

Illumina 66

ScanSpeak 18WU/4741-T00 + D3004/660000 alt R3004/662000

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18WU/4741T00 and D3004/660000. Click images to view large.
Download specs here: [18WU/4741T00](#), [D3004/660000](#).

INTRO

Half through cabinet construction I asked my wife to come to the workshop and take a look. "OK...high WAF!" - she said. Thank you dear, this was exactly what I wanted you to say. So, high-WAF we go, although I'm sure opinions will be divided anyway. For some people bare wood is a no-no. Must be spray paint at least to match modern interior decor.

The "six plus one" is hugely popular for many good reasons. Two drivers, a fairly simple crossover, simple cabinet work and usually high-WAF due to small footprint. The latter really depends on overall fit'n finish. A friend of mine recently visited the local HiFi-Klubben and was told that floor-standers were demonstrated only once a week (!) and most likely it would be the lady of the house having the final word in which loudspeaker was purchased. Highest score had small "5+1" or "6+1" stand-mounts - and they had to be white. High-gloss white! Now, if it must be a stand-mount, take a look at the [Illuminator Monitor](#). If WAF is favorable, you may try out this modest "6+1" having a larger cabinet and eventually *will not take more floor space* than a stand-mount. I know this doesn't count much in WAF terms, but you may give it a shot. Men have to do something to bring back big loudspeakers to our homes!

I recently had a few questions on the SP44 and the writer told that his wife thought the *faceted front panels* were bad! Now, I hadn't seen that one coming. Please take a look at Rawin's/Thailand SP44 [here](#). I think these cabs and front panels are beautiful, but taste cannot be argued - although we do all the time.

Nothing prevents us from making the best of midrange and treble from a two-way floor-stander. It can even be made to produce some decent bass although don't expect anything near a 15" bass driver and please don't think feeding a 6" driver 300 watts will make it into a 15" driver, it doesn't work that way. For most people hifi is not about recreating a live event in their living room, rather having decent gear giving us an *illusion* of a live event. I mean, most music today is enjoyed from MP3 files through iPod ear-plugs anyway!

For bass I have chosen the 4 ohms version of the 18WU range. 4 ohms voice coil makes a more responsive driver for the same gain setting of your line stage by

drawing more current from your amplifier, but no decent solid state amp will have trouble driving this speaker because it can't play immensely loud anyway. 50-100 good solid state watts will do and my [80 wpc Jungson](#) amps just love this speaker.

The 6600 tweeter has been around for quite some time and together with the 7100 tweeter I consider these soft-domes among the best available. As an alternative tweeter, the R3004/662000 can be implemented by changing three resistors. I like this ring radiator!

System sensitivity is around 87 dB/2.8 volts and minimum impedance is 4 ohms. And it doesn't matter if your amp is specified for 8 ohms. I have this question regularly.



Click images to view large.

The sound

Having had the [DTOWTs](#) and all the [Jenzen speakers](#) in the living room for most of the last year I've gotten used to the significant soundstage of large 3-ways systems and it took some time to adjust to a small 2-way floorstander. What helped was the 18WU's ability to throw a dynamic bottom end, the best I've had from a single 6½-inch driver ever. Doing deep bass combined with a clean upper mid is not a problem as long as the 18WU is driven to adequate sound levels. The difference from the large 3-ways is merely derived from the fact that sound is emitted from a rather small area, more point source compared to the Jenzens. It has

to be said I'm listening a fairly close range and only the DTQWTs can deliver the same point source feeling sharing the feature of two front mounted drivers. Having bass emitted at ~80 cm height is also different compared to a bass driver at ~60 cm height. They load the room differently.

And not least important, the 18WU does not loose articulation at low levels! This is a quite unique feature of the 18WU drivers. Too many 6" drivers loose grip at low levels due to high-loss suspensions. High mechanical Q is one of the things we have to look for.

I may have a preference for the ring radiator tweeter, but generally the two versions sound much alike with the 6600 having a little more presence, but this may very much depend on tweeter attenuation. Before installing the crossovers for good, pull some long wires and try out all tweeter attenuation options. It must be tried and don't be seduced by excessive treble levels that may cause ear fatigue in the long run. Play acoustic instruments like piano, flute, oboe, clarinet, etc., and find your preferred tuning.

While writing this, I'm running the ring radiators with 1R5 to the tweeter and with the Jungson in front I have a deep and overall coherent soundstage. If we had to look for competitors in this price range we'd have to look for ceramic and sandwich cone drivers delivering some of the same transparency these Illuminator drivers can manage. A very few may be better and quite few worse and we're into a range of drivers where we're dealing with taste. There are many ways to good sound and the last few years have brought new drivers we didn't dream of twenty years ago.

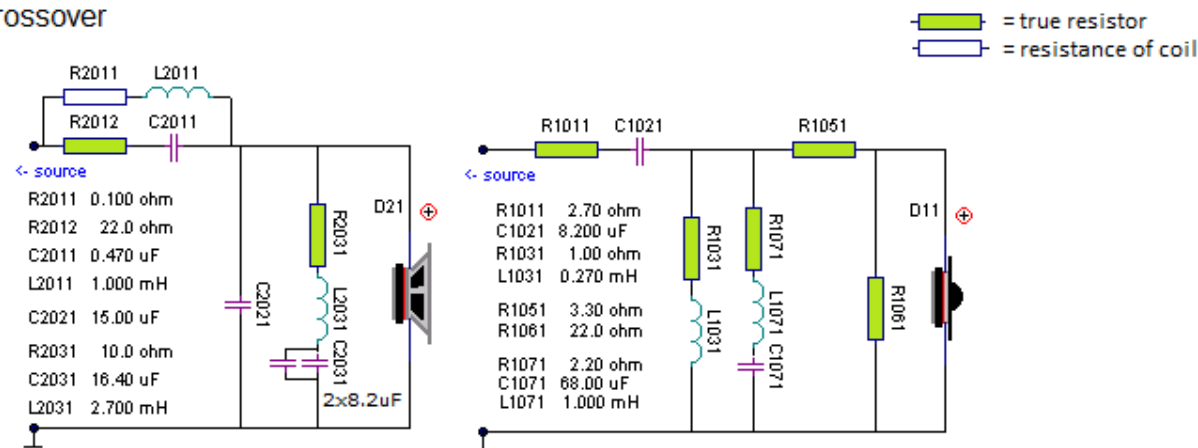
I consider the Illumina 66 a small speaker and if it must be small and we at the same time want decent deep bass we sacrifice efficiency and can you live with this, the Illumina 66 may be an option for you to bring the illusion of a live event into your living room. 87 dB is really not that bad, most "6+1" speakers will make 85 dB.

I obviously do not have all the 2-way floorstanders I've made over time for comparison, but I do not recall any of them being able to do what this one can do.

CROSSOVER

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Illumina 66 crossover



The crossover is tuned to make the flattest possible response in all of the midrange*, thus L2011 is fairly small creating the usual peak at 1 kHz. An LCR circuit is taking care of this and from the value of R2031 it can be seen the impact of the LCR circuit is modest.

For tweeter we see a fairly standard 2nd order topology. The LCR circuit takes care of the huge impedance peak at tweeters point of resonance and further helps smoothing tweeter roll-off.

The crossover is an asymmetrical 4th/2nd order kind of thing and not aimed at textbook phase integration, rather tuned by ear by listening to acoustic instruments. By adding close to 4th order to the midbass and 2nd order to the tweeter + tilting the front panel we achieve positive polarity of both drivers and a fairly flat response from R1011 = 0.47 ohm. Textbook phase integration only exists in a single point anyway from non-dual-concentric drivers, and is furthermore frequency dependent, so don't put too much into this. Due to the shallow slope of the tweeter crossover, the point of crossover is in the range of 2.7 kHz but with the shallow slope, the tweeter is adding its fingerprint to upper midrange in terms of dispersion as can be seen from horizontal dispersion measurements below.

R1011 = 0.47 ohm may lead to listening fatigue in the long run and I use 2R7 to render a proper balance of basic notes and overtones. The choice is yours

depending on personal preference, associated gear and acoustic properties of your room.

