# HORNRESP MANUAL

*Komplett*

A manual for Hornresp in English

By Harald Karlsson

# Innehåll

The main window....9
Upper half of the window....9
Lower half of the window....11
Closed boxes....14
The speaker element in a closed box with the element offset....15
The speaker element in a box with a passive element....16
The speaker element in a bass reflex box....18
Speaker element without baffel....20
The speaker element in the final baffle....21
The speaker element in a flat Open baffle....22
The speaker element in an H shaped Open baffle or a U shaped Open baffle....23
4th order BandPass Box....25
6th order series or parallel BandPass box....27
8th order series or parallel BandPass box....31
Type A Bandpass box....33
Type B Bandpass box....35
The speaker element in a double bass reflex box....39
The speaker element in an Aperiodic Bi-chamber box....41
The speaker element in a muted transmission....42
HORN....44
Normal Horn (Single segment)....44
Normal horn (Multisegment)....46
Backloaded horn....47
Compound Horn....48
The speaker element in a Frontloaded Horn....49
Single segment....49
The speaker element in a backloaded horn....54

Högtalarelementet i ett massladdat horn ....54
Speaker element in horn with offset element ....55
The speaker element in a "Tapped horn" ....56
The speaker element in a "Stubbed horn" ....57
The speaker element in a compound horn ....58
The result windows ....59
Schematic Diagram ....59
Acoustical Impedance ....59
SPL Response ....59
Electrical Impedance ....59
Displacement ....59
Phase Response ....60
Group Delay ....60
“File” menyn ....60
Copy Driver ....60
Paste Driver ....60
Find ....60
Sort ....60
Import ....60
Export ....60
Print ....60
Exit ....60
1 Input parameters ....61
“Tools” menu ....61
Radiation Angel ....61
Horn Segment Wizard ....61
Calculate Parameter ....63
Chamber Type ....64

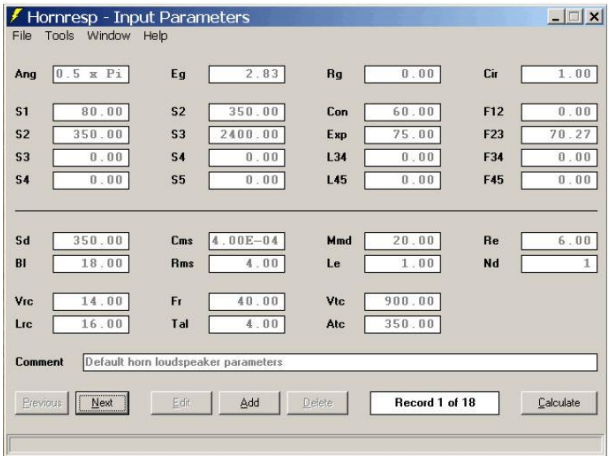
Loudspeaker configuration ....65
System design....66
Resize wizard....67
Loudspeaker wizard ....68
Drive front volume ....77
View schematic ....78
Frequence range ....78
Throat Adapter Designer....78
Wavefront simulator ....79
Options....80
2 Schematic diagram....81
Tools ....81
Throat Adapter Designer....81
Wavefront simulator ....82
Options....83
3 Acoustical impedans ....84
Tools ....84
Sample....84
Compare previous ....84
Range....85
Throat Adapter Designer....86
Wavefront simulator ....86
Options....87
4 Acoustic power ....88
Tools ....88
Sample....88
Compare previous ....88
Output....89

Directivity ..... 91
Impulse ..... 95
Room generator ..... 96
Maximum SPL ..... 96
Power compression ..... 97
Multiple speakers ..... 98
Filter Wizard ..... 98
Efficiency ..... 103
Driver power ..... 104
Particle velocity ..... 105
Throat Adapter Designer ..... 107
Wavefront simulator ..... 108
Options ..... 109
5. Electrical impedans ..... 110
Tools ..... 110
Sample ..... 110
Filter Wizard ..... 111
Range ..... 114
Impedance phase ..... 115
Throat Adapter Designer ..... 115
Wavefront simulator ..... 116
Options ..... 117
6. Diaphragm displacement ..... 118
Tools ..... 118
Sample ..... 118
Compare previous ..... 118
Filter Wizard ..... 119
Diaphragm pressure ..... 123

