

Hi guys!

Recently I had read some of box speaker design. Dickanson's book mainly.

So, my object is to design a vented box with a particular speaker.

I do not understand very well some concepts of the whole design procedure. Here is a summary of what I did:

First, the T/S parameters of the driver:

Re 10.87 Ohms  
fs 55.9 Hz  
Le 1.46 mH  
Mms 30.4 grams  
QM 8.23  
Mmd 26.7 grams  
QE 0.48  
Cms 0.267 mm/N  
QT 0.45  
Rms 1.297 N\*sec/m  
Xmax 3.01 mm  
Vas 46.5 liters  
Pmax 150 Watts  
SD 350.1 cm<sup>2</sup>  
BI 15.53 Tm  
VD 105.4 cm<sup>3</sup>  
Coil Diameter 2.00 Inches  
EBP 116.1  
Gap Height 0.313 Inches  
Magnet Weight 38 ounces  
Efficiency 1.63 %  
Winding Width 0.550 inches  
SPL 94.1 dB 1W-1m

This driver is close to the eminence CA-5910.

The box will be a dual woofer format (2x10). So, Dickanson says that Va will be twice that for a single driver: 46.5liters x 2 = **93 liters**. Also the cone excursion will be half of that a single speaker **Xmax =1.05mm**. In a paralelle configuration the impedance will be half of that a single speaker, so **Re = 5,43 Ohm**.

So, beginning the calculation, I must assume a loose factor **Q<sub>L</sub> = 7**. Doing the calculations with the three set of tables for the different alignements I look the value of **Q<sub>ts</sub> = 0,45** to get the values of **H**, **alpha**, **f<sub>3</sub>/f<sub>s</sub>** and **peak db**:

TABLE 2.5

$Q_L = 7$ QB <sub>3</sub> and SQB <sub>3</sub>				
$Q_{ts}$	H	$\alpha$	$f_3/f_s$	Peak-dB
0.1000	3.8416	34.3925	5.2233	0
0.1100	3.4947	28.2341	4.7386	0
0.1200	3.2058	23.5499	4.3337	0
0.1300	2.9615	19.9046	3.9902	0
0.1400	2.7525	17.0150	3.6949	0
0.1500	2.5712	14.6784	3.4381	0
0.1600	2.4129	12.7685	3.2126	0
0.1700	2.2743	11.1855	3.0128	0
0.1800	2.1495	9.8589	2.8345	0
0.1900	2.0388	8.7361	2.6741	0
0.2000	1.9393	7.7775	2.5289	0
0.2100	1.8494	6.9524	2.3968	0
0.2200	1.7678	6.2372	2.2759	0
0.2300	1.6935	5.6132	2.1647	0
0.2400	1.6254	5.0655	2.0620	0
0.2500	1.5629	4.5822	1.9667	0
0.2600	1.5054	4.1535	1.8778	0
0.2700	1.4522	3.7714	1.7946	0
0.2800	1.4029	3.4295	1.7165	0
0.2900	1.3571	3.1223	1.6429	0
0.3000	1.3145	2.8421	1.5732	0
0.3100	1.2748	2.5944	1.5070	0
0.3200	1.2376	2.3667	1.4439	0
0.3300	1.2028	2.1594	1.3836	0
0.3400	1.1702	1.9699	1.3258	0
0.3500	1.1395	1.7964	1.2702	0
0.3600	1.1106	1.6371	1.2167	0
0.3700	1.0834	1.4905	1.1651	0
0.3800	1.0578	1.3552	1.1153	0
0.3900	1.0335	1.2300	1.0674	0
0.4000	1.0106	1.1141	1.0214	0
0.4100	0.9889	1.0065	0.9776	0
0.4200	0.9683	0.9064	0.9362	0.01
0.4300	0.9488	0.8131	0.8975	0.05
0.4400	0.9303	0.7260	0.8618	0.14
0.4500	0.9128	0.6445	0.8294	0.31
0.4600	0.8961	0.5682	0.8001	0.56
0.4700	0.8802	0.4966	0.7741	0.90
0.4800	0.8651	0.4294	0.7510	1.32
0.4900	0.8507	0.3661	0.7307	1.85
0.5000	0.8370	0.3065	0.7129	2.46

