Sonab OA5 mkII

July 2009

One of my neighbours' daughter threw a party and cranked up the volume of daddy's stereo and fried the voice coil on one of the Philips 9710 drivers in these vintage Sonab OA5 speakers. Poul Erik had bought these speakers at the local second hand market - he was there before me - and had come to like the vivid presentation of these high-efficiency, easy driven speakers of the Seventies. So, he googled "**Philips 9710**" and the connection was made. From eBay Poul Erik bought a pair of 9710s from Germany and one of the drivers was suitable for restoration. The other had had some surround repair - too much white PVA glue - and a resulting Fs of some 90 Hz. Too bad, but that's how goes buying on eBay from second hand dealers knowing nothing about loudspeakers.

The Sonab range of speakers from the Seventies are speakers I've long been looking for in order to find out what the 9710 could do in an omnidirectional set-up, and this OA5-mkII did call for a few surprises.

First of all I assume this *is* a Sonab OA5 mkII from reading the excellent website on these speakers: http://www.carlssonplanet.com/oa5ii.php
The technical data suggests the following:

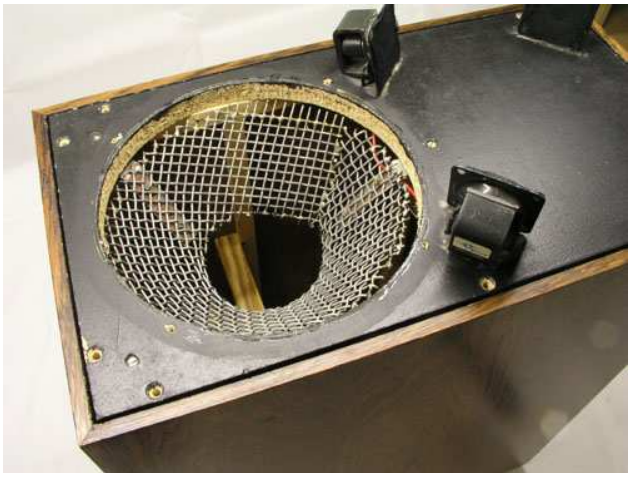
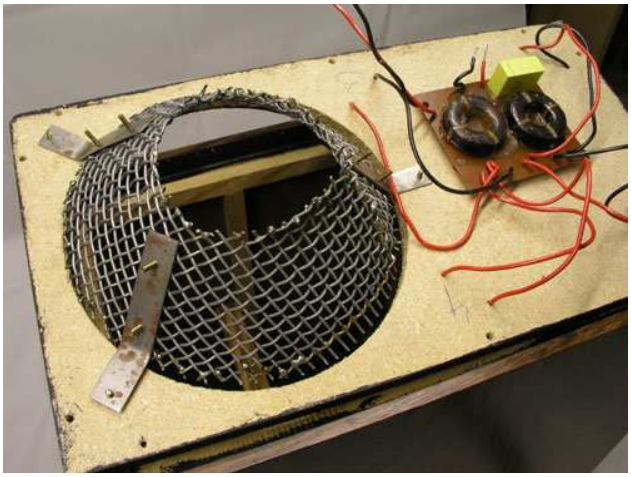
Volume: 47 liter
Dimensions: 24 x 61 x 43 cm
Weight: 10 kgs
Principle: Omni-directional bas-reflex loaded speaker (although it does not have port tubes, see later)
Impedance: 7 ohms
Frequency range: 37-18,000 Hz
Crossover frequency: 2,700 Hz
Bass/mid: Philips 9710
Treble units: Peerless MT 20 HFC

This is all fully in accordance with my findings, except for the 37 Hz bass extension. The speakers have no Sonab badges and taking them apart made me wonder whether this is really a commercial product or some cleaver cloning of the same. I believe this *is* a true Sonab product from the cabinet work, but the 9710 basket and the crossover PCB suggests amateur work.

