FRONT EXPONENTIAL AND SPYRAL HORNS

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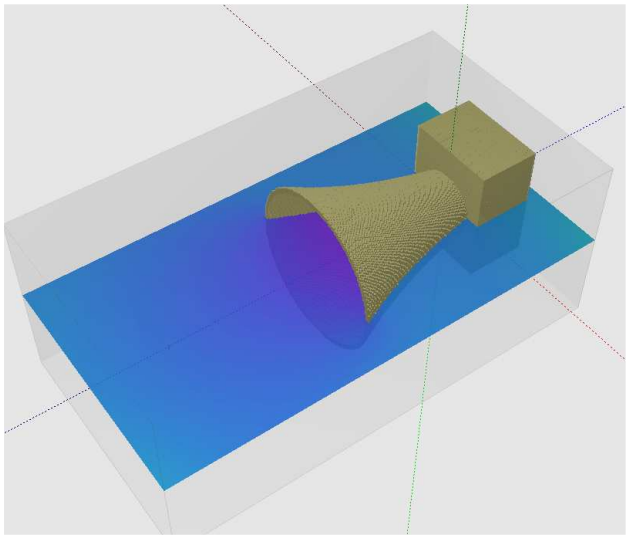
In this test we simulate front exponential horn with Response 3D. Horn length is 1m, input radius 18 cm, output radius 50 cm, driver parameters (Altec 416Z) are given in Fig.1.

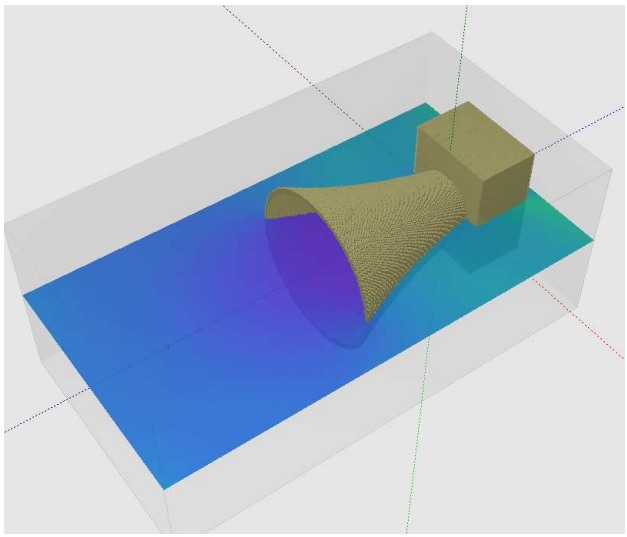
Re	11.500	Ohm	Mms	61.518	Gramm
Sd	854.00	cm2	Cms	0.565	mm/N
Fs	27.000	Hz	Rms	2.739	Ns/m
Vas	600.00	Liters	BL	21.083	T*m
Qes	0.270		R	16.487	cm
Qms	3.810		Le	5.460	mH
			Qts	0.25	

Fig.1

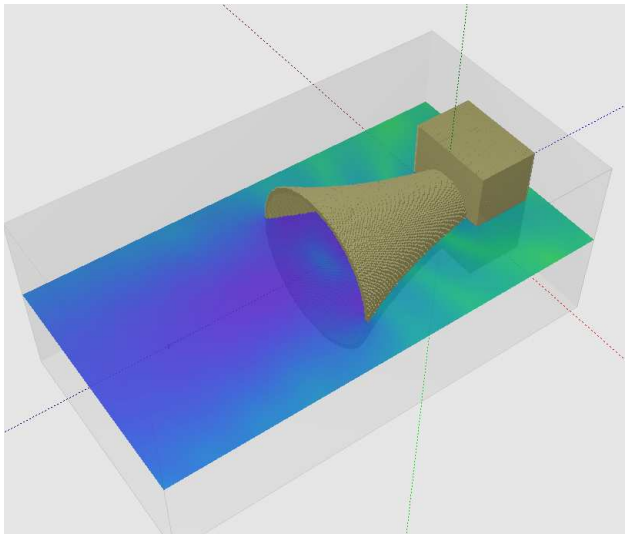
Figs 2 and 3 show calculated SPL distribution at various cross-sections. Fig 3 gives SPL vs. frequency.



