

## Otello



### DESCRIPTION

Two-way, classic bass-reflex monitor loudspeaker with 15cm coated NRSC fibre glass cone midwoofer + 19mm tweeter with fabric dome, double rear volume and diffraction damping foam front.

### SPECIFICATIONS

Sensitivity • 86 dB / 2,83 volts  
Impedance • 8 ohms nominal (minimum 6,4 ohms @ 220 Hz)  
Frequency response • 48 - 20.000 Hz (-3dB) / 38 - 28.000Hz (-10dB)  
Crossover frequency • 2000Hz  
Power rating • circa 60 watts RMS  
Dimensions (W x H x D) • 230 x 360 x 190 mm  
Weight (finished product) • 6,9 kg each

[DOWNLOAD CAD-DRAWING](#)

[DOWNLOAD DIY KIT PARTS LIST](#)

[DOWNLOAD DATASHEET SCANSPEAK D2010-8511](#)

[DOWNLOAD DATASHEET SCANSPEAK 15W/8434G00](#)

The loudspeaker kit contains all the components you need, even small items such as black screws for mounting the drivers, gasket sealing tape, etc. The only thing you need to purchase separately is the wood for the cabinets. The hard-wired crossovers come pre-assembled, matched and tested. The price for this DIY loudspeaker kit is EUR. 387,- each / EUR. 774,- per matched pair. **New lower pricing! See our [general price list for the latest prices.](#)**

### INTRODUCTION

The Otello loudspeaker is a very compact two-way monitor loudspeaker following a classic form-follows-function design. The cabinet internal dimensions are based on the Fibonacci Numbers. The Fibonacci sequence of numbers is named after the Italian mathematician Leonardo of Pisa, known as Fibonacci. His 1202 book *Liber Abaci* introduced the sequence to Western European mathematics. The Fibonacci Numbers are intimately connected with the Golden Ratio; for example, the closest rational approximations to the ratio are 2/1, 3/2, 5/3, 8/5, etc. Fibonacci sequences often appear in nature. More in depth information about the Fibonacci Numbers can be found on [Wikipedia](#). Anyway, enough about the theory, what does it mean in practice? Well, acoustically speaking the sequence is an ideal ratio for the width, height and depth of a loudspeaker cabinet due to the fact that the numbers are not a multiple of each other. In the case of the Otello it's internal width 194 mm and the height is 324 mm. This is a ratio of 3 : 5. The internal depth is 154 mm which is a result of the volume needed, unfortunately not exactly part of the Fibonacci sequence but close enough and still not a multiple of one of the other two dimensions. Also the ratio's are very pleasing visually, there is something "correct" about them.



### THE DRIVERS

The Scan-Speak D2010-8511 tweeter used for the Otello has been around for quite some time but is still, after all those years,

one of the best 19mm dome tweeters available. Made in Denmark it is full of great features. The voice-coil is free from ferrofluid resulting in finer top end detail than ferrofluid filled tweeters. Ferrofluid acts as a heat sink to cool the voice-coil at high SPL's but also works a bit like a brake, especially when the loudspeaker is playing at low sound pressure levels. The tweeter further has diffraction damping foam on the front and a large dual rear chamber resulting in a nice low resonance frequency.



The 15cm mid woofer used for the Otello is also sourced from Scan-Speak and made in Denmark. This 15W/8434G00 mid woofer has a coated NRSC fibre glass cone connected to a low damping rubber surround. Together with the magnet all the parts are mounted in a nice sturdy die-cast aluminium chassis that is vented below the spider. All this results in low mechanical resistance and a very smooth frequency response. These woofers are sold as matched pairs with the kit, as are all drivers from Humble Homemade Hifi. Matching drivers, components and crossovers is imperative for obtaining maximum stable and spacious imaging. You can download datasheets of the mid woofer and tweeter from the grey section at the top of this page.



