Andromeda Mk-II

The Andromeda Mk-II, nine years after the original

Back in the year 2000 I built a speaker called the Andromeda. It was long due to update this speaker with a Mk-II version. Seeing by now the Focal woofer was no longer available, I needed a replacement of equally high quality. The drivers used in this new version are the Eton 12-680/62HEX, a special version of the Scanspeak 18W8545 midwoofer and the Focal Audiom TLR tweeter. All joined together by a combination of a parallel and series-filter.

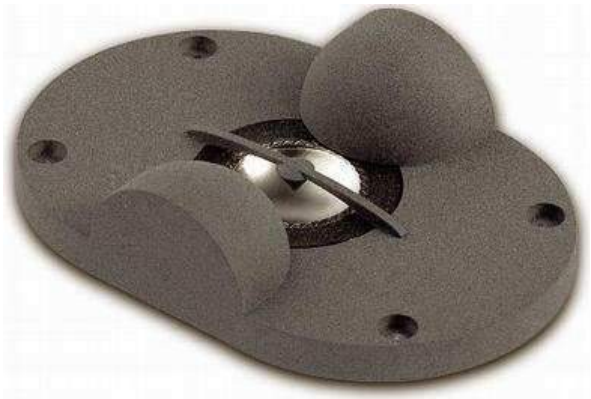
Continuing on the same concept

To repeat myself: I believe that you can only produce "real" bass by moving a large area of air gently and not by moving a small area of air violently. This means that anything smaller than a 10-inch woofer will simply not do. The 12-inch Eton woofer is the ideal candidate if you are looking for a high quality woofer that will work down into the low 20's in frequency without needing an extremely large cabinet (it actually needs about the same volume as the original Andromeda woofer). The Eton 12-680/62HEX only needs about 90 litres! The cone is made of so-called Hexacone: two layers of finely woven kevlar sandwiching a layer of Nomex honeycomb.

The midwoofer: The original Scanspeak 18W8545 had proven it's qualities with a low resonance frequency of 28Hz, a large long throw 42x19 millimeter voice-coil and a very large magnet to give a strong driving force. The cone is made of carbon fibre filled

paper and heavily coated. By the way, I ordered the 18W8545-00-SE version which is basically the same, but come as a closely matched pair. But I wanted even more dynamics in the midrange so I added an extra Scanspeak magnet type 107005 to the rear of the driver (the same size as the original magnet). This gave about 1dB increase in the output level, but more important: more attack, dynamics and expression in the midrange. The magnet can be fixed to the rear pole-plate with 2-part epoxy glue, I used Pattex Super Mix. First of all the extra magnet and the pole-plate must be cleaned with thinner or similar to make them free from grease and other Gremlins. The magnet should be positioned the correct way around so that at first the forces are pushing each other away and then just before the magnet reaches the pole-plate they should attract stongly – be carefull not to trap your fingers. it can hurt! Then I covered the whole rear motor structure with 3mm thick self adhesive foam rubber to minimize mid and high frequency reflections inside the top cabinet.

The tweeter: I like the treble to sound clear and detailed without getting harsh, also good dispersion up into the high treble is important for a nice clear and wide stereo-image. The old tweeter is no longer available but the Focal Audiom TLR can still be obtained if you browse the net. It has an inverse dome with a titanium membrane and a cone-shaped diffuser mount on the front. This diffuser gives very wide dispersion right up to 20kHz - 30 degrees off axis at 20kHz is only down a fraction. It has a high force Neodynium ring magnet, Telar 57 pole and plates, to create a very strong magnetic field in the air-gap. The cavity inside the magnet is filled with mineral wool to dampen resonance's. The 8,5 mm thick precision machined solid aluminium face plate with 2-part precision machined solid aluminium wave guides form an extremely strong construction.



