HATT Mk-VIII

DESCRIPTION

Two-way, bass-reflex micro monitor loudspeaker with 12cm coated NRSC fibre glass cone, double magnet midwoofer (custom version) + 26mm dual Ring Radiator diaphragm tweeter with wave-guide center plug and double magnet.

SPECIFICATIONS

Sensitivity • 84 dB / 2,83 volts
Impedance • 8 ohms nominal (minimum 6,1 ohms @ 245 Hz)
Frequency response • 58 - 40.000 Hz (-3dB) / 46 - 50.000Hz (-10dB)
Crossover frequency • 1600Hz
Power rating • circa 40 watts RMS
Dimensions (W x H x D) • 160 x 280 x 200 mm
Weight (finished product) • 6,1 kg each

DOWNLOAD CAD-DRAWING
DOWNLOAD DIY KIT PARTS LIST
DOWNLOAD DATASHEET SCANSPEAK R2604-8330
DOWNLOAD DATASHEET SCANSPEAK 12W/8524G00

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. 329,- each / EUR. 658,- per matched pair. **New lower pricing! See our general price list for the latest prices.**

INTRODUCTION

The orginal HATT loudspeaker first appeared in 2001 and has been one of the most successful designs from Humble Homemade Hifi to date. There have been many variations on this loudspeaker including some "Special Edtion" versions that used Seas Excel drivers. The basic concept has always been the same in every version, a very compact monitor loudspeaker based around a small 12cm midwoofer. Now it's time for the eighth generation of this little speaker: the HATT MK-VIII. This model has been designed to maximize the potential of a mico-monitor using knowledge gained during the Plutone project. Great detail has gone into the optimal coherence between drivers, cabinet and crossover while keeping cost in mind.

THE DRIVERS

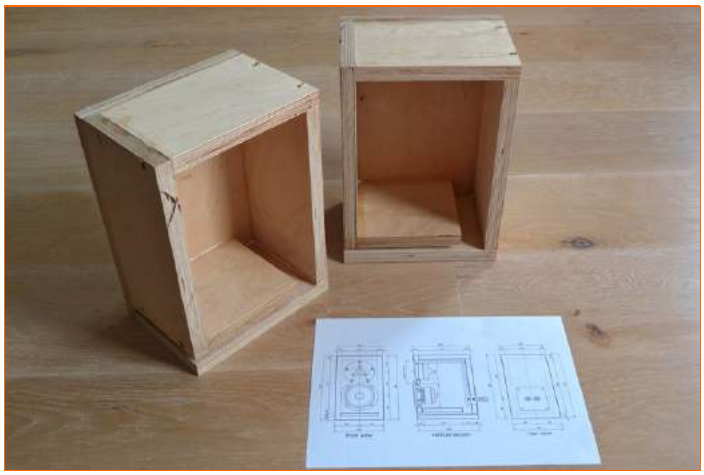
The tweeter used for the MK-VIII version of the HATT is sourced from Scan-Speak and made in Denmark. It is the famous 26mm ring-radiator tweeter R2604-8330. Compared to the basic version, this tweeter has an extra magnet added on the rear increasing the magnetic force and at the same time creating a large rear volume which in turn lowers the tweeter's resonance frequency to a point far outside is used range. Personally I find the double magnet version to sound a fraction more "snappy" than the single magnet version. The single magnet version can sometimes be a little too smooth to my liking. The R2604-8330 has the same

smoothness and transprancy as the single magnet version but with a bit more "bite".