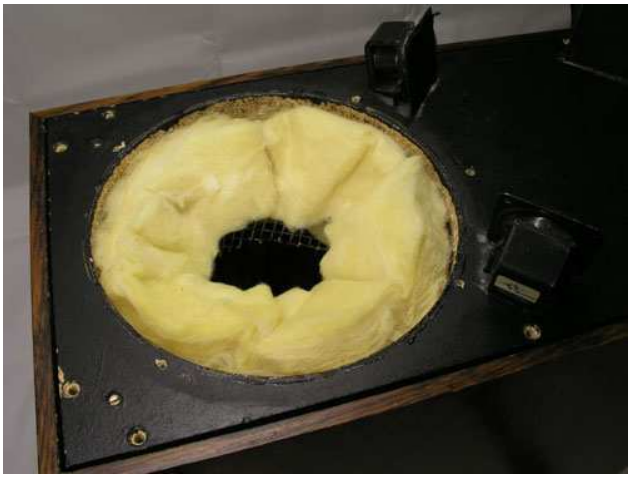
The principles of these speakers can be found on the carlssonplanet website and I won't get into details with this, but the cabinet calls for some comments. Take a look a the photos below. What is this? A 47 liter cabinet with the 9710 driver placed in a metal mesh basket with some heavy glassfiber material between driver and mesh, making a low-pass filter that can be adjusted due to the basket being suspended on three screws that allows you to increase or decrease the acoustic resistance of the fiber material. An acoustic vent, sort of. Something similar can be found on some Lowther drivers. Next we have a cabinet divided into two compartments by two heavy fiberglass sheets. The lower compartment is open to the outside by two 54 mm holes at the bottom, no tubes here. In reality I guess we can call this a two-step aperiodic system with progressively diminishing acoustic resistance towards lower frequences.
What is sure is this: I have never seen a more valve-amp friendly impedance than this, only varying 7 to 10 ohms from 20 to 1000 Hz! Take that! Consequently phase angles are modest, not to say almost flat.
Overall sensitivity is around 90 dB/2.8 volts taken from the midrange with a response rising some 10 dB towards 3-5 kHz. No surprise, the 9710 only has a modest 0.5 mH coil in series, not nearly enough to tame the terribly 9710 treble peaking. However, these speakers are not - fortunately - meant to be listened to on-axis and a rising frequency response is expected from an omni-directional speaker to balance the overall in-room sound.

From setting up the speakers first time it becomes immediately clear that these speakers have a bright presentation. Very bright indeed with way too much treble. There will be a few recordings that will stay on the shelf for good. No matter how the speakers are placed in the room, this stays the final verdict. I badly miss a pre-amp with tone controls to tame the treble region as would have been the case back in the Seventies. If I had to clone the OA5, I'd probably use a 2nd/3rd order filter to tame the treble range. Based on modelling this would also allow the drivers to be connected with same polarity, which may not be such a big deal due to the placement of the tweeters.
The tweeters were not the problem here. The troublemaker is the 9710 treble peaking and only a higher order filter can tame this. Having four tweeters allows a resonably low point of crossover and there's no point in not bringing down the 9710 treble peaking. However, these speakers were for loan, not for tweaking.

I guess these speakers are high WAF, modest size and exquisite veneering.
The speakers came with a black stocking around the 9710 driver. Removed here for the photo shoot.

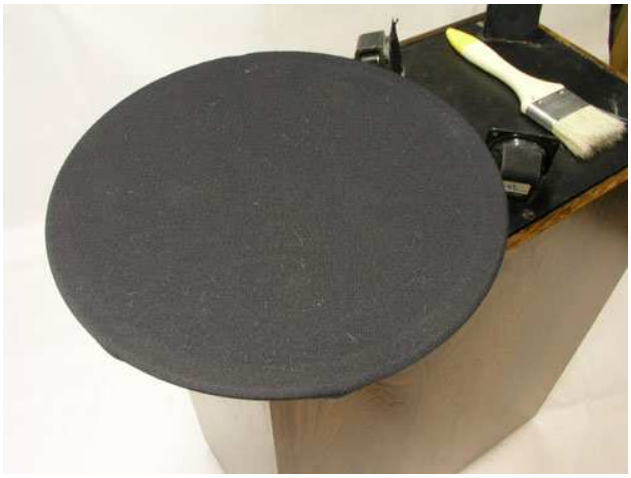
The metal mesh basket holding a ring of fiberglass material. See next photo.