The cabinets

The basic construction for the cabinet walls is a sandwich of two layers of MDF of different thickness' with a layer of lead-bitumen in between. Lead-bitumen comes in flexible sheets of 1x1 meters and weighs 10 kg/m2. From the outside in you have 22mm's of MDF, 5mm's of lead-bitumen and 18mm's of MDF. All three are glued together using a paste made for glueing parquet floors but contact cement will also do. No screw's are used otherwise vibrations from the inner panel may be transferred to the outer panel. The cabinet is internally strengthened with a sort of matrix made of 18mm MDF with circular cutouts to let the airflow freely. To minimise vibrations of the bass-driver, its magnet is supported buy a cutout in the internal bracing. All internal walls are covered

with Pritex foam to minimise standing waves. The front baffle has two outer layers of MDF and therefore has a total thickness of 62mm. The rear-firing bass-reflex ports are also made from mdf. Furthermore there is a seperate compartment on the back of the bass enclosure in which the crossover can be place (the photo shows part of the crossover during tuning). The netto internal volume is about 90 litres and the bass-reflex ports are tuned to about 33Hz.




The total weight of the woofer + cabinet is about 100 kg. To stand this firmly and level on the ground you need spikes. A very cheap and easy way to make spikes for something this heavy is to use four lengths of M10 bolt-thread mounted in the bottom of the cabinet. Place a large washer over the thread and then fix it with a M10 nut. There should be about 30mm of thread left sticking out onto which you screw a M10 capped-nut (a nut with one closed by a round shaped cap) - being a nut it is very easily height adjustable using a spanner. The cabinet will now have minimal contact with the floor as it is resting on four little metal ball-shaped "spikes".

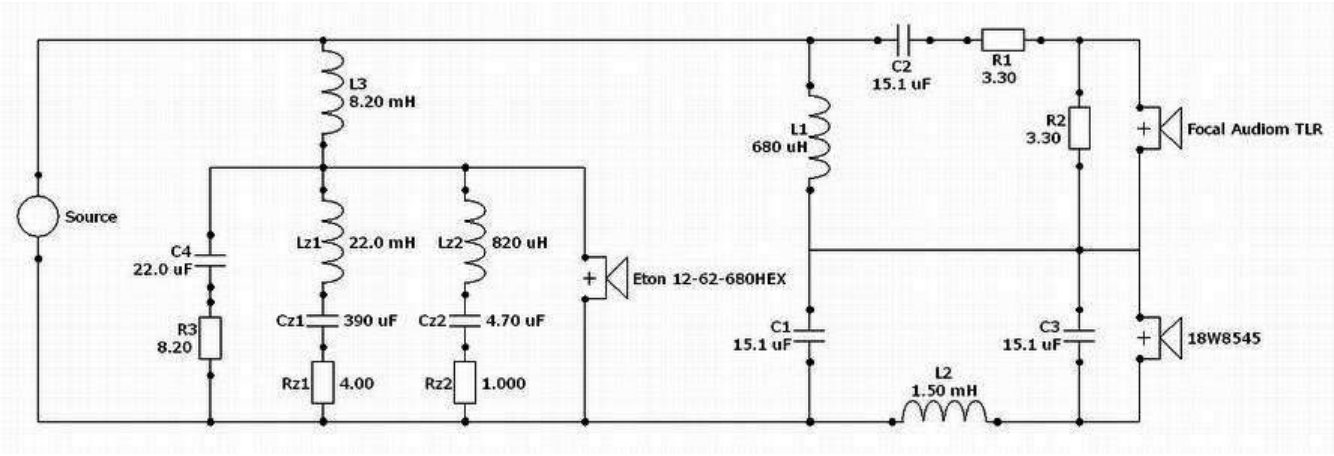
The cabinet for the mid-woofer and the tweeter is built as a closed cabinet using the same principles as the woofer cabinet except for the damping material, which is a 100% fill of sheeps wool with foam covering of the walls. The tweeter is housed in it's own separate sub-enclosure to stop unwanted vibrations in the box reaching the rear of the tweeter, a piece of foam-rubber is pressed between the back of the tweeter and the rear of the sub-enclosure to stop any vibrations in the tweeters rear cover. The "collar" around the sides and rear of the cabinet is made of 30mm thick MDF making the total wall thickness here 74mm's. The front baffle has angled edges to cut down diffraction interference. The total weight of the drivers + cabinet is about 32 kg. This cabinet is placed on the woofer cabinet using three gold-plated SPS-10/GO spikes and protectors by Monacor.