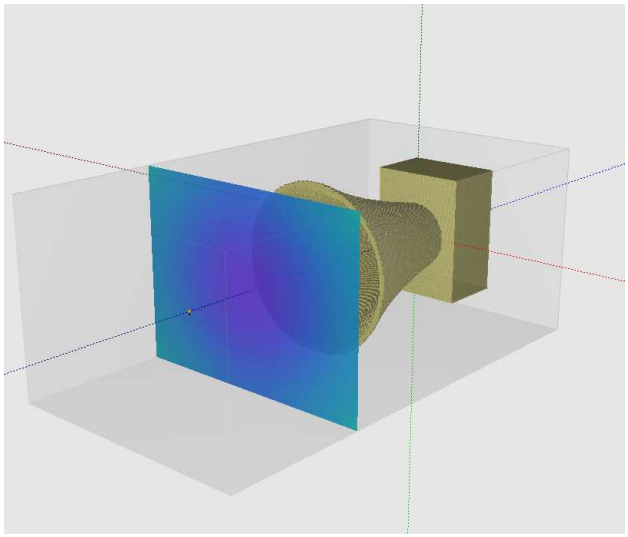
100 Hz



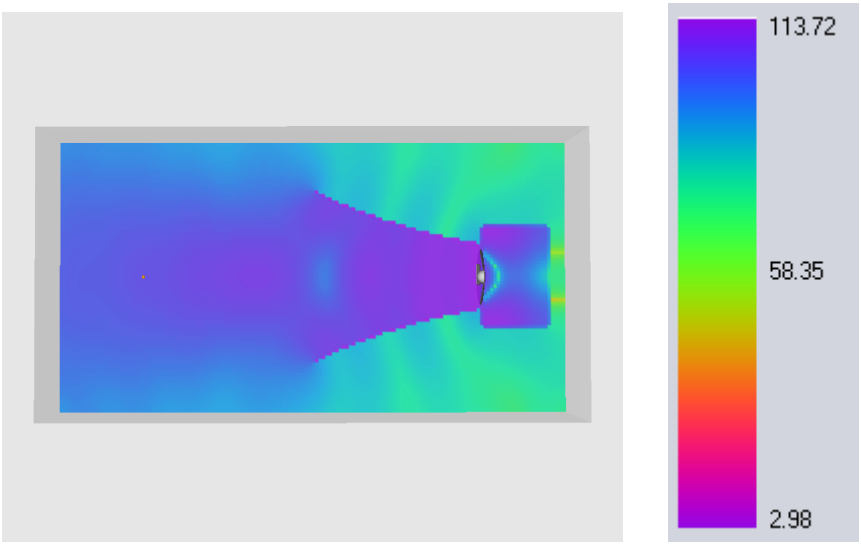
200 Hz



500 Hz

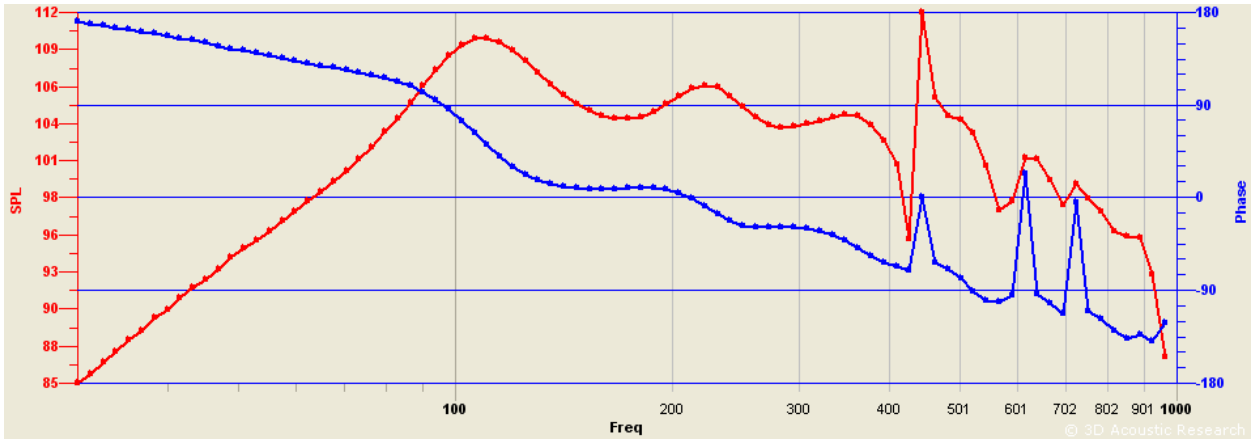


