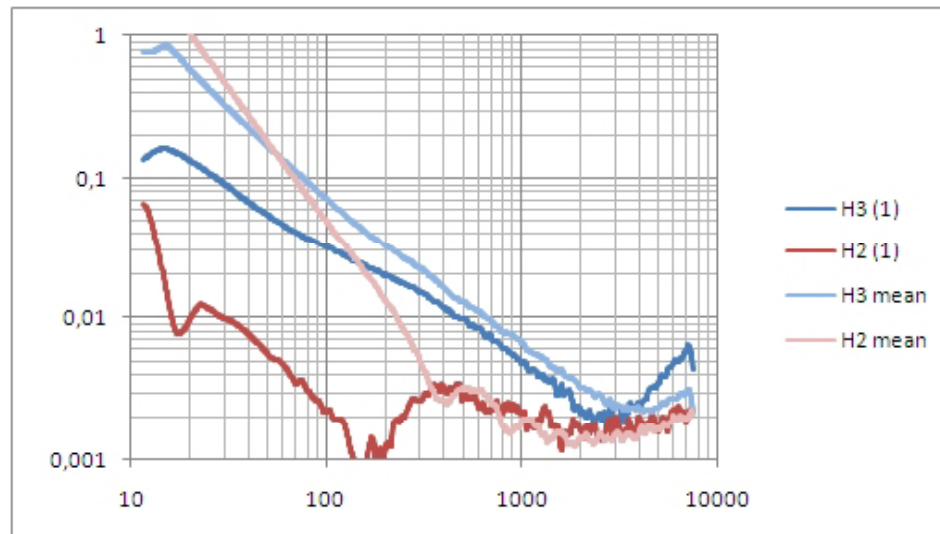
Frequency response (N°1 = red, blue = reference)



Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
7,8	9,9	8,9	8,7	8,4	9,3	8,8	5,8	0,0	3,8

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers

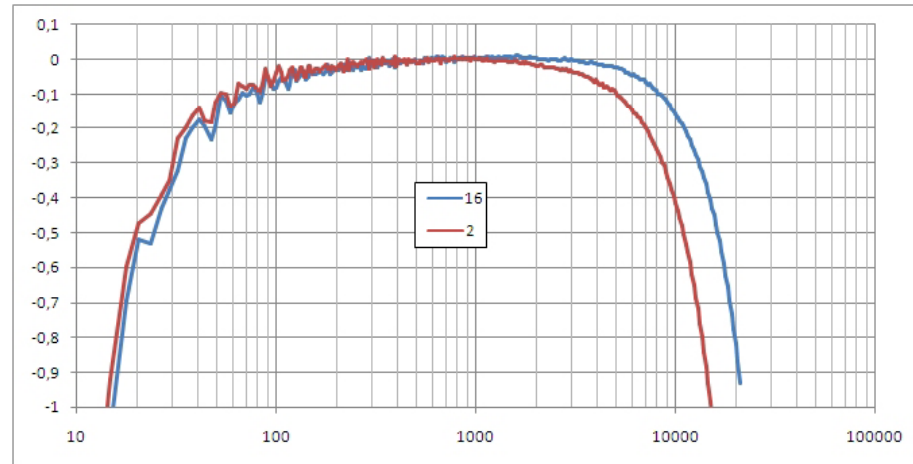


10kHz square wave



Transformer N°2 , Terrell Brian , SE Output transformer

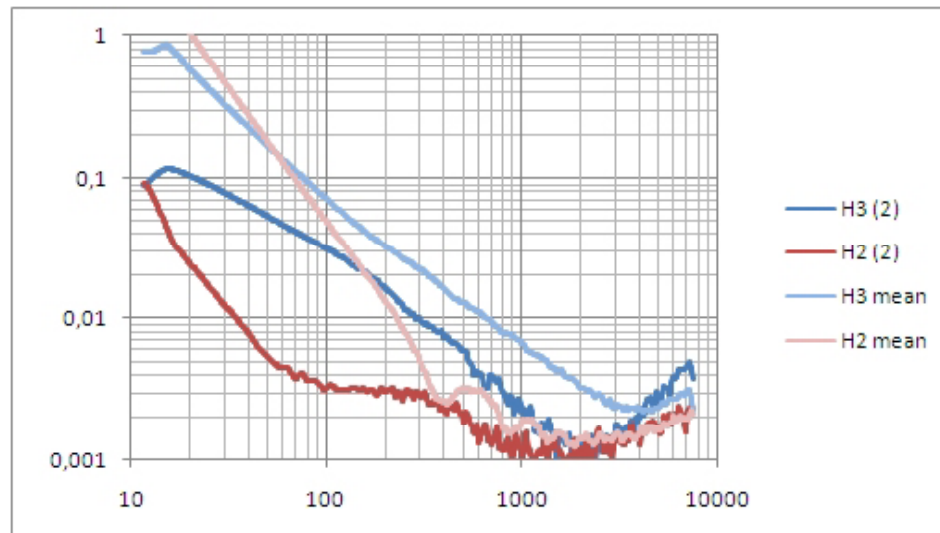
Frequency response (N°2 = red, blue = reference)



Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
7,6	8,6	9,1	8,2	8,7	8,8	8,7	4,9	6,9	5,6

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers

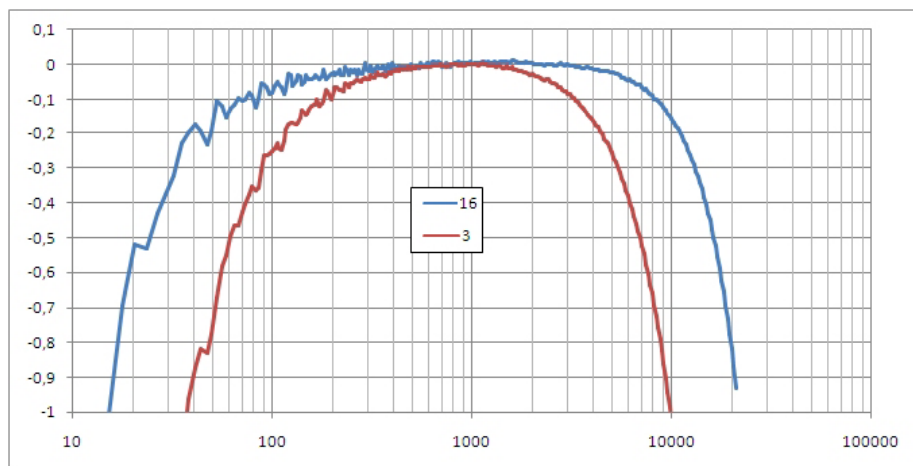


10kHz square wave



Transformer N°3 , Falampin Jérôme , Bouyer ST10 transformer (in soap box)

Frequency response (N°3 = red, blue = reference)

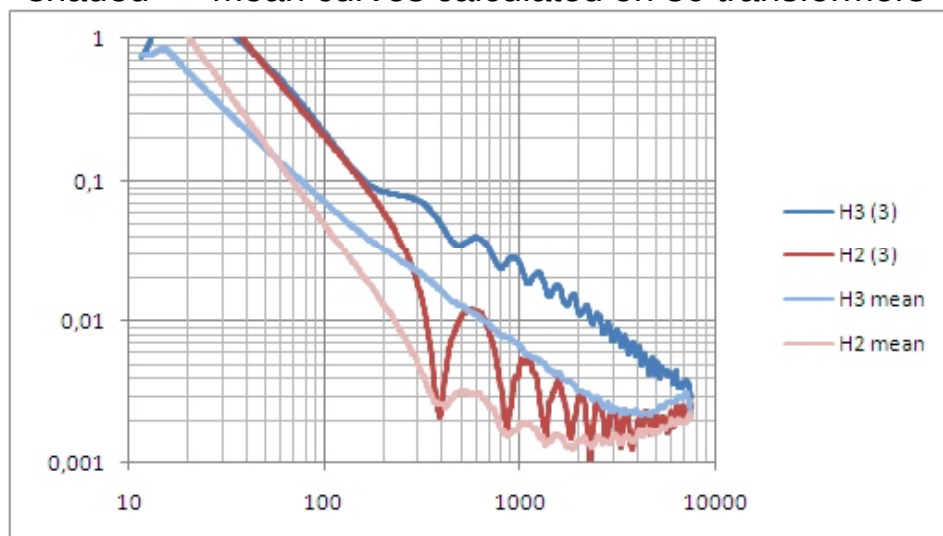


Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
0,0	4,7	9,5	3,2	1,8	1,6	1,7			

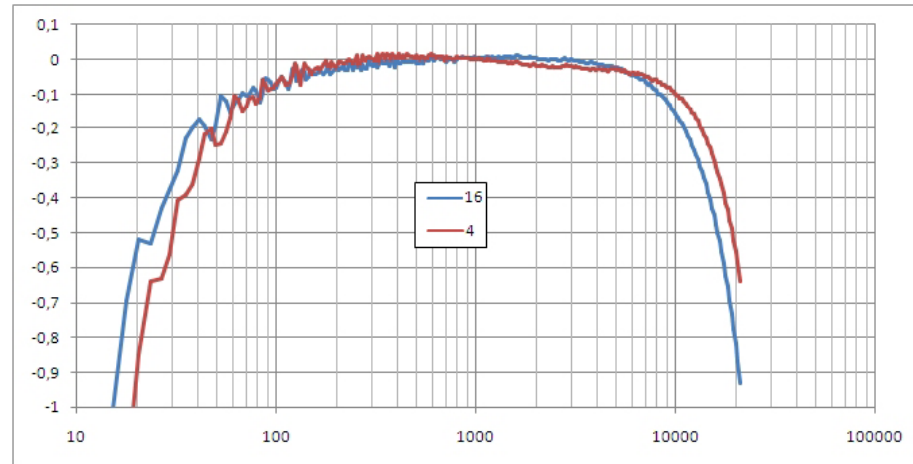
Distortion (red = H2, blue = H3)

shaded = mean curves calculated on 30 transformers



Transformer N°4 , Sullerot Julien , James JH2123

Frequency response (N°4 = red, blue = reference)

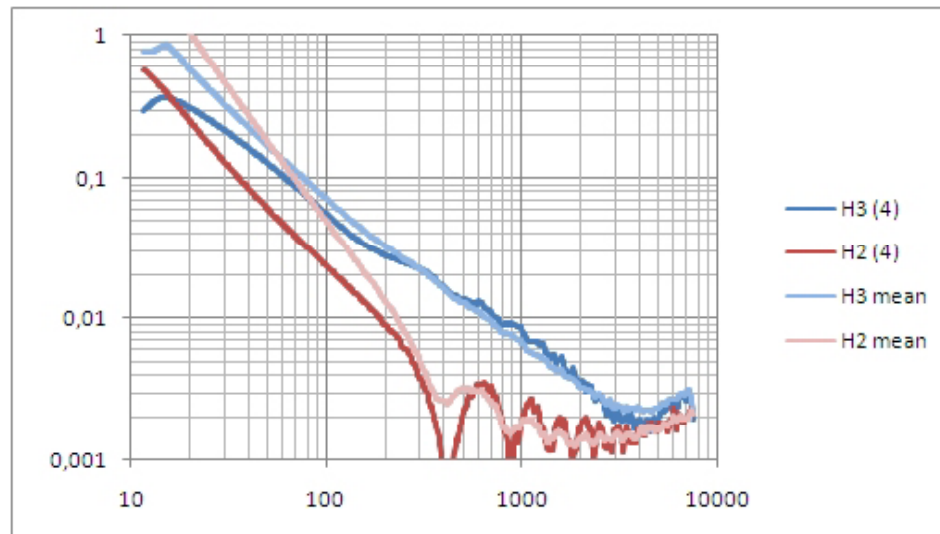


Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
9,3	9,8	8,7	9,3	6,3	5,3	5,9	8,1	6,6	7,6

good frequency response

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers

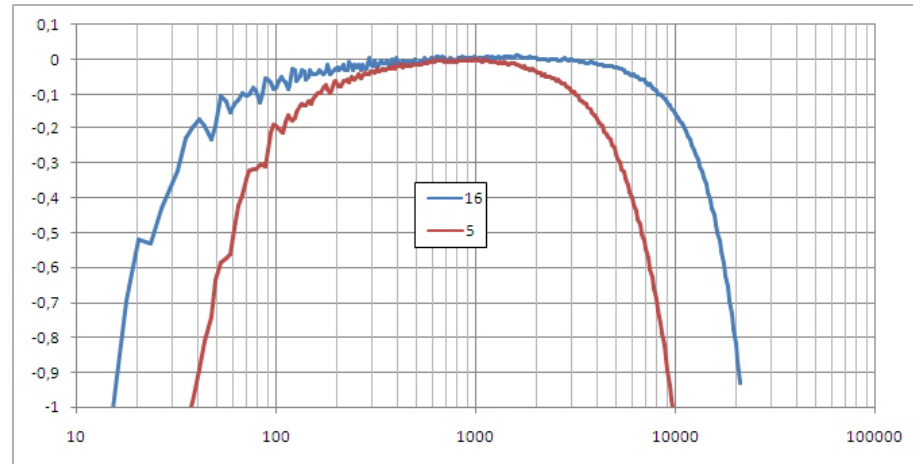


10kHz square wave



Transformer N°5 , Falampin Jérôme, unknown semi-pro vintage transformer (in tea box)