The cabinets of these very small loudspeakers are made from 18 mm / 13 ply marine grade baltic birch plywood. There is an odd number of plies so that the sheet is balanced, this reduces warping. Because this plywood is bonded with grains running against one another and with an odd number of composite parts, it is very stiff. The quality of the wood used for the Otello is so called BB-grade. This means that jointed veneers and small plugs are permitted but to a much lower extent than the cheaper C or CP grade. If you want the surface to be free from plugs then choose B-grade. That type is also ready for clear varnishing without any extra treatment. You can download a copy of the cabinet drawings from the grey section at the top of this page. The cabinets are very simple to make and consist of only six panels each. There is no extra internal bracing. All panels are bevelled 45 degrees at the edges so that when glued together there are no visible panel ends. Using white PVA wood glue and some masking tape it is very easy to put the panels together. Dry fit first to make sure are panels are cut to exact size. Once your are sure the panels will fit it shouldn't take any longer than about 15 minutes to glue a cabinet together. When fitted, leave it over night for the glue to dry. If you don't have the possibility to make bevelled edges you can also just used butted joints. Check out the [HATT MK-VIII](#) page to see how that is done.



I chose to veneer the cabinets, I used a cherry veneer. The veneer is applied with normal white PVA wood glue that is spread with a fine toothed comb over the whole surface area of the cabinet. The veneer is then pressed, between some panels and with the use of clamps, into the wet glue and left for a couple of hours to dry before the next panel is done. Once both cabinets are veneered, all cut-outs made and the whole thing smoothly sanded, it is time for the surface finishing. I used two layers of matt, water-based clear varnish sold here in The Netherlands as "Glitsa Parketlak PT". It is a hard wearing, polyurethane based varnish normally used on hard-wood flooring.



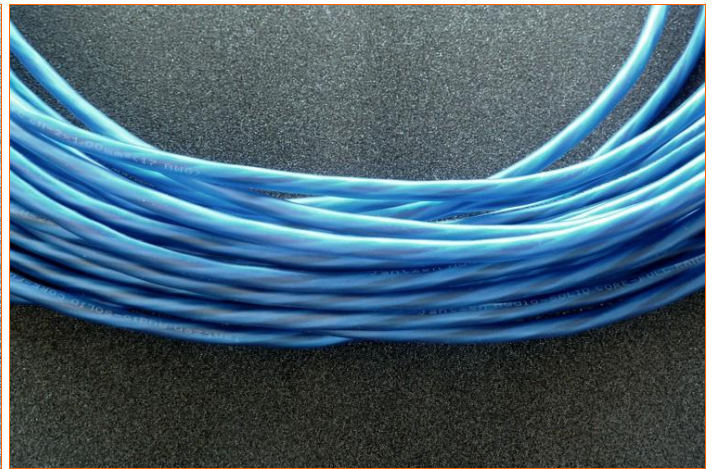
When both cabinets are finished it is time for mounting all the hardware. The DIY loudspeaker kit is sold with all the parts except for the cabinets. Even the black screws for mounting the terminal-plates and the drivers are part of the kit. The damping material is applied to the inside of all the panels except for the baffle and the rear panel. It comes in one long strip that is folded to cover both sides, top and bottom panels. The damping material used is a special type of polyester fibre that varies in density. One side is higher density than the other, the higher density side is placed against the cabinet walls. No glue is needed, the polyester fibre sheets are simply held in place because they are cut slightly over-sized.



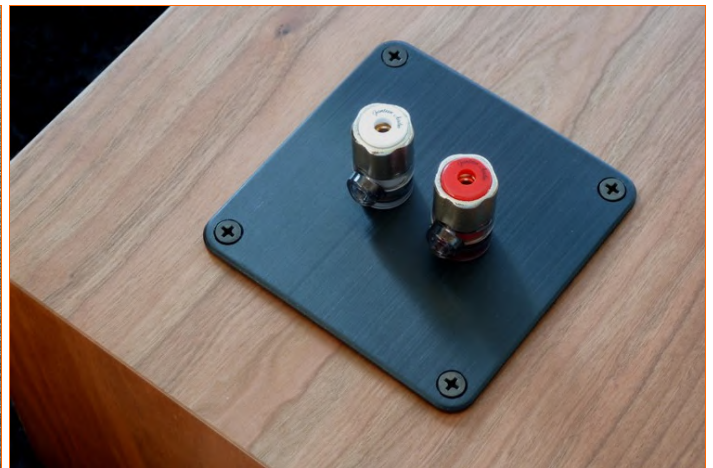
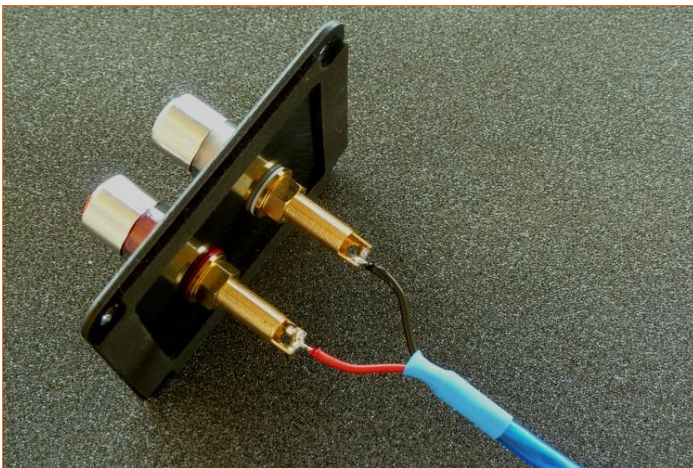
Gasket sealing tape is applied to the cabinet where it will be in contact with the back of the drivers and the ports. The binding-post plate is supplied with its own air-tight seal. The ports press fit into place if you have made the hole exactly 63,5mm in diameter ;-)