Velocity ..... 125
Acceleration ..... 126
Throat Adapter Designer ..... 127
Wavefront simulator ..... 127
Options ..... 128
7. Phase response ..... 129
Tools ..... 129
Sample ..... 129
Filter Wizard ..... 130
Delay ..... 133
Throat Adapter Designer ..... 134
Wavefront simulator ..... 134
Options ..... 135
8. Group delay ..... 136
Tools ..... 136
Sample ..... 136
Compare previous ..... 136
Filter Wizard ..... 137
Range ..... 140
Throat Adapter Designer ..... 141
Wavefront simulator ..... 141
Options ..... 142
Input wizard ..... 143
Abbreviations and parameters ..... 144

Hornresp is a Speaker Design program by David McBean It roared a few decades ago as a design program for horns with hole card input. As is well for us, the program is continuously updated, and is now a good tool for more than just horn calculations. In recent years, there have been major additions to the program, which help simplify for new users, and because of that, it has become extremely popular. The new Wizzard feature has really taken off as it makes it possible to see changes that the user makes in real time. I will show here some of the ways you can use the program, and try to show the functionality of the program's various "options".
The latest version can be downloaded from http://www.hornresp.net.ms/
The next paragraph will show the basic features of the program, followed by some practical examples

## The main window




First, I want to point out that almost everything on the main window can be double-clicked to change it or bring up a sub-window. To start changing the input, first click on ADD and then on EDIT to change in the window.

## Upper half of the window

Ang = Radiation angle (simply the amount of adjacent surfaces. The parameter is called “space”) Free space (ang = 4.00) is the same as free-hanging speakers. Half space (ang = 2.00) is a floor-placed speaker. Quarter space (ang = 1.00) is a wall-mounted speaker. Eight space (ang = 0.50) is a corner-placed speaker. There is a setting for Infinite Horn (ang = 0.00) that is only used when working with horn theory and for ideal horns.

Eg = Amplifier open circuit root-mean-square voltage (volts)
Enter 0 for driver diaphragm constant rms velocity of 10 centimeters per second.

Rg = Is the extra resistance that the amplifier and the connection cables add. Let this value be = 0 except for tube amplifiers Rg = 0.08 is a good value for a professional amplifier with 180 meters of cable.

S1-S5 = hornarean.

L12, L23, L34, L45 = Is the length of each S # section. Double-click on the L12 label to change to con, Exp and Par. If you enter a value in one of the L boxes, the value is locked. If you click on something else, it goes back to L12.

F12 = Horn segment 1 Cut off frequency I Hz

Cir & Fr = Is the lower frequency of the horn mouth and / or the widening angle of the horn. These two values are there for information only.

T = Hyperbolic-Exponential and Le cléac´h horn parameter.

0 = catenoidal

<1 = cosh

1 = exponetial

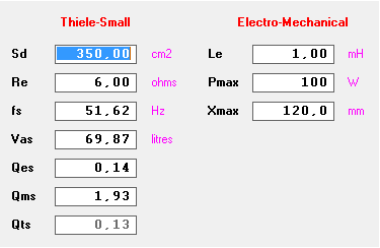
> 1 = sinh

99999.99 = Conical

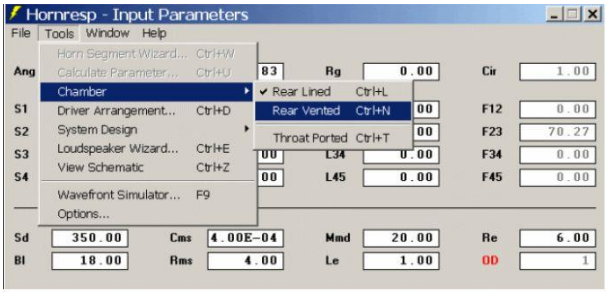
AT = Half angle of the cervix in degrees

## Lower half of the window

Sd, Cms, Mmd,
Re, BL, Rms and
Smile Is the speaker element's parametersFirst enter Sd, Re and Le. The rest of the parameters Hornresp calculates for you if you double-click in the block and enter the necessary parameters in the order Cms, Mmd, BL and then Rms. You also need the usual element parameters Vas, fs, Qes and Qms for the calculation.