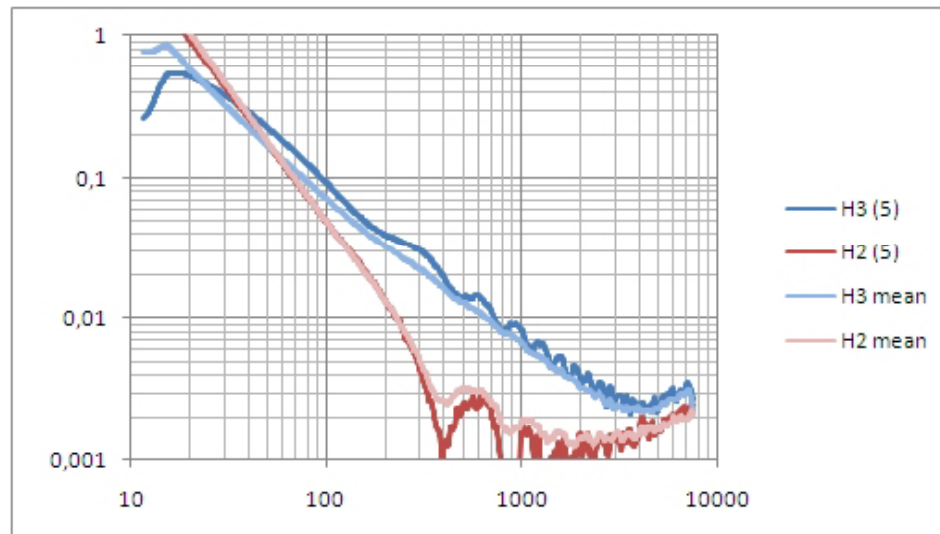
Frequency response (N°5 = red, blue = reference)



Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
4,9	4,6	8,4	5,4	4,8	3,5	4,3	8,1	1,0	5,7

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers

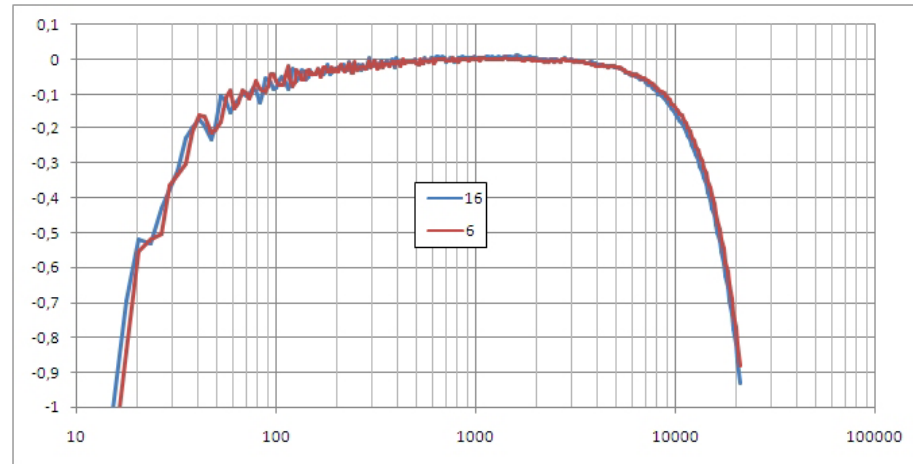


10kHz square wave



Transformer N°6 , Sullerot Julien, Partridge TK 4519

Frequency response (N°6 = red, blue = reference)

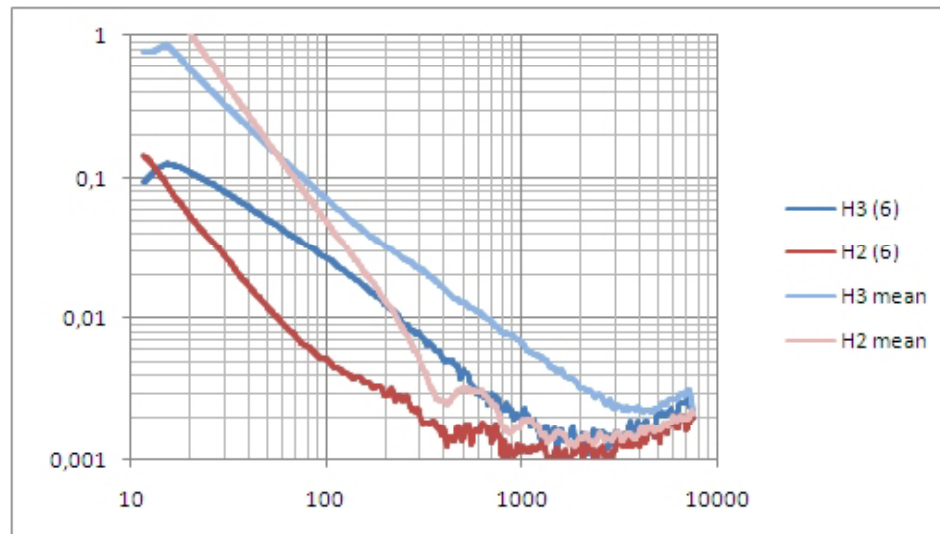


Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
9,5	9,9	9,7	9,7	8,8	7,7	8,4	6,7	7,4	6,9

excellent frequency response.
low distortion .

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers

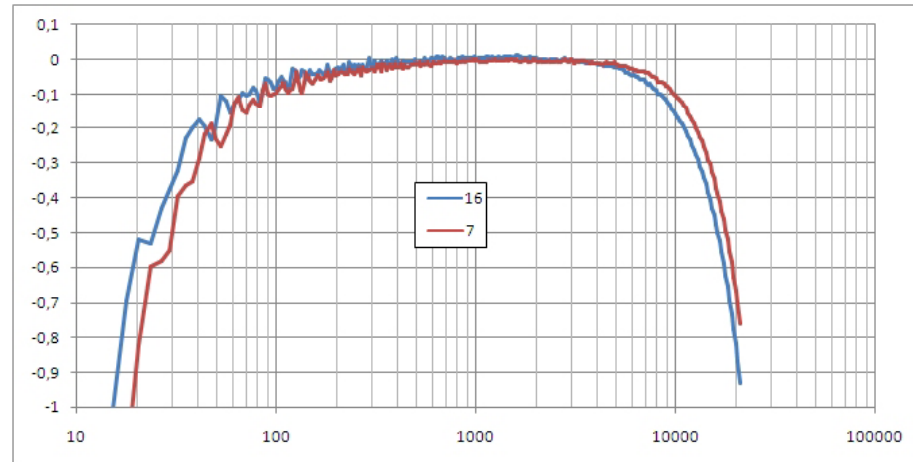


10kHz square wave



Transformer N°7 , van der Veen Menno , toroidal SE-OPT

Frequency response (N°7 = red, blue = reference)



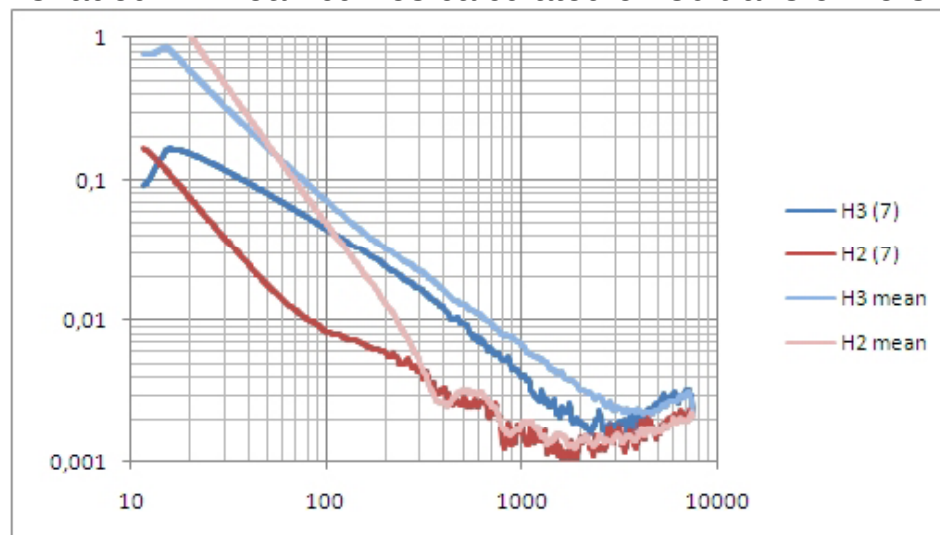
Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
8,9	9,9	8,9	9,2	7,6	7,1	7,4			

very good frequency response.

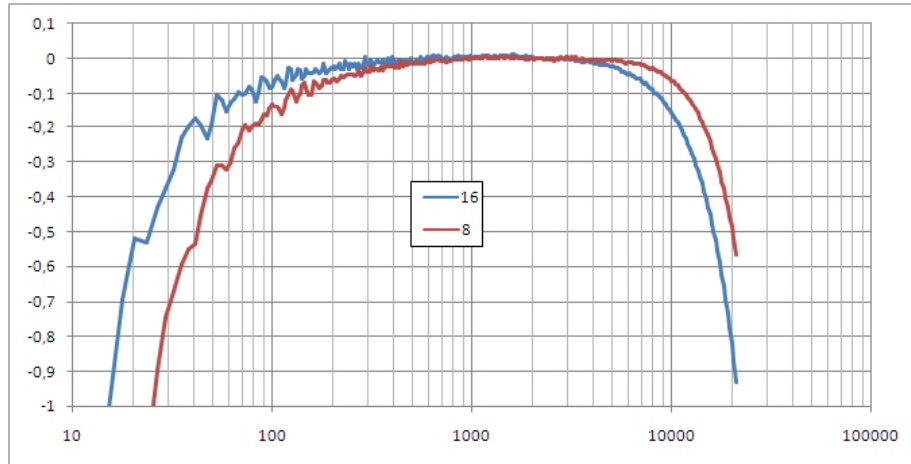
Distortion (red = H2, blue = H3)

shaded = mean curves calculated on 30 transformers



Transformer N°8 , Le Cléac'h Jean-Michel, Magnetics (special order)

Frequency response (N°8 = red, blue = reference)

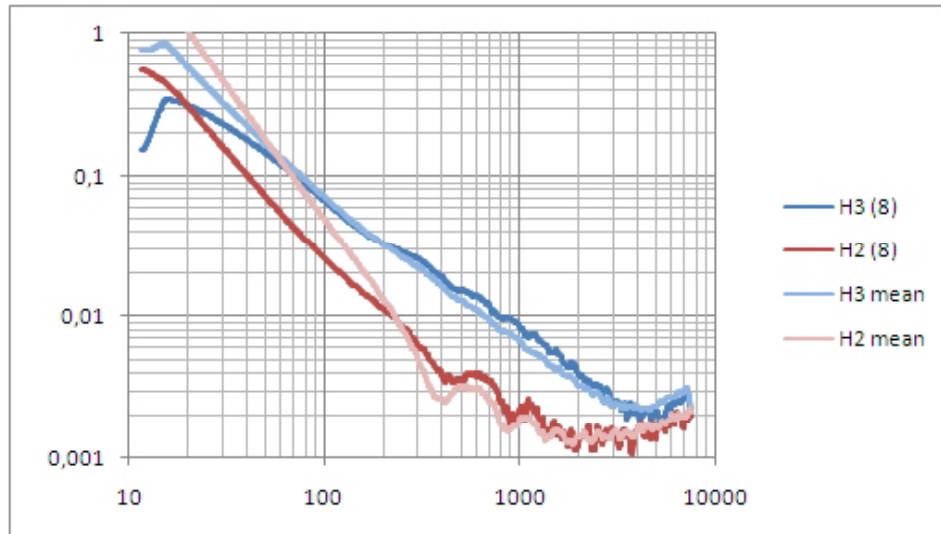


Scores: 0 = bad , 10 = excellent

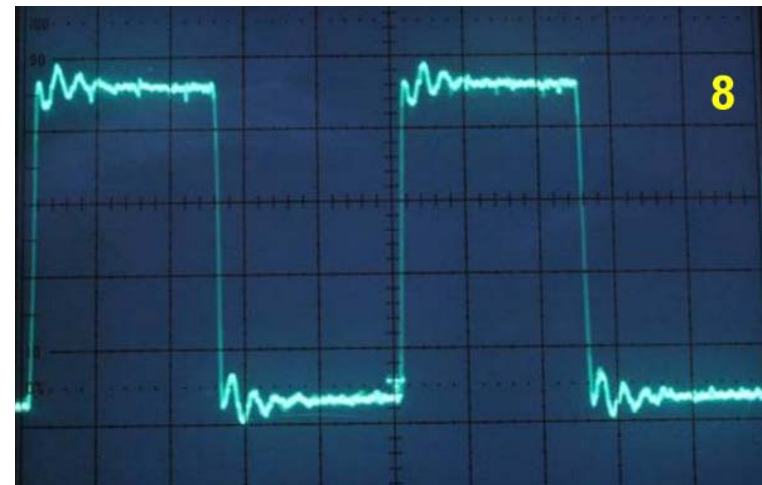
frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
8,3	9,3	7,7	8,5	6,0	5,0	5,6	9,7	9,6	9,7

Excellent square wave response

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers

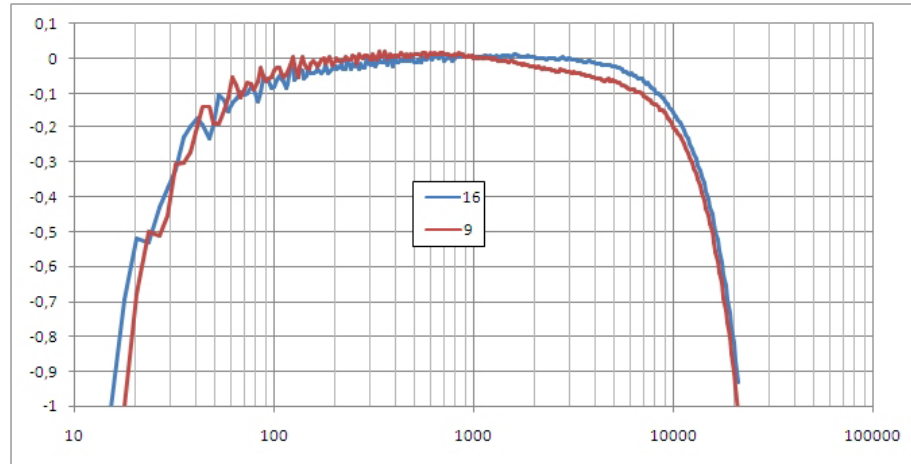


10kHz square wave



Transformer N°9 , Michimori Hirokuni , ex-Tango #10887 (special order), rating 50W, 3.5K