The binding-posts are high quality gold-plated with a free-spinning metal ferrule on the tightening knob that allows a secure connection without any tendency to work loose or damage the wire. Internal wiring is 6N copper solid core wire from Jantzen Audio, the best low-cost speaker cable I could find.



The binding-posts are the same type of binding-posts found on the back of Marantz's higher range amplifiers such as the PM8005 and are designed to accept a wide range of speaker cable termination types.



Both speakers are mirror images of each other. So the off centre tweeter and port should be mirrored. When listening to the loudspeakers best results are achieved with the tweeters on the inside when looking at them from your listening position. Furthermore the speakers are designed for optimum acoustic phase when the woofers are placed at ear-height. Because the acoustic centre of the woofer is a little further back than that of the tweeter, when you place the mid woofer at ear height the difference in off-set is compensated.

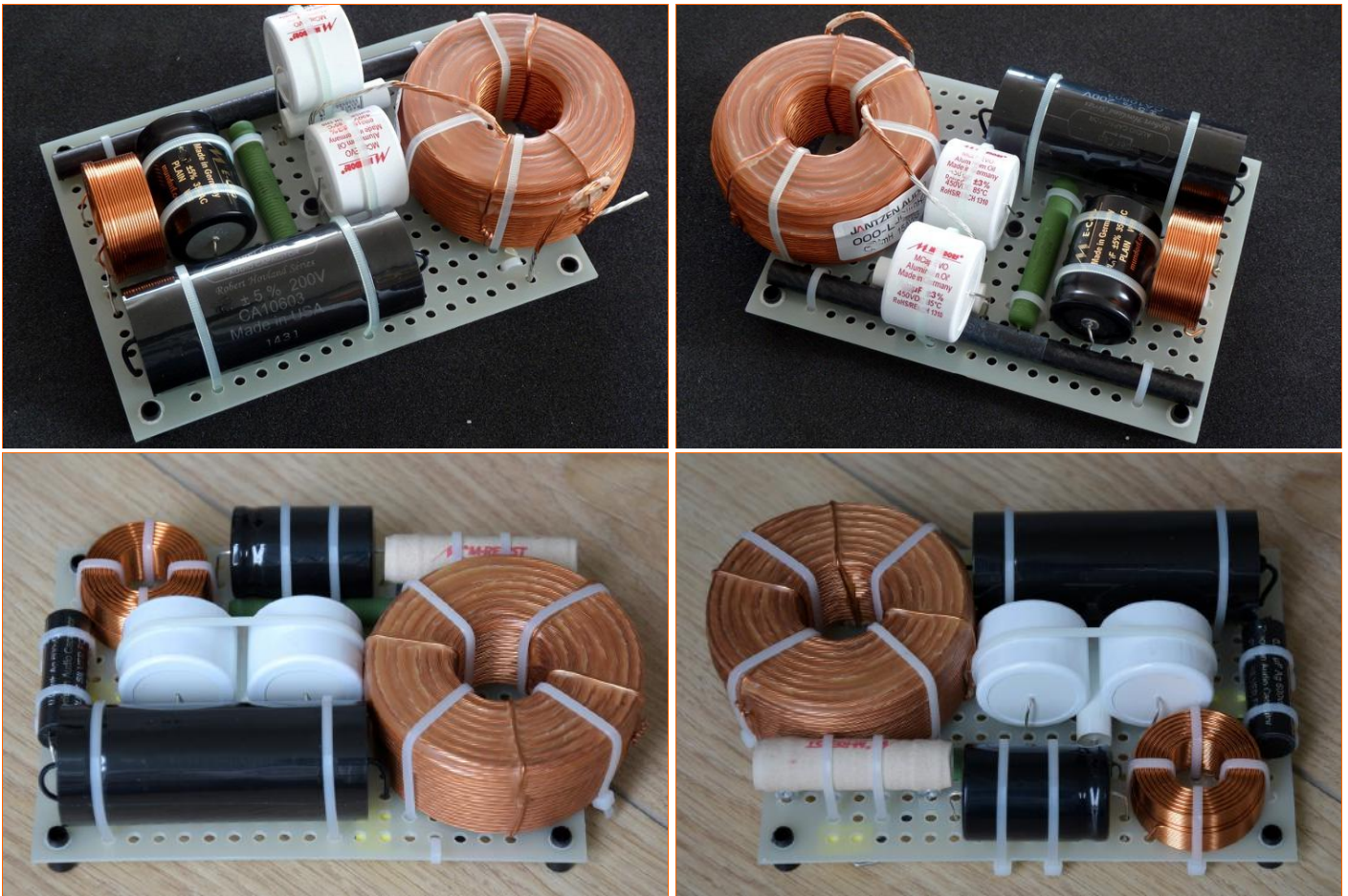


