

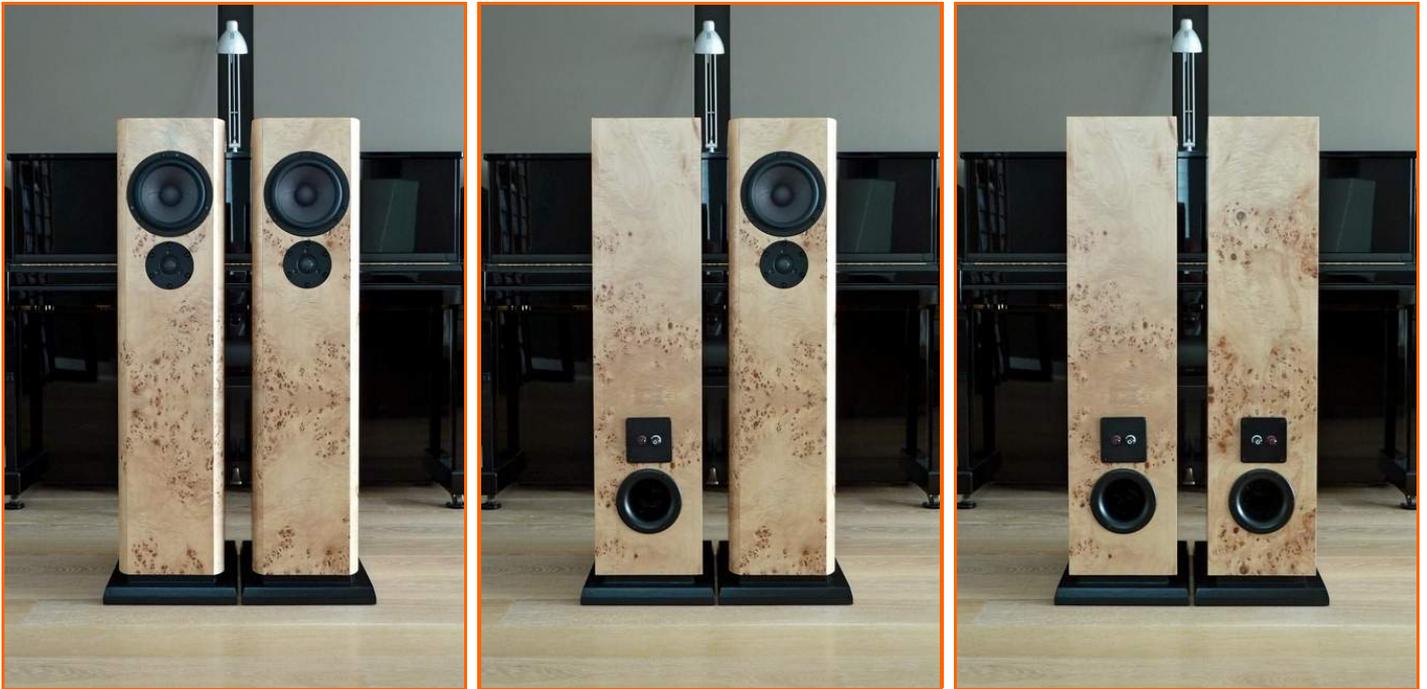


HH Humble Homemade Hifi

L' Orfeo Series Concert Series Tips and Tricks Components Services About us
Orfeo Euridice Speranza Plutone



Orfeo



Very high-grade floorstanding loudspeaker based on the [Scanspeak 18WU/8741T00](#) midwoofer and the [Scanspeak D3004/664000](#) beryllium tweeter. The reference among two-way floorstanding loudspeakers. Not just another "high-end" loudspeaker, but a system that has been tuned to the max by the means of extensive measuring and listening sessions. Optimum coherence and perfect synergy between all parts such as cabinets, drivers, crossover components, internal wiring and connectors.