Frequency response (N°9 = red, blue = reference)



Scores: 0 = bad , 10 = excellent

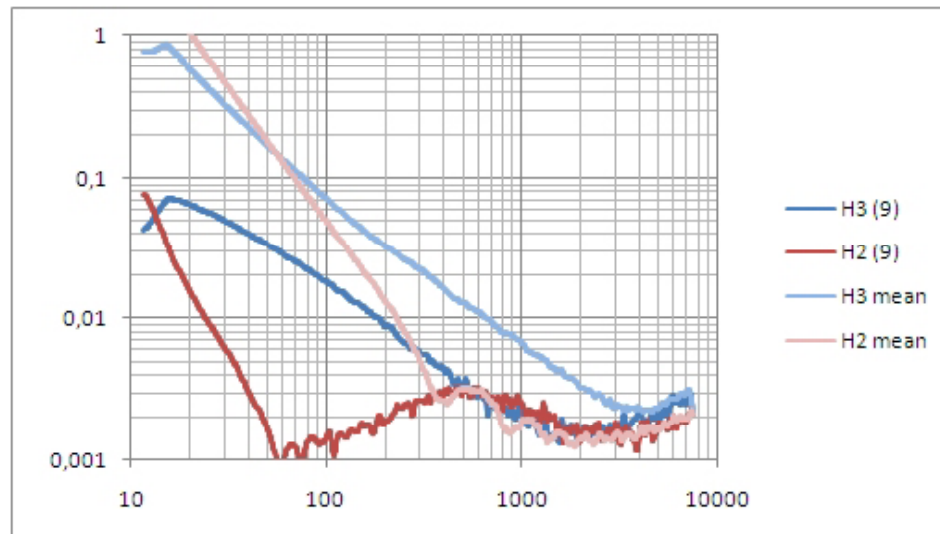
frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
9,4	8,9	10	9,3	10	10	10	8,6	9,1	8,8

excellent frequency response.
best distortion performance.
good square wave response.

10kHz square wave

Distortion (red = H2, blue = H3)

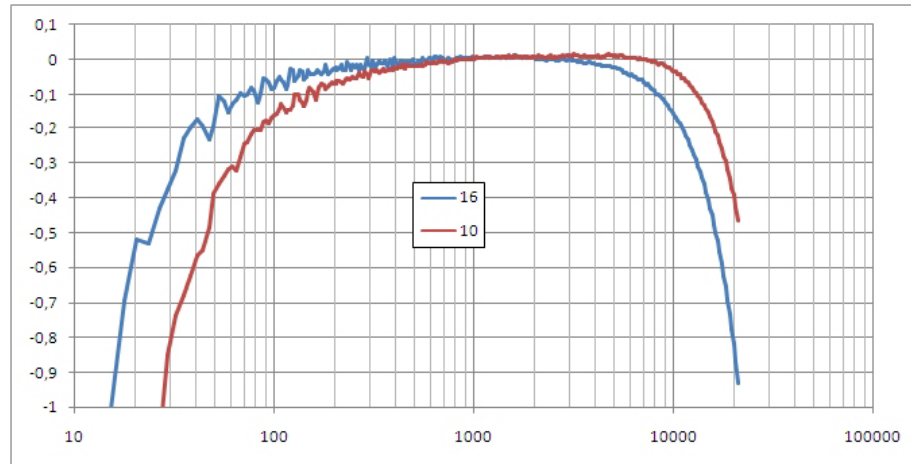
shaded = mean curves calculated on 30 transformers



Compare with N°20

Transformer N°10 , Sullerot Julien, Tamura transformer from a Sun Audio 2A3 amp

Frequency response (N°10 = red, blue = reference)

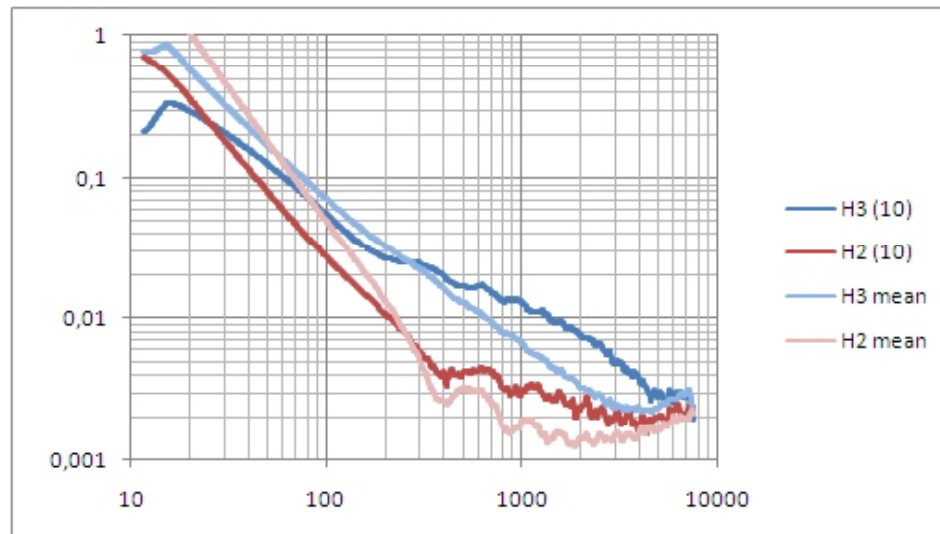


Scores: 0 = bad , 10 = excellent

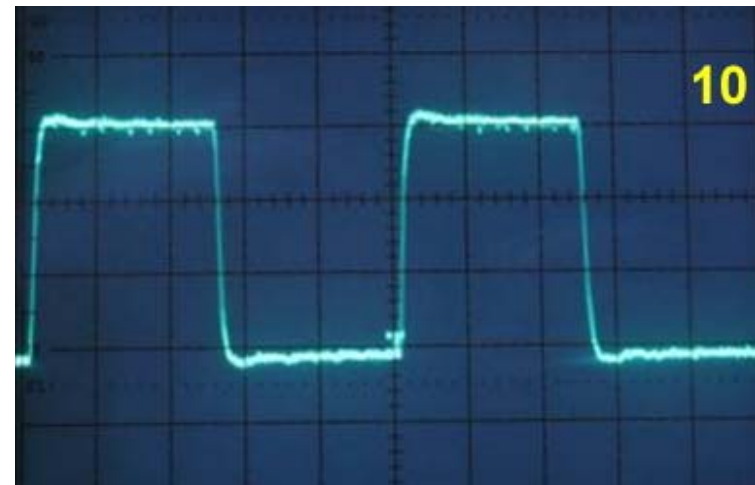
frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
8,1	8,8	7,0	8,1	6,4	4,8	5,7	8,1	10,0	8,7

excellent square wave response

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers

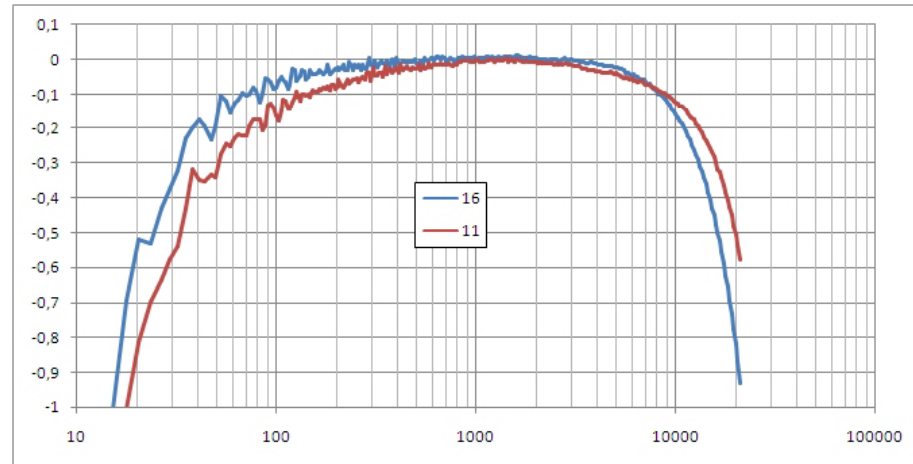


10kHz square wave



Transformer N°11 , Weidhase Ulf , One Parafeed Transformer 3k5 /8 Ohm

Frequency response (N°11 = red, blue = reference)

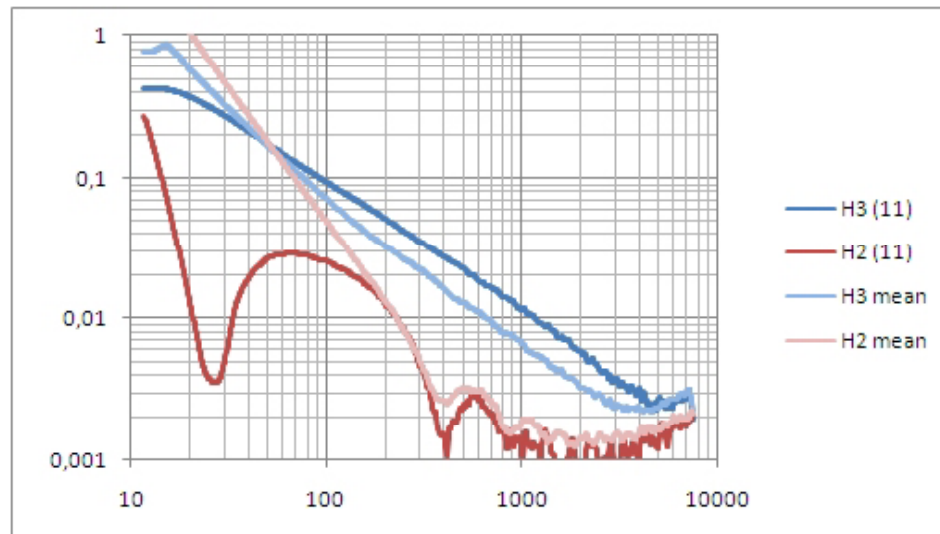


Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
8,4	8,9	8,0	8,5	5,4	7,3	6,2			

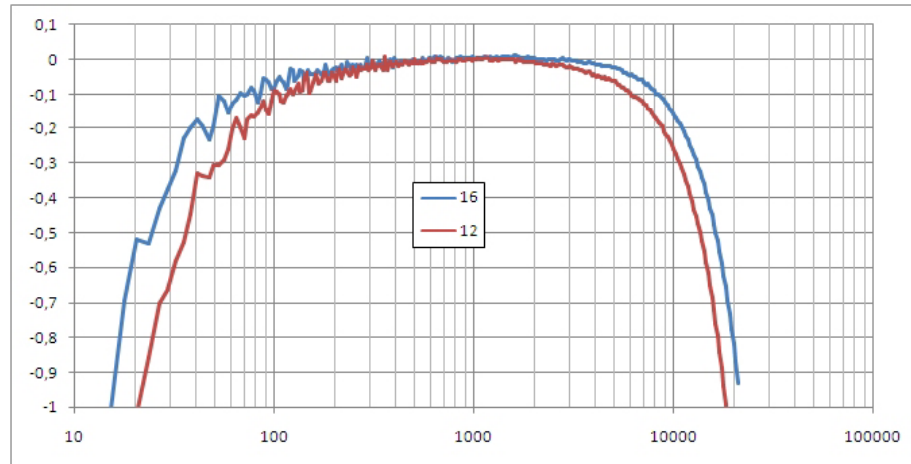
Distortion (red = H2, blue = H3)

shaded = mean curves calculated on 30 transformers



Transformer N°12 , Le Cléac'h Jean-Michel, Meigxu from a Mingda SE amplifier

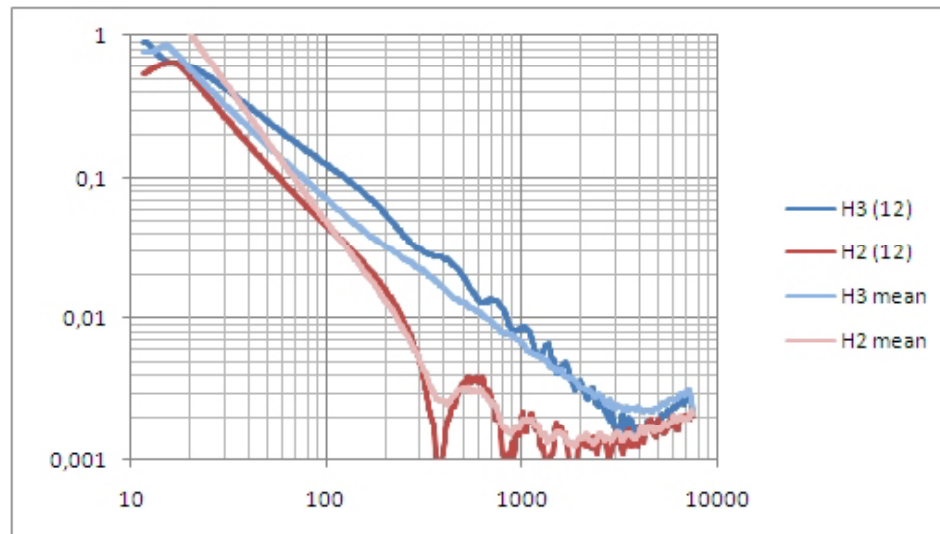
Frequency response (N°12 = red, blue = reference)



Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
6,7	9,3	9,5	8,0	4,4	4,2	4,3	5,7	7,8	6,4