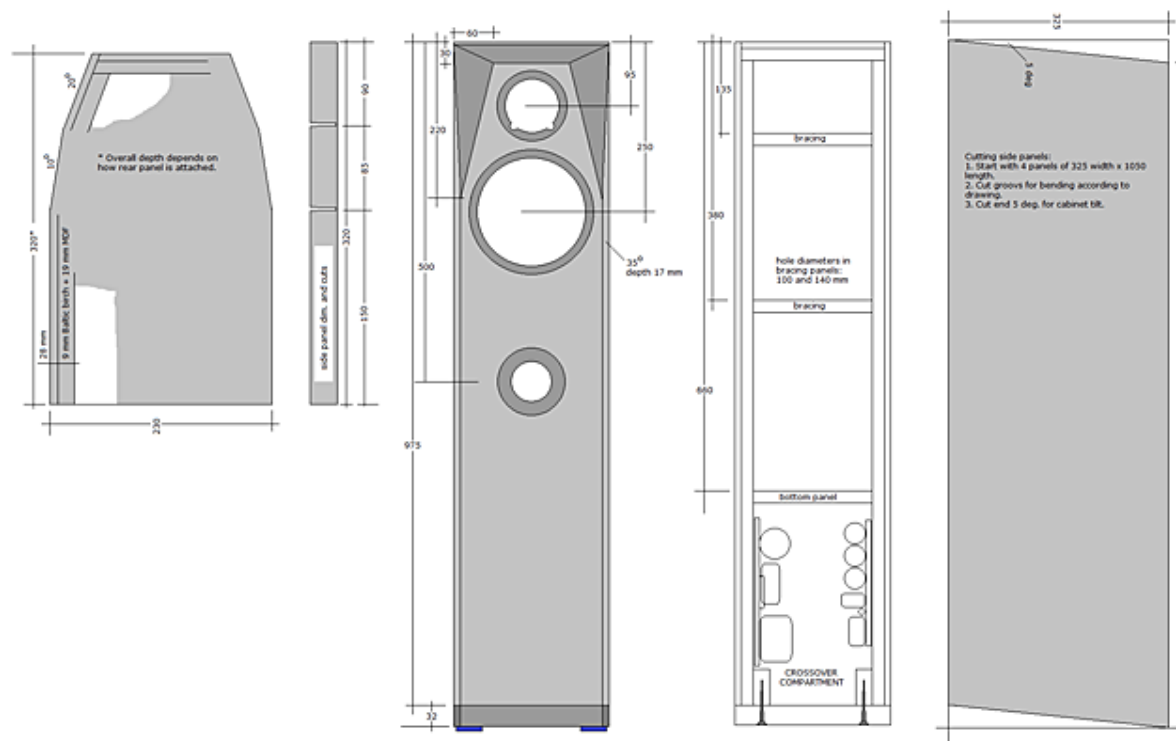
For tweeter attenuation there are two options, R1011 and R1051. R1011 can be varied between 1R5 and 3R3 depending on personal preference. R1051 can be varied from 1R5 to 4R7. Changing R1051 display a higher working point than R1011 as can be seen from measurements below.

*: Most 6" drivers will have a rising response towards higher frequencies. When we place these on a narrow baffle we have baffle step loss; for 20 cm width we will be 3 dB down around 580 Hz. These two things combined often leaves a serious bump around 800-1200 Hz and we need to flatten the response here, otherwise the sound will become much too forward. What is seen over and over again is the use of a large series coil for the bass driver bringing down the upper midrange and the result is a dip in the middle midrange (320-640 Hz) which often makes male vocals thin and anemic; we miss some weight in the overall soundstage as there is a significant amount of energy in almost any music in this range. Thus, a low-value series coil and a linearising circuit can solve the problem. For diy people this doesn't impact cost considerably, but for a commercial designer it's three extra components and they mostly take the easy way. For the underhung voice coil Illuminator drivers we have an inherent recession in the same frequency band and equalising the upper mid becomes even more imperative.



As I wasn't satisfied with my front panel finish I made new front panels and had the spray lacquered by a professional.
 This was what I wanted them to look like. The best "6+1" I've ever made.

CABINET
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Above the basic dimensions for making the Illumina 66 cabinet. What's seen from the drawings and images are certainly not the easiest way of making a pair of 32 liter floor-standers. Obviously the cabs can be made from standard rectangular cross-section. Make sure of the following features:

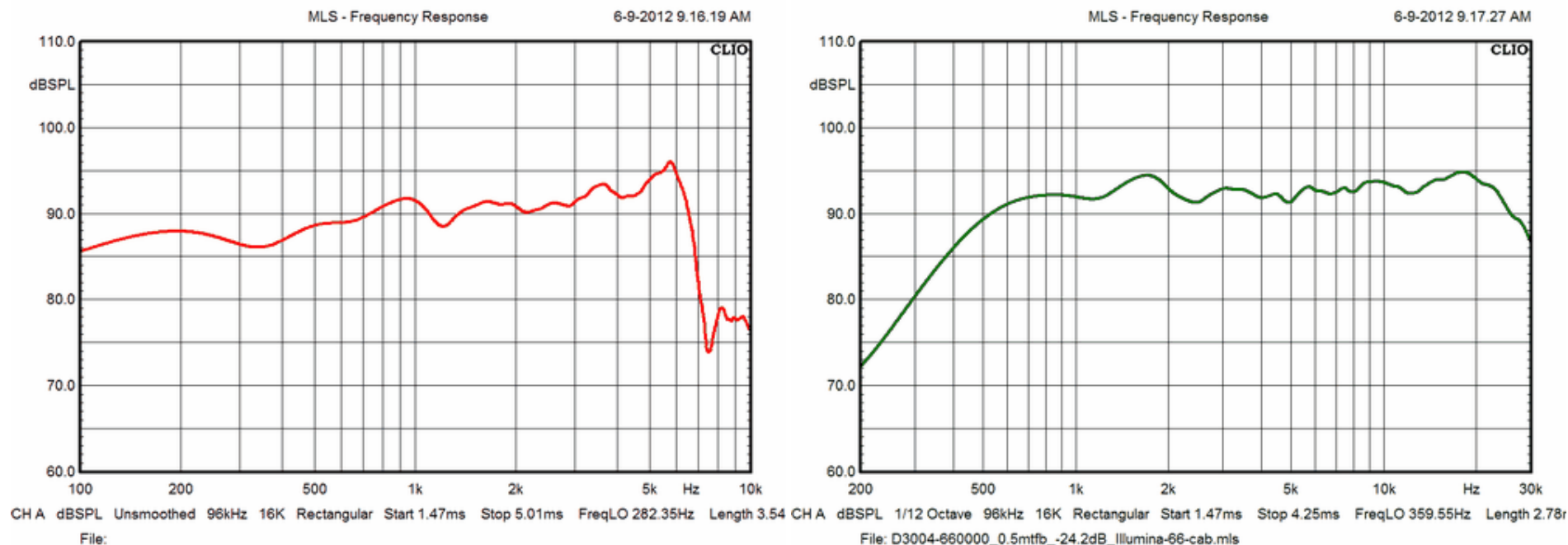
- keep front panel dimensions, faceting and driver placement as seen from drawings
- tilt cabinet 5 deg.
- provide 30-32 liter net volume
- use port 68 x 220 mm.