Depending on the height of the stands you use you can either stand the speakers with the mid woofer in the top of the baffle or turn them the other way around and have the mid woofer at the bottom half of the baffle and the tweeter nearer the top. As long as the mid woofer is roughly at ear height. The crossover is also optimized for this configuration.



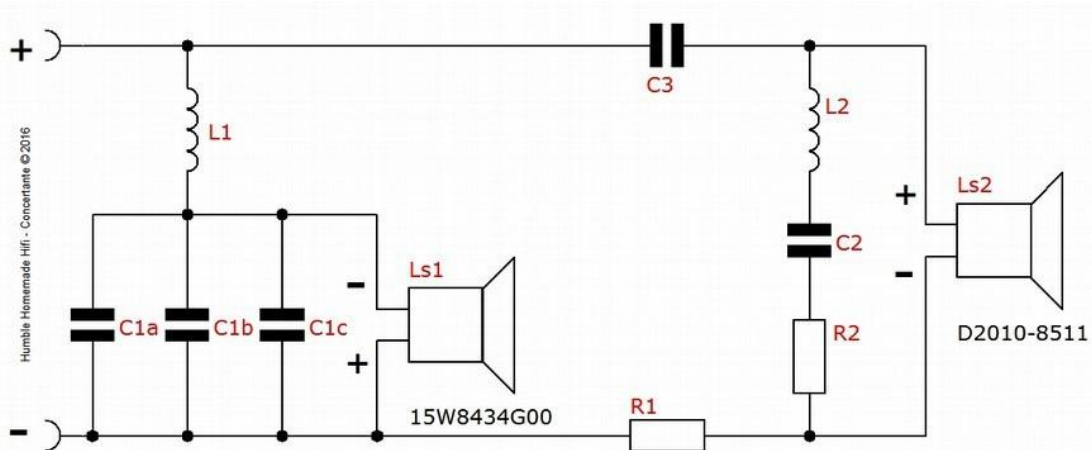
#### THE CROSSOVER

A crossover is the hart and soul of any loudspeaker and extremely important for the end result. The crossovers use very high grade components from renowned suppliers such as Mundorf, Jantzen Audio, Hovland and Duelund Coherent Audio. The crossovers are of course part of the kit and are sold ready-made, matched and tested. The components are all hard-wired from component to component without the use of any extra wire bridges and are mounted on anti static FR4 epoxy circuit boards. The components are held in place with Hellermann Tyton professional grade, halogen free, UL94 V2 rated cable ties.



Above: Two versions of the Otello crossovers: the top two photo's show an earlier pair of crossovers with Duelund CAST Silver Graphite resistors. The bottom two photo's are the latest version with Mundorf MResist Supreme resistors and (as an extra) Duelund Pure Silver Foil bypass capacitors.