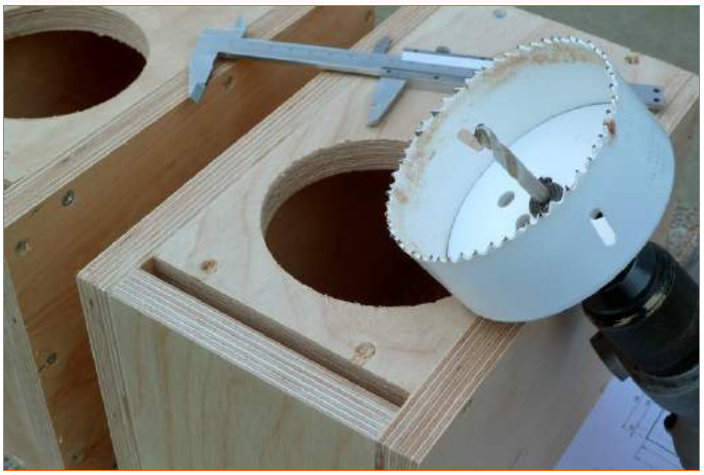
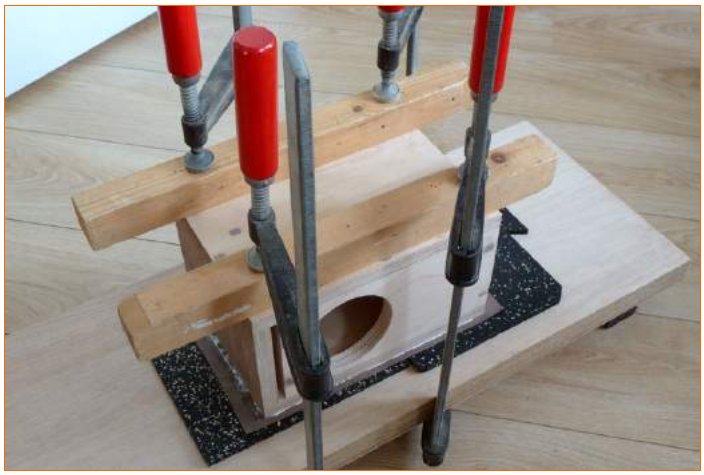

The 12cm midwoofer is also sourced from Scan-Speak and made in Denmark. This midwoofer is based on the 12W/8524G00 and has undergone a small but important modification. An extra magnet has been added on the rear increasing the magnetic force by a few percent. Besides raising the BL-factor it consequently lowers the Q of the driver. Seeing as the moving mass is not altered, the result is better dynamic response and a fraction higher efficiency. The audible result is increased expression in the music and also a better match with the double magnet tweeter. 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 spatious imaging. You can download datasheets of the midwoofer and tweeter from the grey section at the top of this page.

THE CABINET

The cabinets of these extremely small loudspeakers are made from 18mm / 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 HATT 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. This type is ready for clear varnishing without any extra treatment. You can download a copy of the cabinet drawings at the grey section at the top of this page.

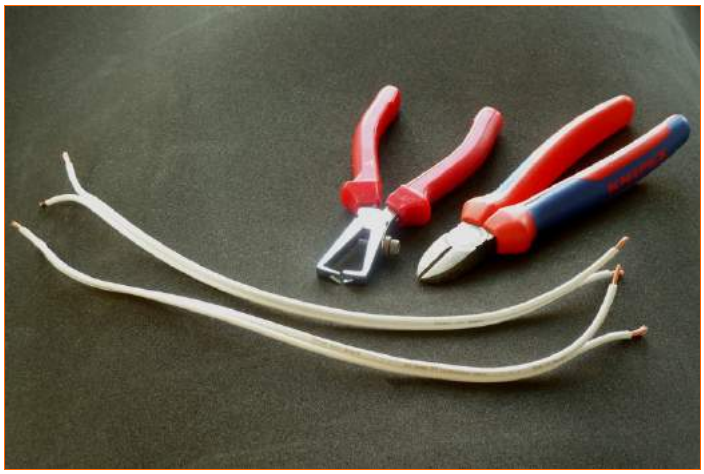



The construction is very easy, the cabinet is made from just seven panels of which one is the panel inside that forms the bass-reflex port. No other form of bracing is needed due to the very small surface area of the panels. The photos above show how compact and simple everything is, I have put a CD and an A4 piece of paper next to the cut sheets for size reference - the side panel is even smaller than an A4. Attention needs to be taken when gluing the panel for the port. It is very important that this has a constant distance from the base panel of 8 millimetres so that the port is tuned to the correct frequency.