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers

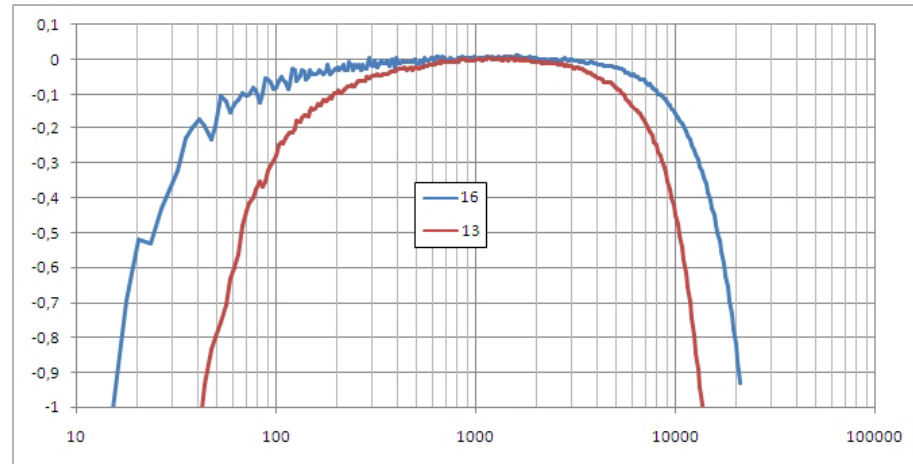


10kHz square wave



Transformer N°13 , Polisois Aristide, DIY grey large transformer

Frequency response (N°13 = red, blue = reference)

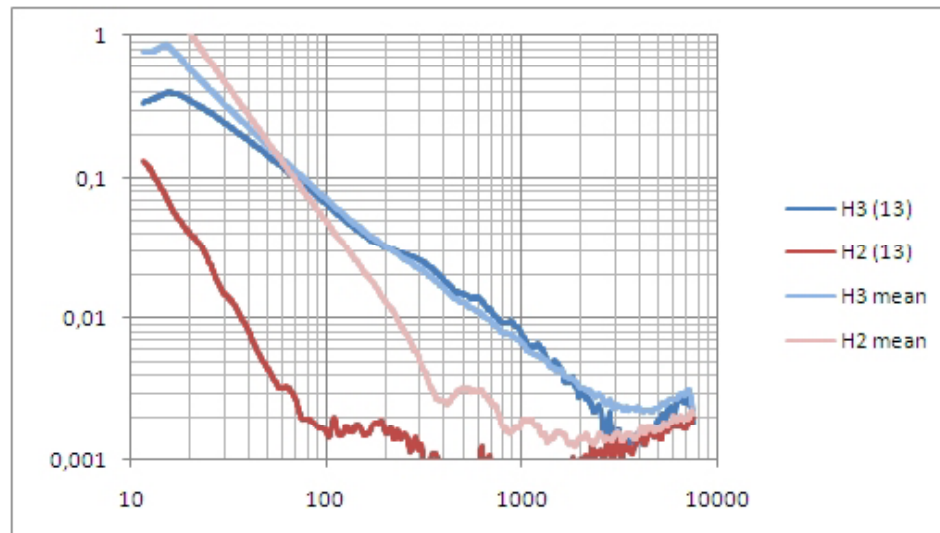


Scores: 0 = bad , 10 = excellent

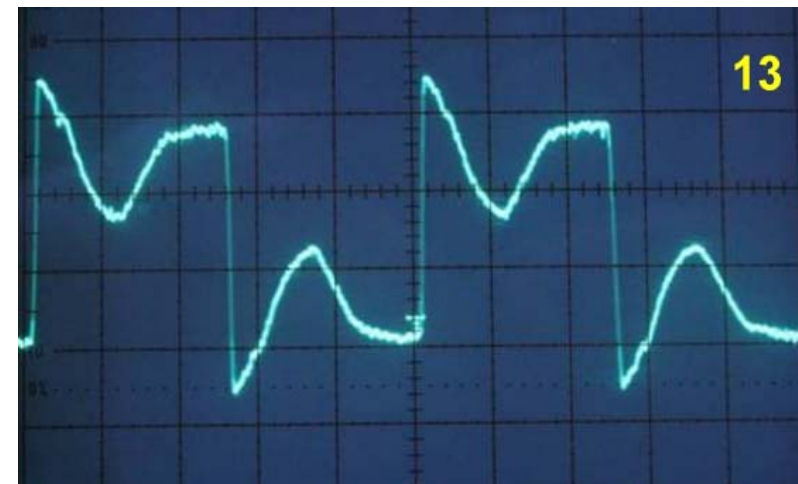
frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
2,1	8,4	8,0	5,2	5,9	8,6	7,0	0,0	3,6	1,2

Distortion (red = H2, blue = H3)

shaded = mean curves calculated on 30 transformers

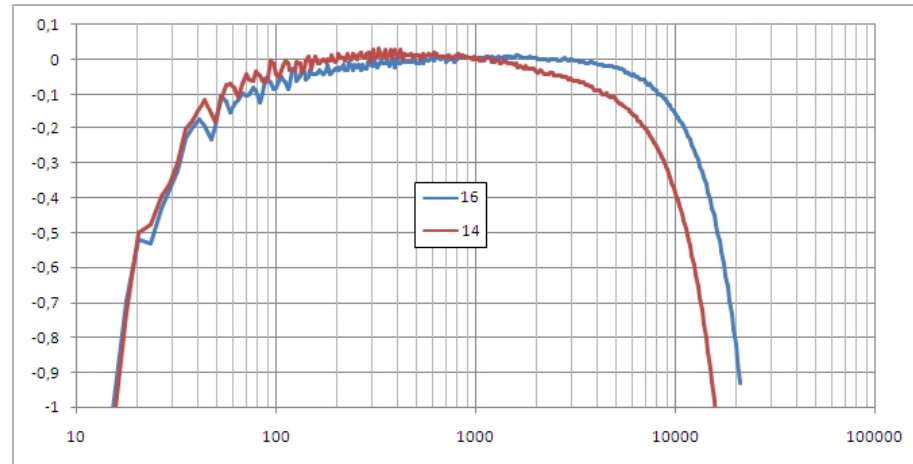


10kHz square wave



Transformer N°14 , Raudonat Ralf , yes, with output transformer regarding the terms

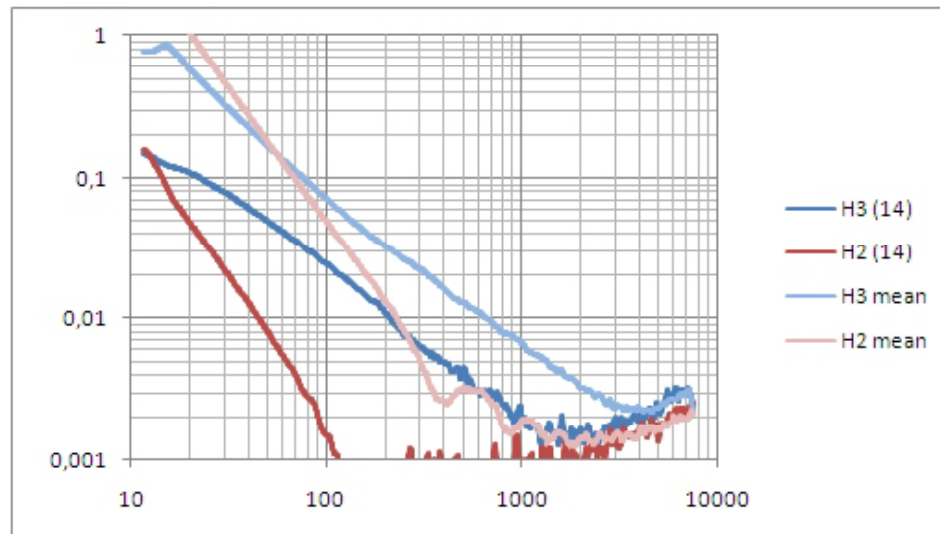
Frequency response (N°14 = red, blue = reference)



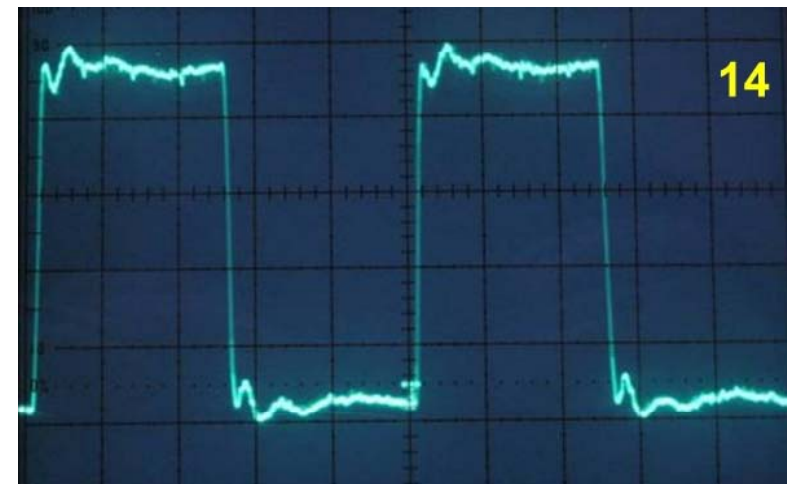
Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
7,7	7,5	6,4	7,4	8,9	8,2	8,6	8,2	9,0	8,5

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers

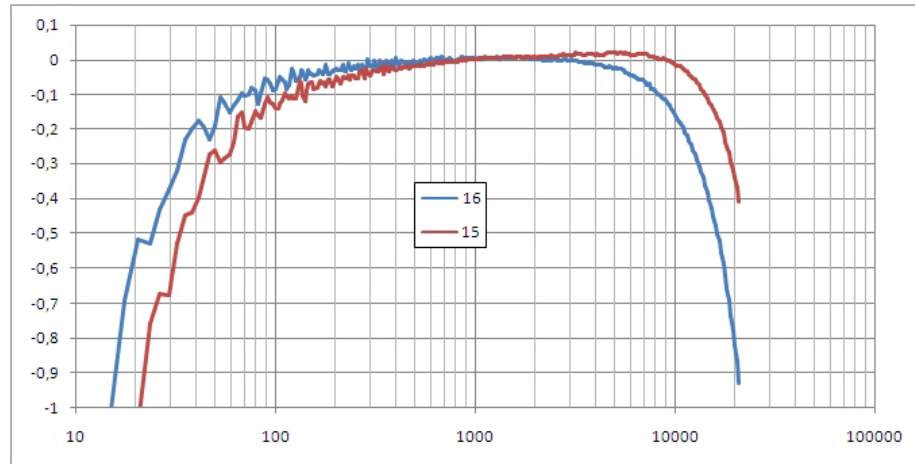


10kHz square wave



Transformer N°15 , Hasling Per & Ole, SE Silk transformer from Tailand 3,0 kOhm

Frequency response (N°15 = red, blue = reference)

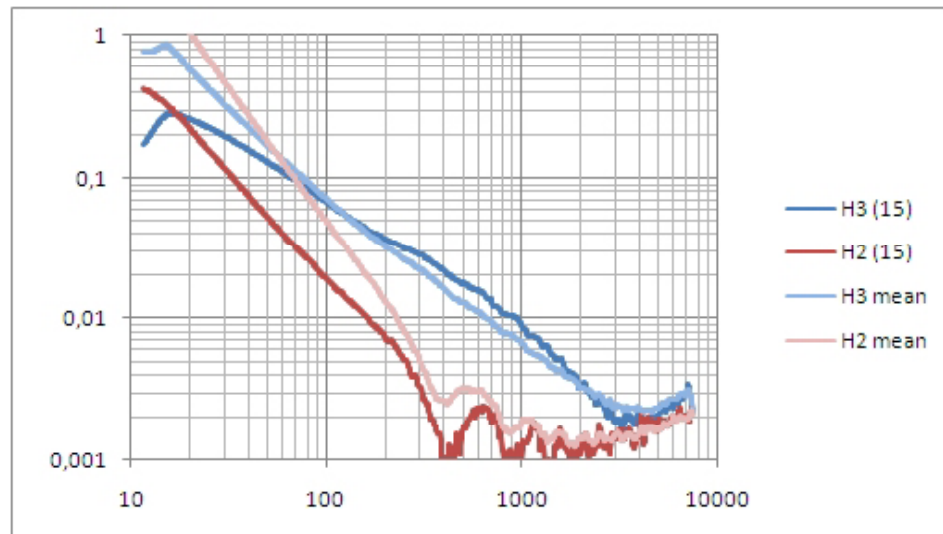


Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
6,7	8,8	9,5	7,9	6,3	5,5	6,0	8,3	9,5	8,7