A higher resolution cabinet drawing is available on request.

The crossover network

This system is designed the same way as the original Andromeda with a 2.5-way crossover, combining both a first-order parallel filter for the woofer and a series filter for the midwoofer and tweeter. The Eton wofoer has three extra parallel compensation networks consisting of a LCR-network (Lz2+Cz2+Rz2) to cut out the cone break-up peak at 2-3kHz and one to flatten the upper of the two impedance peaks caused by the bass-reflex alignment (Lz1+Cz1+Rz1). The RC-network to compensates the rising impedance due to the voice-coil inductance.

The series section of the crossovers consists of a third-order low-pass for the Scanspeak midwoofer (L1+C1+L2) and a second-order high-pass for the Focal tweeter (C2+L1). Furthermore the tweeter's output level is damped some 8dB's by the resistor network R1 and R2 that also flattens the impedance of the tweeter so that it will work correctly with the crossover. All internal wiring is Van Den Hul SCS-16 with double parallel runs to the woofer and single to the midwoofer and tweeter.



L1 = 0,68 mH CFC-12 copper foil inductor; Rdc = 0,15 ohms

L2 = 1,50 mH CFC-12 copper foil inductor; Rdc = 0,23 ohms

L3 = 8,2 mH Erse Super-Q inductor; R = 0,23 ohms

Lz1 = 22mH Mundorf baked varnish air-core inductor 0,71 mm wire; R = 5,66 ohms*

Lz2 = 0,82mH Mundorf baked varnish air-core inductor 0,71 mm wire; R = 0,81 ohms*

C1 = 15uF Clarity Cap SA + 0,10uF Janzten Superior Z-Cap capacitor

C2 = 15uF Clarity Cap SA + 0,10uF Janzten Superior Z-Cap capacitor

C3 = 15uF Clarity Cap SA + 0,10uF Janzten Superior Z-Cap capacitor

C4 = 22uF Clarity Cap APW capacitor

Cz1 = 390uF bipolar electrolytic capacitor

Cz2 = 4,7uF Clarity Cap APW capacitor

R1 = 3,3 ohms / 6 watts carbon film resistor (3x 10 ohms / 2 watts parallel)

R2 = 3,3 ohms / 6 watts carbon film resistor (3x 10 ohms / 2 watts parallel)

R3 = 8,2 ohms / 10 watts MOX resistor

Rz1 = 4,0 ohms / 30 watts MOX resistor (3x 12 ohms / 10 watts parallel)*

Rz2 = 1,0 ohms / 10 watts MOX resistor*

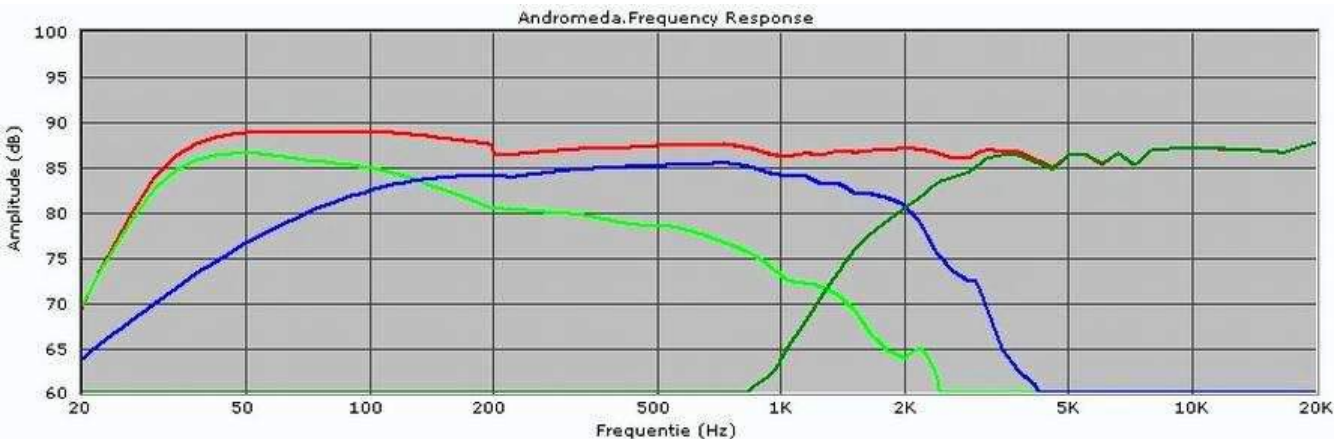
* The total resistance of both LCR-networks must not be altered. So if you find an inductor with a different Rdc than stated in the list, the value of the resistor must be changed correspondingly.