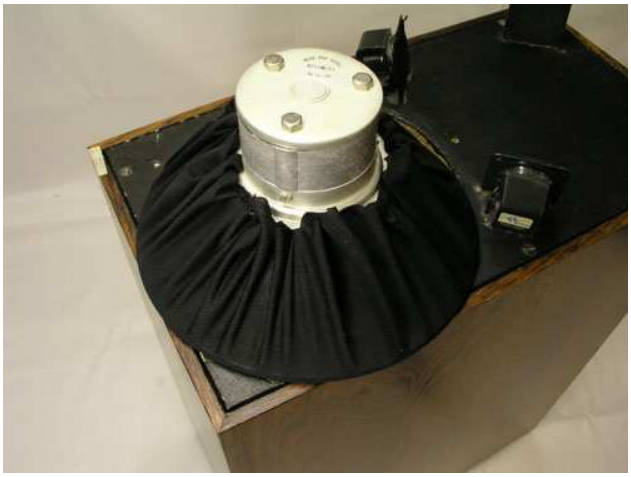
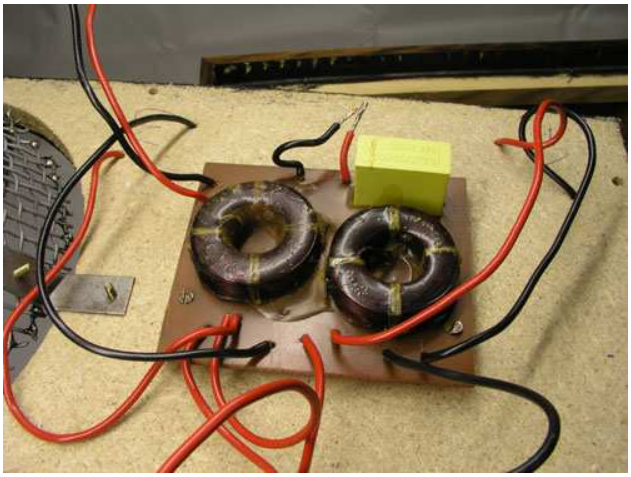

Right: Damping material dividing cabinet into two sections.


Base plate covering two bottom holes of 54 mm diameter. Apparently no feet was ever attached to these speakers. Some small rubber or felt pads would do well in stabilising the speaker on the floor. A DIN socket is seen at the end of the base plate for connecting to the amplifier. I removed this a added a pair of heavy screw connectors.


Left: Cabinet interior. Right: Two sheets of fiberglass placed as shown on drawing below.

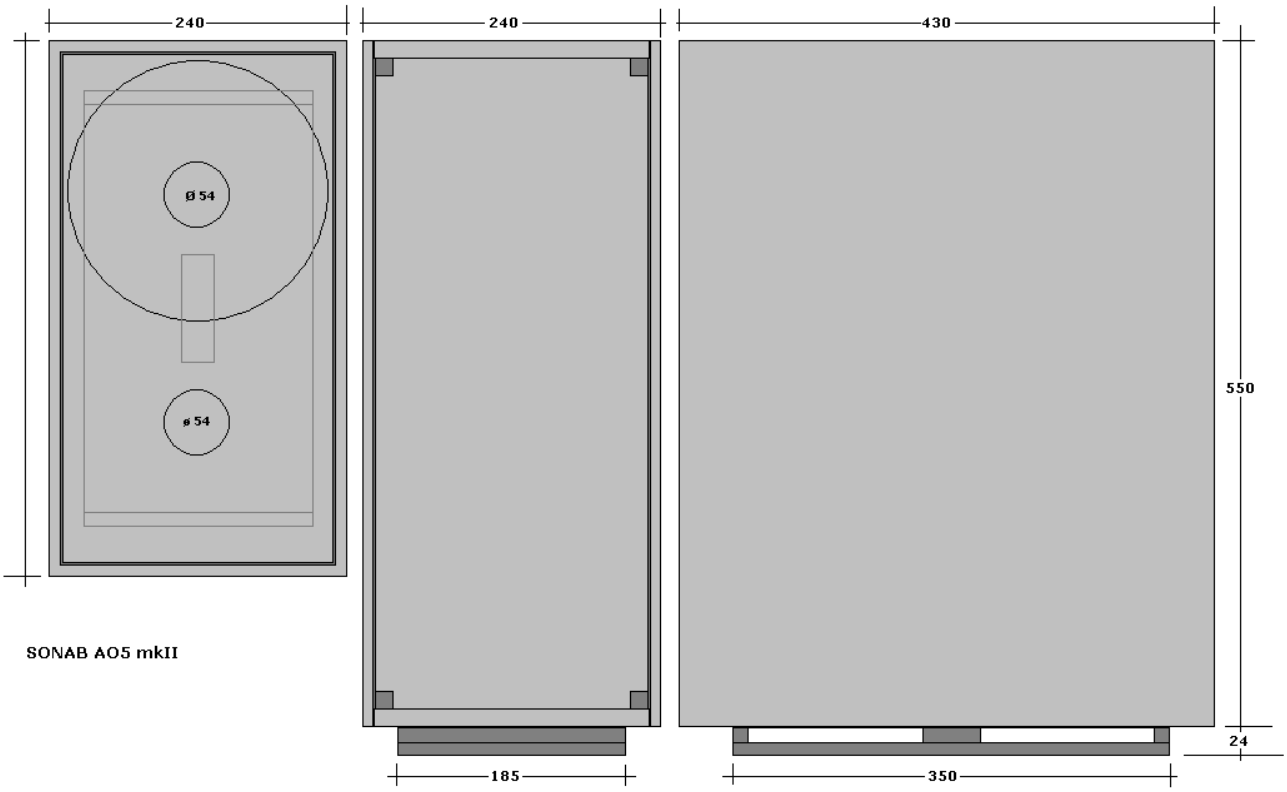



Left: Two renovated 9710 drivers, i.e. cone suspension added a thin layer of flexible coating.
Right: I rarely have to sew making loudspeakers, but this calls for a stocking of front grille cloth as the drivers pointing upwards are true dust collectors.