TABLE 2.2

$Q_L = 7$ SBB <sub>4</sub> and BB <sub>4</sub>				
$Q_{ts}$	H	$\alpha$	$f_3/f_s$	Peak-dB
0.2000	1.0000	5.8980	3.3686	0
0.2100	1.0000	5.3339	3.1518	0
0.2200	1.0000	4.8457	2.9521	0
0.2300	1.0000	4.4204	2.7674	0
0.2400	1.0000	4.0478	2.5960	0
0.2500	1.0000	3.7114	2.4366	0
0.2600	1.0000	3.4286	2.2883	0
0.2700	1.0000	3.1699	2.1503	0
0.2800	1.0000	2.9388	2.0220	0
0.2900	1.0000	2.7315	1.9031	0
0.3000	1.0000	2.5448	1.7932	0
0.3100	1.0000	2.3761	1.6922	0
0.3200	1.0000	2.2233	1.6000	0
0.3300	1.0000	2.0843	1.5162	0
0.3400	1.0000	1.9576	1.4406	0
0.3500	1.0000	1.8419	1.3728	0
0.3600	1.0000	1.7357	1.3122	0
0.3700	1.0000	1.6392	1.2583	0
0.3800	1.0000	1.5484	1.2104	0.01
0.3900	1.0000	1.4656	1.1679	0.06
0.4000	1.0000	1.3890	1.1302	0.14
0.4100	1.0000	1.3181	1.0966	0.24
0.4200	1.0000	1.2523	1.0667	0.37
0.4300	1.0000	1.1911	1.0399	0.51
0.4400	1.0000	1.1341	1.0160	0.66
0.4500	1.0000	1.0809	0.9944	0.82
0.4600	1.0000	1.0313	0.9750	1.00
0.4700	1.0000	0.9849	0.9574	1.17
0.4800	1.0000	0.9414	0.9415	1.36
0.4900	1.0000	0.9006	0.9270	1.55
0.5000	1.0000	0.8622	0.9137	1.74

TABLE 2.8

$Q_L = 7$ SC <sub>4</sub> and C <sub>4</sub>				
$Q_{ts}$	H	$\alpha$	$f_3/f_s$	Ripple-dB
0.2500	1.0338	3.8961	2.3949	0
0.2600	1.0534	3.6755	2.2282	0
0.2700	1.0703	3.4551	2.0784	0
0.2800	1.0842	3.2360	1.9439	0
0.2900	1.0951	3.0193	1.8229	0
0.3000	1.1028	2.8062	1.7137	0
0.3100	1.1073	2.5977	1.6149	0
0.3200	1.1086	2.3952	1.5251	0
0.3300	1.1065	2.1997	1.4431	0
0.3400	1.1012	2.0125	1.3679	0
0.3500	1.0926	1.8347	1.2986	0
0.3600	1.0810	1.6672	1.2345	0
0.3700	1.0667	1.5109	1.1751	0
0.3800	1.0498	1.3665	1.1200	0
0.3900	1.0309	1.2343	1.0689	0
0.4000	1.0103	1.1146	1.0215	0
0.4100	0.9886	1.0070	0.9777	0
0.4200	0.9662	0.9113	0.9373	0
0.4300	0.9436	0.8266	0.9001	0
0.4400	0.9212	0.7521	0.8660	0
0.4500	0.8992	0.6868	0.8348	0.01
0.4600	0.8780	0.6297	0.8064	0.01
0.4700	0.8578	0.5798	0.7804	0.02
0.4800	0.8385	0.5361	0.7567	0.03
0.4900	0.8203	0.4978	0.7351	0.05
0.5000	0.8031	0.4642	0.7155	0.07

$Q_{ts}$		SBB <sub>4</sub>	BB <sub>4</sub>	QB <sub>3</sub>	SQB <sub>3</sub>	SC <sub>4</sub>	C <sub>4</sub>
0,45	H		1,0000		0,9128		0,8992
	$\alpha$		1,0809		0,6445		0,6868
	$f_3/f_s$		0,9944		0,8294		0,8348
	Peak dB		0,82		0,31		0,01

So, the box volume  $V_B$ ,  $f_3$  and  $f_B$  are as follow:

	SBB <sub>4</sub>	BB <sub>4</sub>	QB <sub>3</sub>	SQB <sub>3</sub>	SC <sub>4</sub>	C <sub>4</sub>
V <sub>as</sub>		93,00 lts.		93,00 lts.		93,00 lts.
$\alpha$		1,0809		0,6445		0,6868
V <sub>B</sub>		<b>86,04 lts.</b>		<b>144,30 lts.</b>		<b>135,41 lts.</b>

H		1,0000		0,9128		0,8992
f <sub>s</sub>		55,9 Hz.		55,9 Hz.		55,9 Hz.
f <sub>B</sub>		<b>55,9 Hz.</b>		<b>51,0 Hz.</b>		<b>50,3 Hz.</b>

f <sub>3</sub> /f <sub>s</sub>		0,9944		0,8294		0,8348
f <sub>s</sub>		55,9 Hz.		55,9 Hz.		55,9 Hz.
f <sub>3</sub>		<b>55,6 Hz.</b>		<b>46,4 Hz.</b>		<b>46,7 Hz.</b>

Here is my first question;

Should I pick an exact value for the Box volume dictated by one of the three alignements? I mean if should I make the box exactly 86,04 lts. for the BB<sub>4</sub> alignment, or 144,30 lts. for the SQB<sub>3</sub> alignment or 135,41 lts. for the C<sub>4</sub> alignment? Or,... Could I take some intermediate value for the box volume like 100 lts. between the BB<sub>4</sub> and C<sub>4</sub> alignements??