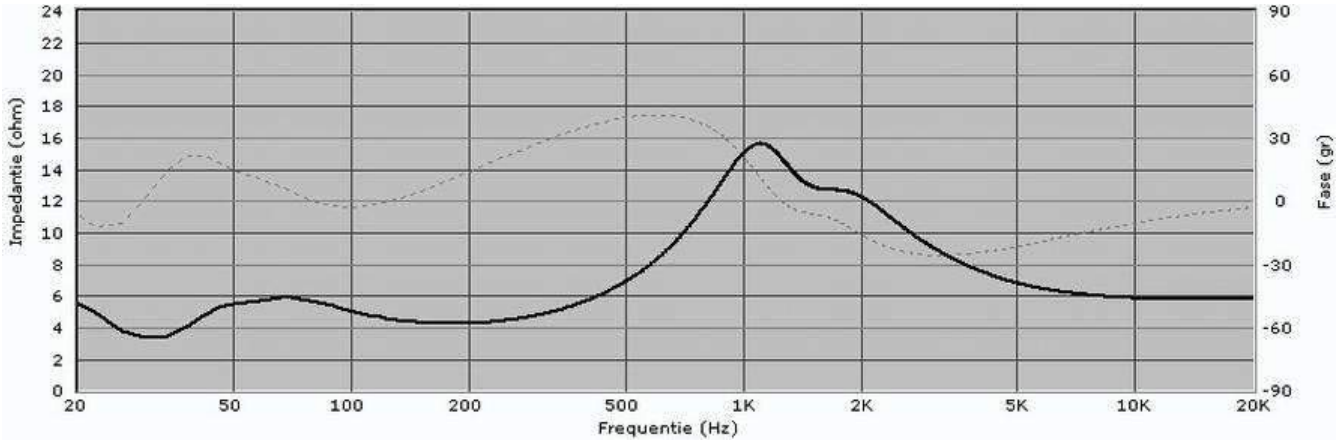
Positioning

These loudspeakers where not designed to stand on a bookshelf or in a corner, they need some space!

Listening and measurments

Compared to the original Andromeda, this new Mk-II version has deeper, stronger and slightly warmer bass. From the bass up it is more coherent with a very smooth and dynamic midrange and a detailed, clear treble that never fatigues. Ambient information is more obvious and micro details are eaier to follow - all in all a succesfull update!





Alternative version

By coincidence, while I was working on this speaker, Scott from Loveland Colorado in the US mailed me about an alternative version for this speaker, seeing as he had a Seas CA26RFX H1305 woofer and a different Focal TC120Tdx2 tweeter already at home. The midwoofer is the standard Scanspeak 18W8545. This is his version and comments:

"*Hello Tony,*

……..I used the Clarity SA + Mundorf Supreme Caps along with the 12-AWG foil inductors as you suggested. The box was made with .75 inch MDF with a .5 inch thick oak exterior. They were originally built to be in my office as a secondary sound system. I have an old Arcam integrated amp and a Marantz CD 63. Two weeks ago I connected the Andromeda top cabinets to my secondary system on a bookshelf. I was impressed with the detailed sound even though they were not broken in yet. After two weeks I decided to silicon the crossover and add some stuffing to the speaker box. After doing this I decided to connect these little speakers up to my main system. I converted most of my garage into an audio room where I have a pair of Apogee Stages driven by Rogue monoblock