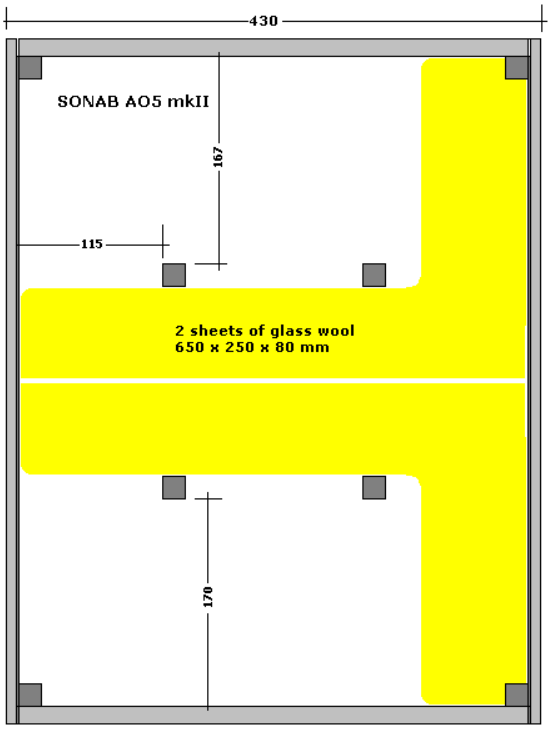
Right: Crossover is simplisity itself. 0.5 mH to the bass drivers and a 2nd order filter for the tweeters consisting of 6.8 uF cap and 0.5 mH coil. I feel certain the crossovers are original as few diy'ers would use wax for coating the coils. The film capacitor (polyester) will probably last forever, so no reason to change this with some PP that may not be much better. The coil in series with the 9710 is from pretty thin wire, but we're not dealing with heavy loads of amperes here, so not much would be gained from changing this one either.

Sonab OA5 mkII cabinet



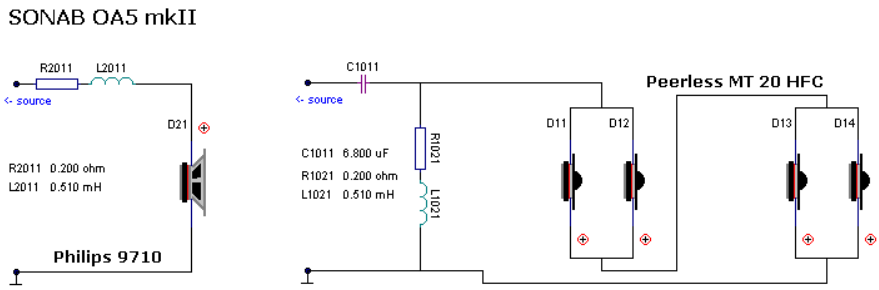
Cabs are made from thin 12 mm particle board veneered on both sides to make an overall thickness of 13 mm. Bottom and top are made from 16 mm particle board. A number of fillets are placed inside to strengthen the cabinet and damp resonances. Se photos above.

These cabs are lightweight! Some 10 kgs in total incl. drivers, crossover and damping material and we may expect a highly resonant system but this doesn't appear to be the case. The bass quality is anything but boomy. Not reaching deep, but short and fast, undoubtedly due to overall construction and not least the special use of damping material.

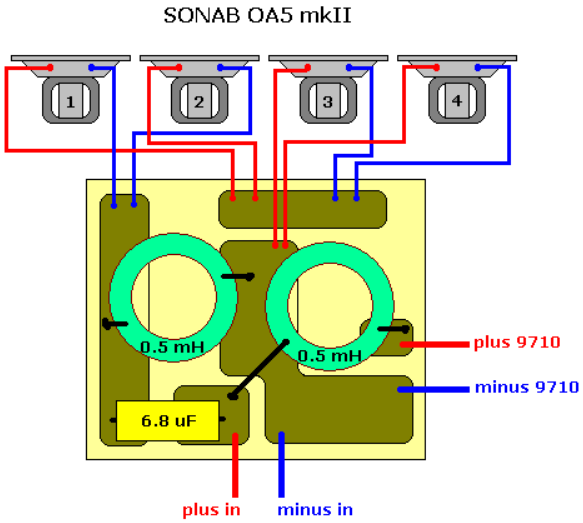


This is how the damping sheets are arranged in the cabinet.
The 9710 driver is placed to the left here.
Cross braces are placed symmetrically.