MEASUREMENTS

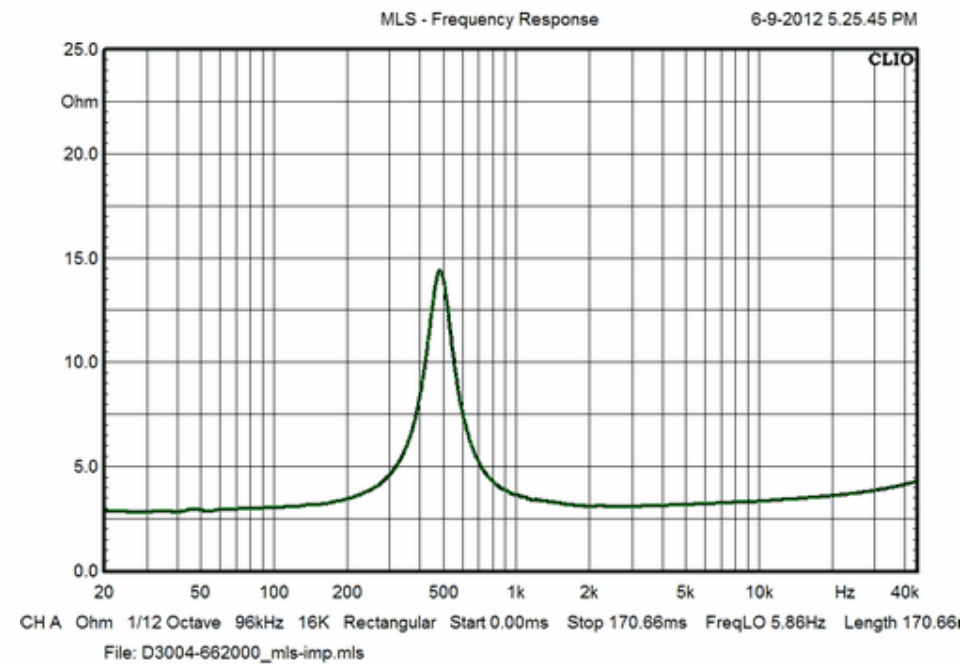
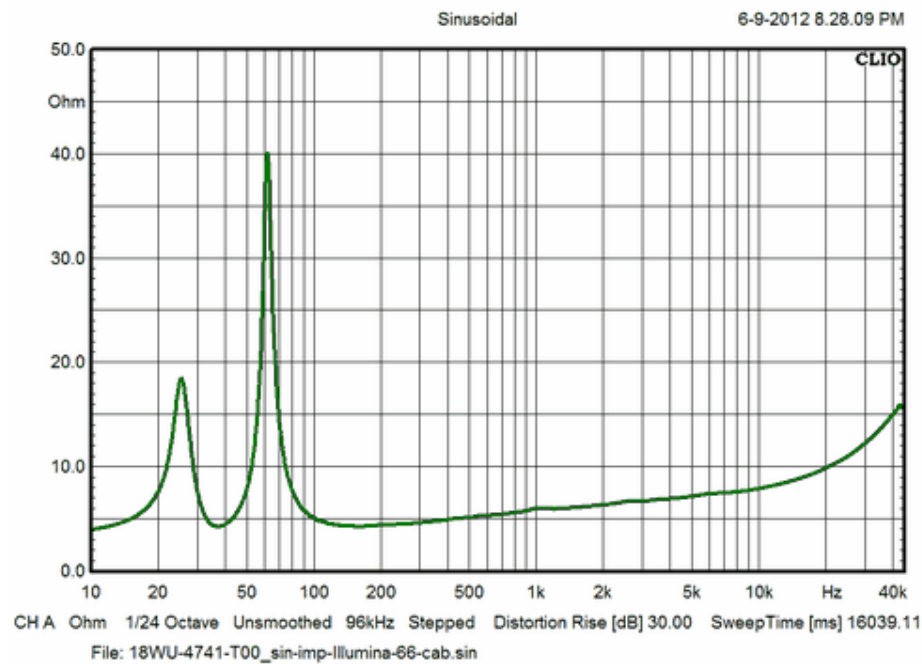
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Measurements may give us an idea of tonal balance of a system, i.e. too much or too little energy in certain areas. Measurements may tell us about bass extension if far-field measurements are merged with near-field measurements. In addition to this ports may contribute to bass extension. Most of us diy'ers do not have access to an anechoic room for full-range measurements from 20-20000 Hz.

What cannot be seen is what kind of bass performance we get in a given room. Bass performance is highly dependent on in-room placement of your speaker and the same speaker can be boomy in one place and lean in another. Actual SPL level at 1 meter distance and 2.8V input is useful for an estimate of system sensitivity and combined with the impedance profile may give an idea of how powerful an amplifier is needed to drive the speaker to adequate levels. What measurements do not tell is the very sound of the speaker unless displaying serious linear distortion. The level of transparency, the ability to resolve micro-details, the "speed" of the bass, etc., cannot be derived from these data. Distortion measurements rarely tell anything unless seriously bad and most modern drivers display low distortion within their specified operating range. Many people put way too much into these graphs and my comments here are only meant as warning against over-interpretation. There are way more to good sound than what can be extracted from a few graphs. Every graph needs interpretation in terms of what it means sonically and how it impacts our choice of mating drivers, cabinet and crossover design.



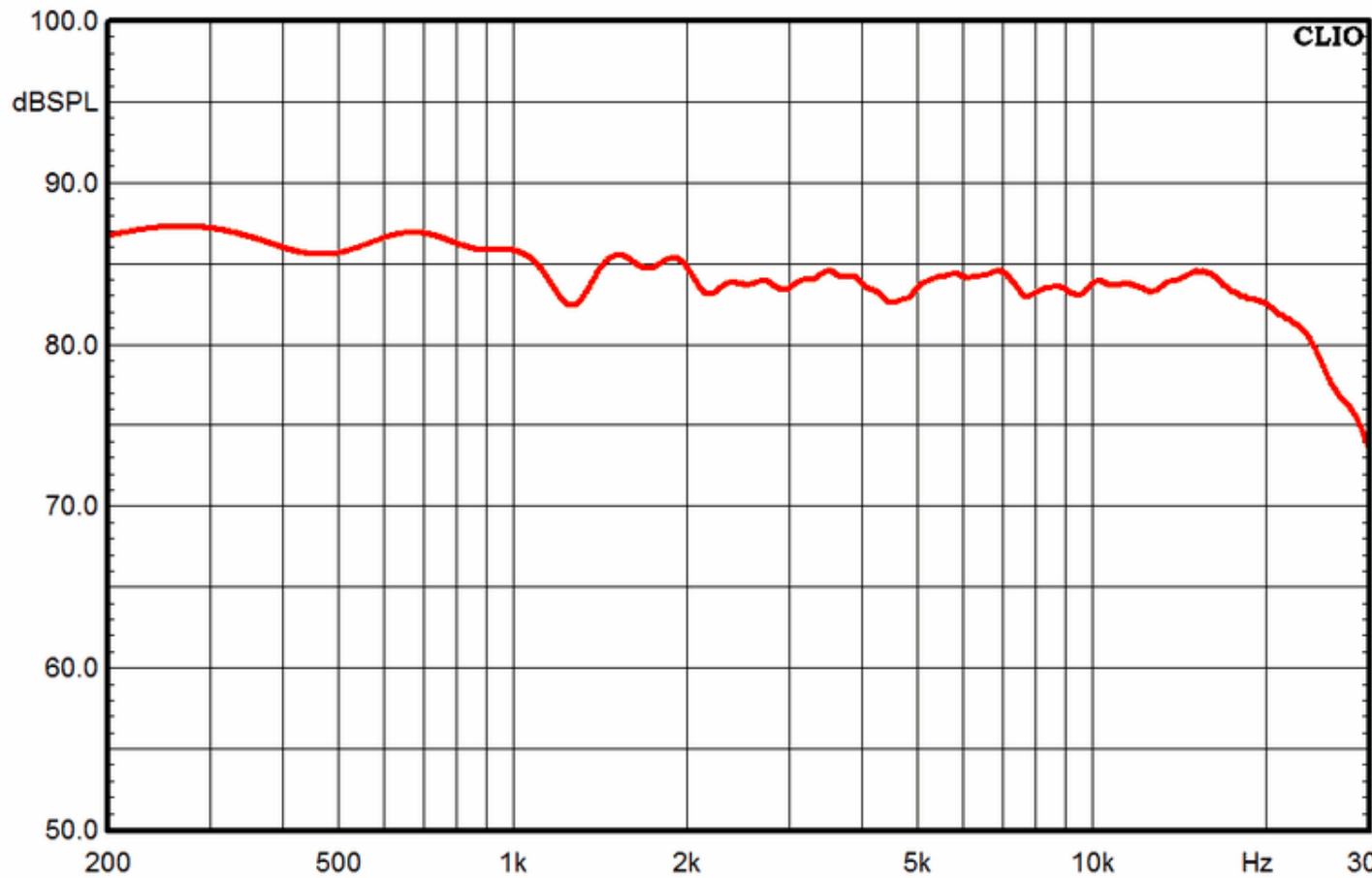
Left: SPL @ 1m/2.8V from 18WU/4741-T00 driver in cabinet. Right: SPL @ 1m/2.8V from D3004/660000 in cabinet.



Left: Impedance of 18WU/4741-T00 driver in cabinet. Right: Impedance D3004/660000 in cabinet.