500 Hz

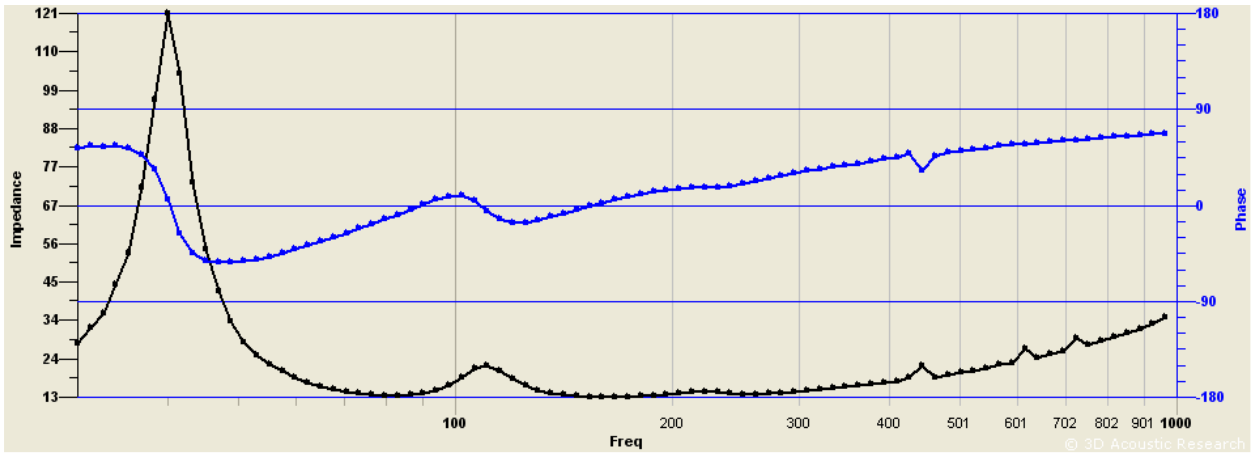


500 Hz

Fig. 2 SPL distribution, dB



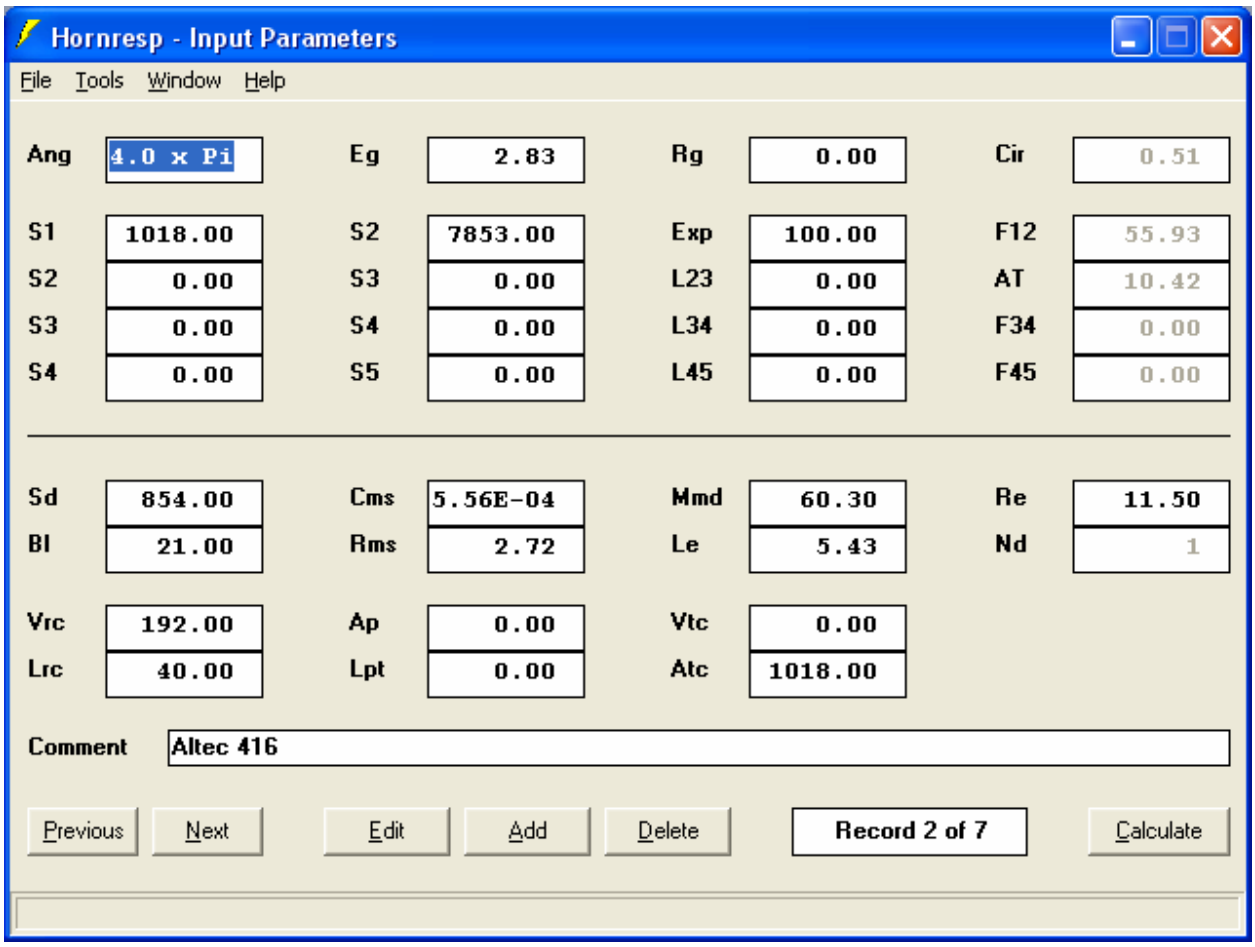