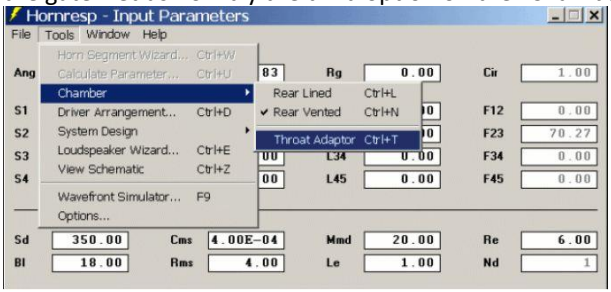



Nd is for the number of elements series and / or parallelrc is the volume of the rear chamber to which the speaker element is connected
Lrc is the length of the back chamber
Ng Based on the rear chamber being a closed chamber by default
Fr is the airflow resistance in Rayls / cm for the damping material
Speech Is the thickness of the damping material
Vtc and Atc Defines a closed neck chamber. Under the "TOOLS" menu you can change the closed back chamber to something else



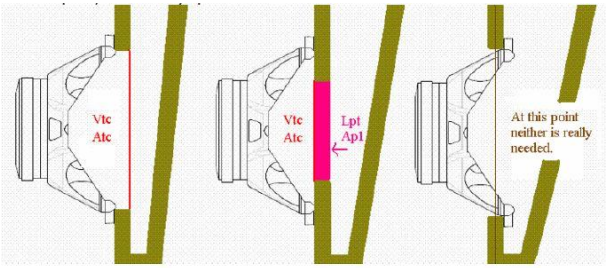

Now we get this:

Let's construct a bass reflex rear chamber.
Fr and Tal become Ap and Lpt where Ap is the area of the gate and Lpt the length of the gate. Let us now try the third option on the "Chamber" menu.

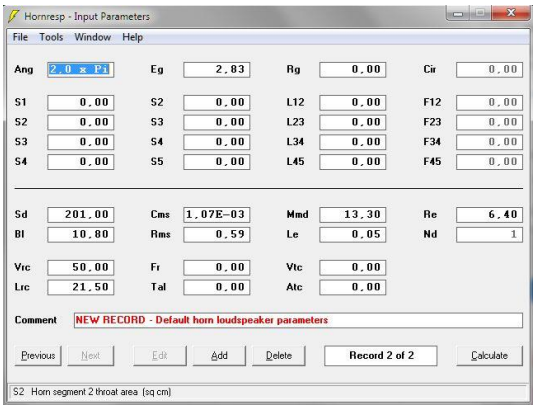


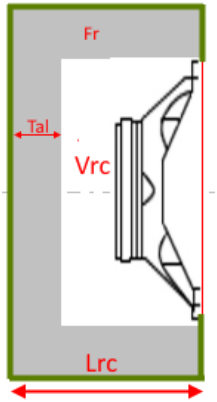

Throat Adapter? What has changed?

"Throat adapter"
Now we have Ap1 & Lpt This is the chamber section in front of the neck chamber (baffle). Ap1 is the area of the hole in the baffle (<Sd) and Lpt is the material thickness of the baffle.Nedan finns en grafisk illustration av konceptet Vtc/Atc – Ap1/Lpt

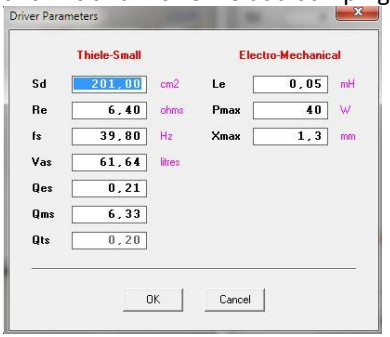

Vtc
Atc
Vtc
Atc
Lpt
Ap1
At this point neither is really needed.

## Closed boxes



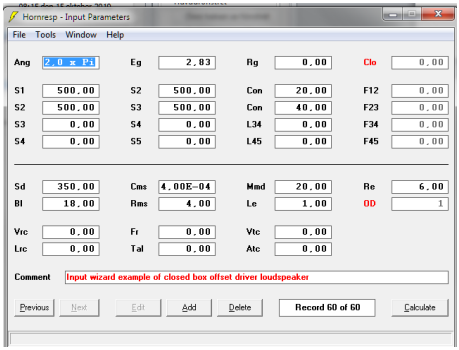



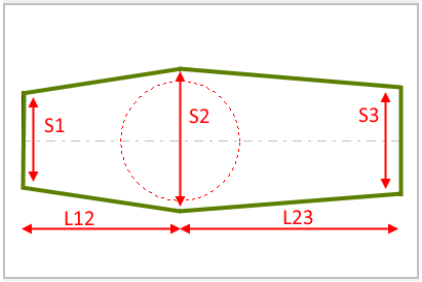

Select "rear lined" from "Chamber type" in the tools menu. Set S1-S5, L12-L45 = 0 and Vrc and Lrc> 0. To add damping material set Fr and Lrc> 0.