Sonab OA5 mkII crossover



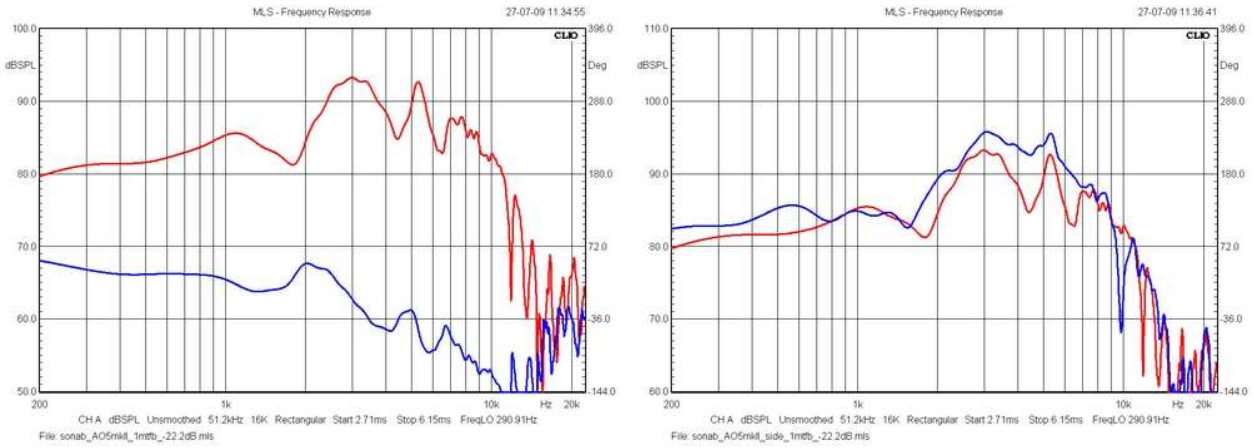
OA5 mkII crossover design, simplicity itself. 1st order to the 9710 and 2nd order to the tweeters.
All tweeters are 8 ohms.



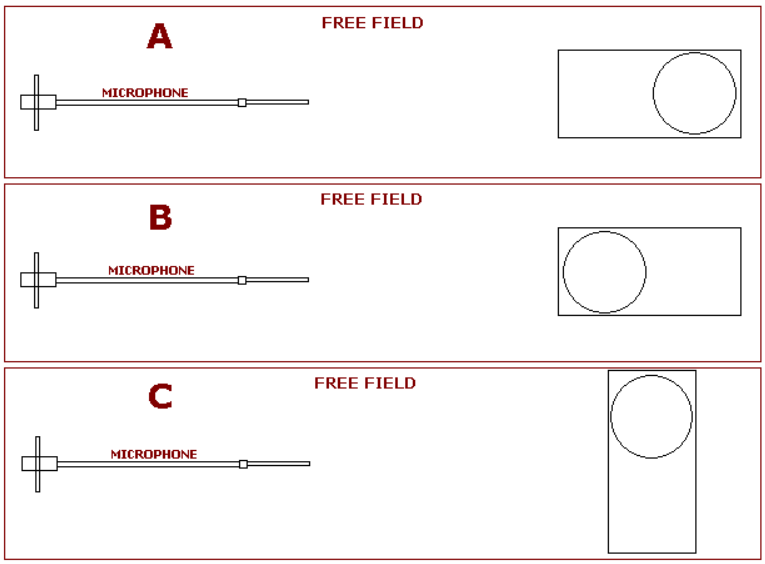
Crossover layout.
The PCB looks like the very first PCBs I made many years ago with a marker directly on the copper side before etching. That's what made me wonder if this speaker is a cleaver clone or the real thing.

Measurements

How on Earth do we measure an omnidirectional speaker spewing sound in all directions? Definitely not an easy task and what's shown below is with every possible reservation except for the impedance measurements. At least these can't be argued.