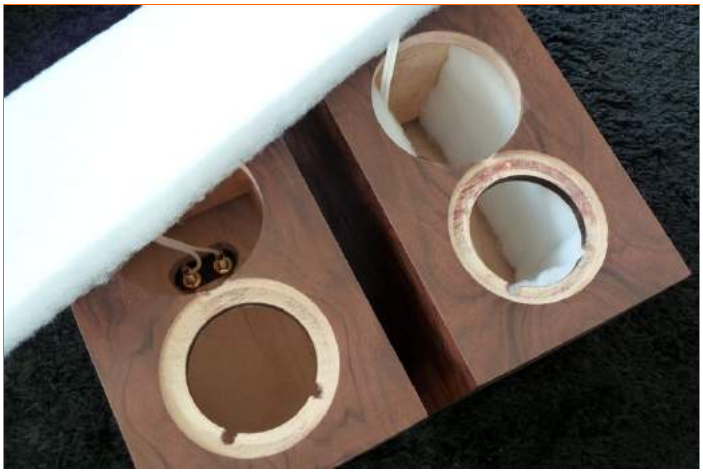



I chose to veneer the cabinets so besides glue I also used wood screws to fix all the panels together. Using screws is much quicker than using glue clamps but does require a little more effort in the final stage because the screw heads have to be filled and sanded before the cabinets are veneered. I used a dark coloured American Walnut Burl veneer, book-matched and mirrored which I think looks quite chique on these miniature loudspeakers. 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 into the wet glue and left for a couple of hours to dry before the next panel is done (photo above right). 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 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. They are the same type 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. Internal wiring is high quality copper litz wire, flexible, easy to use, very affordable and it sounds great! The photo's show 5N Supra cable that was used in the prototype cabinets.



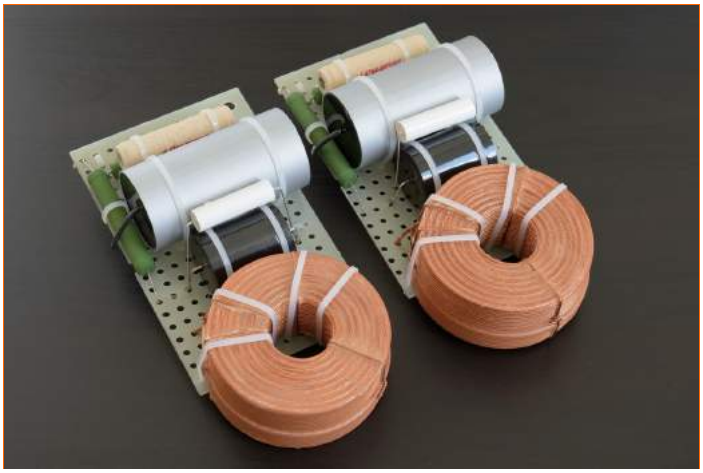
Damping material is applied to the inside of both side panels, rear panel and top panel. It comes in two pieces per cabinet, one long strip that is folded in a U-shape and covers the side and top panels. A smaller piece is then applied to the inside of the rear panel and then later covered by the crossover. 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 back of the mid woofer chassis and on the recessed tweeter cutout on the cabinet. The binding-post plate is supplied with it's own air-tight seal.

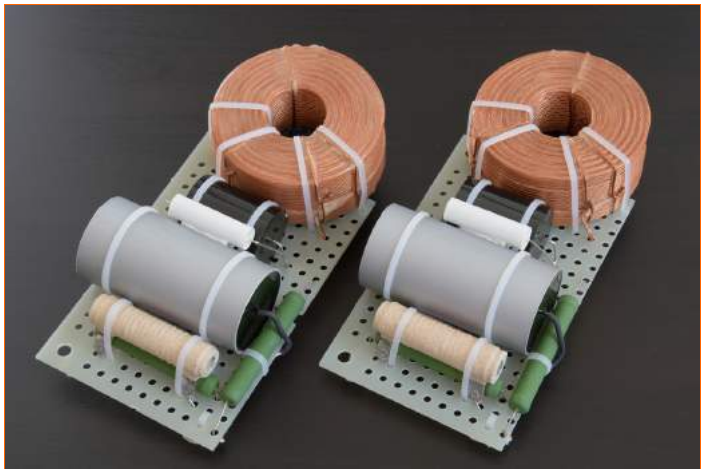



As you can see on the photos and in the CAD-drawing the mid woofer is not flush mounted in the cabinet baffle but actually stands on top covering the recessed tweeter face-plate. This is done for two main reasons, first of all it brings the acoustic centres of both drivers as close as possible together creating a near point source so that even at near-field listening distances the image is not stretched out. Secondly it brings the woofer into better acoustics phase with the tweeter. With this measure both their acoustic centres are practically in line with each other. This is important for good imaging.