very good square wave response

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers

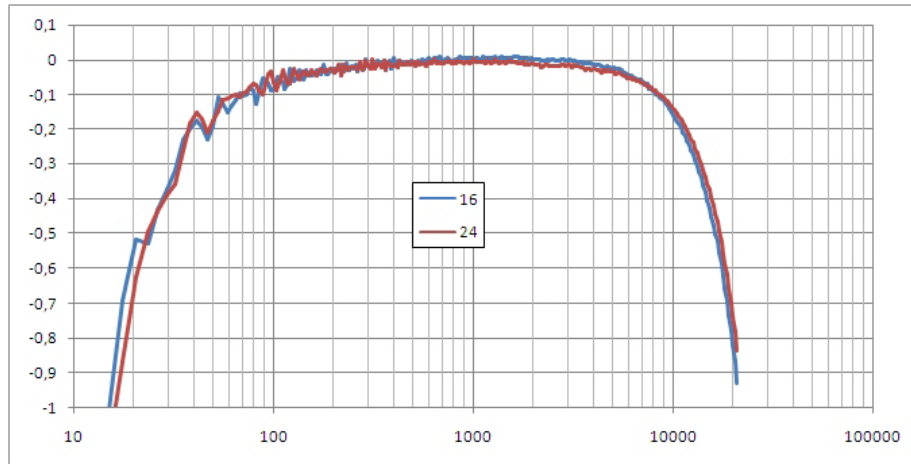


10kHz square wave



Transformer N°16 , Dolinskyi Arkadii, DIY EI transformer

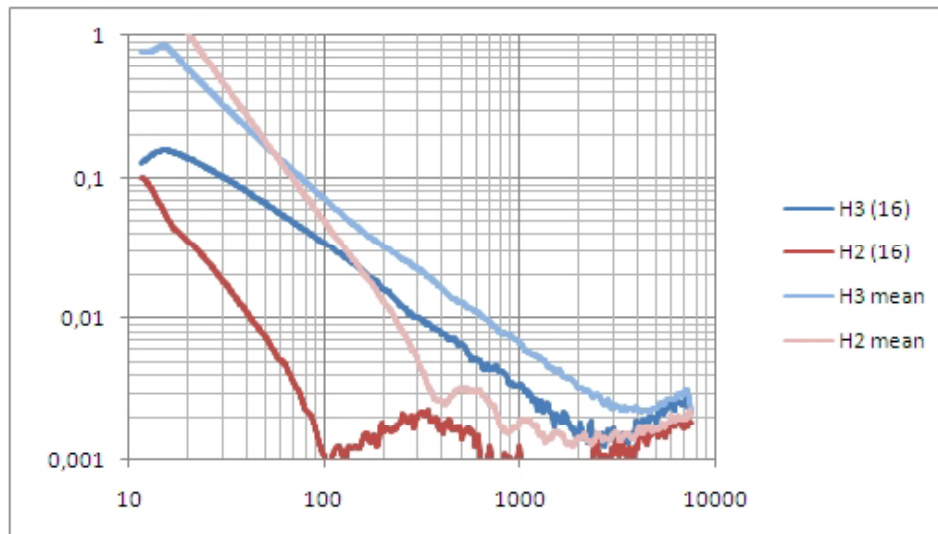
Frequency response (N°16 = blue = reference; 24 for comparison)



Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
9,4	9,9	9,9	9,7	8,1	8,5	8,3			

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers



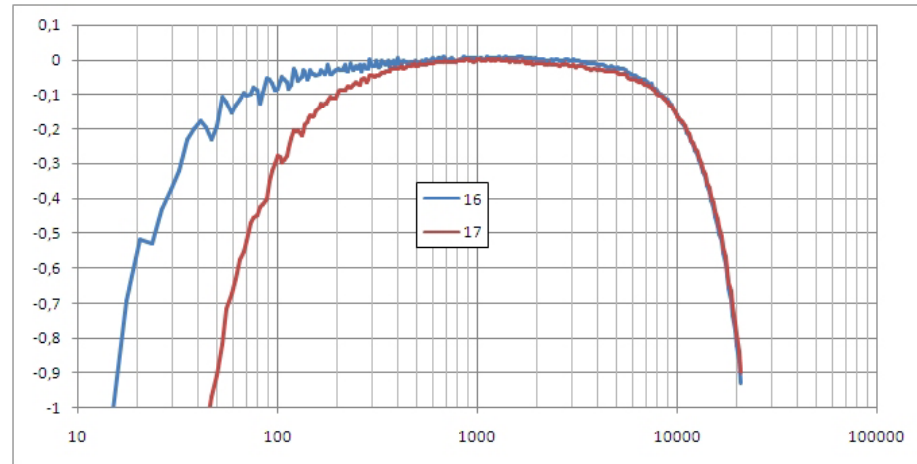
excellent frequency response.
low distortion .

Transformer N°17 ,

Weidhase Ulf ,

Transformer

Frequency response (N°17 = red, blue = reference)

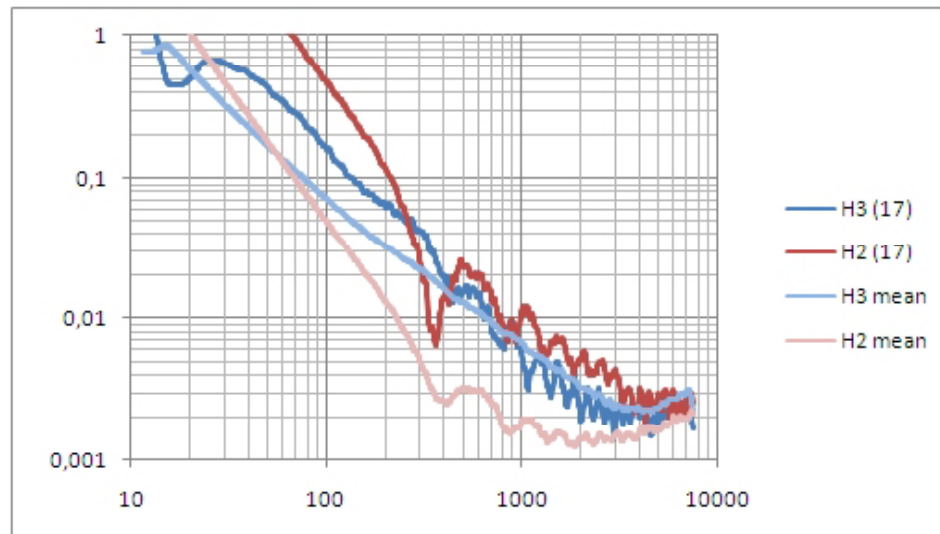


Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
4,2	8,7	6,1	6,0	3,4	0,0	2,1			

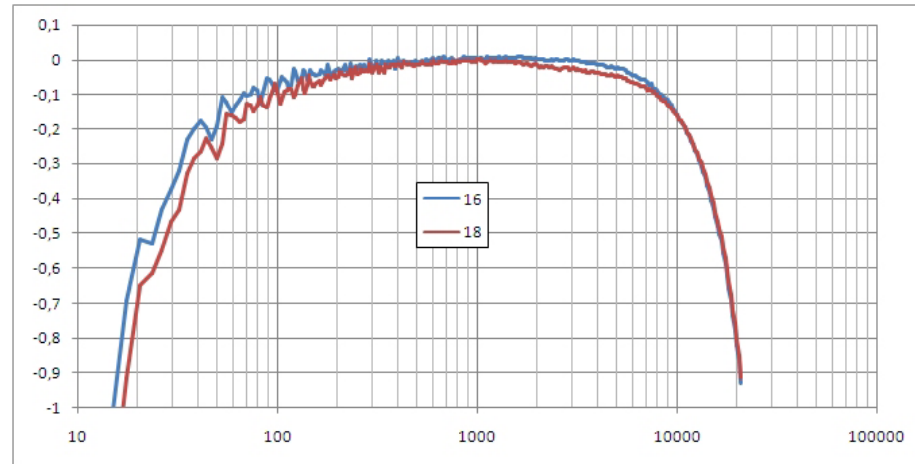
Distortion (red = H2, blue = H3)

shaded = mean curves calculated on 30 transformers



Transformer N°18 , Schwarz Andreas, a selfmade single ended output transformer

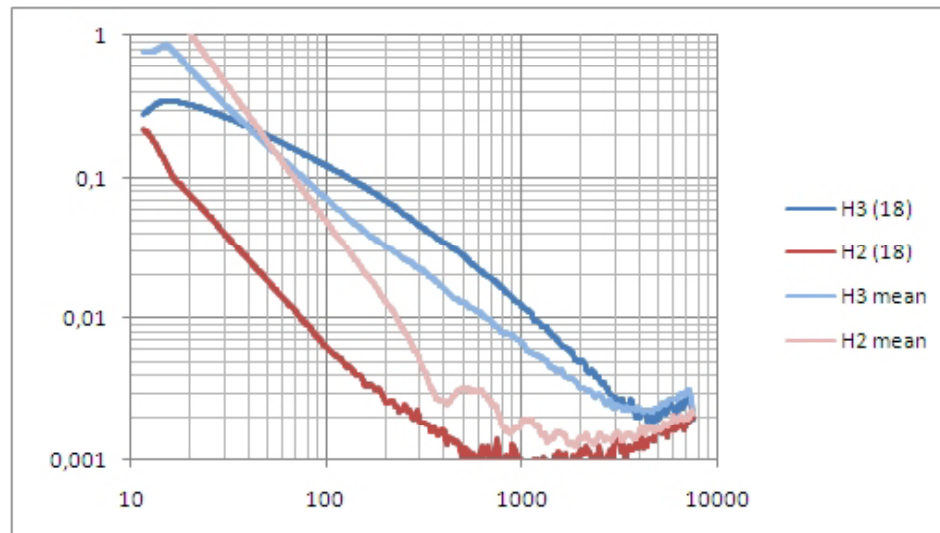
Frequency response (N°18 = red, blue = reference)



Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
9,2	9,6	9,7	9,4	5,2	7,2	6,0			

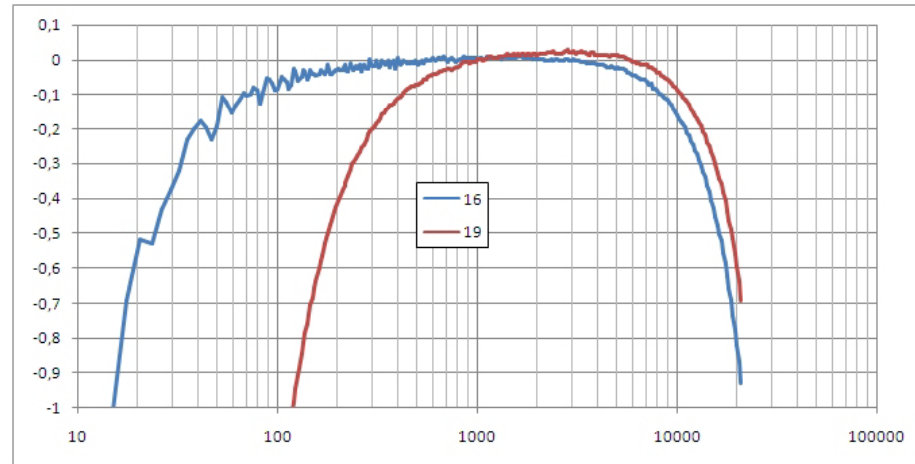
Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers



excellent frequency response.
Low H2 distortion .

Transformer N°19 , Polisois, Aristide, DIY toroid transformer

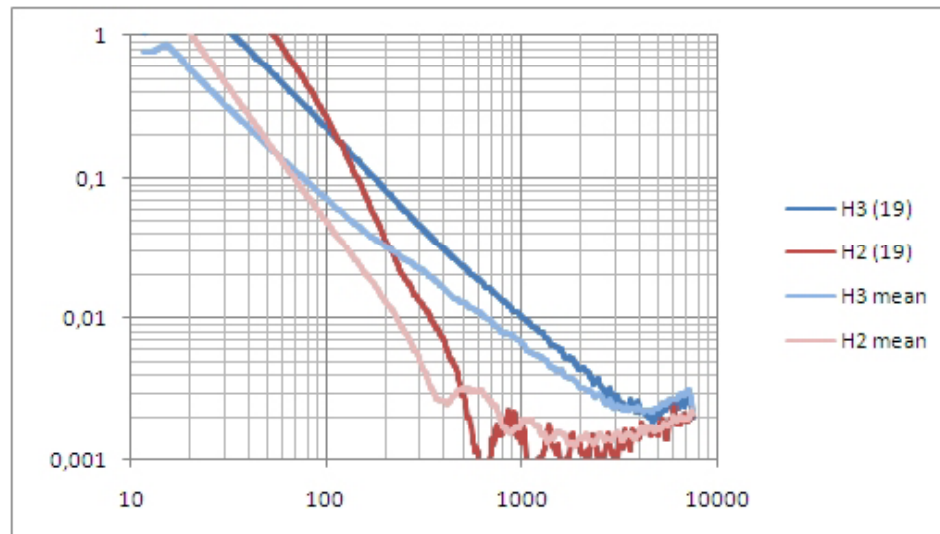
Frequency response (N°19 = red, blue = reference)



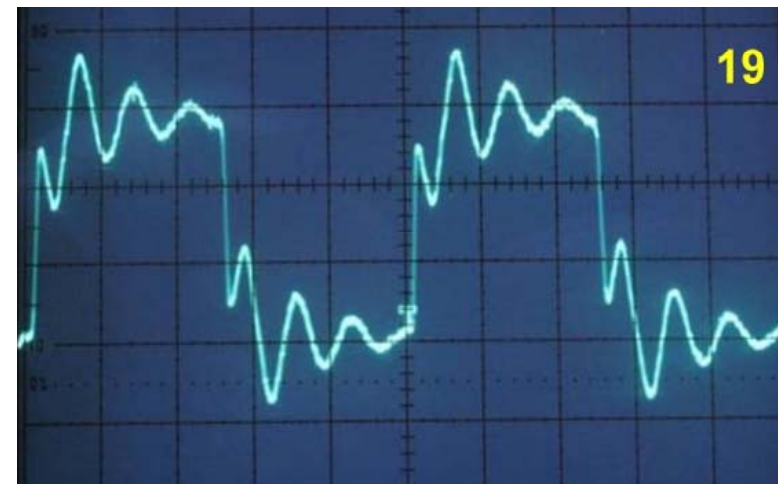
Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
0,3	0,0	0,0	0,2	1,9	0,8	1,5	7,0	5,0	6,4