Here you can use the Loudspeaker Wizard to make real-time changes.

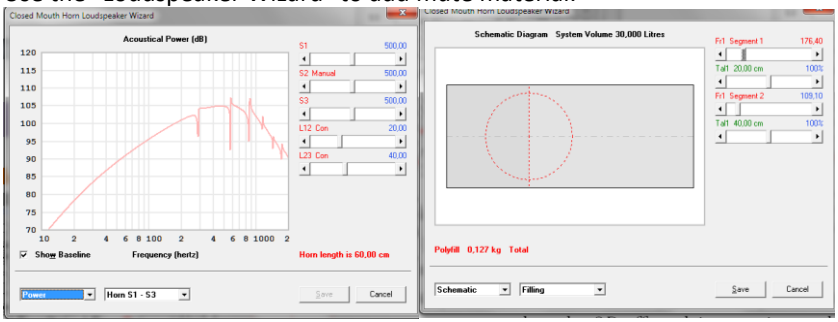
# The speaker element in a closed box with the element offset



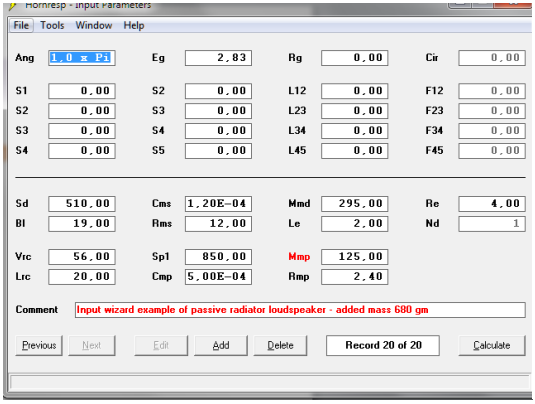

Specify two segments and select the OD offset driver option by double-clicking on either the Cir or Fta label in the "Edit" mode to select the Clo "Closed horn mouth option". Set Vrc, Lrc, Vtc and Atc = 0

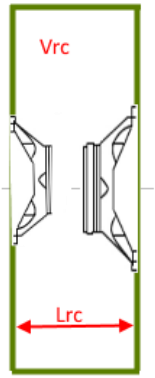
Use the "Loudspeaker Wizard" to add mute material.




Set L12 = 0.01 cm unless the element is offset

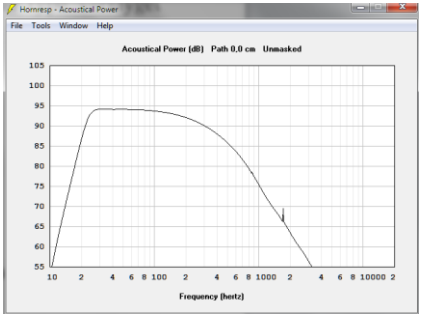
# The speaker element in a box with a passive element



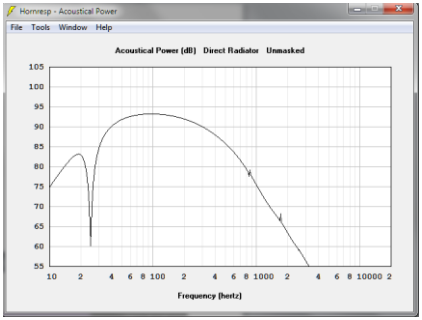



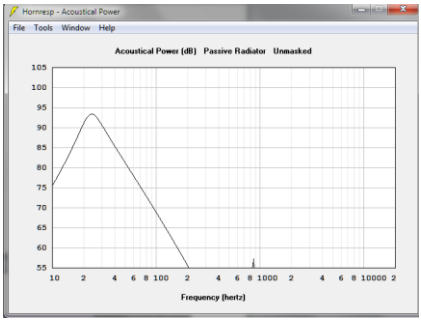

Select the “Rear Passive Radiator” option from the “Chamber Type” tool and set S1-S5 and L12-L45 = 0 and Vrc and Lrc> 0

The default setting calculates the combined sound pressure from the element and the slave element.