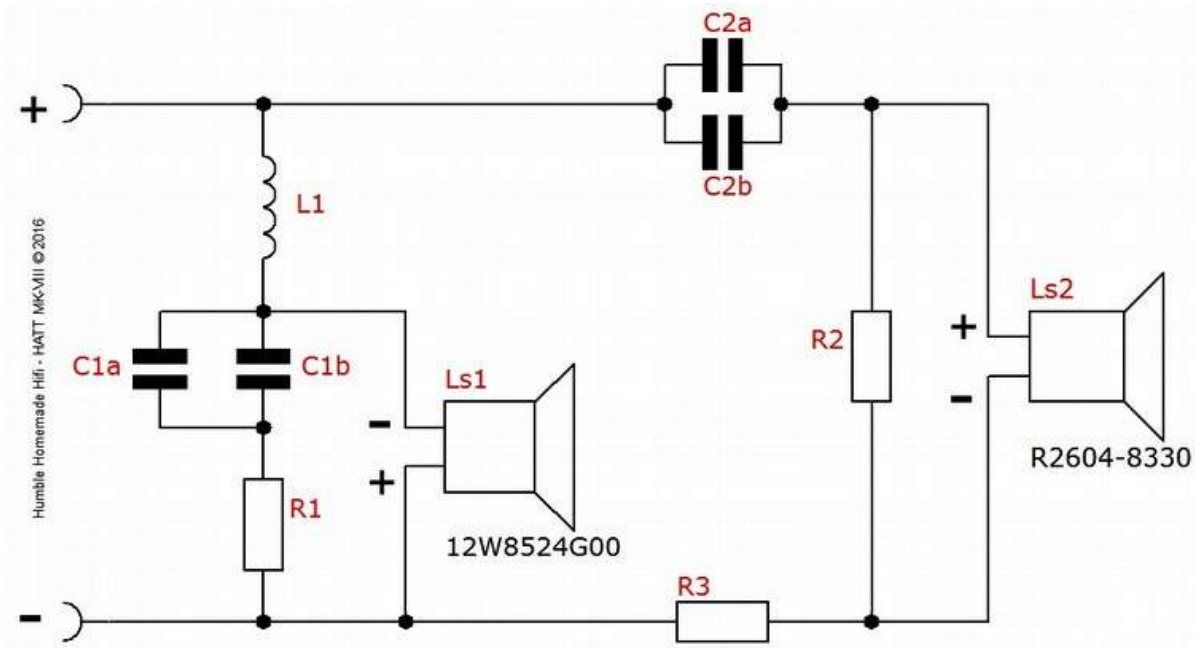

THE CROSSOVER

The crossovers of the HATT MK-VIII use high grade components from Mundorf and Jantzen Audio. The crossovers are 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.





The crossovers are supplied with matching screws. The crossovers should be screwed to the inside of the rear wall. The crossover uses a first order low-pass on the woofer and a first order high-pass on the tweeter. The woofer has a Zobel-network parallel to it that flattens the inductive rise of the woofer voice-coil so that the single inductor can do it's work properly. Without the Zobel the low-pass function would be partly counteracted. The tweeters level is brought inline with that of the woofer by means of a pair of resistors. These resistors also have the job of creating a nearly flat impedance so that the high-pass capacitor works correctly. The mid woofer is connected in reverse electric phase relative to the tweeter.