Specifications

Sensitivity	85 dB / 2,83 volts
Impedance	8 ohms nominal (minimum 6,6 ohms @ 118 Hz)
Frequency response	34 - 40.000 Hz (-3dB)
Dimensions (W x H x D)	242 x 1066 x 400 mm
Weight (finished product)	37 kg each
Price DIY loudspeaker kit (all parts except wood)	EUR. 1375,- each (includes ready-made and tested crossover)



The Orfeo in detail

The cabinets are made from a mixture of mdf and marine-grade baltic birch plywood with a panel thickness of 22mm. Basically all internal panels and diffusers are made from mdf, while the outer "shell" is made from plywood. A high resolution CAD-drawing can

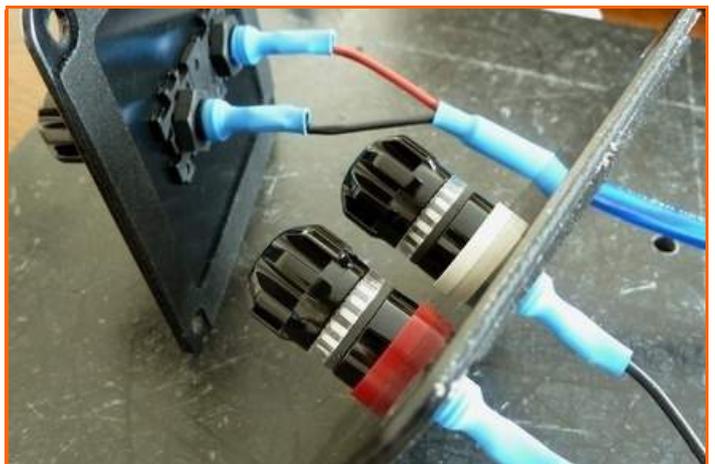
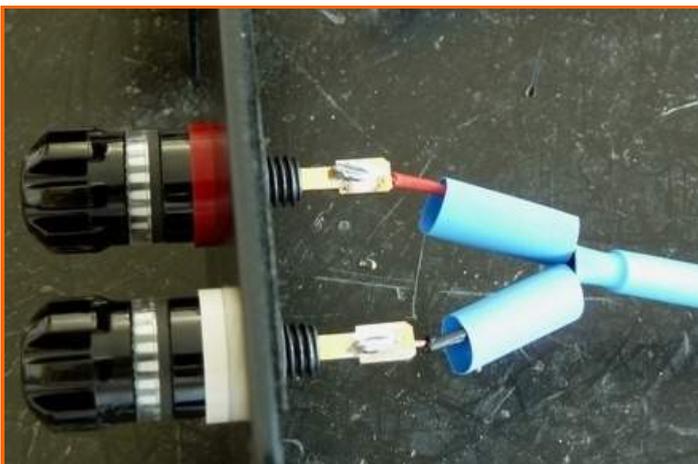
be found at the [download](#) section of this website. Because 22mm is not a standard available thickness for birch plywood, I built these enclosures from 18mm birch-ply with an extra layer of 4mm plywood glued on top (both standard thicknesses). Birch plywood is available with a standard thickness of 24mm, so feel free to use this for the outer shell if a shop near you supplies this. The cabinet is designed in such a way that you can make it completely from straight-cut panels. No mitred joints are needed so you should be able to put these cabinets together with just basic tools. As you can see in the photo's I used a table-saw to cut the 45 degree angles on the diffusors, but you can use hand-tools instead - nobody will see the end result anyway! All contact surfaces and joints must be fully glued together. I used water-resistant, white wood-glue and also used screws to hold everything into place while the glue dried. I could get away with using screws instead of clamps this time because I finished these cabinets with a rather thick paper-backed veneer, covering up any nasties. Should you decide to apply clear varnish directly to the birch plywood or want to paint the cabinets in a colour, then the use of (lots of) clamps is the best solution.



The internal diffuser panels do a very good job of minimizing the severity of standing-waves due to the varied width and depth that they create inside the cabinets. So well actually, that hardly any damping-material is needed. Just some Intertechnik Sonofil-S to fill up the spaces between panels C and D and some that covers the inside of the top and bottom panels. The pieces between the diffuser panels hold themselves in place, the bit at the top of the cabinet is held into position with a few staples or nails, the bit at the bottom is held into position because the filter rests on top. I have found that the smaller the amount of damping-material that is used, the more open, dynamic and uncompressed a loudspeaker will sound. There are limits to this of course, where no damping-material at all nearly always leads to a lack of definition in the bass and midrange, especially when more complex music is played.