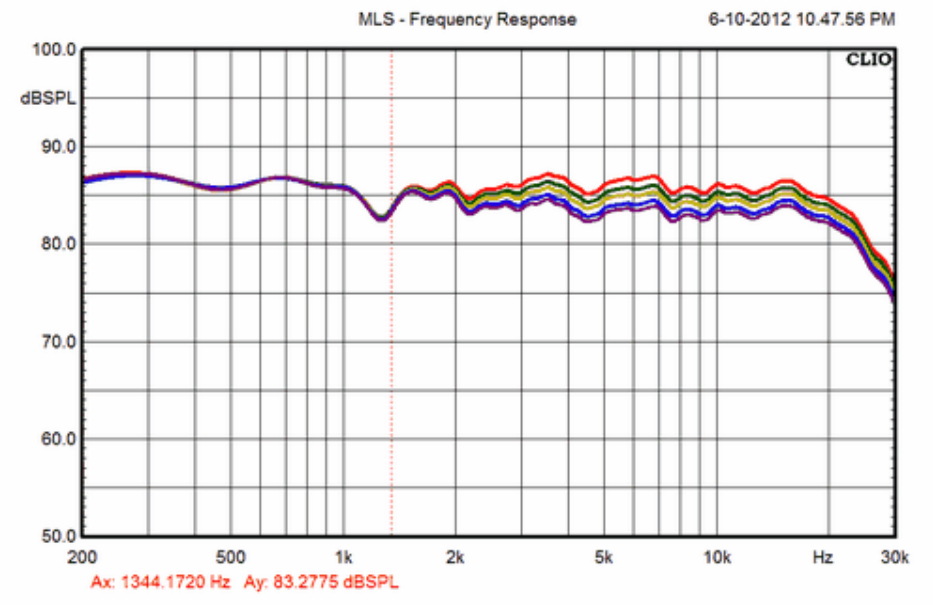
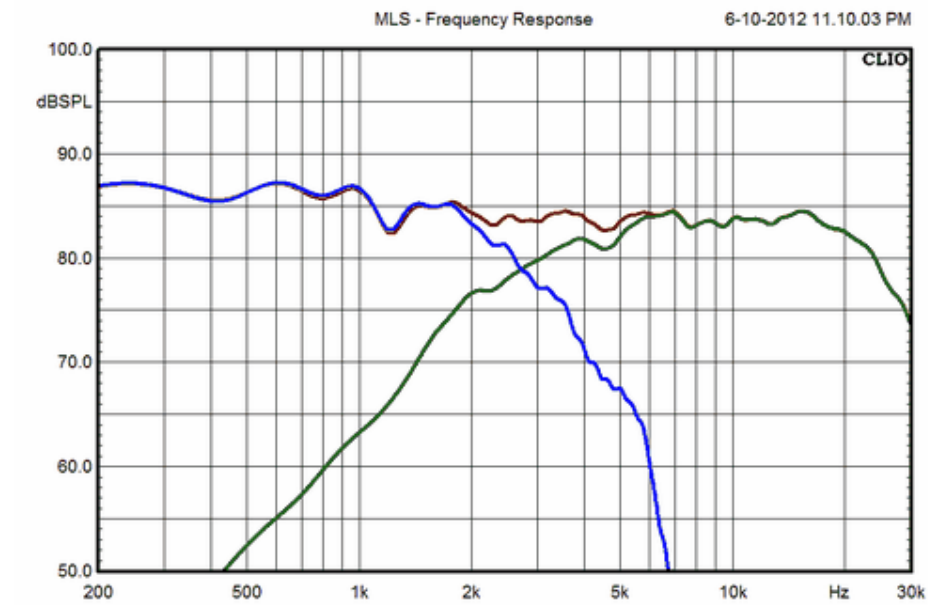
MLS - Frequency Response

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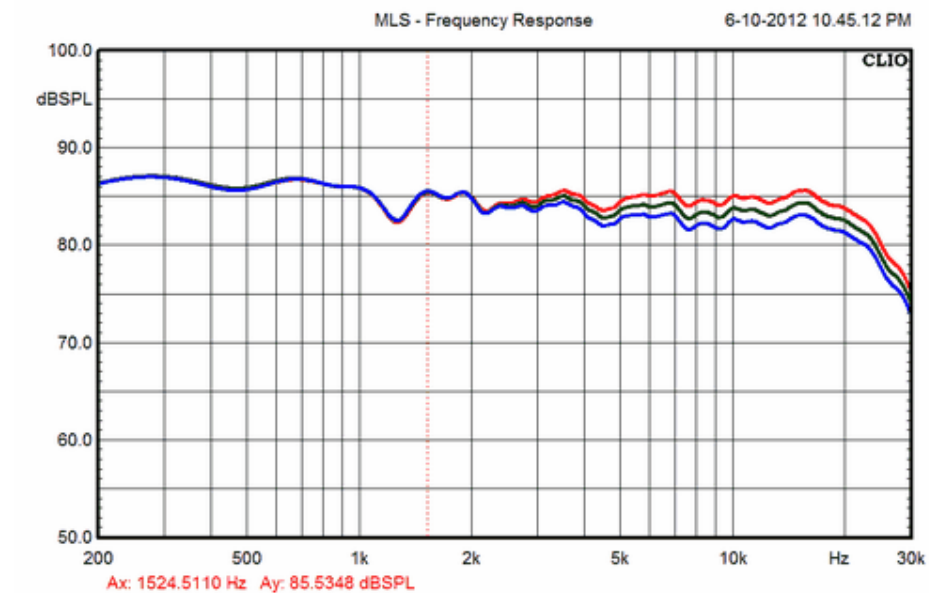


CHA dB SPL 1/12 Octave 96kHz 16K Rectangular Start 1.40ms Stop 4.18ms FreqLO 359.55Hz Length 2.78r
File: V2_spl_0.5mtfb_-24.2dB_B.mls

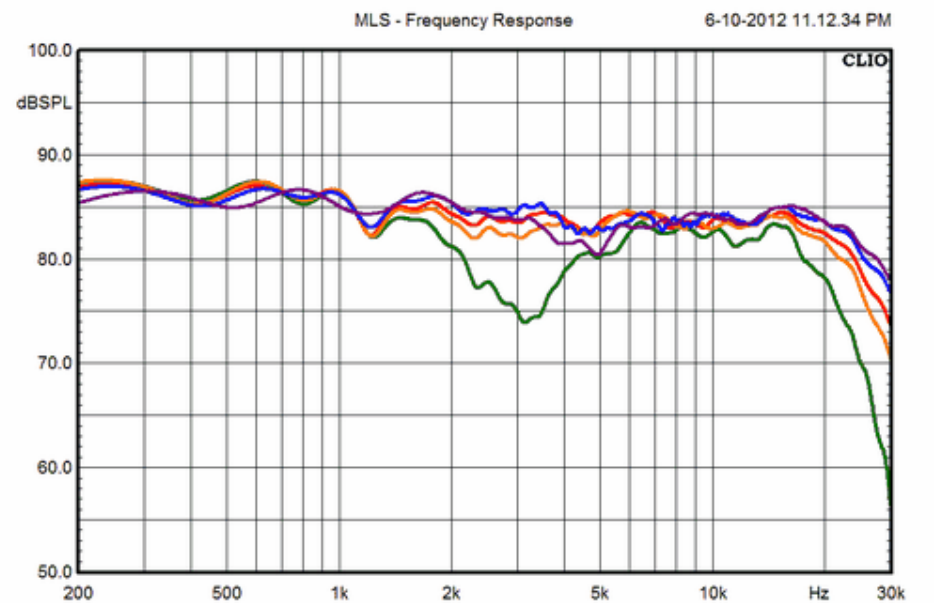
Final system response measured at 0.5 m, normalised for 1 meter, 2.8V. System sensitivity = 87 dB/2.8V.
Tweeter attenuation: R1011 = 2.2 ohm.



Left: SPL from drivers driven from crossover. Point of crossover = 2.7 kHz.
Right: Tweeter attenuation by changing R1011, here 0R47, 1R0, 1R5, 2R2 and 2R7. 1R0 provides an nearly flat response.



CHA dB SPL 1/12 Octave 96kHz 16K Rectangular Start 1.40ms Stop 4.18ms FreqLO 359.55Hz Length 2.78r
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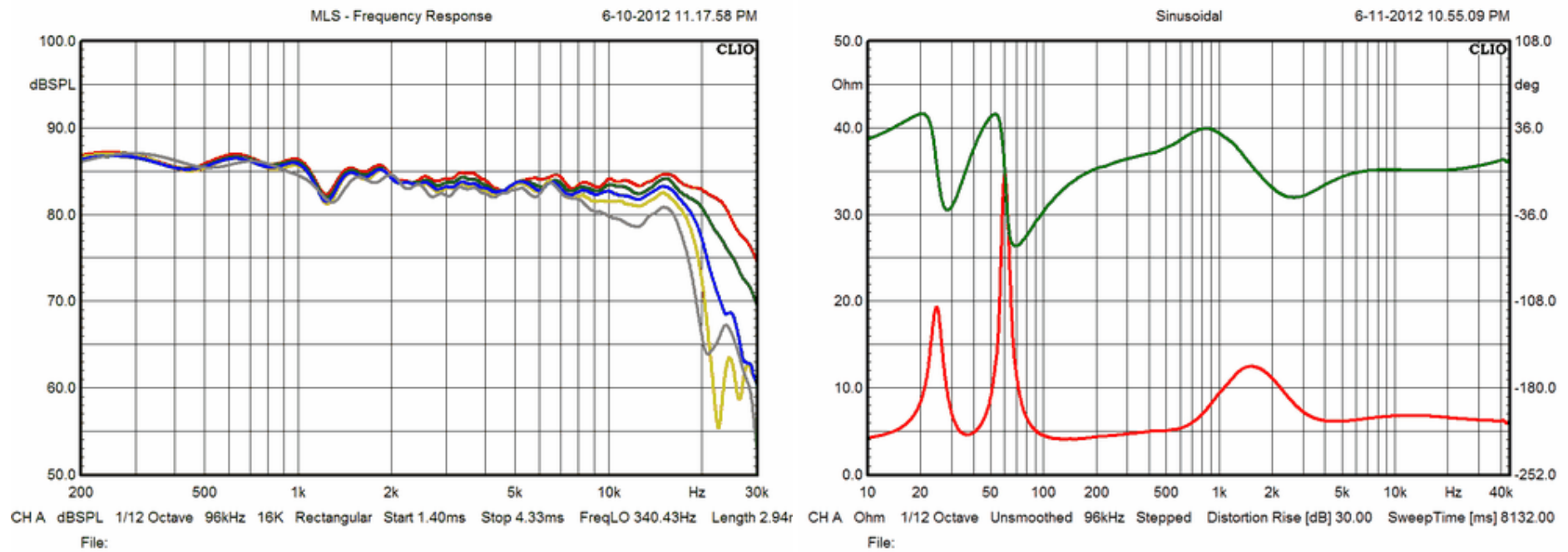