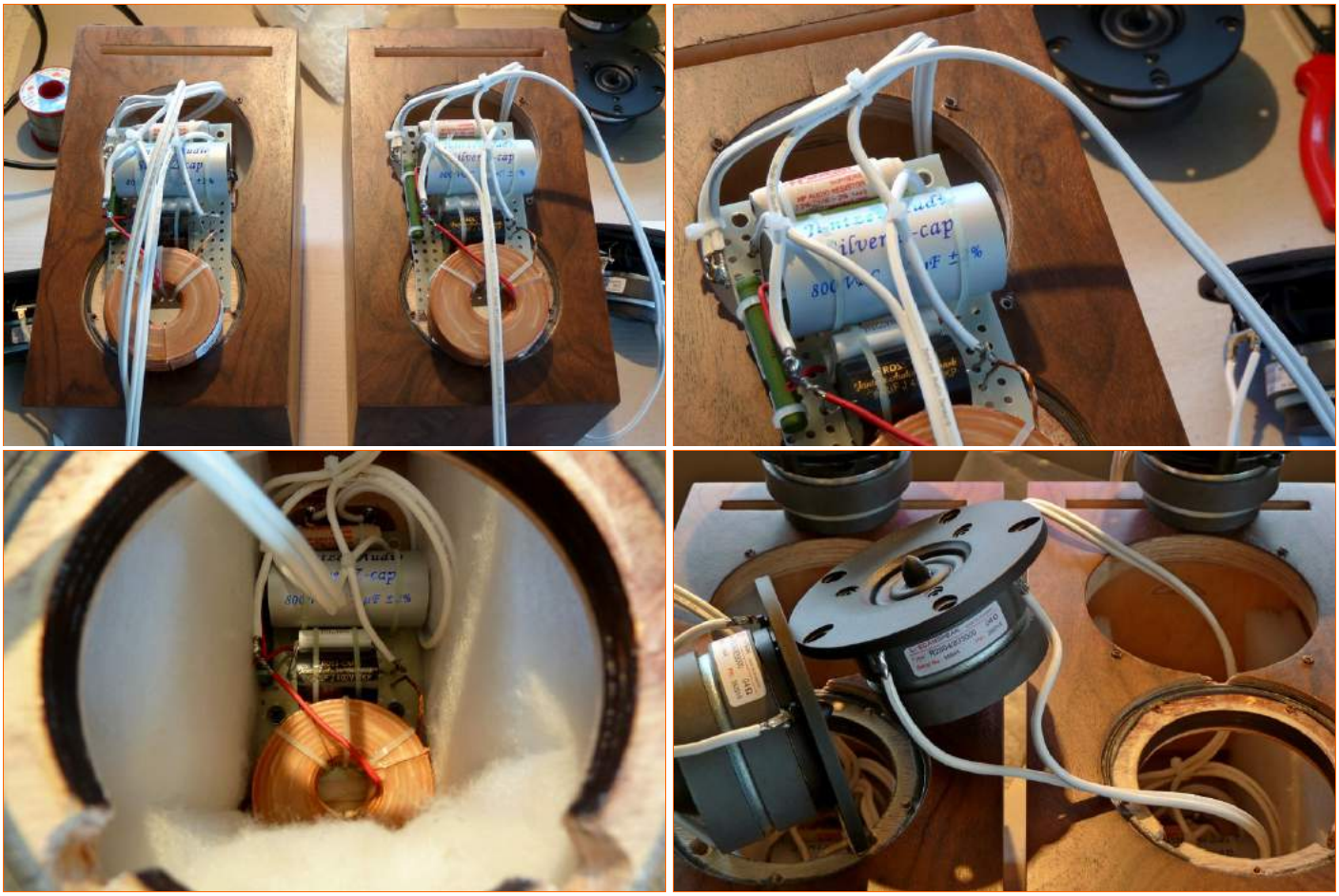


Inductor
L1 = Jantzen Audio Litz Wire Wax Coil / 15AWG

Resistors
R1 = Jantzen Audio Superes / 10 watts
R2 = Jantzen Audio Superes / 10 watts
R3 = Mundorf MResist Supreme / 20 watts