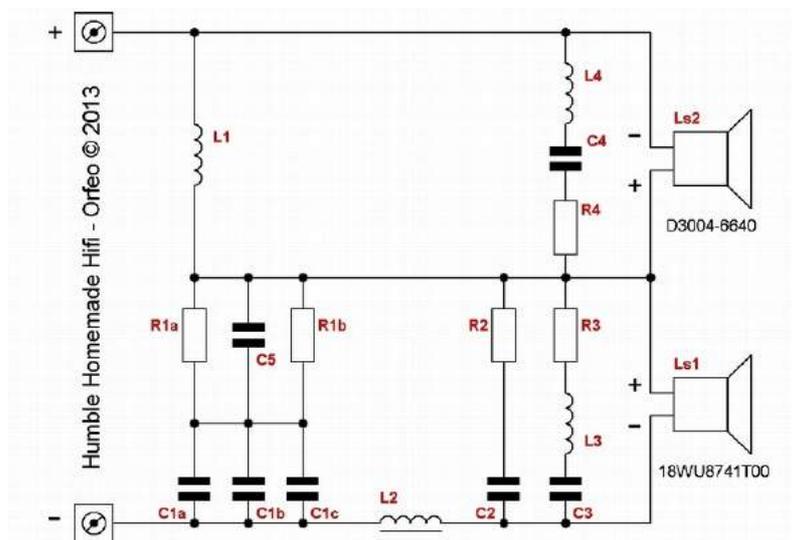
The photo's below show details of the WBT-0703-Cu Nextgen binding-posts with the black anodised aluminium terminal-plates and Jantzen Audio 6N internal wiring (all supplied with the kit). I used a bit of heat-shrink tubing to make things look smart but it will also work without ;-)



Unlike diffuser panel A, the panels B, C and D don't go all the way down to the bottom of the cabinets. This leaves some space to place the port and the crossover in the lower part of the cabinet. The crossover is screwed to the bottom panel and can be accessed after the cabinets are built via the relatively large cut-out for the port. The middle photo was taken through this cut-out. This reflex-port used is the Intertechnik Jet Set-70 with very large, stream-lined internal and external flares. The centre tube has to be cut to a length of 110mm. The tube is then terminated with an internal flare and the larger external flare and then taped together. The bass-reflex ports must have an air-tight seal on the cabinet by means of self adhesive compression tape (supplied with the kit) that is applied to the rear of the outer port flare. The terminal-plates and the drivers come with their own foam backing. For screwing in all the black hex-head screws (also supplied with the kit) I use an electric screw-driver for the most part. The final tightening I always do by hand, that way you get a feel of how tight the screws are and you can't over tighten them and cause any damage, for example to the plastic rim of the reflex-ports. Always work cross-ways, so first one screw nearly all the way in, then the screw opposite and so on.



The drivers, crossovers and terminals should be connected together with the supplied Jantzen Audio 6N solid-core wire. The tweeter is connected in reverse phase relative to the woofer. The crossover is basically a simple asymmetric series network with a few correction networks added to compensate minor irregularities in the output level resulting in a frequency curve that is extremely flat over the entire range. The low-pass function for the midwoofer is formed by $L1 + C1 + L2$ and the high-pass function for the tweeter is done by $L1 + C1$. The tweeter level is lowered to match that of the midwoofer by means of resistor $R1$. $R1$ is bypassed by the small capacitor $C5$. This lets the energy of the top octave pass unrestricted, compensating for the slight top-end roll-off that the tweeter has by nature seeing as the optimum listening axis is designed to be at woofer height. By placing the woofer above the tweeter there is better acoustic phase integration between the two drivers, resulting in a more spacious image. The tweeter also has an LCR-filter ($L4 + C4 + R4$) parallel to its terminals that tames a little bump in the output level around 4-6kHz. This bump "comes for free" with this tweeter (please check Scanspeak's [datasheet](#) to see what I mean). Although it doesn't look very severe, if this bump is not dealt with, the tweeter can sound a bit on the sharp side of neutral. The LCR-network parallel to the midwoofer ($L3 + C3 + R3$) has a similar function and tames the large bump in its output around 4-6kHz (again, check Scanspeak's [datasheet](#)). Using an LCR-network instead of using a higher order crossover was the way to go here, a steeper crossover slope did cope with the peak but phase integration at the crossover-point to the tweeter was far from ideal. This could have been dealt with by giving the tweeter a higher order crossover but that would have led to more components in the tweeter's signalpath, resulting in a less pure treble and higher costs. Finally we come to the RC-network $R2 + C2$ that has two functions: first of all it compensates the inductive rise caused by the midwoofer's voice-coil so that the function of inductor $L2$ is not counter-acted. Secondly, because the value of the capacitor is larger than the textbooks predict, it also has a small corrective function on the output level of the midwoofer in the midrange. All the crossover components have not only been chosen for their high sonic and build quality, but have also been selected for maximum synergy with each other and with the drivers, internal-wiring and connectors used.