SPL



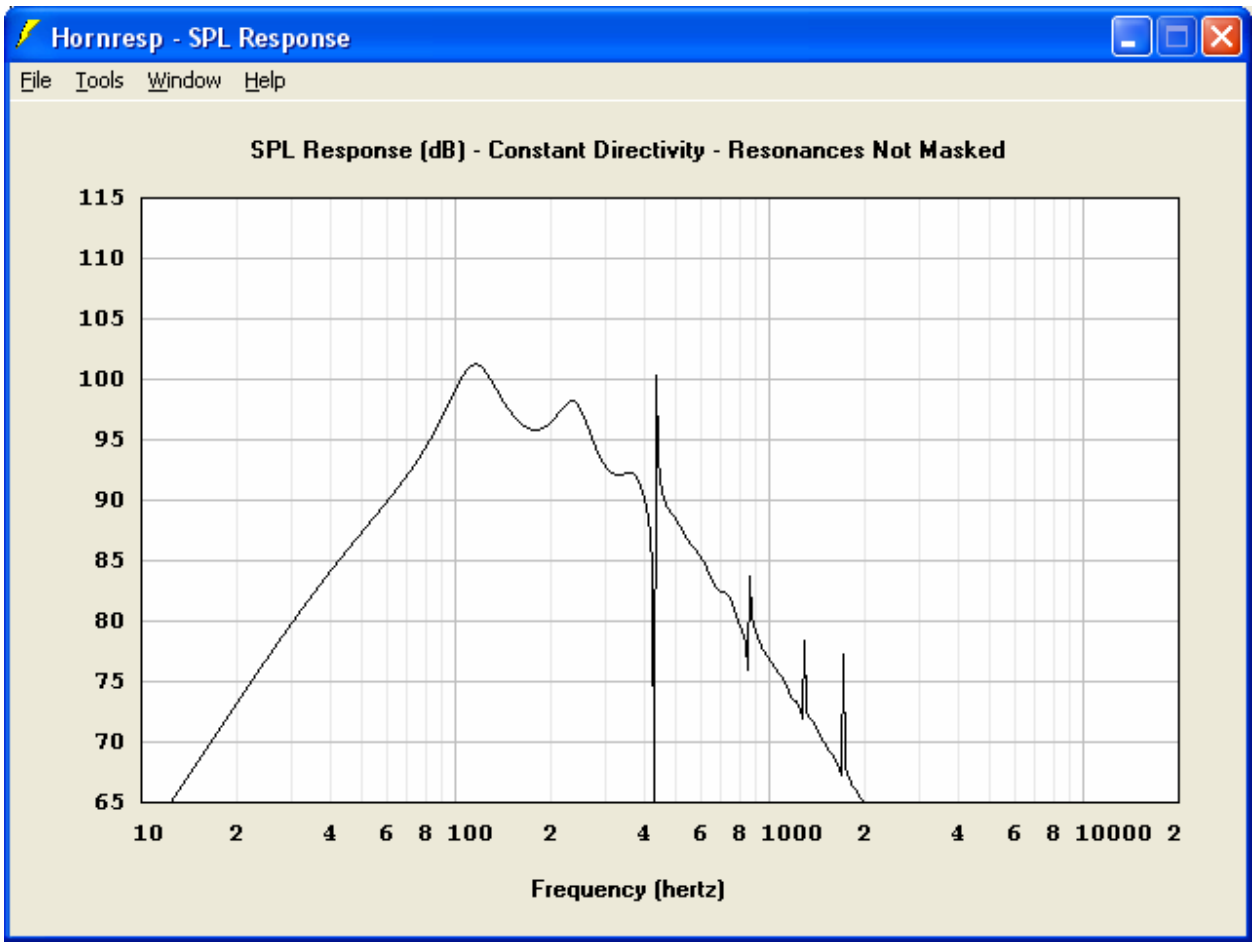
Impedance

Fig.3 SPL and electrical impedance vs. frequency (1m on axis from horn exit)