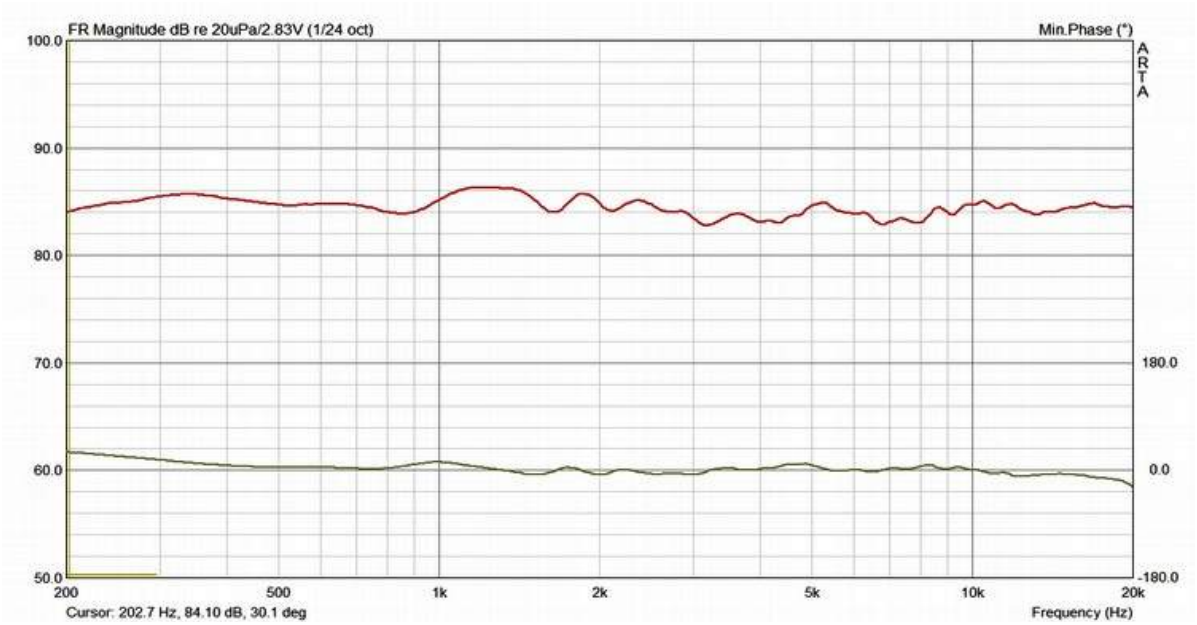
Capacitors
C1a = Jantzen Audio Cross Cap / 400VDC
C1b = Foil bypass cap / 3000VDC

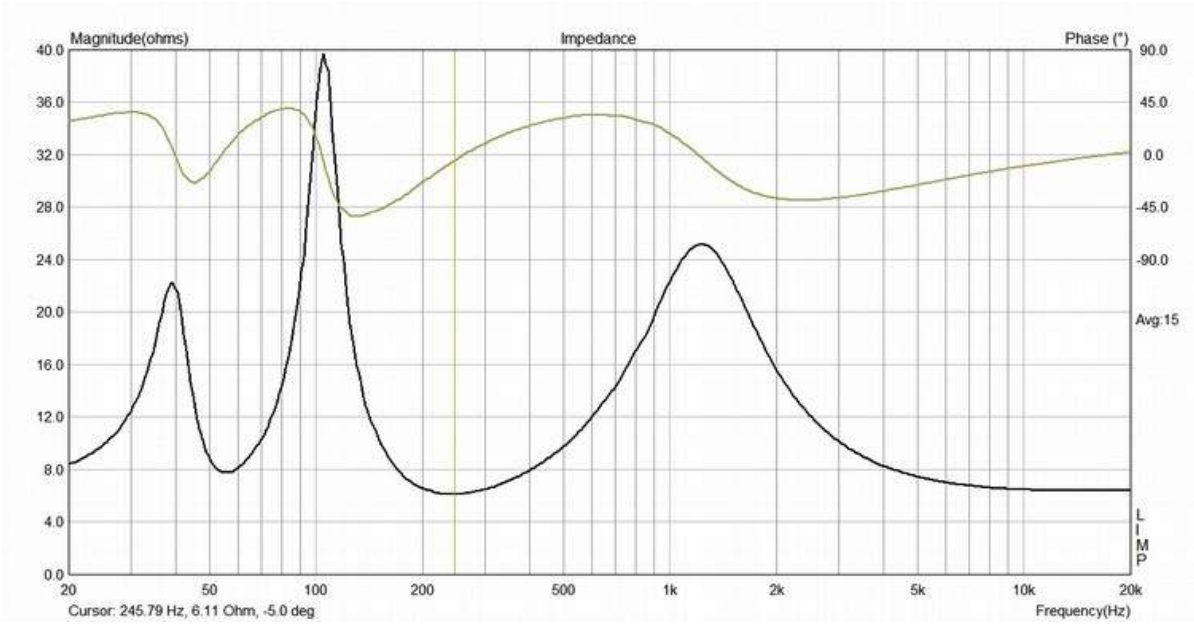
C2a = Jantzen Audio Silver Z-Cap / 800VDC
C2b = Foil bypass cap / 3000VDC