Inductors

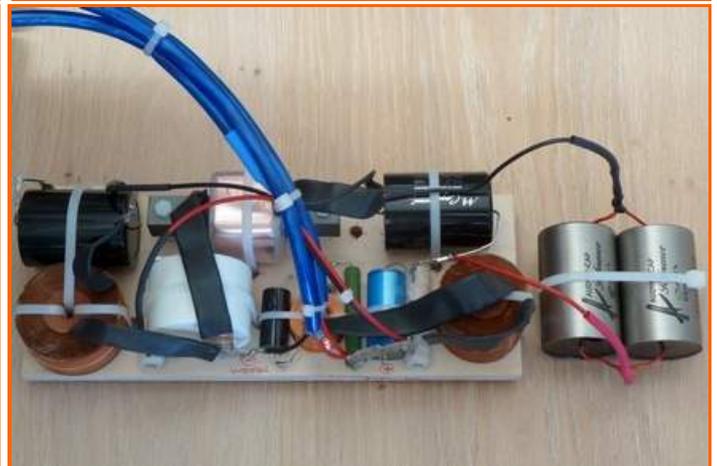
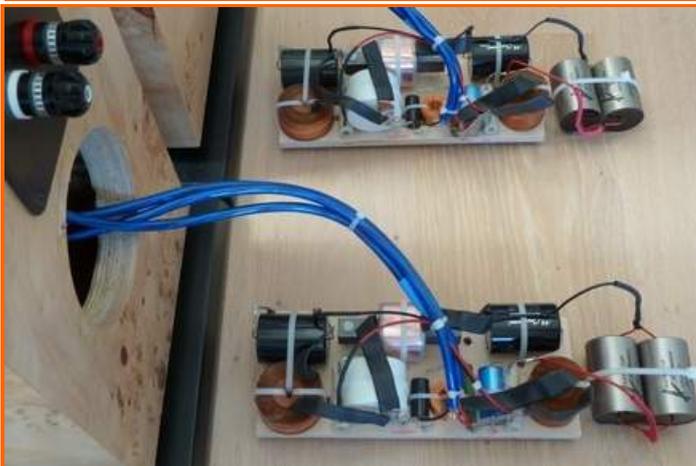
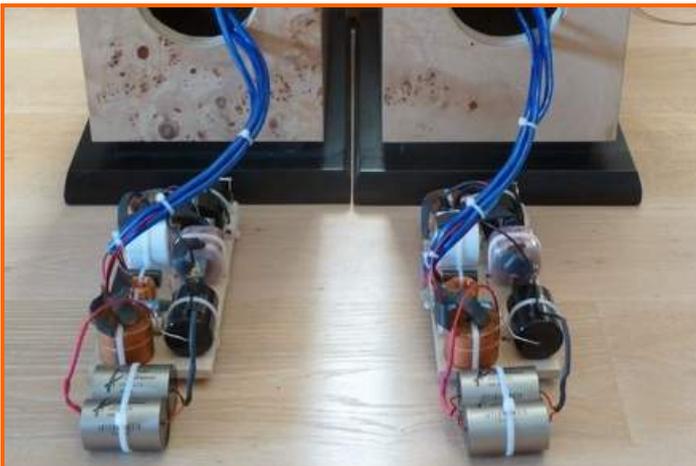
- L1 = Jantzen Audio 14AWG Wax Coil copper foil / paper in beeswax
- L2 = Mundorf MCoil CFS14 Copper Foil with Laminated Feron I-Core
- L3 = Jantzen Audio 16AWG Wax Coil copper foil / paper in beeswax
- L4 = Jantzen Audio baked varnish air-core / 0,70mm wire