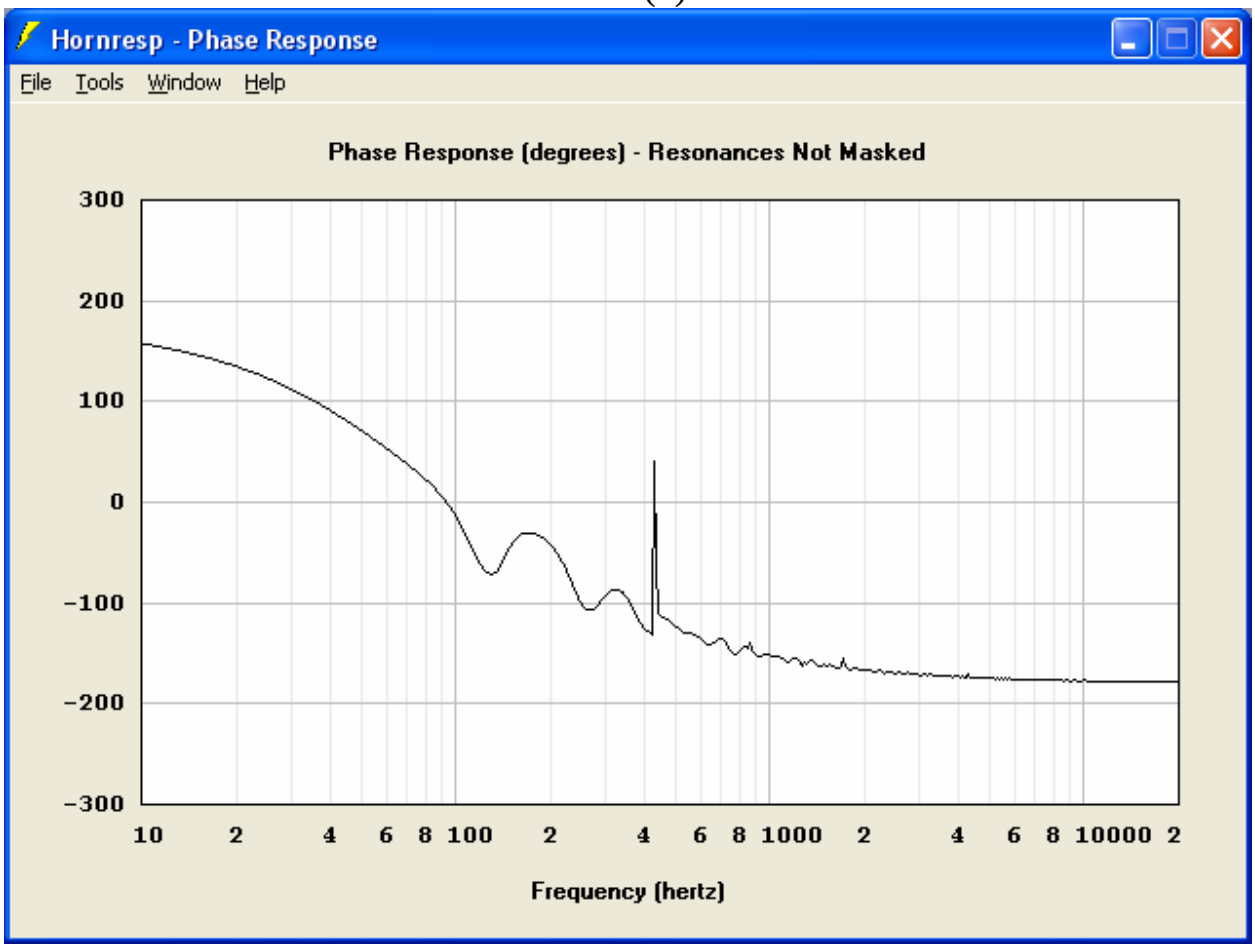
We didn’t build real horn and take measurements. To compare the results one can use another program, i.e. HornResponse, which indeed is based on 1D horn equation.


Hornresp - Input Parameters
File Tools Window Help
Ang 4.0 x Pi
Eg 2.83
Rg 0.00
Cir 0.51
S1 1018.00
S2 7853.00
Exp 100.00
F12 55.93
S2 0.00
S3 0.00
L23 0.00
AT 10.42
S3 0.00
S4 0.00
L34 0.00
F34 0.00
S4 0.00
S5 0.00
L45 0.00
F45 0.00
Sd 854.00
Cms 5.56E-04
Mmd 60.30
Re 11.50
Bl 21.00
Rms 2.72
Le 5.43
Nd 1
Vrc 192.00
Ap 0.00
Vtc 0.00
Lrc 40.00
Lpt 0.00
Atc 1018.00
Comment Altec 416
Previous Next Edit Add Delete Record 2 of 7 Calculate