CHA dB SPL 1/12 Octave 96kHz 16K Rectangular Start 1.40ms Stop 4.10ms FreqLO 369.23Hz Length 2.71r
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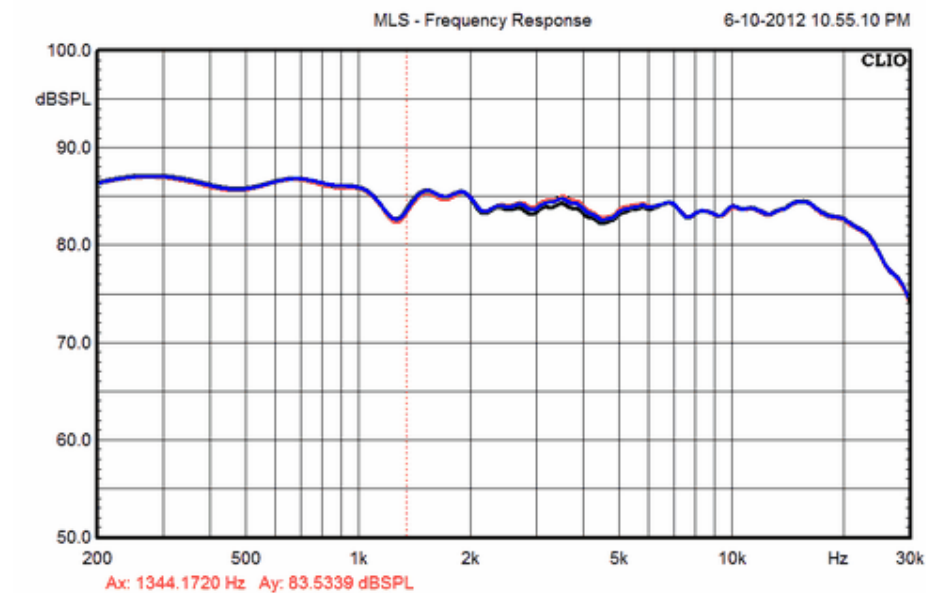
Left: Tweeter attenuation by changing R1051, here 2R2, 3R3 and 4R7.

As can be seen, this makes a higher working point for tweeter attenuation compared to changing R1011.

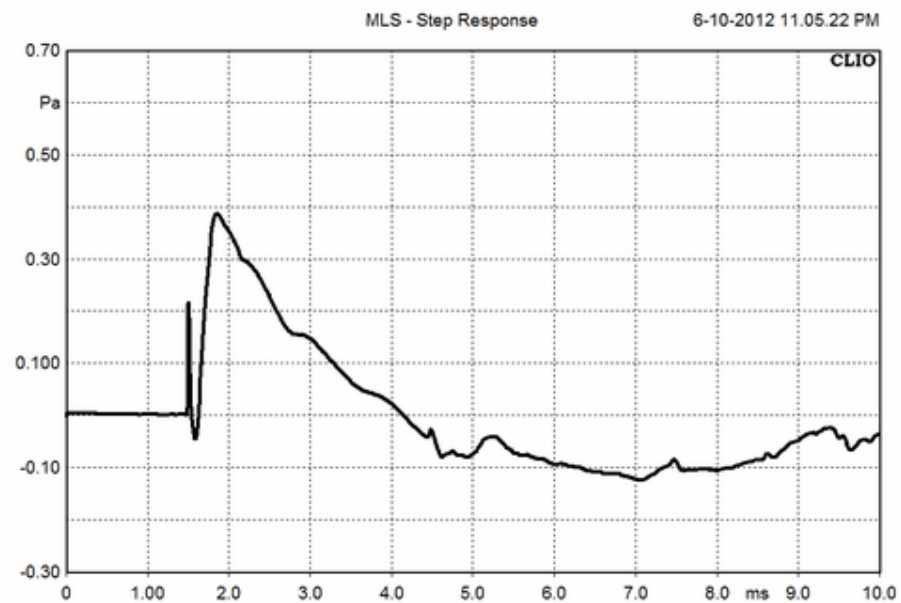
Right: Vertical dispersion measured at 0.5 m at tweeter height (blue) and downwards. Green = below bass driver.



Left: Horizontal dispersion at 0, 10, 20, 30 and 45 deg. angle. Quite an exceptional even even dispersion.
 Right: Final system impedance. Minimum = 4 ohms. Green = phase.



CHA dB SPL 1/12 Octave 96kHz 16K Rectangular Start 1.40ms Stop 4.18ms FreqLO 359.55Hz Length 2.78r
 File:



CHA dB SPL 1/12 Octave 96kHz 16K Rectangular Start 1.40ms Stop 4.41ms FreqLO 332.18Hz Length 3.01r
 File:

Just this to show the impact of C1021, here at 6.8 (black), 8.2 (blue) and 10 uF (red). This makes less impact than we would think.
 Right: Step response.

CROSSOVER KIT

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Illumina 66								
Coils:						dim. mm		
Coil No.	Wire Ø mm	AWG	mH	Ohm	Ø x h x Ø	core	discs	pcs
WAX		12	1.0	0.18	83			2
1307	1.00		2.70	0.92	25 x 30 x 51	0	0	2
WAX		14	0.27	0.12	56			2
1057	1.00		1.00	0.55	25 x 30 x 42	0	0	2
Caps		type	volt	uF	mm, Ø x L			
Superior Z-cap		MKP	800	0.47	16x43			2
Superior Z-cap		MKP	800	15	52x70			2
Superior Z-cap		MKP	800	8.2	36x70			6
Standard Z-cap		MKP	400	68.0	44 x 68			2
Resistors		watt		ohm	mm, 10 W			
Superes		10		22	bass RC	8 x 53		4
Superes		10		10	bass LCR	8 x 53		2
Superes		10		2.7	T att default	8 x 53		2
Superes		10		1.0	T RL	8 x 53		2
Superes		10		3.3	Tatt	8 x 53		2
Superes		10		2.2	T-LCR	8 x 53		2
Superes		10		1.5	extra T att	8 x 53		2
Superes		10		3.3	extra T att	8 x 53		2
								38
Miscellaneous		item #						
terminals		satin nickel			pair			2
ports		#900018			68 x 220			2
wire, red		silver plated PFTE			meters			6
wire, black		silver plated PFTE			meters			6
solder tag strips		gold plated						3
felt material, 8 mm					square meters			1
acoustilux, 30 mm					square meters			1
drivers								
ScanSpeak		18WU/4741T00						2
ScanSpeak		D3004/660000						2

For full quotation with/without drivers incl. shipping, please contact Jantzen Audio at contact@jantzen-audio.com
Remember to state where you live to calculate shipping.