Resistors

- R1a = Mundorf M-Resist Supreme / 20 watts
- R1b = carbonfilm resistor / 0,25 watts
- R2 = Mundorf M-Resist Supreme / 20 watts
- R3 = Mundorf M-Resist Supreme / 20 watts
- R4 = Jantzen Audio SuperRes Non-Inductive / 10 watts

Capacitors

- C1a = Intertechnik Audyn Tri-Reference / 600VDC
- C1b = Intertechnik Audyn Tri-Reference / 600VDC
- C1c = Mundorf MCap Supreme Silver Oil / 1000VDC
- C2 = Mundorf EVO Oil / 450VDC
- C3 = Mundorf MCap Supreme Silver Oil / 1000VDC
- C4 = Jantzen Audio Cross Cap / 400VDC
- C5 = ERO KP1832 / 200VDC

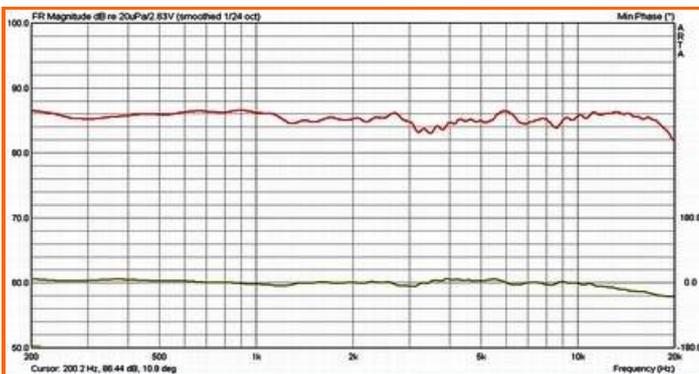


Orfeo DIY loudspeaker kit contents

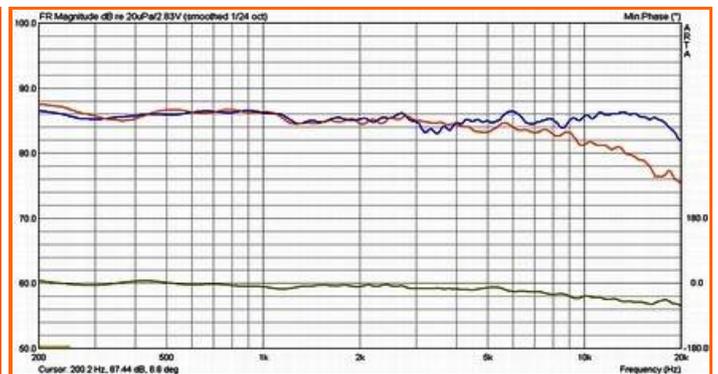


Orfeo - listening and measurements

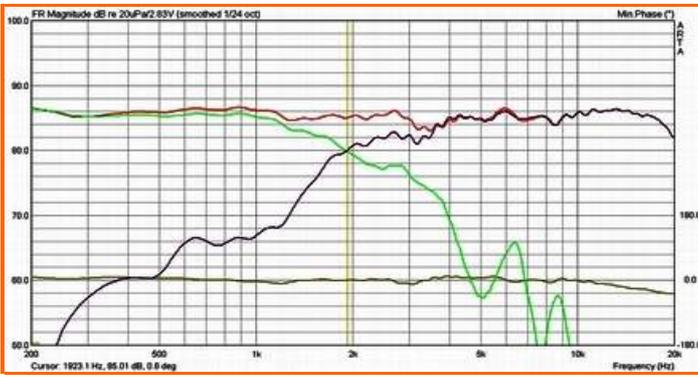
These loudspeakers were designed for optimum results when ear-height is about on axis with the woofer. This also how the measurements were taken. Playing with the amount of toe-in lets you find the right balance between top-end clarity and image size. The distance between the rear of the cabinets and a wall should be at least 30cm's. By varying this distance you can adjust bass-weight to your personal situation. Placing a loudspeaker directly in front of a wall is never a good thing, but if that is the only option for you, you might want to stuff the ports with a pair of old socks (wash them first!) After you have finished building these loudspeakers give them a few weeks of normal use to settle in, at least about 100 hours. As with any loudspeaker, when first connected they will sound a bit on the rough at the top and boomy at the bottom and the image will tend to stick to the loudspeakers. After a while the sound will grow, become smoother, more spacious and will extend at both frequency extremes. Once fully burnt-in these loudspeakers will sound extremely neutral, with heaps of (micro) detail and at the same time very smooth with a natural ease to them. A nice balance between warmth and detail. Bass is deep and well defined. The midrange is very neutral and the top end clear. You can listen to them for hours on end and never get tired, they make you to just want you to listen to the music. These loudspeakers perform well with a large variety of source equipment and amplification. I have tried them on things varying from a low-budget Marantz based system up to rigs costing several tens of thousands of euro's. The Orfeo's just seem to grow as the quality of the equipment grows with them. You are welcome to audition them for yourself - don't forget to bring along your favourite cd's or hi-res audio files!