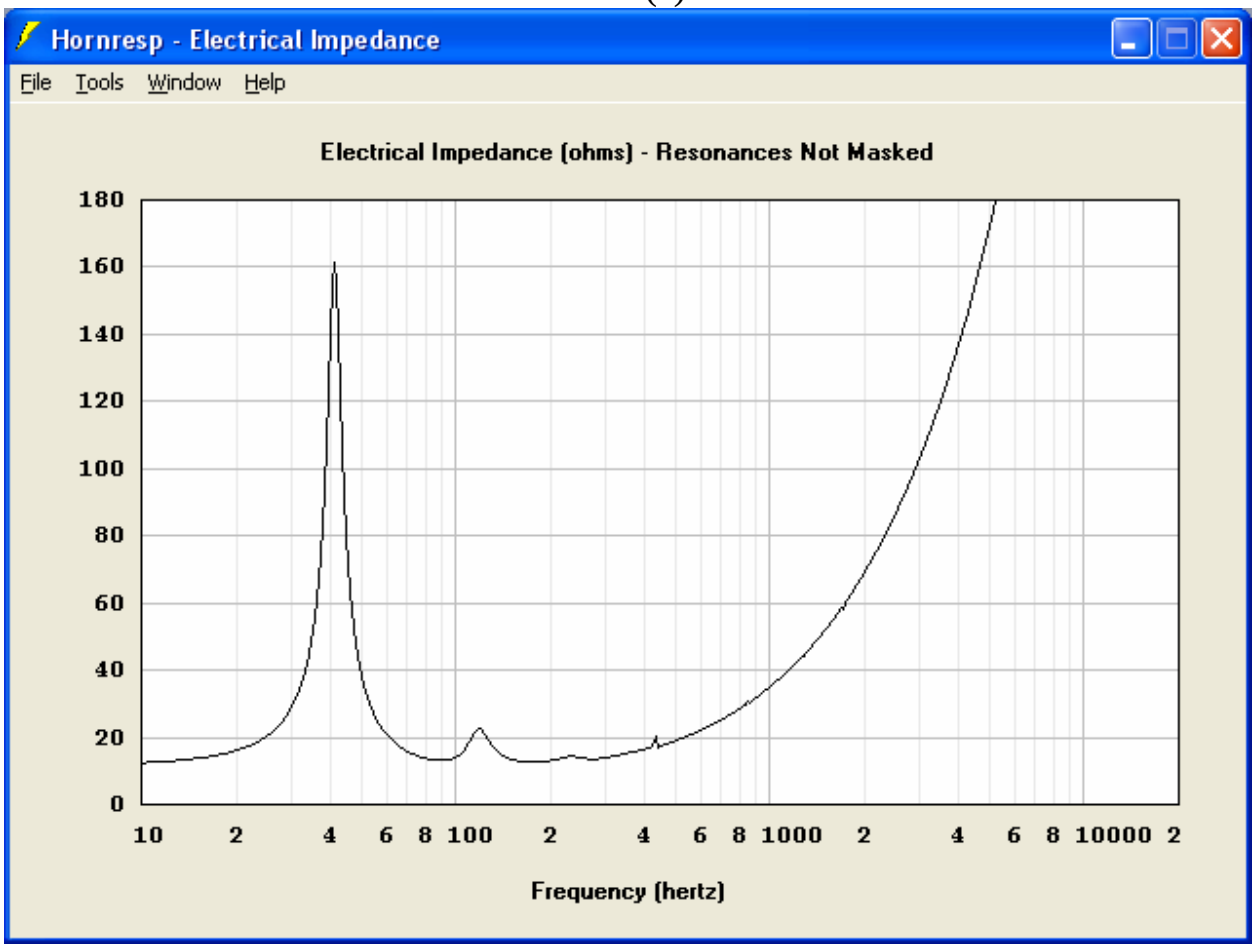
(a)


Hornresp - SPL Response
File Tools Window Help
SPL Response (dB) - Constant Directivity - Resonances Not Masked
115
110
105
100
95
90
85
80
75
70
65
10 2 4 6 8 100 2 4 6 8 1000 2 4 6 8 10000 2
Frequency (hertz)

(b)


Hornresp - Phase Response
File Tools Window Help
Phase Response (degrees) - Resonances Not Masked
300
200
100
0
-100
-200
-300
10 2 4 6 8 100 2 4 6 8 1000 2 4 6 8 10000 2
Frequency (hertz)

(c)



(d)

Fig. 4 HornResponse simulation of the horn

Comparing figures we conclude that our results are in good agreement with HornResponse.

SPIRAL HORN

Because Response 3D can deal with complex shape enclosures it is a joy to add a spiral to the horn. This spiral increases the path length traveled by waves, however, the cross section in the direction of wave number becomes smaller. Particular spiral we added divides internal horn volume into two sections and rotates 720 degrees (2 turns) around the axis on the horn length of 1 m (Fig.5). We never will build such spiral horn but Fig. 6 and 7 show what is obtained by simulation.