tube amps, Naim pre-amp and a fully loaded Linn Sondek. When I connected the little Andromeda top cabinets to this system I was blown away! I could not believe how amazing these speakers sounded. The detail was incredible especially on female vocals. I tried some big orchestral pieces, and with the lights out I could not belive how a small speaker could make such a big sound. In some recordings, I actually like the sound of the Andromeda top cabinets over my Apogee Stages, and these Stages have the new updated crossovers designed by North Creek. When I did a sound test the little mini Andromeda's they went down to 30 Hz and fell off sharply at 28 Hz.

After building only these top cabinets it got me thinking: could I make a speaker that betters the Apogee Stages in all types of music? After another evening of listening to the Andromeda monitors I can honestly say that I enjoy the music more than when I listen to my Apogee Stages. The only thing missing with the Andromeda monitors is that full body sound and deep bass......"

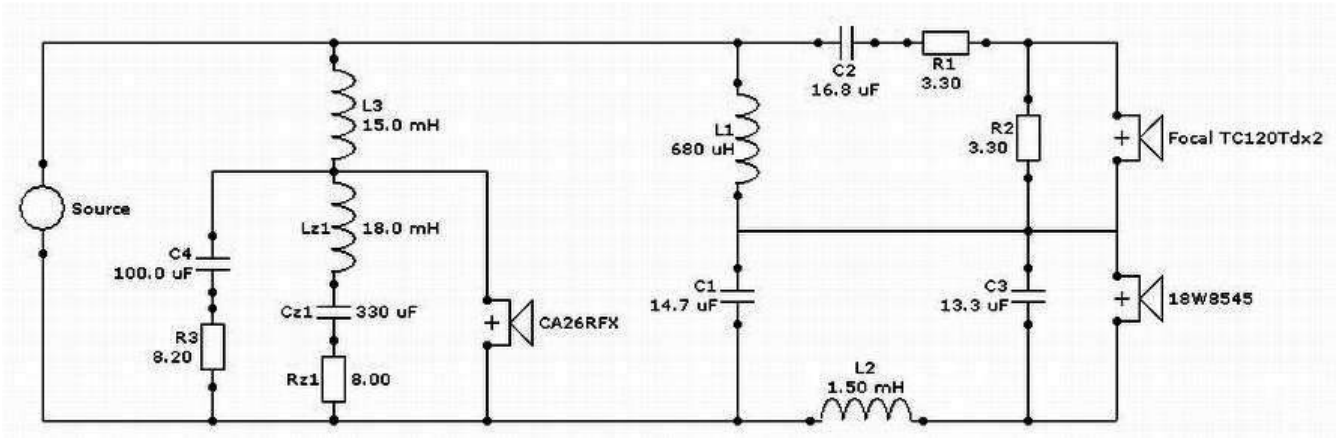
And then after a few more weeks:

