

## INTERESSANTE PROGETTO SCAN-SPEAK IN INGLESE

SITO UFFICIALE : <http://www.brennwald.matthias.com/>

### THE "SCANSPEAKER"

[This loudspeaker design is based on a speaker by Pirmin Schwitter. I used the same drivers but I built a different case and crossovers. I'd like to thank him for his ideas and advice!](#)

### Drivers

[As the name of the "ScanSpeaker" suggests, all the drivers are made by ScanSpeak.](#) I used the [8545 woofer](#) (17cm diameter) and the [9900 tweeter](#) (aka "The Revelator", 28mm dome). These are expensive, but very good drivers. But: I have to admit I have used drivers which are easier to work with...

**The 8545 woofer's** membrane of woofer is made of a mix of carbon-fibres and paper and it has an inverse dust-cap. It has ScanSpeak's SD-1 drive to achieve a very linear "motor". The woofer's Thiele-Small parameters are:

Qts: 0.27  
Qes: 0.29  
Qms: 3.69  
fs: 28 Hz  
VAS: 49 l  
Mmd: 21 g  
B\*L: 8.3 Tm  
Rms: 1.0 Ns/m  
SPL: 88 dB/2.83V/1m  
Le: 0.4 mH  
Rdc: 5.5 Ohm



The 8545 has the reputation of very smooth reproduction of voices. This wasn't true in my speakers at all until I added impedance-compensation for the impedance-rise caused by the voice-coil. After doing so the 8545 easily outperforms the Seas Excel magnesium drivers I used in my "Tube-Speakers" (ok, I didn't try the impedance-compensation with the "Tube-Speaker" yet...).

The 8545 has a strange "bump" at about 600-700 Hz. It doesn't look like a membrane-resonance at the waterfall-diagrams so it can be corrected with an LCR-network.



**The Revelator** is one of the best tweeters I have ever listened to. It has a special frontplate which is supposed to produce good lobing-behaviour. I've been told that this frontplate causes a slight resonance somewhere between 10 kHz and 20 kHz, but I couldn't see it on my measurements. The dome diameter is 28mm and the resonance-frequency is at 530 Hz, so the Revelator goes lower than most other tweeters. The Revelator has NO ferrofluid in the gap to muddle the sound or to damp the resonance. Therefore it's a good idea to care about the resonance-peak in the cross-over network. The Revelator acts a bit like a "diva" when designing the crossover. I think this is mainly because of the very high resonance-peak, but it's also because the Revelator's resolution is very good, so it's really easy to hear differences of different capacitor-types (by the way: good caps don't have to be expensive!!!!).

### The Case

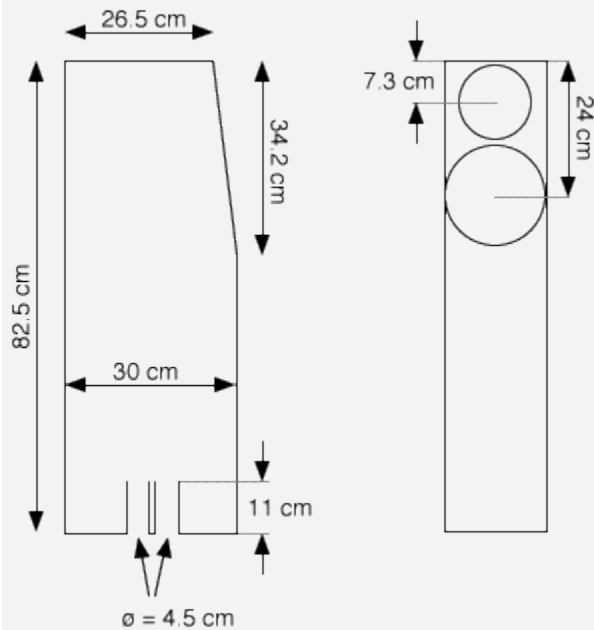
The case is as important as the drivers to make a good speaker! An ideal case does not vibrate at all - the driver's membranes are the only thing that should move. To get a "dead" case I built the case from 18 mm particle-board (inside) and 10 mm MDF (outside). I put ceramic tiles on the inside (like tiles in your bathroom), then a layer of "Hawaphon" (lead particles). On top of all this I put 10 mm felt and some wool to damp resonances/reflections inside the case. All in all the thickness of the walls is about 4 cm (without the felt).