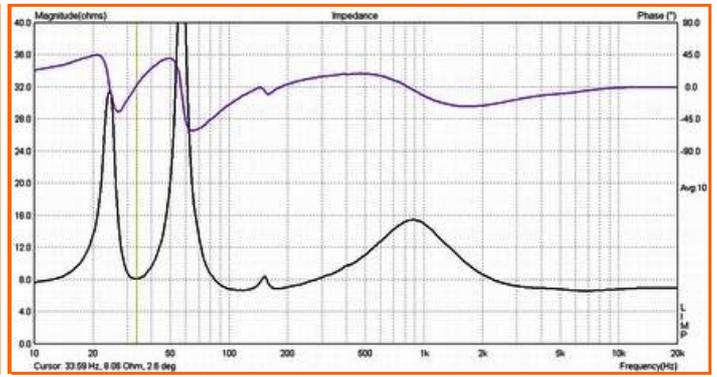
Above left: the summed response of the finished system measured on axis at woofer height (red) with corresponding acoustic minimum phase (olive green); frequency range 200Hz - 20kHz, vertical range 50dB - 100dB, subdivision 2dB's.



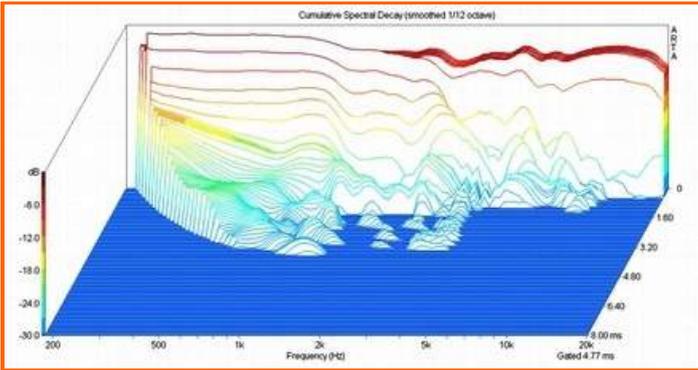
Above right: the summed response of the finished system measured on axis (blue) and 30 degrees off-axis (orange); frequency range 200Hz - 20kHz, vertical range 50dB - 100dB, subdivision 2dB's.



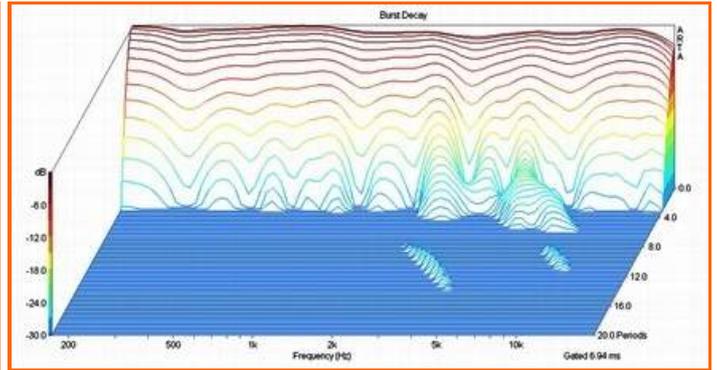
Above left: individual frequency curves of the midwoofer (green) and tweeter (dark purple) and the summed response of the finished system (red) with corresponding acoustic minimum phase (olive green); frequency range 200Hz - 20kHz, vertical range 50dB - 100dB, subdivision 2dB's. The crossover point is centred at about 1900Hz.