The crossovers are supplied with PCB spacers and matching screws. The crossovers should be screwed to the inside of the rear wall. Note that the mid woofer is connected in reverse phase relative to the tweeter. The crossover consists of a modified second order low-pass on the woofer of which the capacitance value is relatively small in relation to the inductor. Three capacitors are connected in parallel to obtain the exact value needed as it is not available as one single capacitor. The crossover on the tweeter is a true first order high-pass. The tweeters impedance peak is flattened by the LCR-network so that the single Hovland capacitor can do it's work properly. Without the impedance compensation there would be a large bump in the tweeters output level below the crossover point. Finally the tweeter's level is brought down to match that of the woofer by means of a single Duelund CAST Silver Graphite resistor. Because the crossover turned out so simple we were able to use a Duelund resistor (for optimum fine detail) and still keep the cost of the kit low. A very good example of *less-is-more*. Update: the kit now uses a Mundorf MResist Supreme resistor for even better price / performance ratio.



**Inductors**

- L1 = Jantzen Audio Litz Wire Wax Coil / 15AWG
- L2 = Jantzen Audio baked varnish air-core / 0,70mm wire

**Resistors**

- R1 = Mundorf MResist Supreme / 20 watts

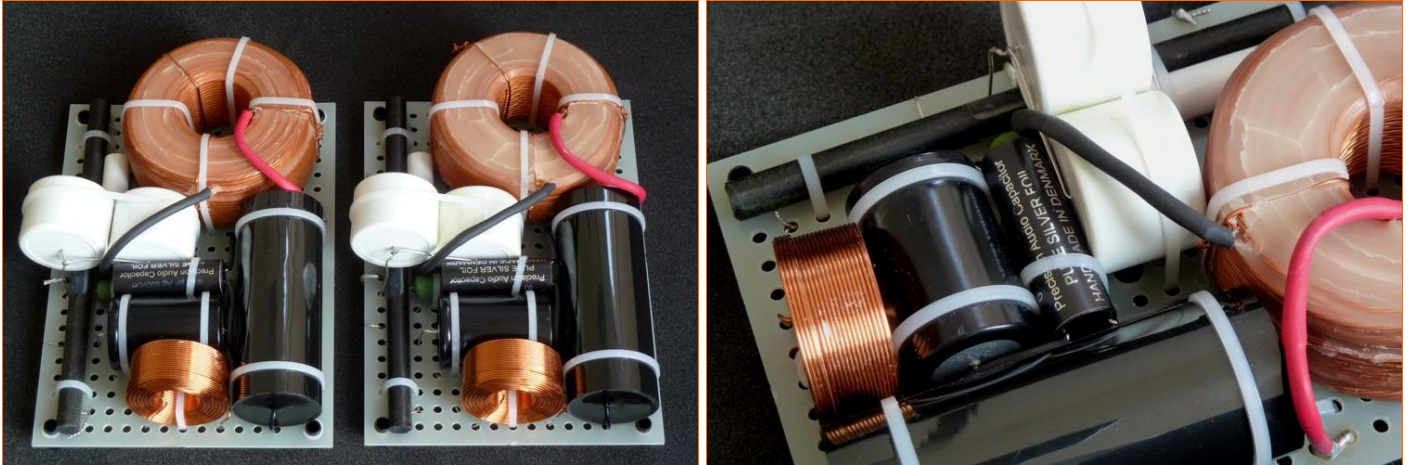
**Capacitors**

- C1a = Mundorf EVO Oil / 450VDC
- C1b = Mundorf EVO Oil / 450VDC
- C1c = Foil bypass cap / 3000VDC