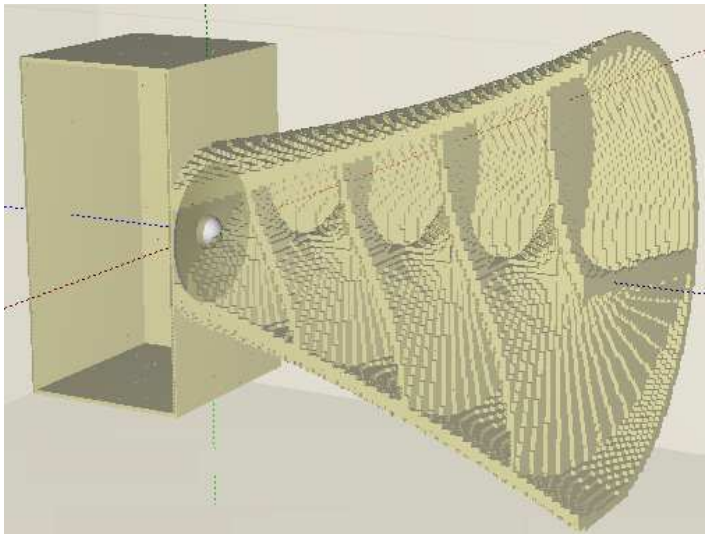
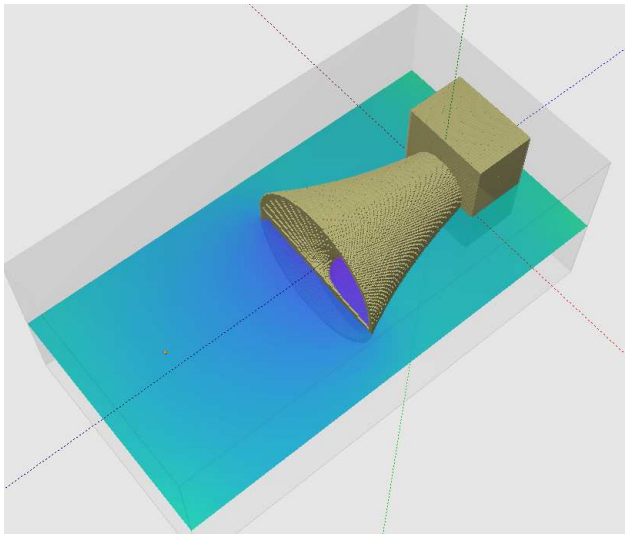
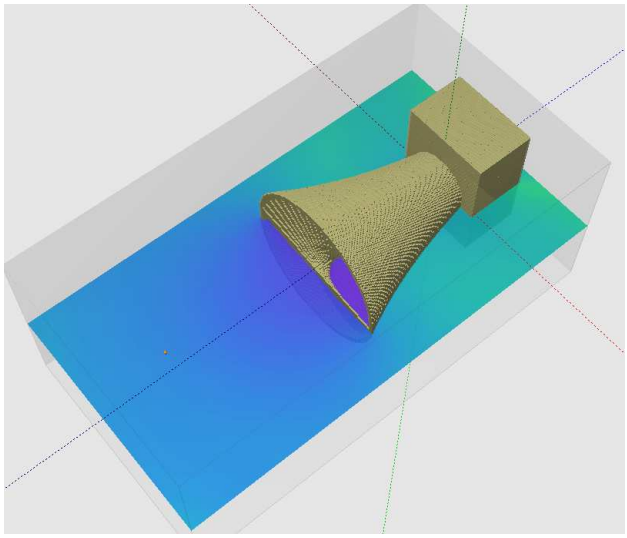


