Designing bass-reflex enclosure

Midrange box

Step-0 Speaker's spec

f0 =	110	[Hz]
Q0 =	0.31	
m0 =	1.3	[g]
a =	3	[cm]

Step-1 Determine Alpha

Alpha = 1 (Recommended value: 1-2)
(Limit: 0.5-3)

FYI

Q0: Speaker's Q0 (including output Z of amp)
alpha: Stiffness ratio of speaker and enclosure
f0: Speaker's lowest resonance frequency
fl: Cut off frequency (-3dB)

Conditions for flat response

No.	Q0	Alpha	fb/f0	fl/fo
1	0.18	10.5	2	2.7
2	0.21	7.5	1.7	2.3
3	0.26	4.5	1.4	1.8
4	0.3	3	1.2	1.5
5	0.38	1.4	1	1
6	0.42	1.1	0.93	0.87
7	0.47	0.73	0.83	0.73
8	0.52	0.56	0.76	0.64
9	0.56	0.49	0.72	0.6

Step-2 Duct Tuning Frequency

fb = 100 [Hz]

Tuning frequency

Q0	fb [Hz]		Q0	fb [Hz]	
0.2	f0 * 1.8 =	198	0.42	f0 * 0.9 =	99
0.22	f0 * 1.6 =	176	0.45	f0 * 0.9 =	99
0.25	f0 * 1.5 =	165	0.48	f0 * 0.8 =	88
0.28	f0 * 1.3 =	143	0.5	f0 * 0.8 =	88
0.3	f0 * 1.2 =	132	0.52	f0 * 0.75 =	82.5
0.32	f0 * 1.2 =	132	0.55	f0 * 0.7 =	77
0.35	f0 * 1.1 =	121	0.58	f0 * 0.7 =	77
0.38	f0 * 1.0 =	110	0.6	f0 * 0.65 =	71.5
0.4	f0 * 1.0 =	110	0.62	f0 * 0.65 =	71.5

Step-3 Volume of enclosure

V = 1.83 [l] (Calculated from parameters above)
V = 5.50 [l] (Corrected)

Step-4 Dimension of duct

k = 0.3 (Recommended value:0.2-1)
S = 8.48 [cm2] (Calculated)
S = 18.86 [cm2] <==
L = 6.70 [cm] (Calculated)

Dimension input
d = 4.9 [cm] ==>
L = 6 [cm] ==>

fb = 100.87 [Hz] (Re-calculated)

Step-5 Dimension of enclusure

W = 360 [mm]
H = 120 [mm] ==> V = 6.91 [l]
D = 160 [mm]