I used a bass-reflex construction to get enough bass-SPL: I put two channels in the bottom of the case, "looking" to the floor (the speaker stands on spikes, about 2 cm above the floor). The idea of this arrangement is that the midrange "garbage" coming out of the bass-reflex channels is damped by the carpet. The internal volume of the case is about 18 Liters. The front is 18.8 cm wide which is about the diameter of the woofer. It is important to make the front as narrow as possible to move the frequencies where reflections from the corners of the case appear as high as possible (away from the frequency-range where the ear is most sensitive).

Maybe I'll build a new case some day. I might change the following:

- Use a "sandwich"-case with two thin MDF-layers (about 5 - 10 mm) and a thicker layer of sand in between (about 20 mm). Such a case will be as "dead" as dead can be.
- Another good case could be a ceramic pipe like the ones used in the sewer-channels. These tubes are very cheap or you can even have them for free from the next construction-place. Look at Esben Beck's ["Speakers from the Sewer"](#) at the Speaker-Building-Page.

The back of my case is removable to allow changes at the inside of the case. I experimented with different stuffings and carton-plates as deflectors to avoid standing waves. The following is not bad: I put a piece of carton at the top of the case with some foam glued to it. The angle between the carton and the front-plate is about 30 degrees so standing waves along the height are damped. This is very important because the bass-reflex-channels are just at the other end of the standing-wave (at the bottom of the case).



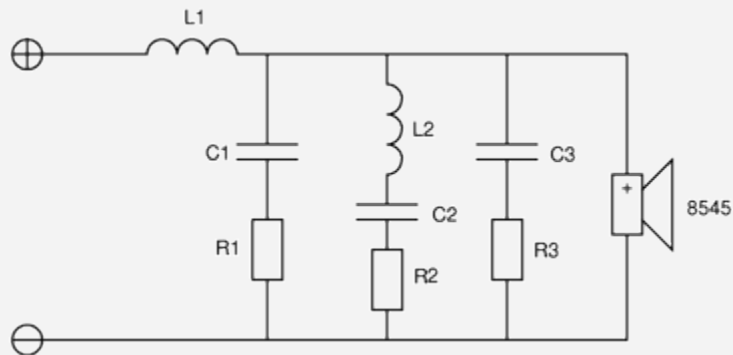
## The Crossover

The Crossover changes from time to time... Sometimes I have ideas how to improve the crossover and then I start soldering, listening, measuring, soldering, listening, soldering, measuring, listening, soldering - until I get a completely new crossover-network or else I return to the old schematic.

There are two points which are important with this speaker:

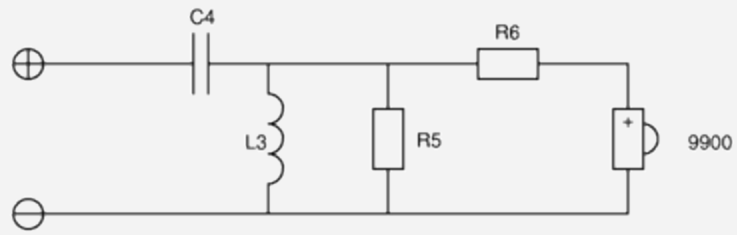
- The tweeter's impedance-peak is very high, so it's a good idea to correct for the impedance-peak. In my crossover this is done by the L-pad before the tweeter. The main purpose of the L-pad is to match the tweeter's sound-pressure-level to the woofer, but it flattens the impedance peak very well, too.
- The woofer's "hump" at about 600-700 Hz must be treated with a LCR-network. The value of the inductor must be very high (I used 15 mH) because lower values will cause a dip which is wider than the woofer's peak which we want to cancel.

### a) The woofer's cross-over network



$L1 = 1.8 \text{ mH}$   
 $L2 = 15 \text{ mH}$   
 $C1 = 10 \text{ } \mu\text{F}$   
 $C2 = 15 \text{ } \mu\text{F}$   
 $C3 = 3.9 \text{ } \mu\text{F}$   
 $R1 = 5.6 \text{ Ohm}$   
 $R2 = 4.4 \text{ Ohm (tot. resistance of LCR including L2)}$   
 $R3 = 1 \text{ Ohm}$

### b) The tweeter's cross-over network



C4 = 3.9  $\mu$ F  
L3 = 0.82 mH  
R5 = 10 Ohm  
R6 = 8.9 Ohm