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers

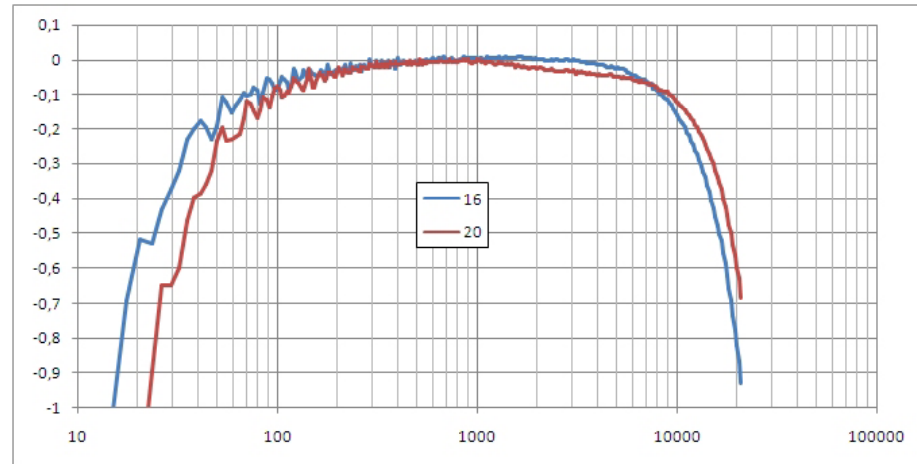


10kHz square wave



Transformer N°20 , Le Cléac'h Jean-Michel, Tango FX3.5

Frequency response (N°20 = red, blue = reference)

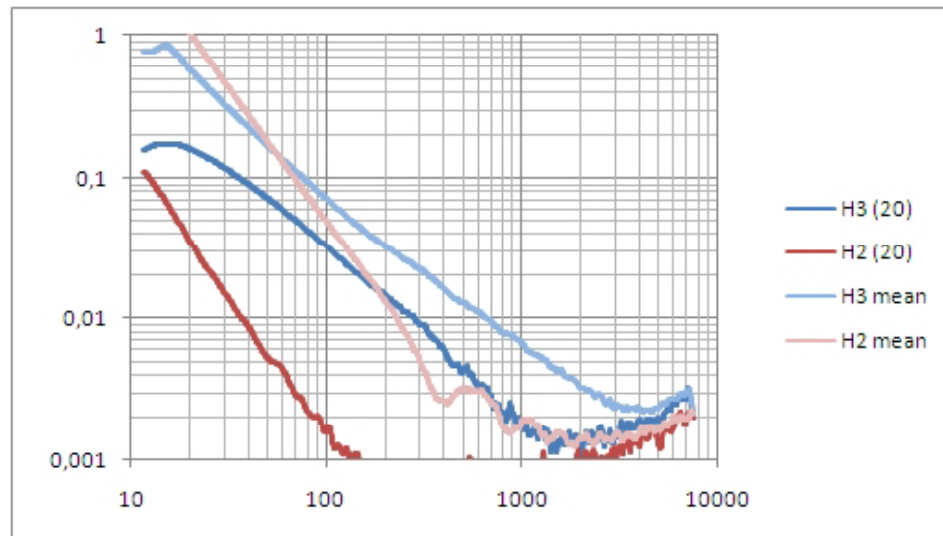


Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
8,5	9,8	8,5	8,9	7,9	8,8	8,2	9,1	9,3	9,2

very good square wave response

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers



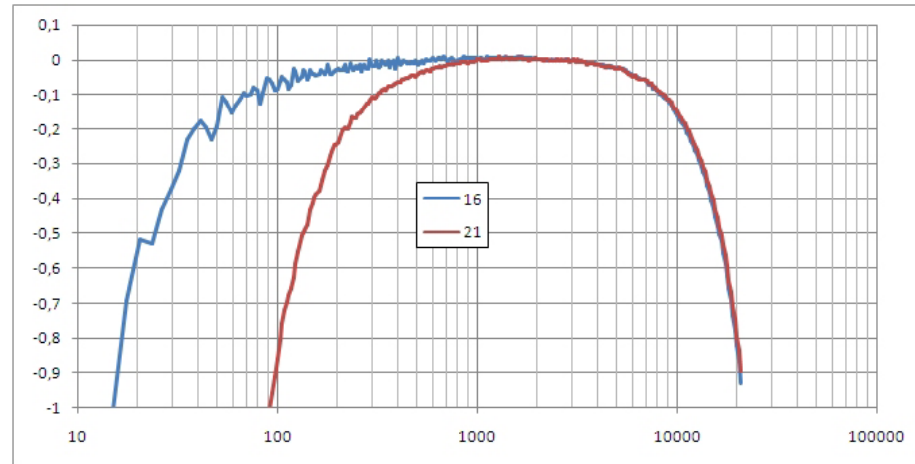
10kHz square wave



Compare with N°9

Transformer N°21 , Falampin Jérôme, DIY parafeed transformer

Frequency response (N°21 = red, blue = reference)

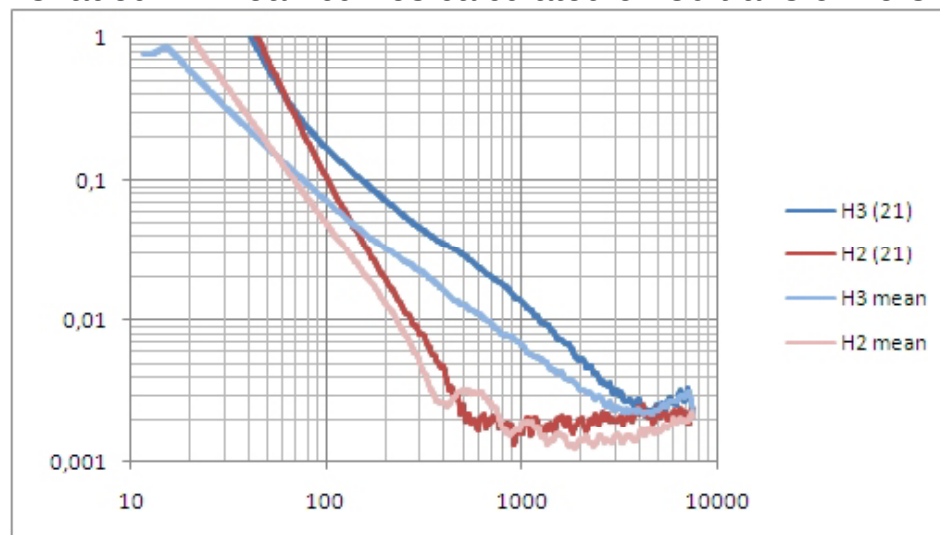


Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
1,0	4,7	2,9	2,6	0,0	0,4	0,2			

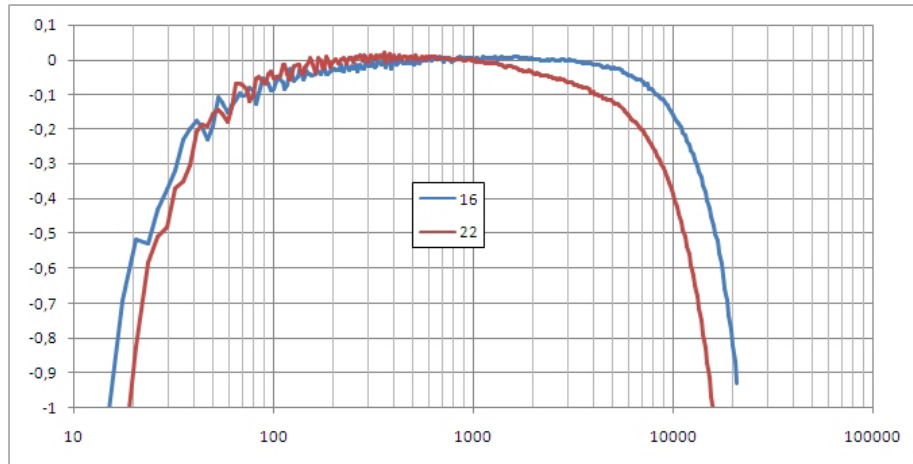
Distortion (red = H2, blue = H3)

shaded = mean curves calculated on 30 transformers



Transformer N°22 , Weidhase Ulf, transformer

Frequency response (N°22 = red, blue = reference)



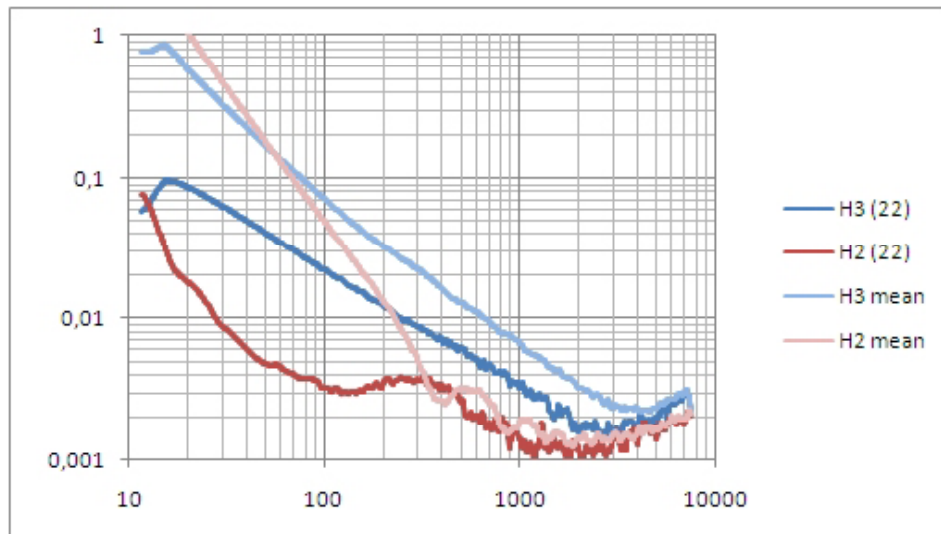
Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
6,7	7,5	9,6	7,5	9,4	9,1	9,3			

very low distortion

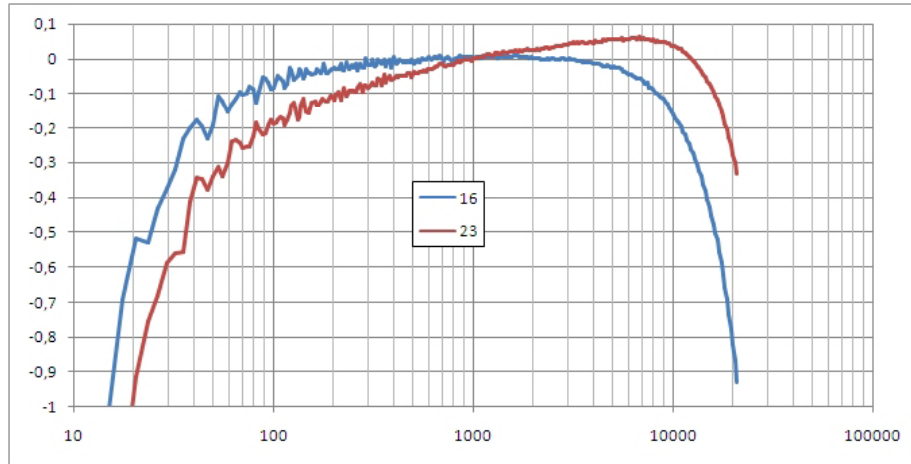
Distortion (red = H2, blue = H3)

shaded = mean curves calculated on 30 transformers



Transformer N°23 , van Willenswaard Peter, AudioNote Trans-300 double-C-core

Frequency response (N°23 = red, blue = reference)

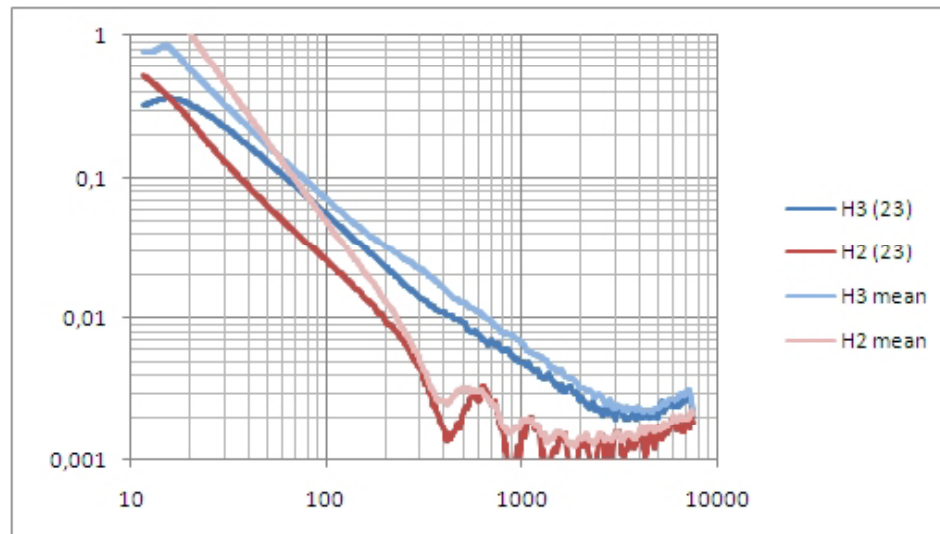


Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
8,7	6,5	6,5	7,6	6,2	5,3	5,8			