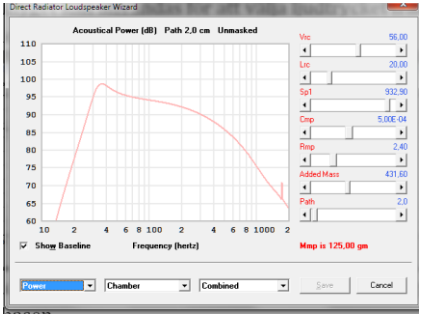



The "Output" tool can be used to select the sound pressure from either the element or the slave base.

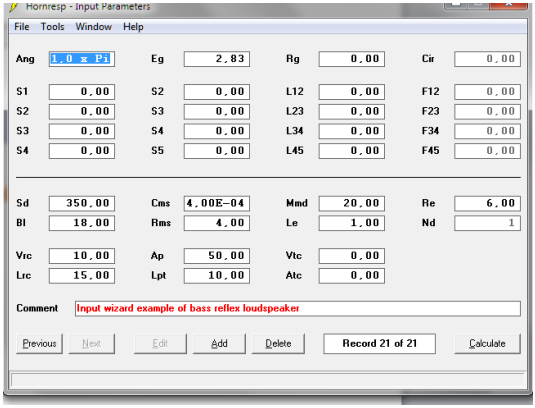


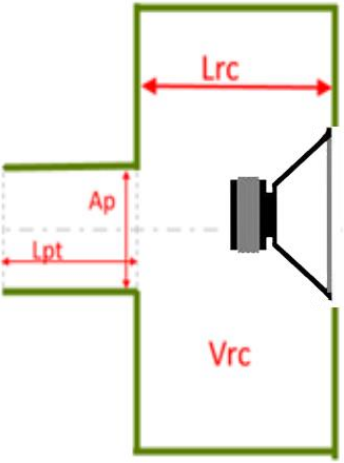



Use the “Loudspeaker Wizard” to specify the mass in grams placed on the slave base.



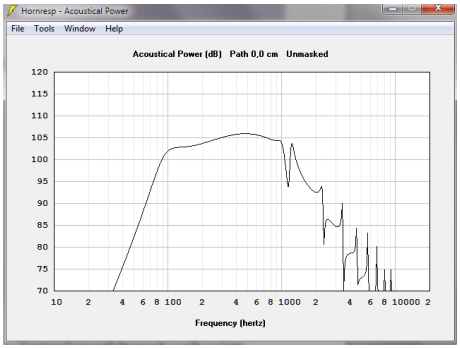
# The speaker element in a bass reflex box



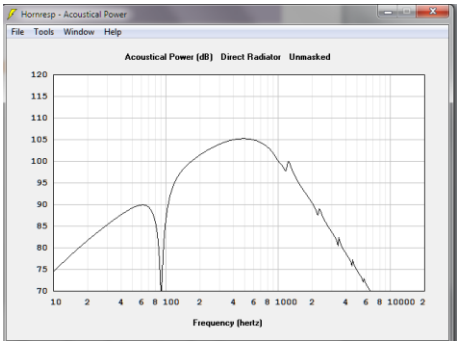



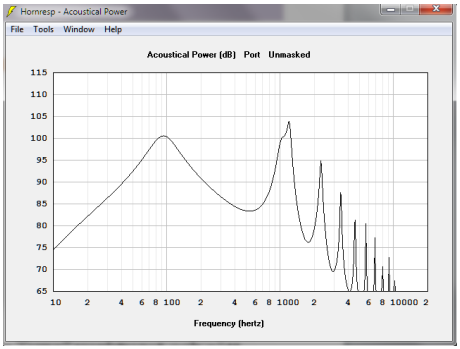

Select the “Rear Vented” option from the “Chamber Type” tool and set S1-S5 and L12-L45 = 0 and Vrc, Lrc, Ap and Lpt> 0.

By default, the combined sound pressure from both the element and the port is calculated.

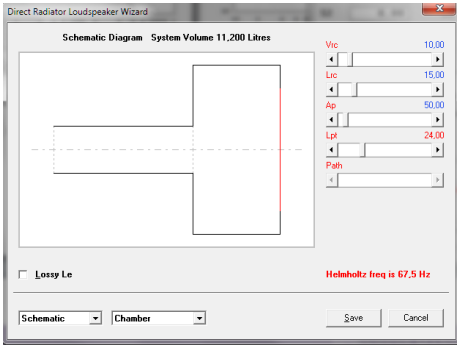



The "Output" tool can be used to display the sound pressure from either the element or the port.