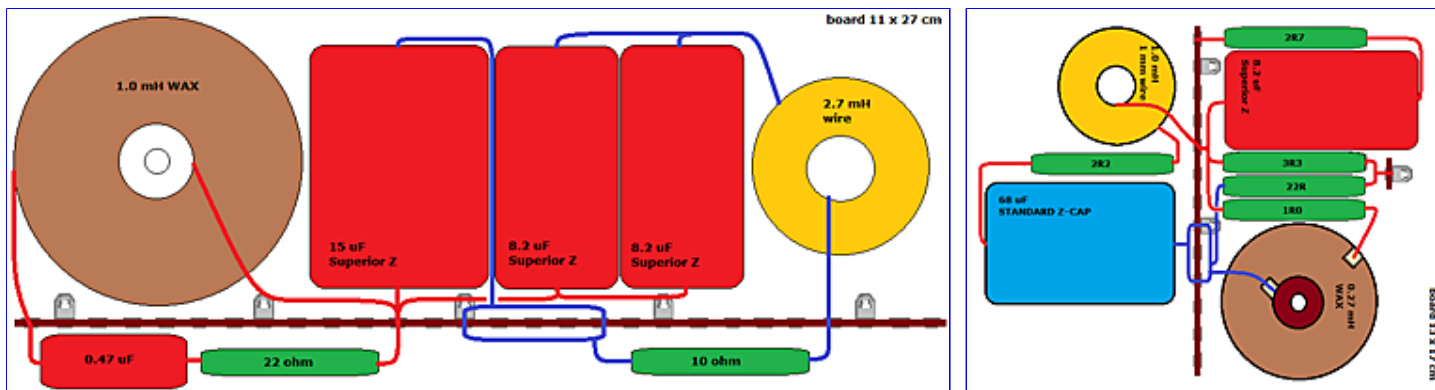
Download kit sales presentation:

All technical question at: troels.gravesen@hotmail.com

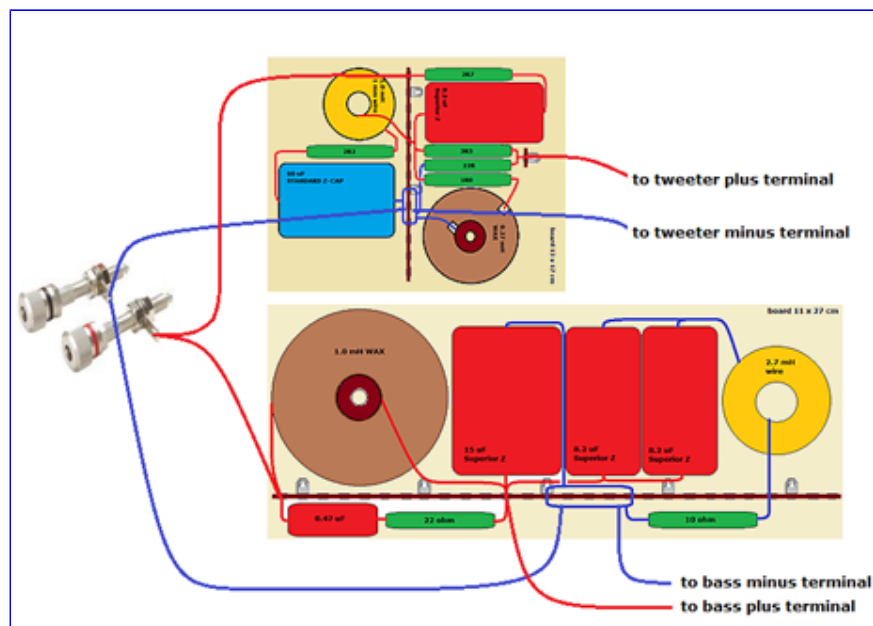
For 6620 version, order 6600 version plus the following resistors: 2 x 1R5, 2 x 2R2 and 2 x 10R, all 10 watt Superes.