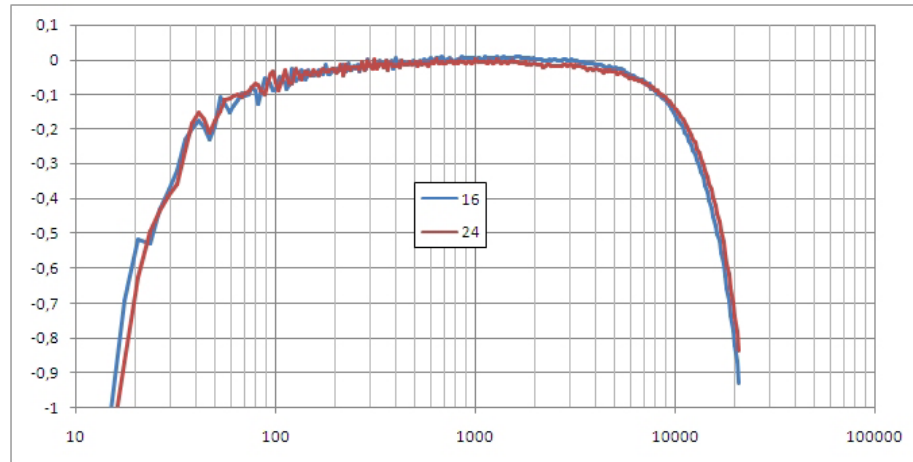
Distortion (red = H2, blue = H3)

shaded = mean curves calculated on 30 transformers



Transformer N°24 , Hubertse Rob, custom made OPT by AE-Europe

Frequency response (N°24 = red, blue = reference)

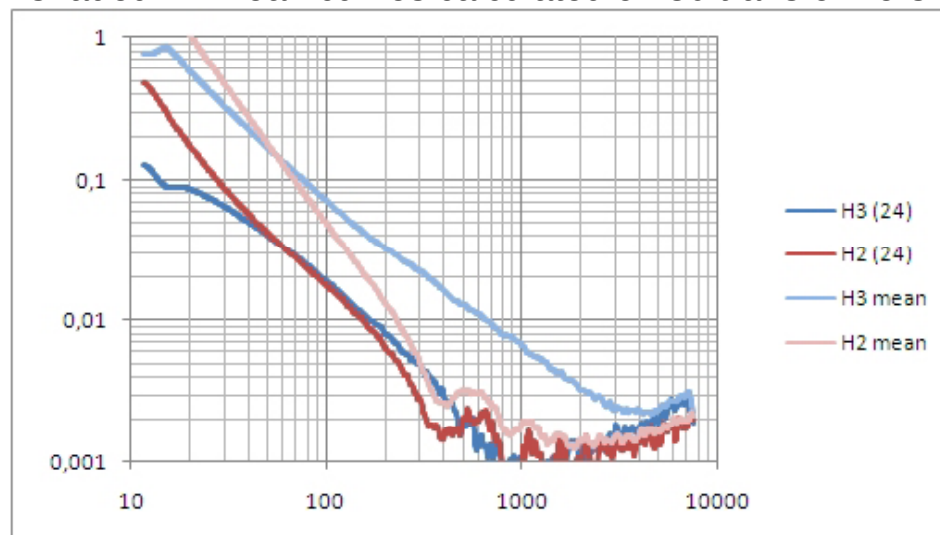


Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
9,5	9,9	9,6	9,6	9,5	5,9	8,0	10,0	9,7	9,9

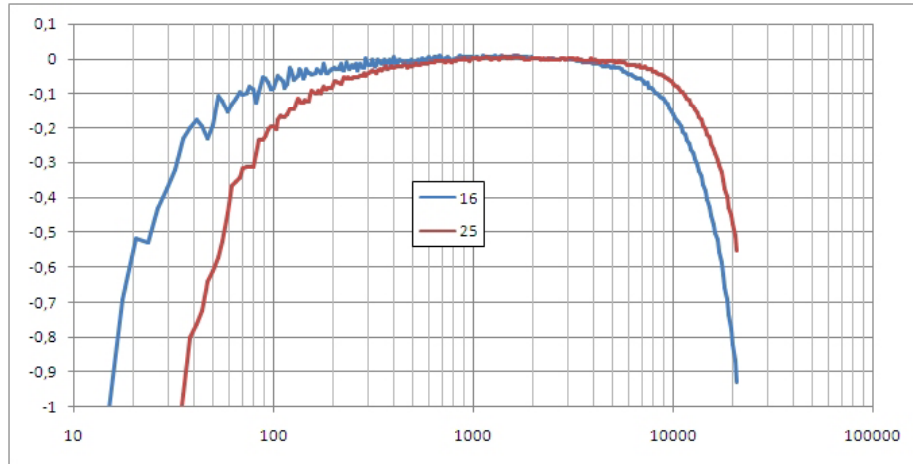
excellent frequency response.
low H3 distortion
excellent square wave response
10kHz square wave

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers



Transformer N°25 , Le Cléac'h Jean-Michel, small and old Audionote

Frequency response (N°25 = red, blue = reference)

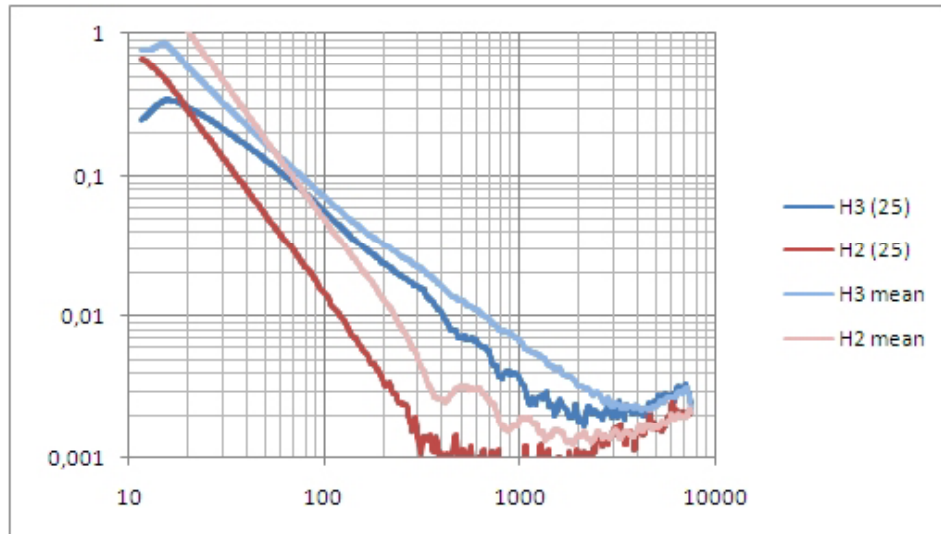


Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
6,7	9,1	6,4	7,5	6,3	5,3	5,9	9,1	9,6	9,3

very good square wave response

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers

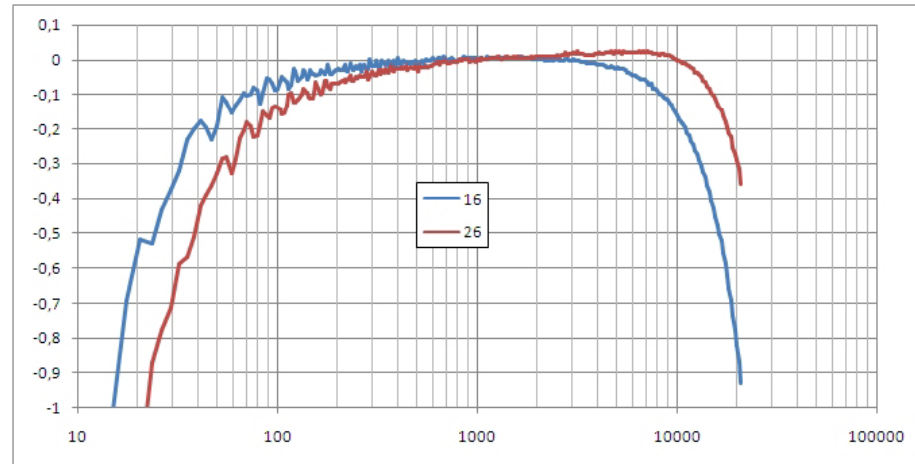


10kHz square wave



Transformer N°26 , Monmagnon Yves, Dissident Audio transformer

Frequency response (N°26 = red, blue = reference)

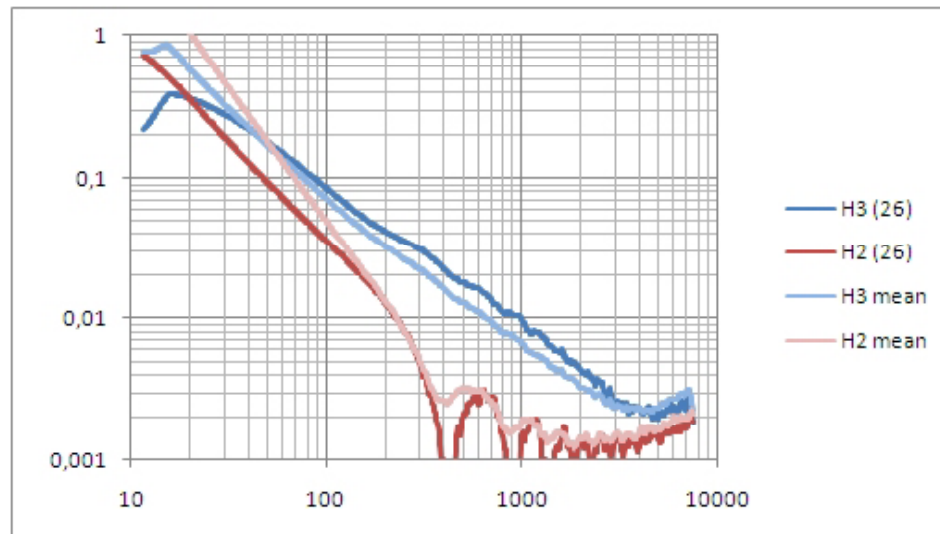


Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
9,4	8,6	4,8	8,4	6,8	5,5	6,3			

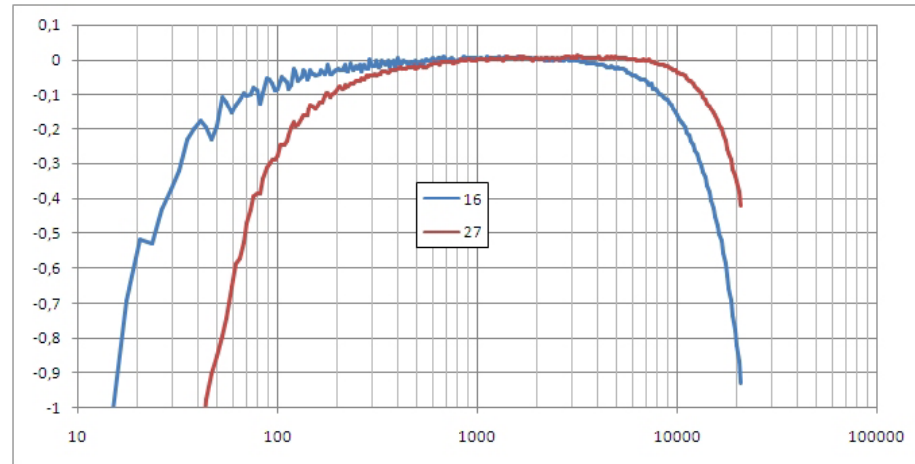
Distortion (red = H2, blue = H3)

shaded = mean curves calculated on 30 transformers



Transformer N°27 , Pierre-Francois Brand, transformer

Frequency response (N°27 = red, blue = reference)

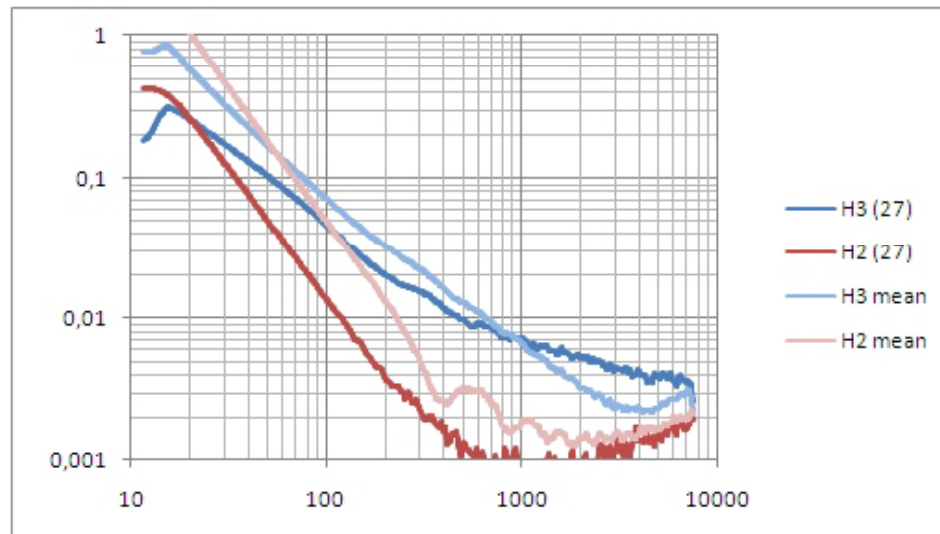


Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
6,1	8,7	7,3	7,2	5,5	4,7	5,2	9,3	8,1	8,9

good square wave response

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers



10kHz square wave

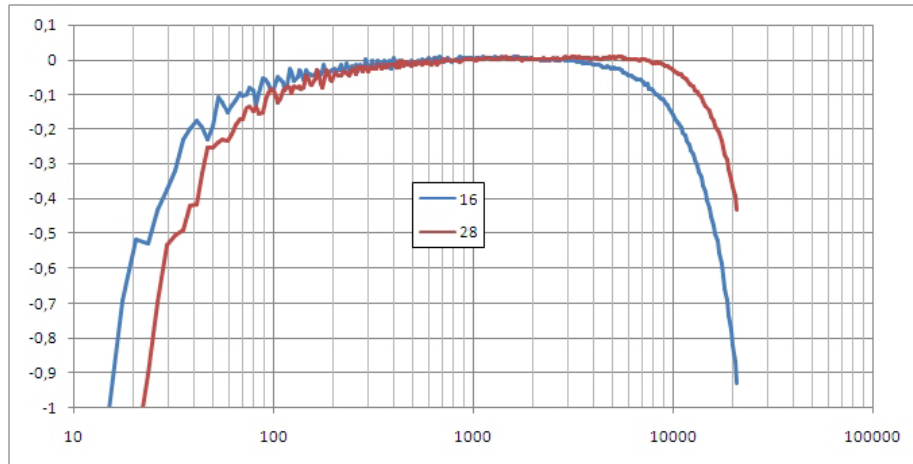


Transformer N°28 ,

Pierre-Francois Brand,

transformer

Frequency response (N°28 = red, blue = reference)