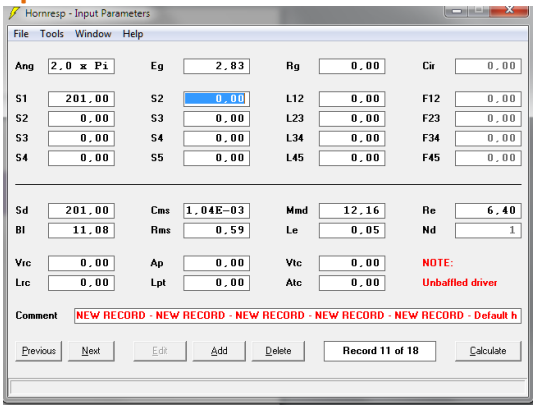


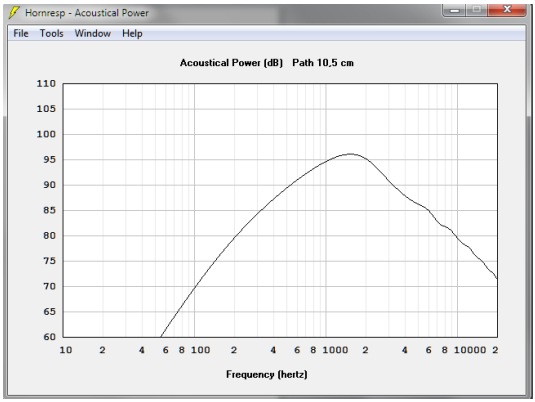

Use the "Loudspeaker Wizard" to correct the rear port length.
An internal end correction is added to the Lpt "rear port tube length" when appropriate. If an end correction is added, the Helmholz resonance frequency can be read in the status bar.



## Speaker element without baffel



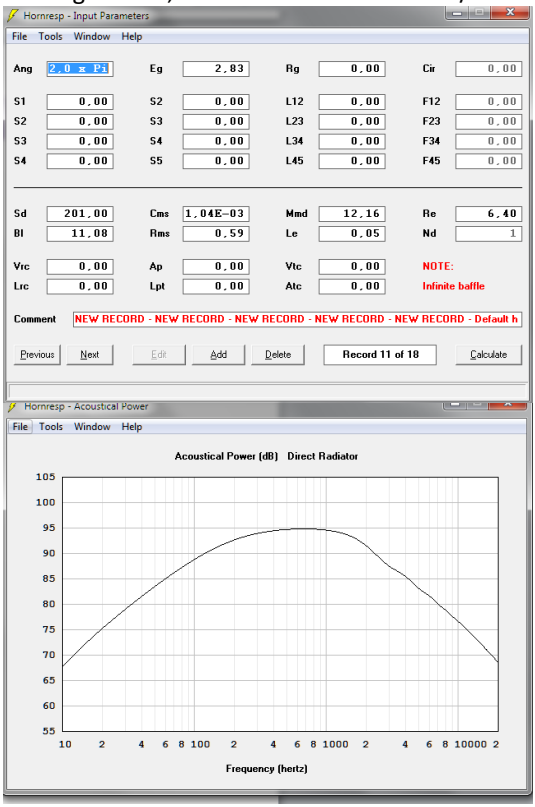

Set S1 = Sd x number of speaker elements and S2 to L45 = 0.



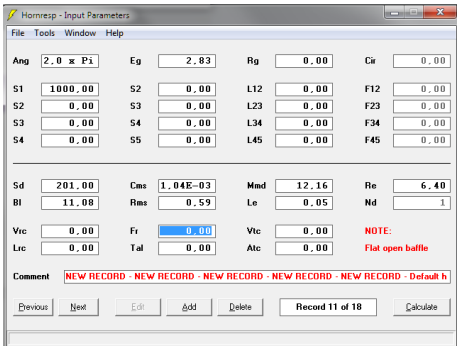

Calculates the combined sound pressure for page 1 and page 2 in the menu "Acoustical Power"
Use the "output" tool to select either page 1 or page 2
The acoustic path length is calculated automatically, and is the length of the shortest acoustic path between the two acoustic centers in the dipole system. The acoustic centers are assumed to be point sources

## The speaker element in the final baffle

Set Ang = 2 x Pi, S1 to L45 = 0 and Vrc and / or Lrc = 0.