CROSSOVER LAYOUT

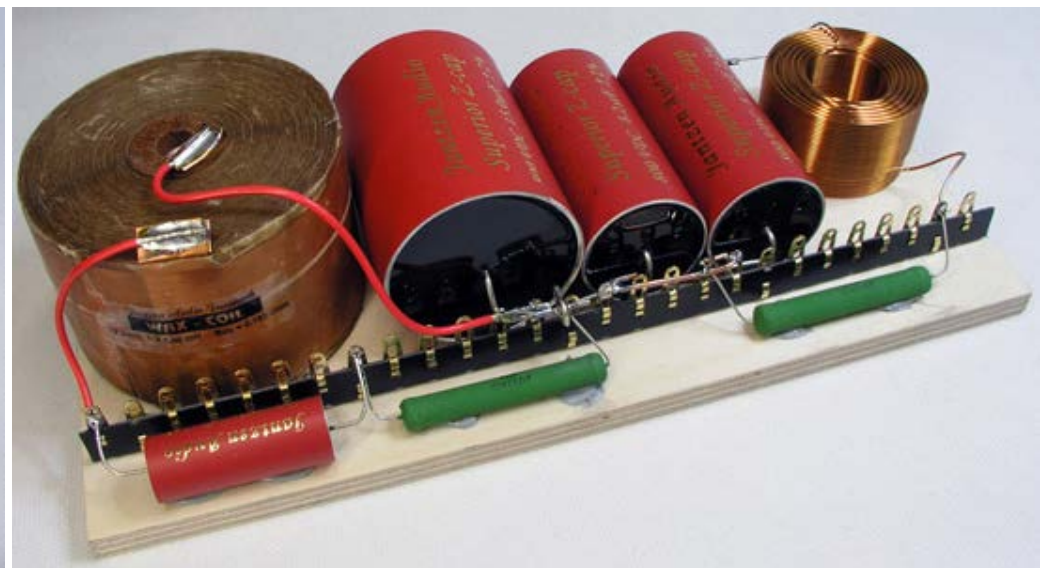
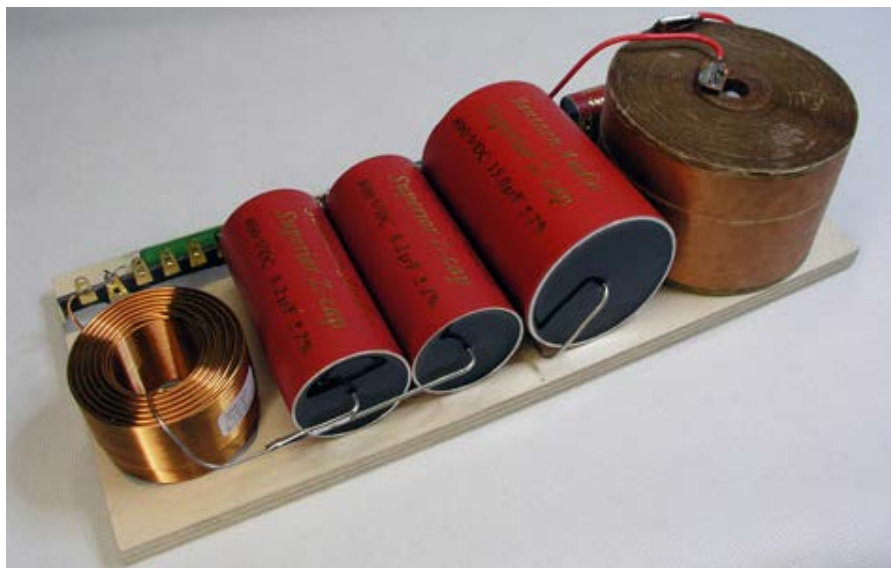
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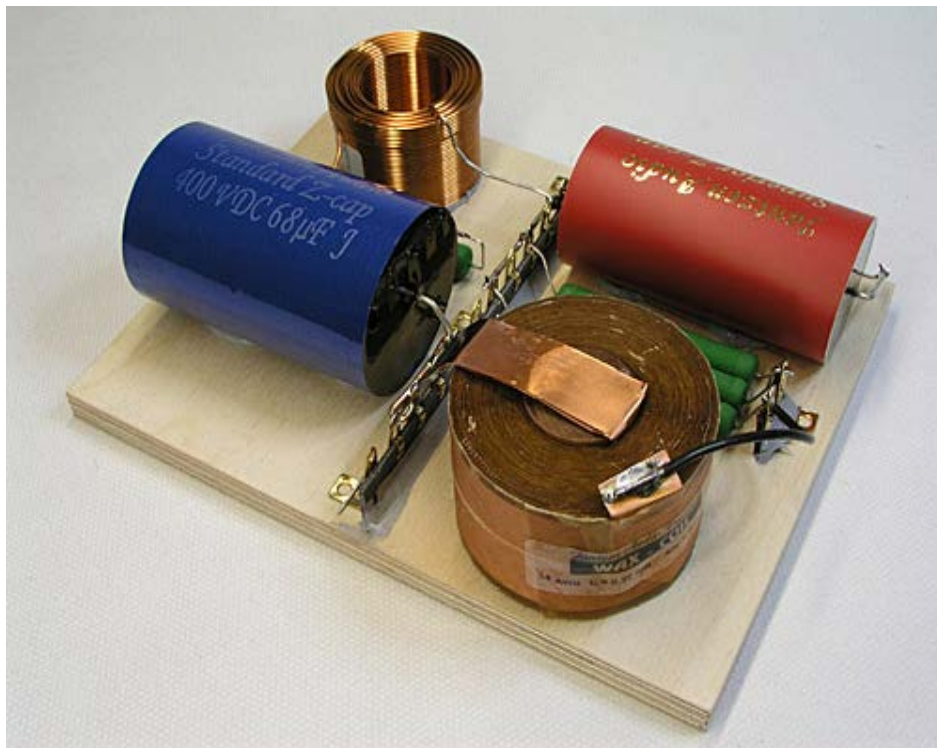
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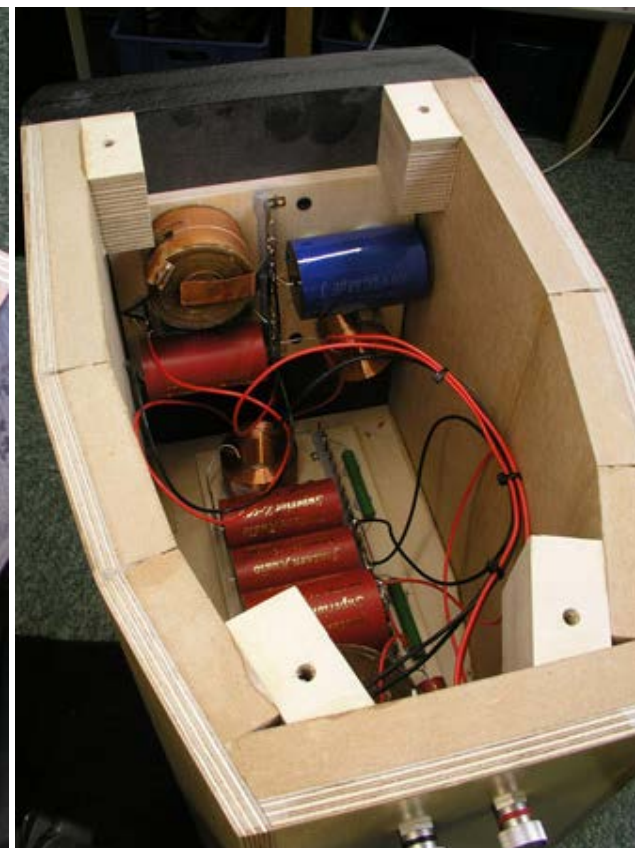
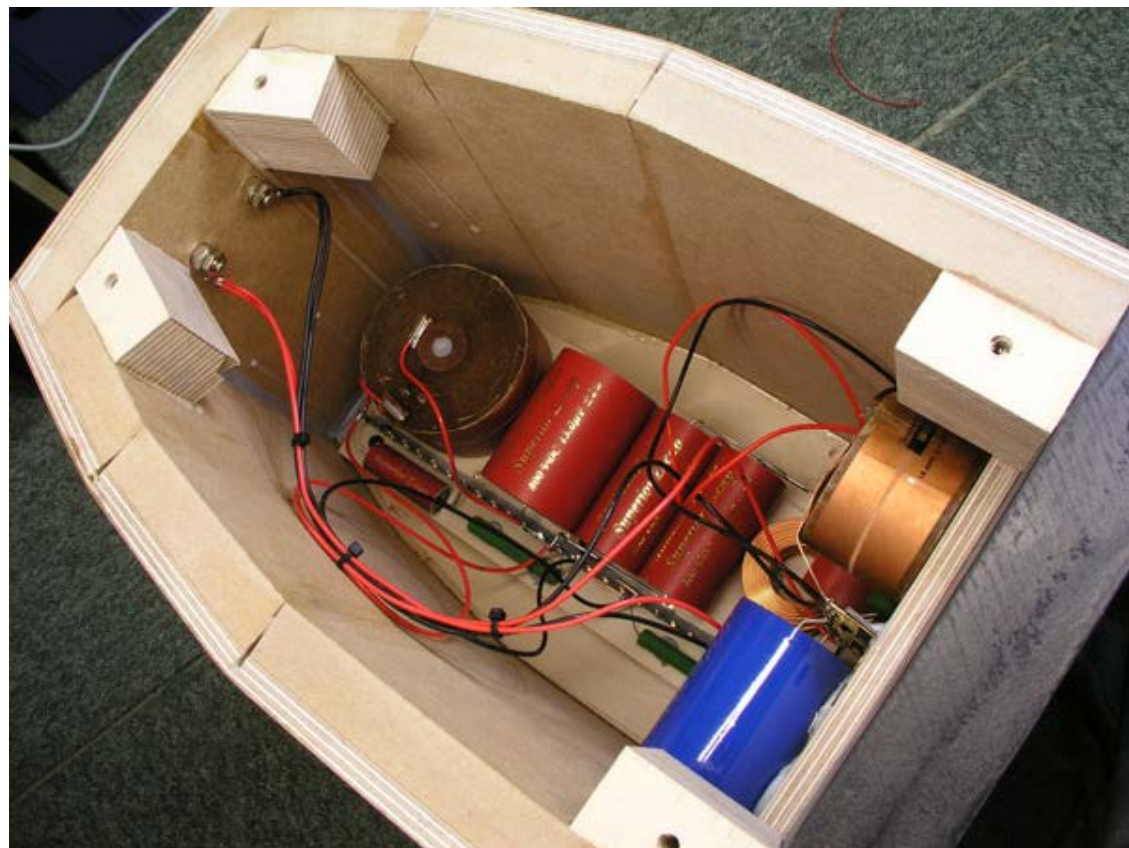
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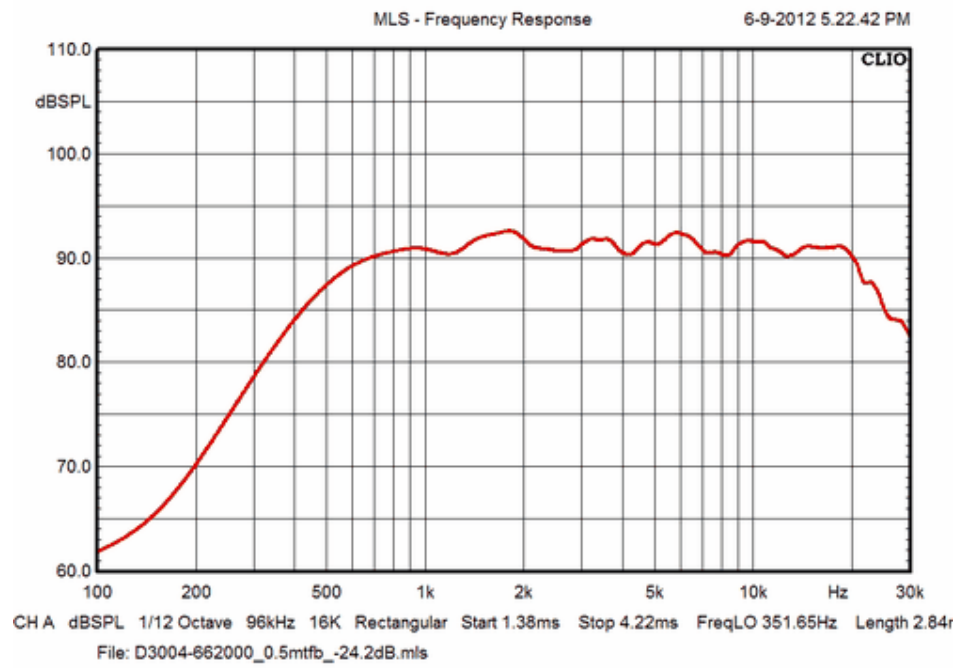
The best part of the whole process: Mounting the drivers!

R3004/662000 version
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Click image to view large.
Download specs [here](#).