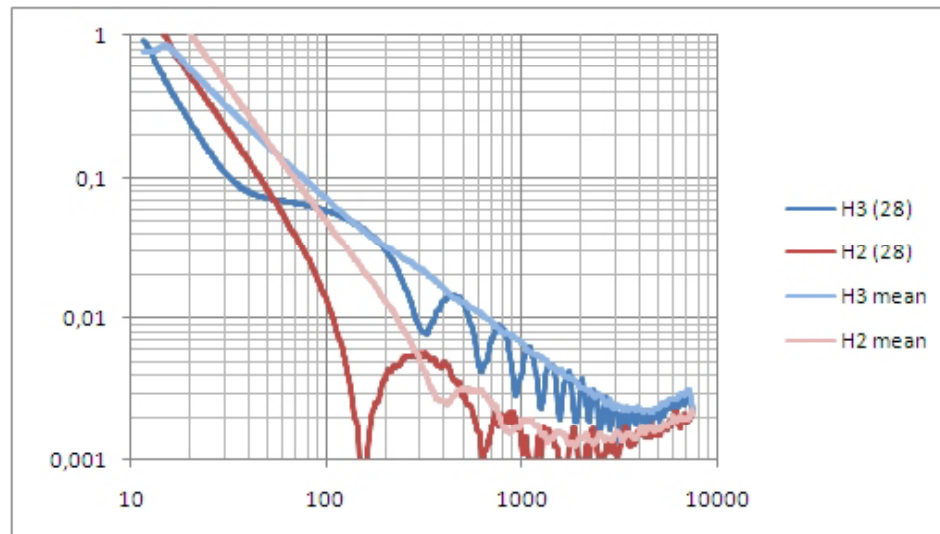
Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
9,6	9,6	7,8	9,3	7,3	4,6	6,2			

good frequency response

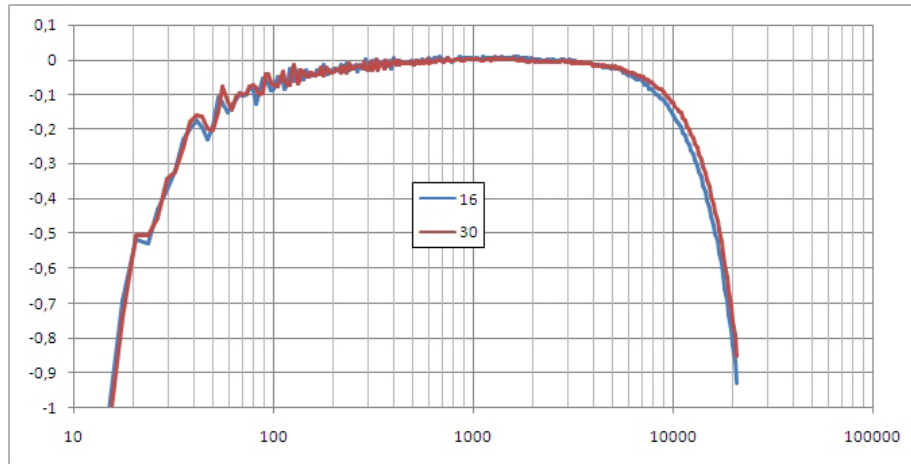
Distortion (red = H2, blue = H3)

shaded = mean curves calculated on 30 transformers



Transformer N°30 , Lundahl Per, LL1693/70mA

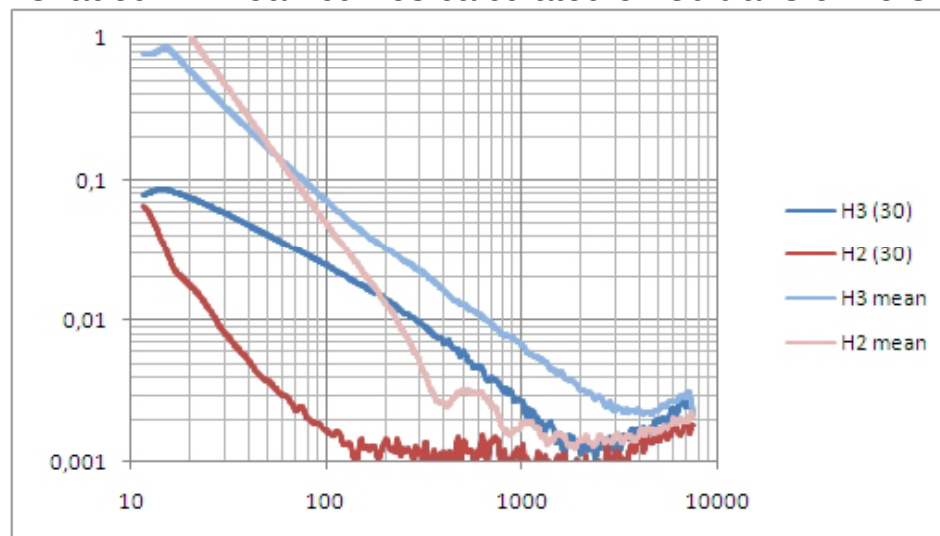
Frequency response (N°30 = red, blue = reference)



Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
10,0	10,0	9,8	10,0	9,4	9,5	9,5			

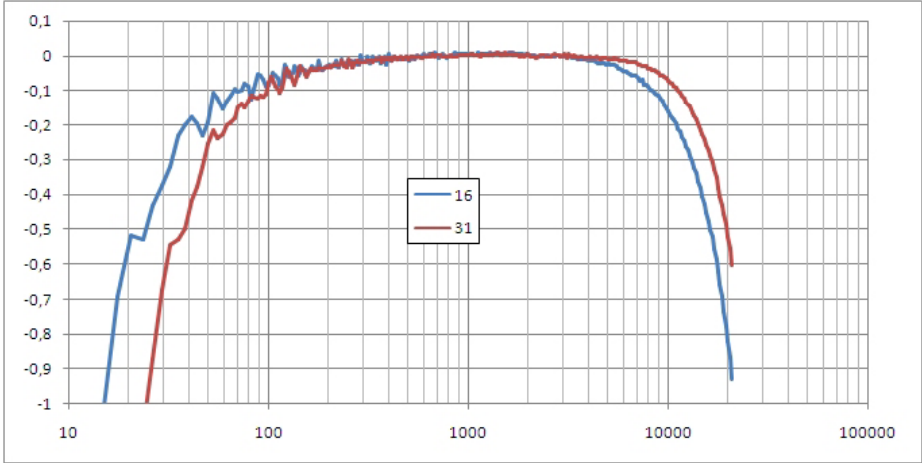
Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers



The best frequency response.
Very low distortion .

Transformer N°31 , Lundahl Per, LL1664AM/70mA

Frequency response (N°31 = red, blue = reference)

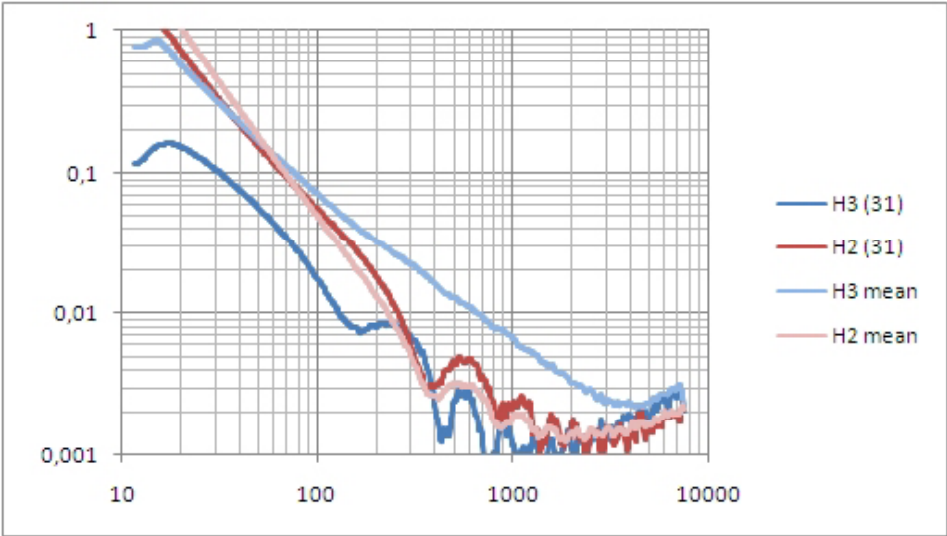


Scores: 0 = bad , 10 = excellent

frequency response				distortion			10kHz square wave		
width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
8,7	10,0	8,1	9,0	8,5	3,8	6,6			

good frequency response

Distortion (red = H2, blue = H3)
shaded = mean curves calculated on 30 transformers



transfo	owner	model and/or description	frequency response				distortion			10kHz square wave		
			width	flatness	symmetry	weighted	H3	H2	weighted	HF resonance	overshoot	weighted
1	Højbjerg, Karsten	toroidal transformer in cardbox	7,8	9,9	8,9	8,7	8,4	9,3	8,8	5,8	0,0	3,8
2	Terrell, Brian	SE Output transformer	7,6	8,6	9,1	8,2	8,7	8,8	8,7	4,9	6,9	5,6
3	Falampin, Jérôme	Bouyer ST10 transformer (in soap box)	0,0	4,7	9,5	3,2	1,8	1,6	1,7			
4	Sullerot, Julien	James JH2123	9,3	9,8	8,7	9,3	6,3	5,3	5,9	8,1	6,6	7,6
5	Falampin, Jérôme	Unknown semi-pro vintage transformer (in tea box)	4,9	4,6	8,4	5,4	4,8	3,5	4,3	8,1	1,0	5,7
6	Sullerot, Julien	Partridge TK 4519	9,5	9,9	9,7	9,7	8,8	7,7	8,4	6,7	7,4	6,9
7	Veen, van der, Menno	toroidal SE-OPT's	8,9	9,9	8,9	9,2	7,6	7,1	7,4			
8	Le Cléac'h, Jean-Michel	Magnetics (special order),	8,3	9,3	7,7	8,5	6,0	5,0	5,6	9,7	9,6	9,7
9	Michimori, Hirokuni	ex-Tango #10887 (special order), rating 50W, 3.5K	9,4	8,9	10	9,3	10	10	10	8,6	9,1	8,8
10	Sullerot, Julien	Tamura transformer from a Sun Audio 2A3 amp	8,1	8,8	7,0	8,1	6,4	4,8	5,7	8,1	10,0	8,7
11	Weidhase, Ulf	One Parafeed Transformer 3k5 /8 Ohm Transformer	8,4	8,9	8,0	8,5	5,4	7,3	6,2			
12	Le Cléac'h, Jean-Michel	Meigxu (Mingda),	6,7	9,3	9,5	8,0	4,4	4,2	4,3	5,7	7,8	6,4
13	Polisois, Aristide	DIY grey large transformer	2,1	8,4	8,0	5,2	5,9	8,6	7,0	0,0	3,6	1,2
14	Raudonat, Ralf	yes, with output transformer regarding the terms	7,7	7,5	6,4	7,4	8,9	8,2	8,6	8,2	9,0	8,5
15	Hasling, Per + Ole	SE Silk transformer from Tailand 3,0 kOhm	6,7	8,8	9,5	7,9	6,3	5,5	6,0	8,3	9,5	8,7
16	Dolinskyi, Arkadii	DIY EI transformer	9,4	9,9	9,9	9,7	8,1	8,5	8,3			
17	Weidhase, Ulf	Transformer	4,2	8,7	6,1	6,0	3,4	0,0	2,1			
18	Schwarz, Andreas	a selfmade single ended output transformer	9,2	9,6	9,7	9,4	5,2	7,2	6,0			
19	Polisois, Aristide	DIY toroid transformer	0,3	0,0	0,0	0,2	1,9	0,8	1,5	7,0	5,0	6,4
20	Le Cléac'h, Jean-Michel	Tango FX3.5	8,5	9,8	8,5	8,9	7,9	8,8	8,2	9,1	9,3	9,2
21	Falampin, Jérôme	DIY parafeed transformer	1,0	4,7	2,9	2,6	0,0	0,4	0,2			
22	Weidhase, Ulf	Transformer	6,7	7,5	9,6	7,5	9,4	9,1	9,3			
23	Willenswaard, van, Peter	AudioNote Trans-300 double-C-core	8,7	6,5	6,5	7,6	6,2	5,3	5,8			
24	Hubertse, Rob	custom made OPT by AE-Europe.	9,5	9,9	9,6	9,6	9,5	5,9	8,0	10,0	9,7	9,9
25	Le Cléac'h, Jean-Michel	small and old Audionote	6,7	9,1	6,4	7,5	6,3	5,3	5,9	9,1	9,6	9,3
26	Monmagnon Yves	Dissident Audio transformer	9,4	8,6	4,8	8,4	6,8	5,5	6,3			
27	Pierre-Francois Brand	Transformer	6,1	8,7	7,3	7,2	5,5	4,7	5,2	9,3	8,1	8,9
28	Pierre-Francois Brand	Transformer	9,6	9,6	7,8	9,3	7,3	4,6	6,2			
30	Lundahl, Per	LL1693/70mA	10,0	10,0	9,8	10,0	9,4	9,5	9,5			
31	Lundahl, Per	LL1664AM/70mA	8,7	10,0	8,1	9,0	8,5	3,8	6,6			