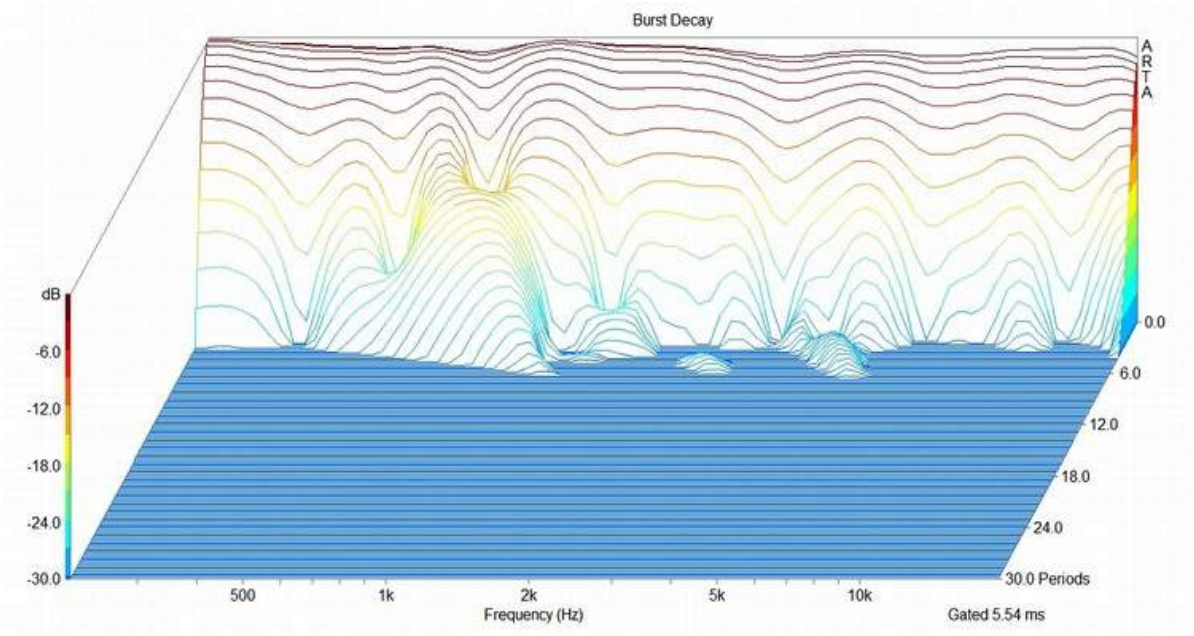


MEASUREMENTS

The measurements show a frequency curve flat within +/- 1,5dB. This indicates a very neutral tonal balance. System efficiency is average for a two-way micro monitor with around 84dB / 2,83V. The impedance plot shows an easy load for most amplifiers with it's nominal 8 ohm impedance.