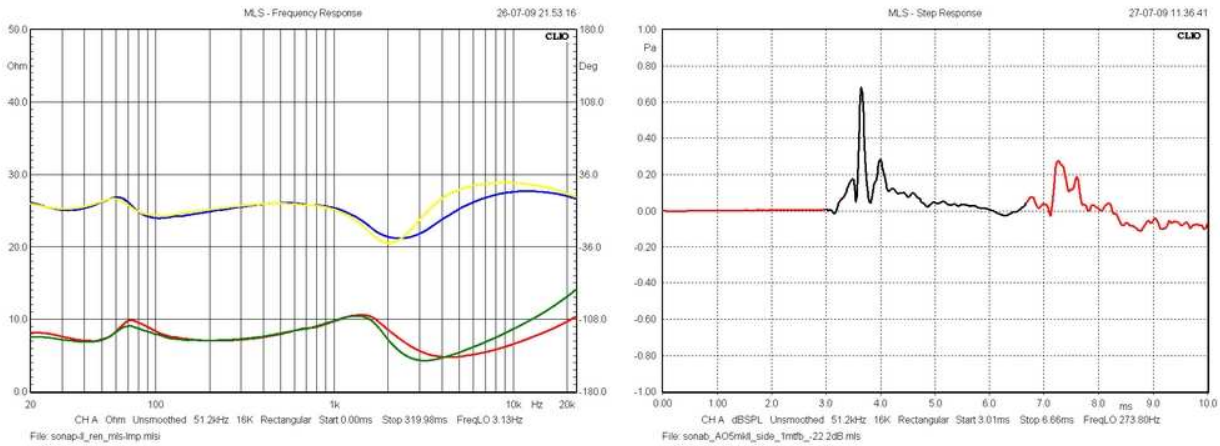


Left: Conventional gated measurement, 1 meter distance at 20 cm above top panel height.
Speaker placed like A (see below). Blue = minimum phase.
Right: Red = position A, Blue = position C.



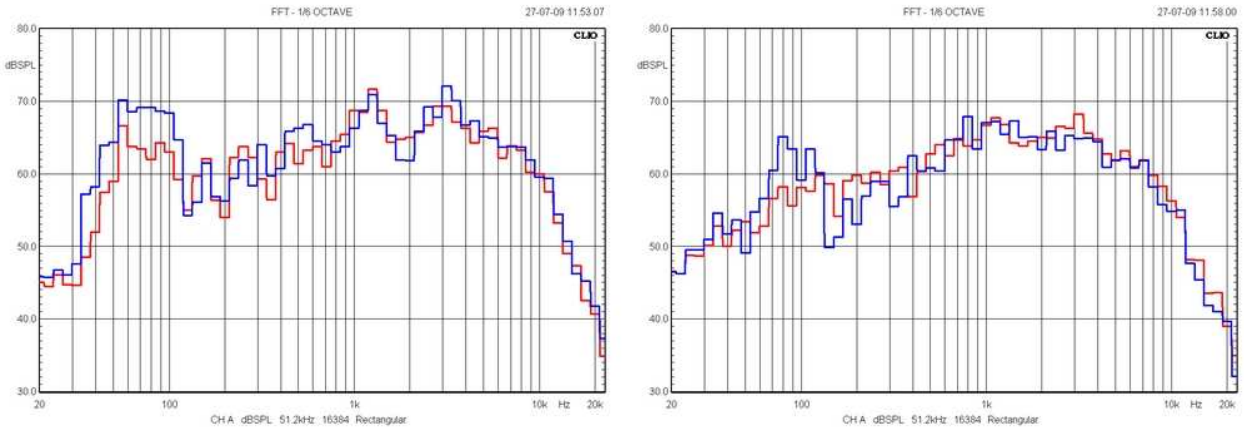
Various speaker positions during measurements. Position B not shown here.

Here a measurement on-axis, 0.5 meter distance normalised for 2.8V/1 meter.
System sensitivity is around 90 dB/2.8V/1m valued from the response @ 500 Hz.



Left: Impedance of left and right speaker showing decent bass tuning, i.e. placement of damping material.
Right: Step response measured from position C (side).

The last four graphs are from various measurements with speaker against a wall with different distances to side wall.



Left: 9710 side against wall and 0.5 m to sidewall (blue) and 1.5 m to side wall (red). Right: Tweeters against wall and speaker 0.5 m to side wall and 1.0 m to side wall (red). With the 9710 not up against the wall and 1 meter to side wall makes a decent smooth, albeit seriously rising response. This is against most recommendations I can find that will suggest the 9710 being close to the wall, but this seems to consistently produce a serious dip in the ~130-200 Hz range, something that will add to the thinness of sound. It lacks weight as most music has a lot of energy in this range.
By the way: These speakers do not say much below 50 Hz where the 37Hz claimed low-end extention seems fairly optimistic. The heavy cabinet damping is partly responsible for this. The 9710 can do better, but not at the same time produce an impedance profile like seen here.