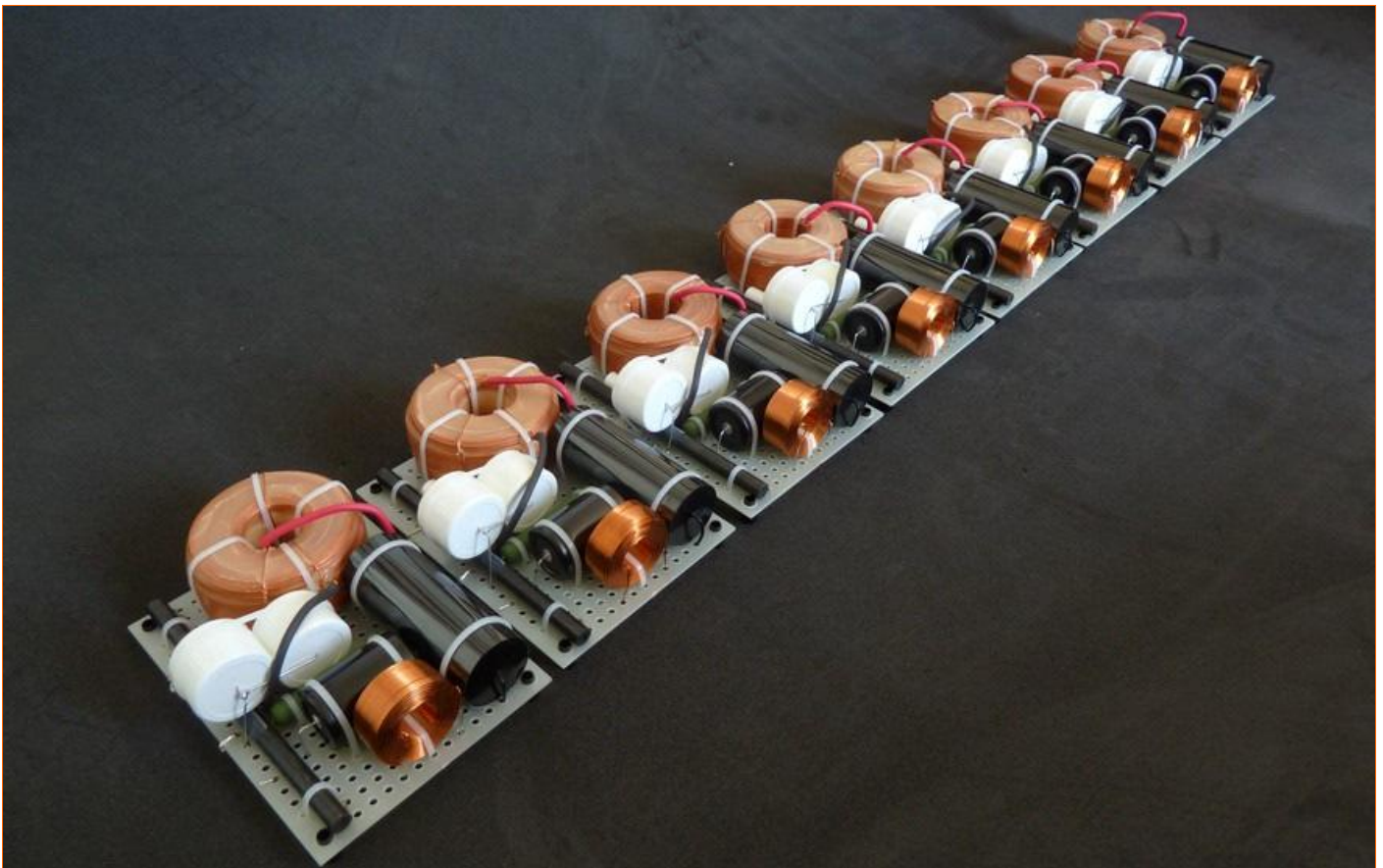
- C2 = Mundorf ECap AC Plain / 50VDC

R2 = Jantzen Audio SuperRes Non-Inductive / 10 watts