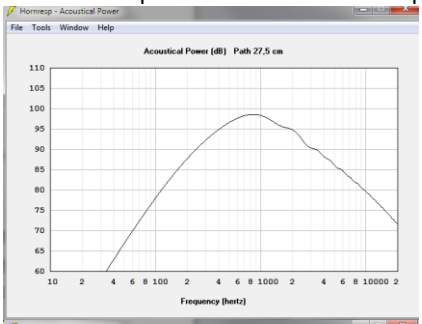
# The speaker element in a flat Open baffle

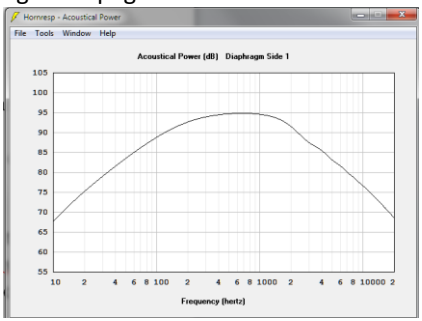


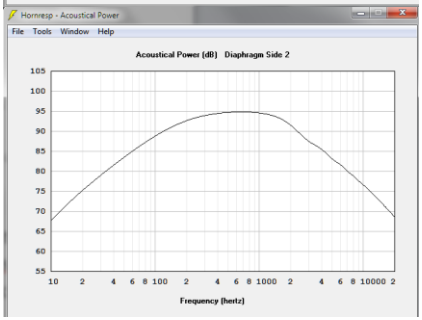

Set S1 = baffle area and S2 to L45 = 0.

Calculates the combined sound pressure for page 1 and page 2 in the "Acoustical Power" menu

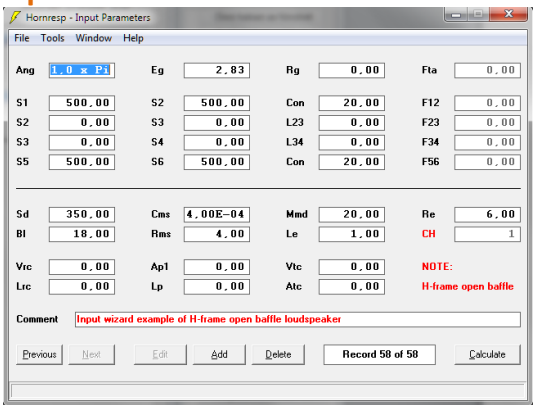
Use the "output" tool to select either page 1 or page 2