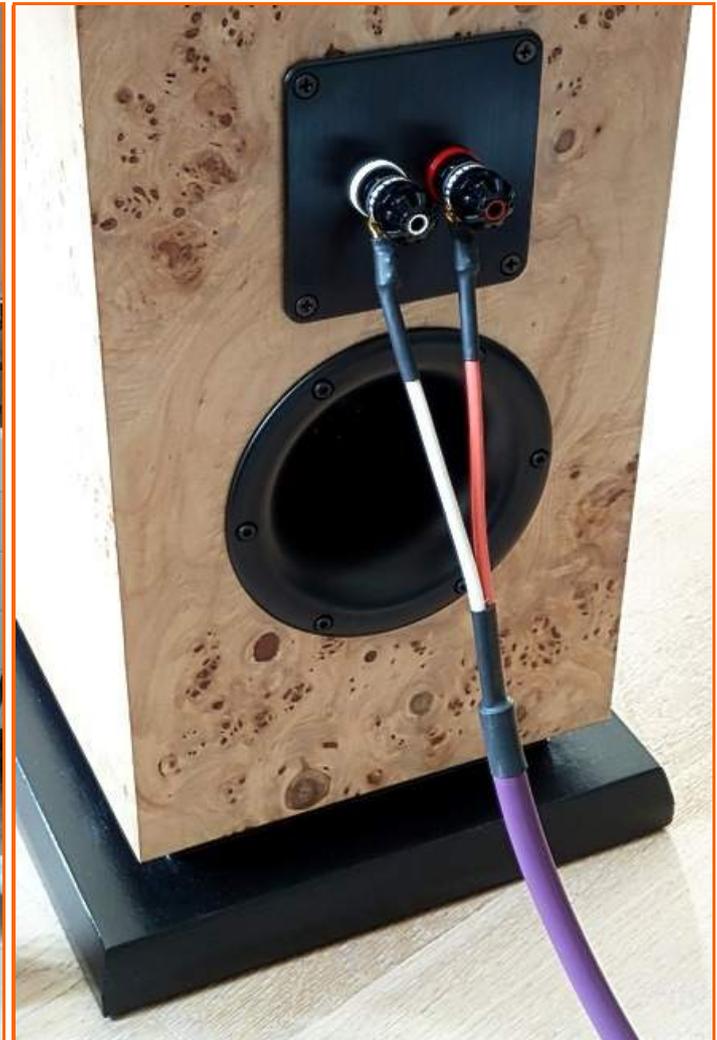
Above right: Impedance plot (black) with corresponding electrical phase (purple) of the finished system; frequency range 10Hz - 20kHz, vertical range 40 ohms, subdivision 4 ohms. A healthy 8 ohm nominal load with the port tuning frequency at 33Hz. Impedance minimum 6,6 ohms at 118Hz.



Above left: Cumulative Spectral Decay of the finished system; frequency range 200Hz - 20kHz, vertical range -30dB, subdivision 6dB's, time window 8 milliseconds.



Above right: Burst Decay of the finished system; frequency range 200Hz - 20kHz, vertical range -30dB, subdivision 6dB's, time window 20 periods.



Orfeo - built by others



Orfeo by Jan from The Netherlands

"Truly enjoyable!"



Orfeo (with Furutech Alpha S-14 internal wiring) by Niels from The Netherlands

"I bought the Orfeo speakers for use in my studio for recording and mixing music. I need monitors that let me hear every single detail but at the same time are also very musical, because music is my business. The Orfeo is right at the spot where analytics meets musicality. In five months Orfeo became "Chef de Musique" in my studio. He is strict and honest, but never angry nor shouting at me. And when I get the mix right, he will sing a song for me!"



Orfeo by John from The Netherlands

"Listened to the Orfeo's at TG's place, and that was a pleasant experience! So I quickly started building them myself. Meanwhile my own Orfeo's are playing to full satisfaction. During the burn-in phase the speakers became calmer and more open, so it is certainly necessary to give this driver- and filter-combination some time to settle in. Result: a very detailed sound, with a nice open soundstage. Whatever you fire at these speakers: they do not flinch. You can listen to them for hours and never get tired. And even when the volume gets louder, you never have the idea that the speakers are coming to their limits and therefore they can handle so much more. On the other end: even in very soft passages every detail remains. For me, a must for anyone who wants a not too large speaker in his room, but requires great performances."



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