C3 = Hovland Super Cap / 200VDC

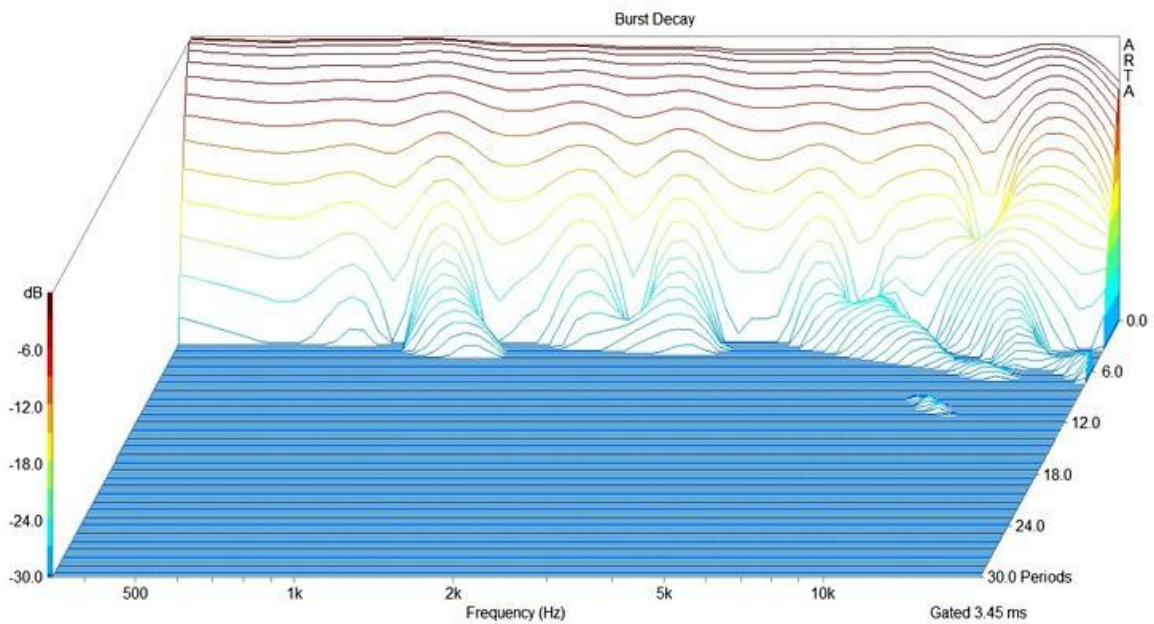
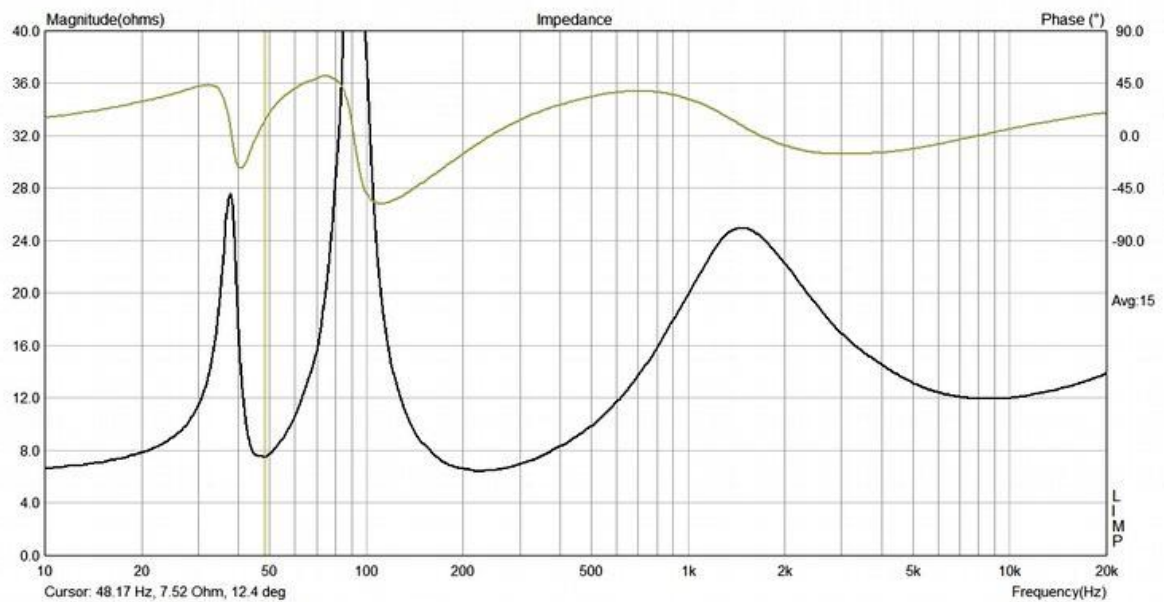
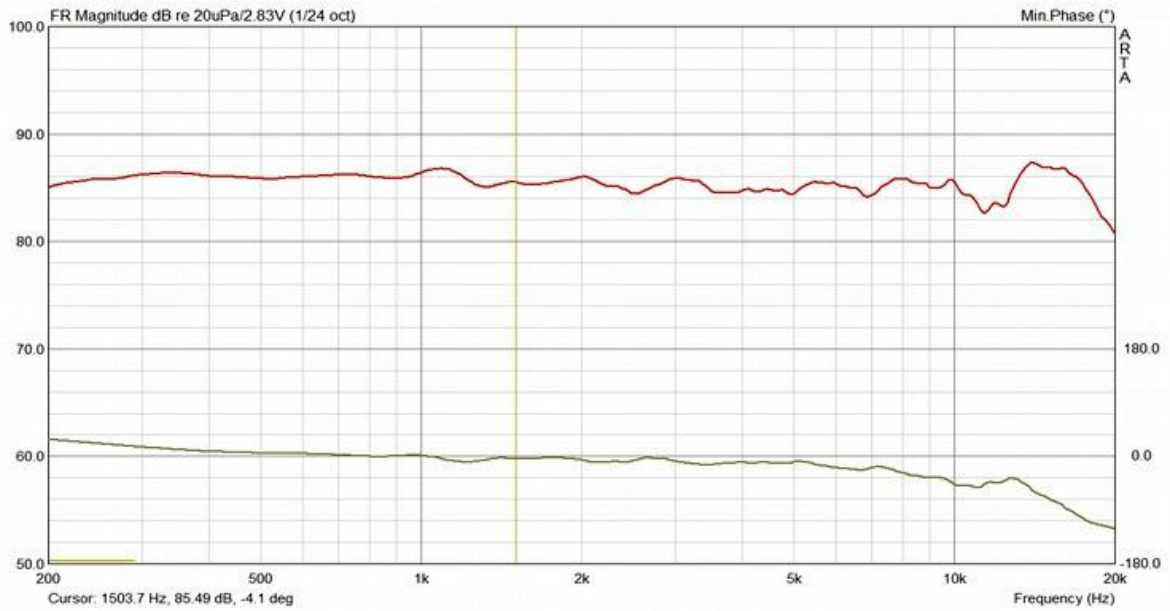