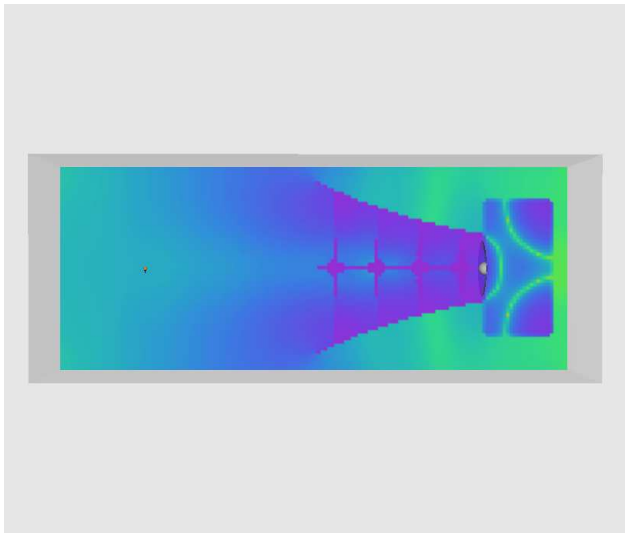
Fig 5



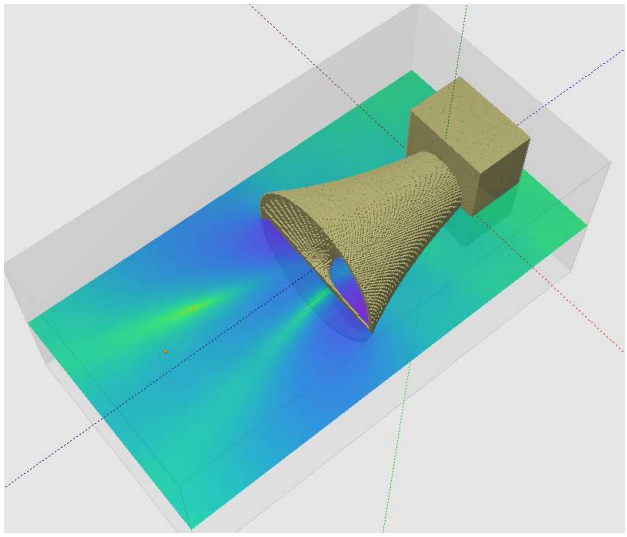
100 Hz



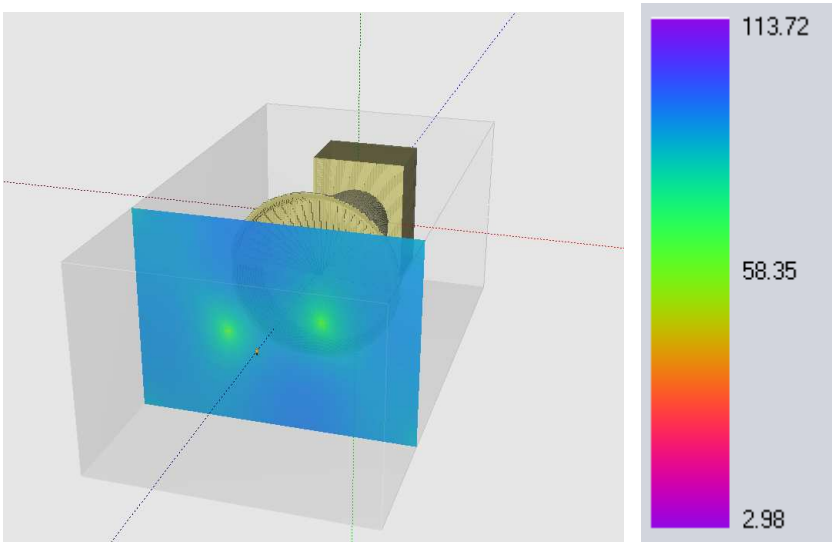
200 Hz



500 Hz

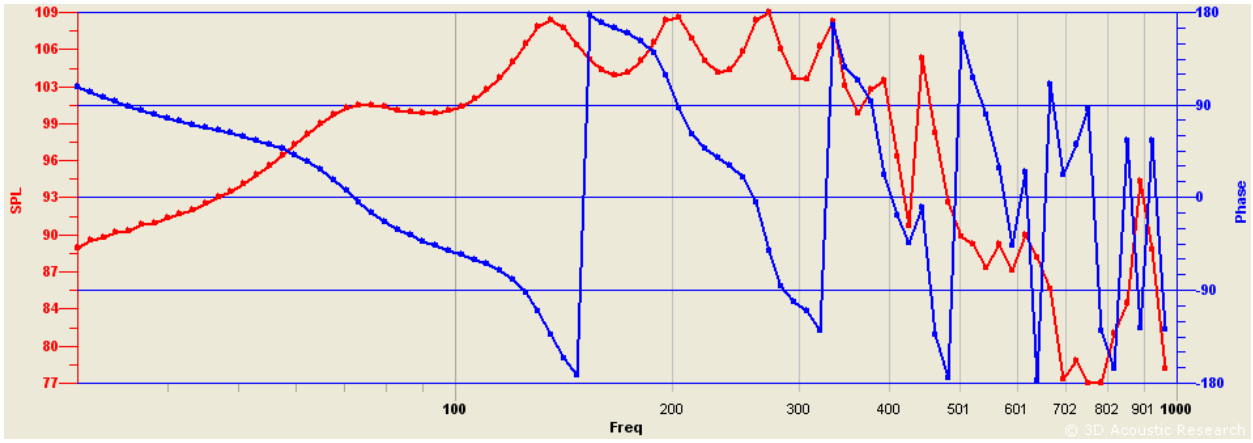


500 Hz

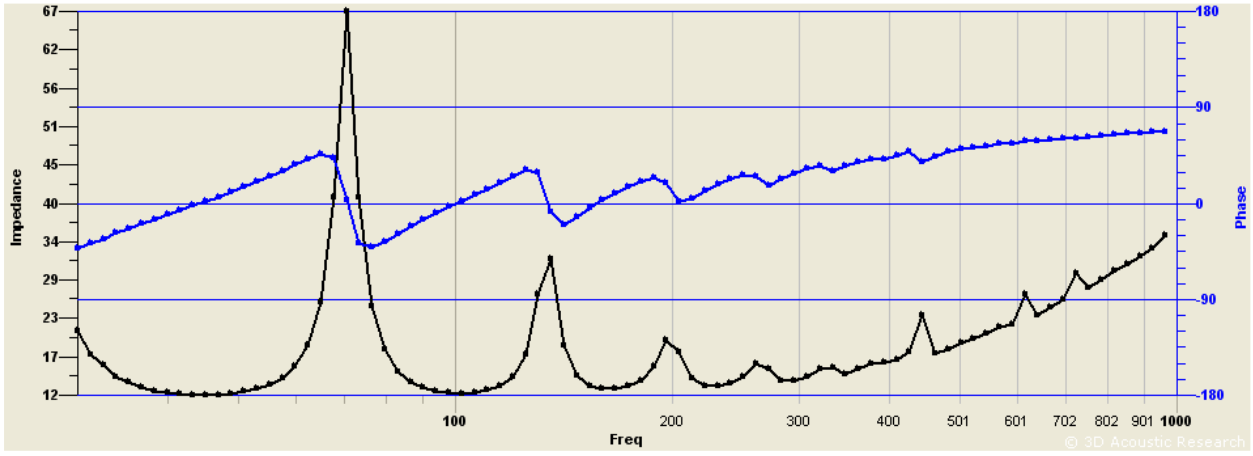


500 Hz

Fig. 6 SPL distribution in spiral horn, dB



SPL



Impedance

Fig.7 Response at 1 m from horn exit.