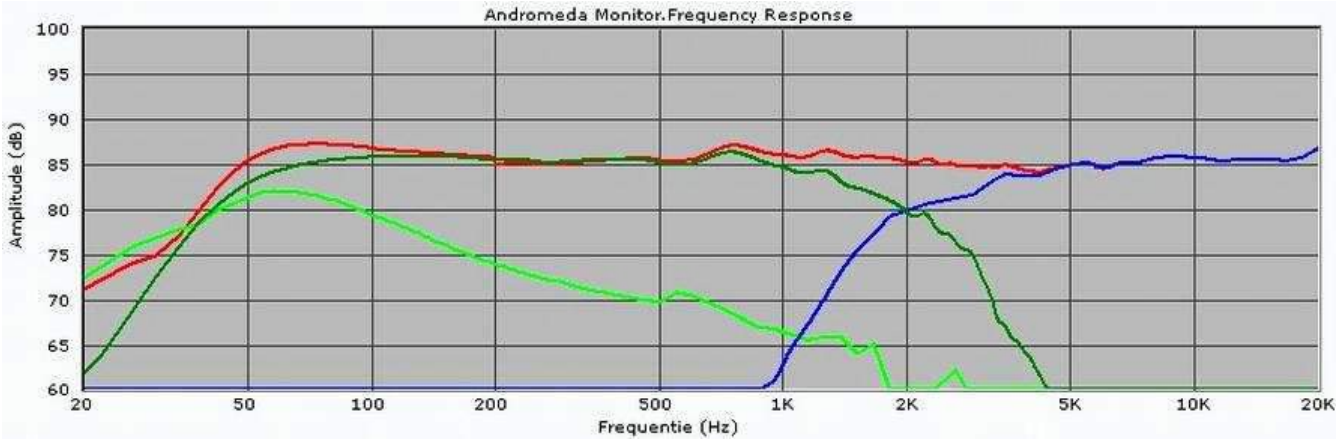
"*.....I just wanted to give you an update on the Andromeda speakers with the Seas woofers. I just completed the project Wednesday and have had a few days to listen to these speakers. I am very happy with the sound. In fact I am so pleased that my Apogee Stage speakers have been replaced by these new speakers! I have been a huge Apogee speaker fan for the past 15 years but I actually enjoy the sound from my new Andromeda speakers more. Adding the 10 inch woofer gave me the impression that the ScanSpeak midrange did not have to work as hard. The speakers took on a more "relaxed" sound. The deep bass is there, but only when the music calls for it. Large orchestral pieces sound amazing. The speakers just seem to dissappear and the sound fills the room.*

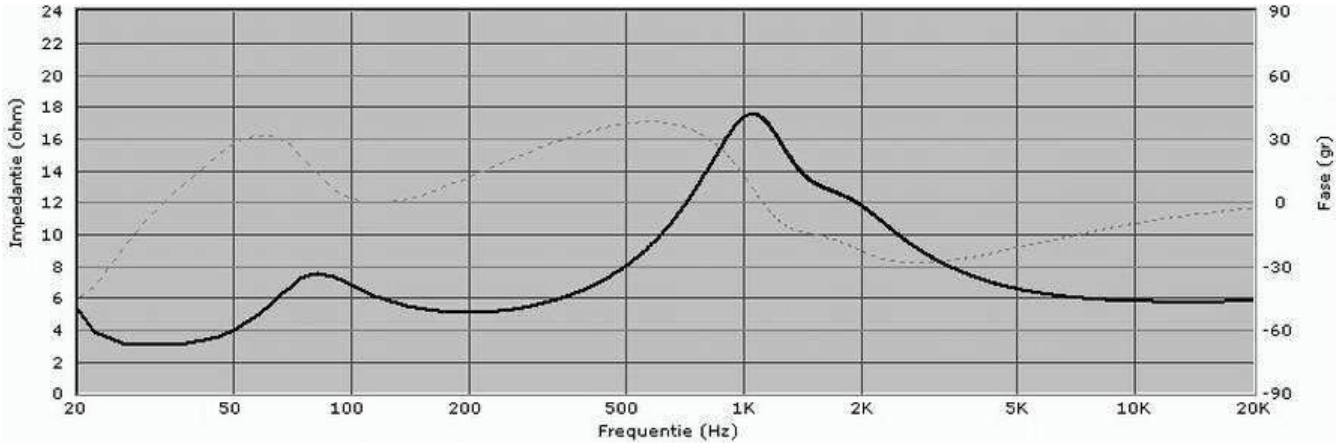
The bass box is made from .75 inch MDF and .5 inch solid oak. There is a 3 inch port tube tuned to about 30 Hz. The total volume of the bass box is 90 liters so I could add the Eton 12 inch woofer in the future. I used the iron core inductors from Parts Express that you recommended. I think these speakers could be a really good alternative for someone who wants to build the Andromeda MkII speakers but needs to cut about $1500 off the total budget.

Thank you soooo much for all your help. I could never afford to buy a pair of speakers like this from an audio dealer. Their sound reminds me of the Wilson Sophias. Very detailed and dynamic!

I will try to make a link on my web page soon that will have these Andromeda Speakers".







Tony Gee, The Netherlands, May 2009