Above: the Otello crossovers with Duelund Pure Silver Foil bypass capacitors.



#### MEASUREMENTS

The measurements show a frequency curve flat within +/- 1,5dB. This indicates a very neutral tonal balance. The little bumpy bit at the top is a characteristic of the tweeter. System efficiency is good for a compact two-way monitor with around 86dB / 2,83V. The impedance plot shows a healthy 8 ohms nominal impedance.



The burst decay of the finished system shows a smooth decay. Range 200Hz - 20kHz; Vertical scale 0dB to -30dB's; Time scale 30 periods.





#### LISTENING IMPRESSIONS

The tonal balance of this loudspeaker is very neutral, well balanced and coherent. It is seamless from top to bottom. Bass is surprisingly good for such a small loudspeaker, in my listening notes I also wrote "funky bass" which I guess describes it quite well. They can even be placed reasonably close to a rear wall without becoming boomy. The midrange is articulate making vocals easy to follow and the top end has a nice refined and transparent nature to it. The little 19mm dome in combination with the Hovland Super Cap do the top octaves very well, with heaps of detail and always smooth. The overall sound is not tuned to be exciting, it is just extremely neutral which makes the Otello not at all fussy. It just gets on with the job of conveying what is on the recording in an honest manner. Voices and dialogues are articulate and very easy to follow which also makes it the ideal speaker for use on all channels of a home theatre. An impressive little speaker! You will find some video's of the Otello on [YouTube](#) to give you a quick impression.



Contents of the Humble Homemade HiFi DIY loudspeaker kit Otello (standard version).

What customers say about the Otello:

*"I recently was able to audition a pair of Otello speakers, built by my friend Loris. A very compact two-way monitor loudspeaker following a classic form-follows-function design. The result is simply GREAT, very neutral, well balanced and coherent, with a bass surprisingly good for such a small loudspeaker. Good work and have fun."* (review by [Audio Andromeda](#) - Italy)



"Hi Tony, everything worked out as planned and so the Otellos are now part of my secondary system (all NAD). After some burn-in time the small amount of glare is gone and they also seem to be able to deliver some nice and well integrated bass! Many thanks for the fine achievement. I think you were able to get the maximum out of these drivers with your design, everything's smooth and effortless, regardless of the music: blues, classical music, even Mahler. The speakers are so good that I will surely try them out in my primary system (Kuzma/Ayon/Croft). Maybe they'll wet my appetite for your Plutone speakers ;-)" (Jochen - Graz, Austria)



"I recently built a pair of Otello speakers to go in my bedroom with the help of the Humble Homemade HiFi kit, they sound just great! A bit of woodwork and some soldering and you have yourself a world class monitor. I think the best description of them is I absolutely love listening to them. The detail and clarity is superb for speakers this size. Tony has put together a wonderful small speaker, such a well created crossover means they handle any type of music well and get the most out of the drivers. Now I'm just looking for my next project to use Tony's design in." (James - Elizabeth Bay, Australia)