Final comments

Taking the Sonabs to our living room I tried all possible speaker placements. From our sofa, some 2½ meter to the speakers, I found the speakers placed flat against the rear wall to produce the best sound. Having the speakers standing out from the wall with either the 9710 or the tweeters against the wall just didn't work. Phase tracking between drivers is fairly good when I measure the response on-axis, i.e. like measuring a conventional speaker (data not shown), but despite treble coming from all over the place, having the drivers "on-line" appear to compromise driver integration, thus flat against the wall with a 20 cm distance between cabinet and wall.

These speakers are quite good at "making music in a room" - if you get my meaning. Forget about pin-point imaging and the like. Listening to the ever-lasting Jazz at the Pawnshop, all the usual details of rattling glasses and people speaking is pretty much gone. Overall the sound lacks bass and the middle and upper treble is dominant and prevents you from turning up the volume, which again will make the sound even slimmer as we do need a certain loudness level to energize the room. A drummer seriously hitting his cymbals... let's be honest about the treble coming from 5 drivers in different locations, it just isn't good from these speakers.

This may all sound a bit negative, but I still think omnidirectional speakers are interesting and I may well give it a shot some day. The later Sonab models with tilted midbas and quarter-circle of tweeters may sound differently and seems more like something that did address the issues discussed above. Stig Carlsson's persistent work on speaker and room integration is admirable to say the least but this OA5 wasn't the final answer to this most troublesome area.

Response to article

Hi Troels,
Firstly, thanks for your web-site. I have really enjoyed reading your articles over the past few years. The first thing I do each day as I logon to my PC is to check and see if there are any additions to your web-site. You have provided a great resource for the DIY community. Secondly, your article on the Sonab speakers is very interesting. I am hoping you continue to look into omnidirectional speakers - the audio community seems very divided on their merits, however it seems that good omnidirectional speakers have some very passionate supporters. I found these reviews of the Shahinian Arc speakers, which may interest you. I think the Arcs use SEAS CA22RNY and 27TBF/G drivers. The slope of the Arc front panel is consistent with your comments about the later versions of the Sonabs. Anyway, thanks for the great work. Regards, Campbell A.

(Response from Johan/Norway, suggesting this OA5 mkII is indeed a kit version, which explains the missing badge. Furthermore there should have been a mesh support on top of the speaker and the 9710 basket for the damping material was made from plastic in the original. Thanks Johan for your comments.)

- jeg er også glad for det at du har prøvd ut Sonab OA 5 mk II, og som Carlssonentusiast vil jeg bemerke følgende. De svake punktene gjengivelsen henger sammen med to ting: foreldede elementer og manglende avstemming av kassen. Både Philipsbassen og Peerlessteeterene har sine svakheter, og de kan med fordel byttes slik dt er anbefalt på Carlssonplanet og Faktiskt. Man kan også sette inn et bassrefleksrør slik enkelte entusiaster har gjort, med godt resultat. Det ser ut som du har fått en kit-modell av OA 5 mk 2, altså et hjemmebygg. Det går frem av dempekurven, som er av plast i orginalen og av den manglende runde pinnen som skal stikke opp mellom diskaneten på orginalen. Hvis det mangler emblemer på fronten også så er det nok temmelig sikkert et kit som noen har laget. Jeg er av den overbevisning at du har tenkt disse tankene, og jeg har et håp om at du skal prøve ut en modernisert verson av OA 5 mk II. Igjen takk for mye intressant lesning! Mvh Johan.

Hi!
It's fun to read when somebody really looks into to something. In your piece of the Sonab OA-5 there are a few things that strike me as odd. I think, as you already suspect, that these are not the same as original factory-built units. Some things look correct, others don't.
Correct looking:
The box (the four side walls). The damping-material and it's position inside the box.
Incorrect looking: The support for the net between the tweeters is not there (see picture 1 below). The baffle it self looks strange but perhaps it is just repainted. The crossover looks like some I have seen on kits for the "Pop-boxen" except for the capacitor which is much newer than that. (Pop-boxen = DIY-version of OA-5).
This damping basket looks like nothing I have seen from Sonab, either it looks like picture two below or it's made of plastic on the ones I've seen. The bottom of the speaker is not as it normally is, perhaps the chipboard under the speaker has been replaced. The DIN-plug is also not original.

Perhaps this is a speaker that has been refurbished with home-made parts?