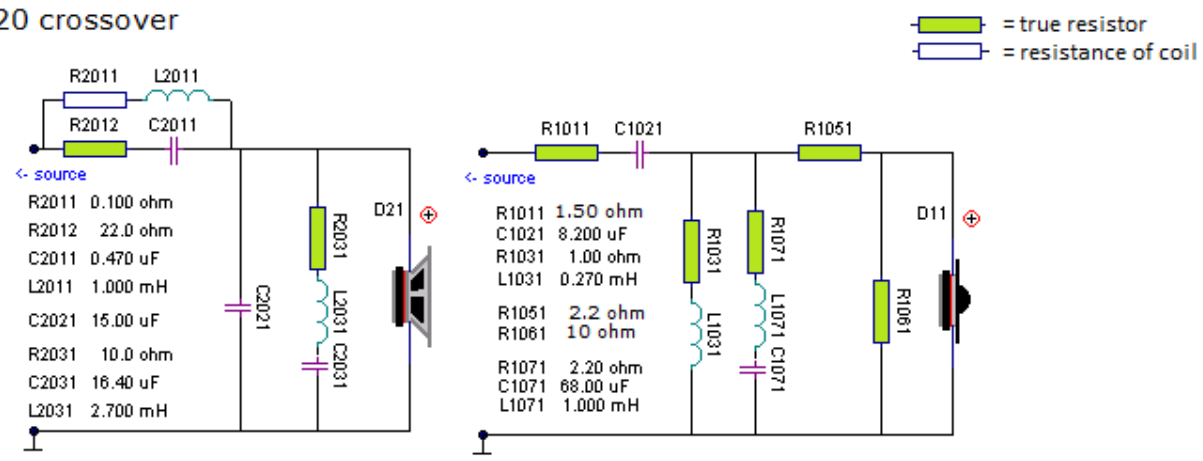
The ring-radiators have many fans - and I'm one of them. This Revelator diaphragm is here fitted with the Illuminator magnet system and rear chamber, displaying reduced sensitivity but far enough for most systems. As always - well, depending on actual baffle - these ring radiators deliver a smooth frequency response, here +/- 1.5 dB from 700-20000 Hz.



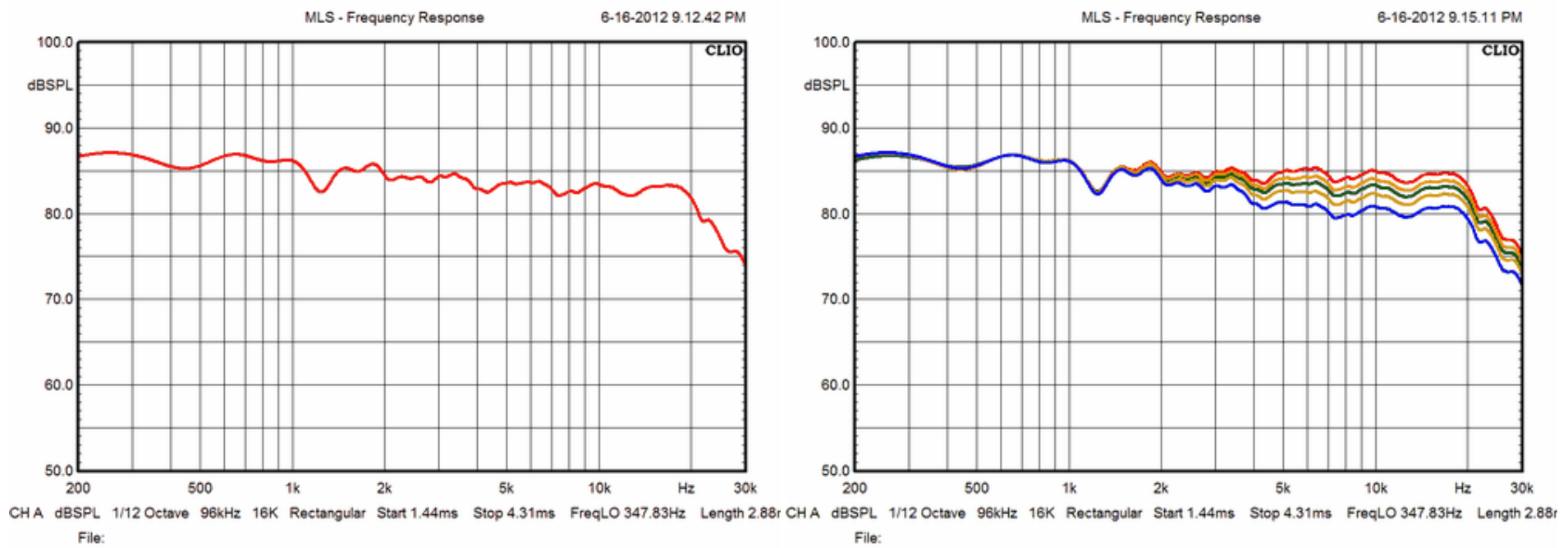
SPL from R3004/662000 on Illumina cabinet front panel. Makes crossover work easy.

R3004/662000 Crossover

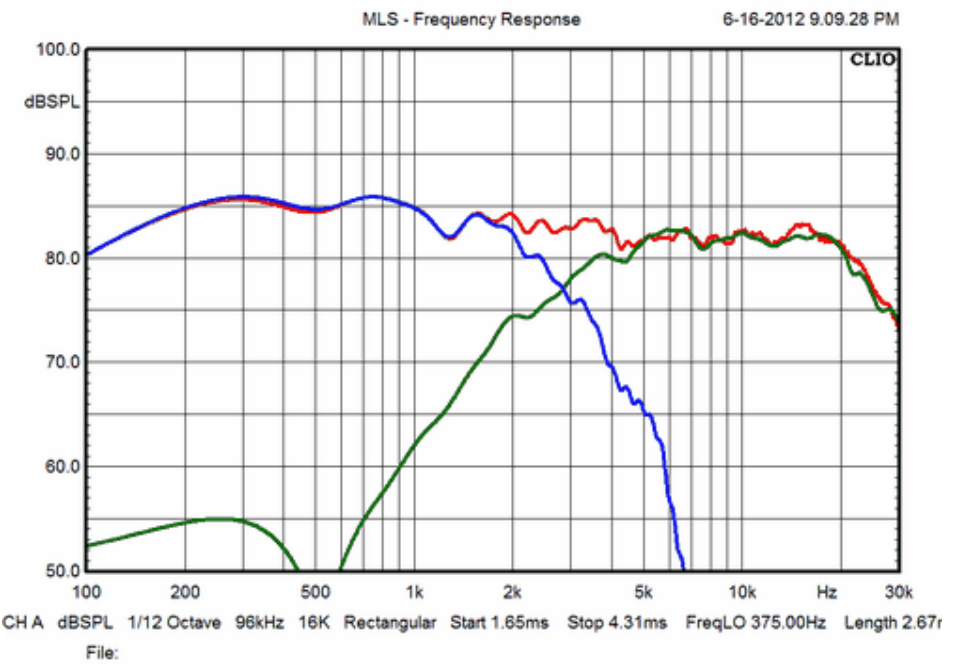
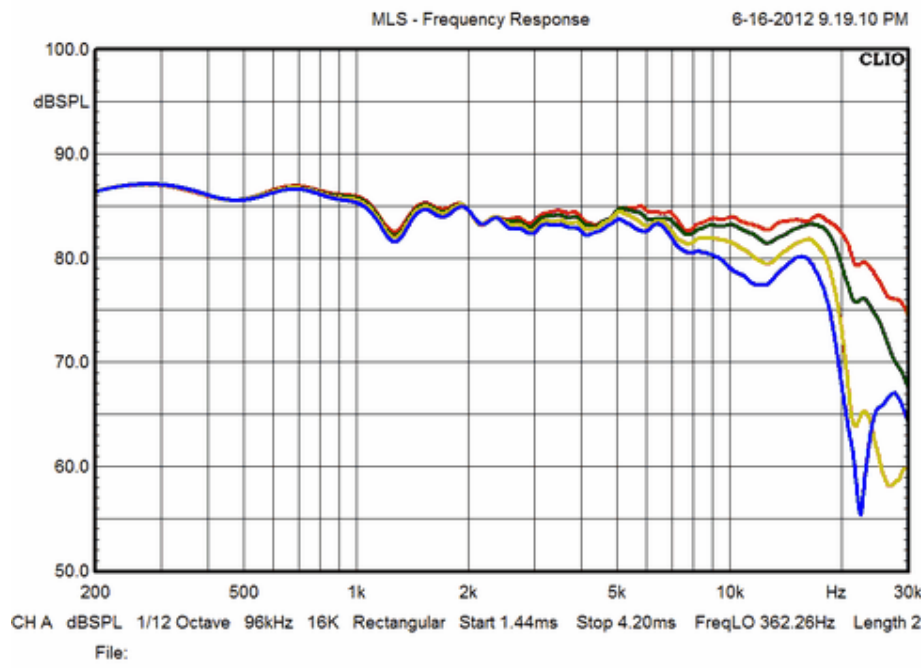
Illumina 6620 crossover



The only changes from the 6600 options are values of R1011, R1051 and R1061.
Order 6600 tweeter version plus the following resistors: 2 x 1R5, 2 x 2R2 and 2 x 10R, all 10 watt Superes.



Left: SPL of 6620 version with 1R5 to tweeter (R1011). Right: Tweeter attenuation from R1011 = 0R47, 1R0, 1R5, 2R7 and 3R3.



Left: Horizontal dispersion at 0, 10, 20 and 30 deg. Right: SPL of drivers driven from crossover incl. summed response (red). Point of crossover around 2.7 kHz.