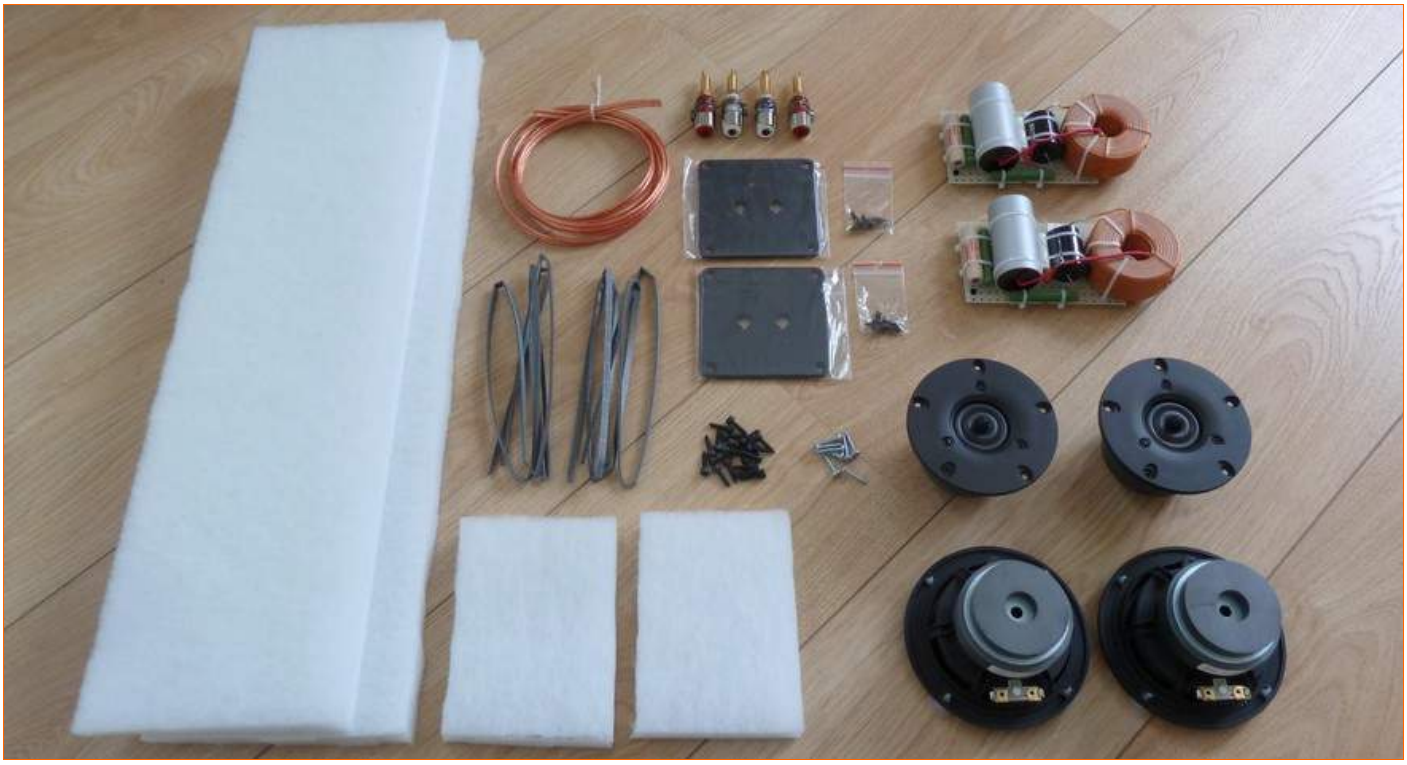




The burst decay of the finished system shows a very smooth decay. There is some very slight delay around 850Hz due to the energy coming from the front-firing slotted port, but nothing serious. If the slotted port is closed then this range is as tight as the rest. But then the bass is also gone ;-) Range 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 doesn't seem to have any preference at all to a certain type of music, which to me is a very good thing. For example, listening to Marin Marais *"Suitte d' un Goût Etranger"*, performed by Jordi Savall on the Alia Vox label, the complex interaction of the bass viols, baroque guitar, harp, harpsicord and percussion is portrayed in a very realistic manner with rich harmonics, lots of detail and also lots of space. The little HATT MK-VIII actually sounds a lot bigger than it looks. Positioned well, the image is projected in all directions around the loudspeakers. Deep bass is of course limited due to the size of the woofer and the cabinet, but by no means does the speaker sound thin. It surprises you with how much bass it does produce for such a tiny speaker. The opening track *"Baby Tonight"* on Robert Glasper's *"Black Radio 2"* has some quite low notes, with the HATT MK-VIII they sound full and strong. The midrange is well defined and open making it easy to follow what is going on in the music. The treble has a nice combination of detail and smoothness letting you hear the smallest details in the music but never getting sharp. A sort of airyness and transparancy combined with coherency and smoothness. Basically the HATT MK-VIII is a high quality miniature loudspeaker suited for small to medium sized listening rooms. I could also imagine nine of them performing well in a compact 5.1.4 Dolby Atmos Home Theatre system. The small speakers being easy to "hide" and the overall soundscape being very realistic. You will find some video's of the HATT MK-VIII on YouTube to give you a quick impression.



Contents of the Humble Homemade Hifi DIY loudspeaker kit HATT Mk-VIII (standard version).

What customers say about the HATT Mk-VIII:

"Hi Tony, today the speakers are finished and are now playing. I can only say that I am very satisfied and Karin too, so much more detail! The guitar by Nino Josele (Paz album) sounds natural, great combination with the Quad amplifier. Thank you very much for such a design (Joop - The Netherlands)"

"We chose to paint the cabinets in the same gray color as the background. Painting did cost a lot of extra time but I am happy with the result. They sound fantastic! They will work fine on my self-built front and hybrid amplifier. In between I also put together a streamer with a Raspberry-Pi module and my self-built DAC. I now stream hi-res files from my NAS and am very happy with the result. Thank you for your fantastic speaker design. Also on behalf of my wife. She thinks the end result is nice, thanks to its modest size." (Gert - Heerhugowaard, The Netherlands)



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