Listening:
When you talk about your listening impressions they don't sound to me as the numerous pairs I have had at home. They are normally not so bright, rather the opposite! If you are standing up close to the speaker they are of coarse very bright since you then also get the direct radiating sound from the speaker (9710). The tweeters are often "hissing" producing terrible "sssszzzssz" noise and the bass is not too bad. With good tweeters they are nice with Dire Straits and similar music. If the tweeters are in working order but hissing you can fix them somewhat, see: http://www.carlssonplanet.com/renovation.php?lang=sv&. Scroll down to: "Coata gamla diskanter" and read on.
So my question is really if you have tuned the damping-basket before listening / measuring? There is a method to tune the basket for the correct damping using a tone generator, a volt-meter and an amp. If the damping basket and its material is too tight you would get poor bass. If you check out the download area of CarlssonPlanet you'll find three documents that might be of interest if you have not already seen them: http://www.carlssonplanet.com/downloads/index.php?act=viewall. OA-5K Broschyr. Popboxen – original article from 1964. Carlsson Ortho-Acoustic loudspeakers: Design and Performance principles. Some are in Swedish but I think you'll manage. I hope you will find something of interest in these ramblings because I found your study interesting! When somebody does something like this about something that interests me I'm glad about it. So I try to respond with some input of my own. Would you like a copy of how the damping is to be adjusted? Can the damping basket be adjusted on your speakers?
Thanks a lot for the interesting reading, **Martin.**

My comments in bold:

Hej
Tack för din intressanta genomgång av Sonab OA5.Tyvärr är det nog ingen kit(byggsats)utan ett DIY. Flera detaljer talar mot, t,ex
- Pinnen mellan diskanterna saknas
- Det ska vara en tygpåse **(original fjernet af mig da den var i dårlig stand)**
- Det ska vara tätningslist under basen **(original fjernet af mig og erstattet med gummiliste)**
- Basen ska var fäst med gummibussningar
- Det ska vara fästbyglar till diskanterna
- Baffeln ska vara försänkt flera cm
- Delningsfiltret ser inte rätt ut
- Kondensatorn är för modern **(filmkondensatorer fandtes længe før Sonab, så ??)**
- Jodå,det ska finnas ett Sonab-märke
- Dämpkorgen har fel metallnät

Detta fann jag vid en snabb genomgång.Kan precisera om du vill. Jag har några bilder från kitet till Typ 1 om du är intresserad?
mvh, Rolf

Hej, det här är vad jag har om OA5 kit.Obs att det är typ1,men den stora skillnaden är baffelns läge och ett högre galler.Bilderna är scannade ur en tidning-TfA nr 18 1968. Konstigt att inte någon enda människa tycks ha någon byggbeskrivning i original kvar.Det såldes ju massor....mvh Rolf

Click image to download 4 kit files (zip file, 3MB). Pics 2 and 4 from left taken from carlssonplanet website on OA5 mkII.

Hi!
Nice to see that there is good response to your article. I have also seen the article on the 9710, (Actually been considering to build he cabinet with the two CT62 tweeters since I have all parts lying around).
So I just planned to make a few clarifications to my last mail:
- The support was mounted on the baffle when you purchased the kit. (It's not something you add when assembling.)
- The idea with "coating" is perhaps incorrectly described, it is not about coating the cone.The idea is to glue back he cone to the basket. On old MT20 it sometimes starts to come loose around the edges resulting in this terrible hissing sound.If your tweeters are mint this shall not be done since nothing then will be gained!
- Regarding the adjustment of the basket I tried to enclose it in the e-mail but it only came back, so now I have uploaded it on CarlssonPlanet under downloads instead.
Good luck! By the way, I just realised we have had this E-mail conversation in English, would Danish/Swedish be better?
Best regards, Martin

My comments:
The speaker tested in this article seems more in accordance with the factory made OA5 mkII looking at the photos on the carlssonplanet website. Apparently the kit (OA-5 K) had recessed drivers, i.e. top panel was lowered into the cabinet making a flat top. However, the basket holding the damping material below 9710 driver looks home made. I'm pleased to see the bottom panel with the two holes being in accordance with the kit design, despite to speaker support looking homemade too. The crossover looks OK being two coils and a cap. The placement of damping material seems OK.
All things equal, I believe that what I heard here has been well in accordance with what an OA5 mkII customer heard back in the Early Seventies. Having properly working drivers, correct crossover and cabinet with correctly placed damping materials, it can't go much wrong.
Thanks to all for contributing with comments and pics on this interesting design. Regards, Troels.

And thanks for your second mail, Martin. Having the Service Manual for the OA5 mkII is great. Lots of details here.
Download manual from this link: Service Manual OA-5 Type 2 Loudspeaker
Best regards, Troels.

The Carlson/Sonab Speakers you came across are not DIY but genuine, I came across an identical pair in the mid 90's working in a London 2nd Hand HiFi Shop.
Ciao T

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Believe it or not: My neighbour has picked up another pair of Sonabs: This time the OA-14! To be reported later this year.