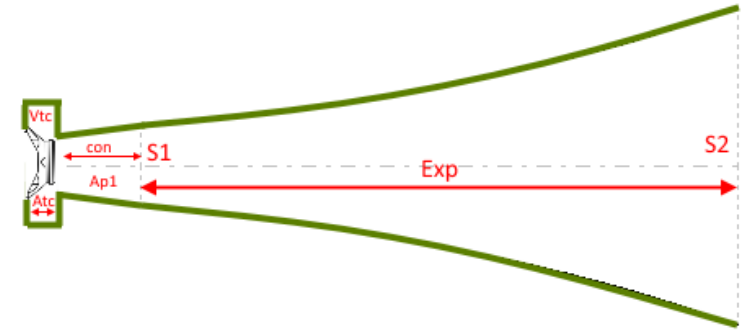


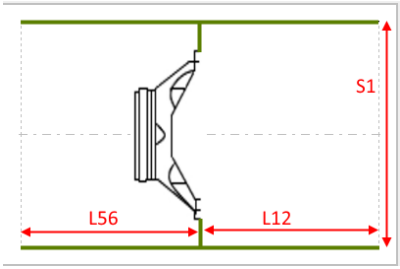



## The speaker element in an H shaped Open baffle or a U shaped Open baffle



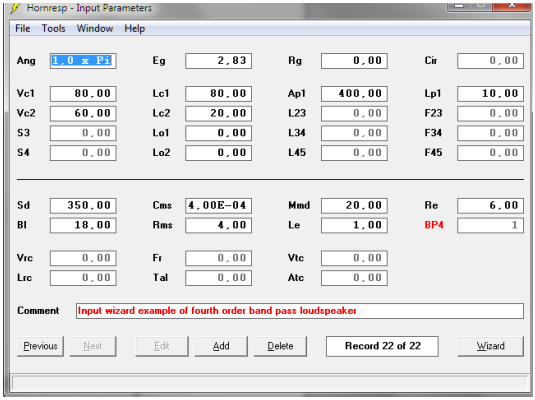



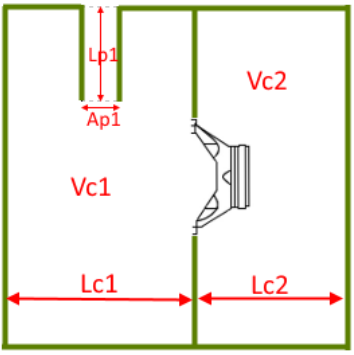




Select the CH Speaker option and set S1 = S2 = S5 = S6,
Vrc and / or Lrc = 0 and Vtc and / or Atc = 0.
To specify a U-shaped system, set either L12 or L56 = 0.1.
To specify a direct radiating speaker element In flat OpenBaffel set L12 and L56 = 0.1.
To specify a direct radiating speaker element without baffle, set L12 and L56 = 0.1 and S1, S2, S5 and S6 = Sd x number of speaker elements.

The combined acoustic output is calculated with the normal settings, "Output tool" can be used to calculate either page 1 or 2's acoustic output.
The acoustic path length is calculated automatically, and is the length of the shortest acoustic path between the two acoustic centers in the dipole system. The acoustic centers are assumed to be point sources.

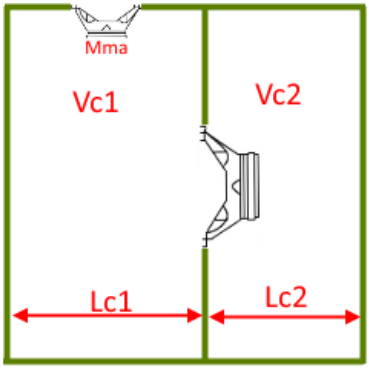
## 4th order BandPass Box



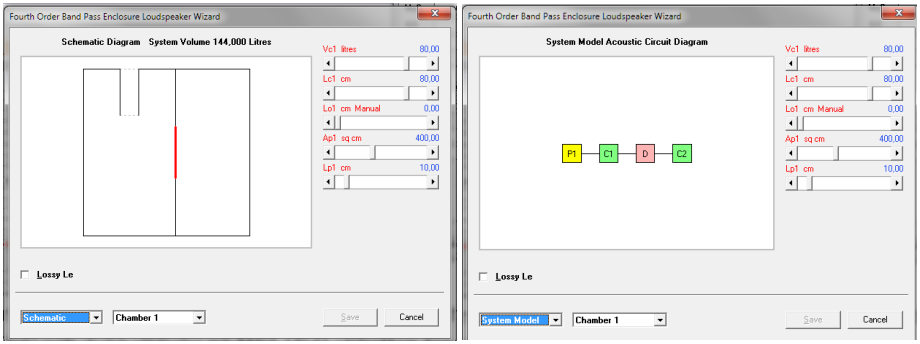




Select the BP4 option from the "Loudspeaker Configuration" tool.
Or press “Ctrl” and double-click the ME1 (Nd) label to select BP4. Press "Ctrl" and double-click the Fr label to select "passive Radiator". To select several slave bases, press "Ctrl" and double-click the SP1 label.
To replace an external port with a slave base element, double-click the Ap1, Ap2 or Ap3 label for that port. The label name is then changed to Mma and the Mma text

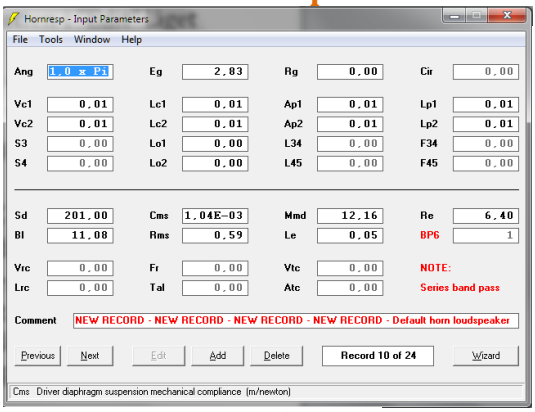
box then becomes the mass in grams added to each Slavbas cone.

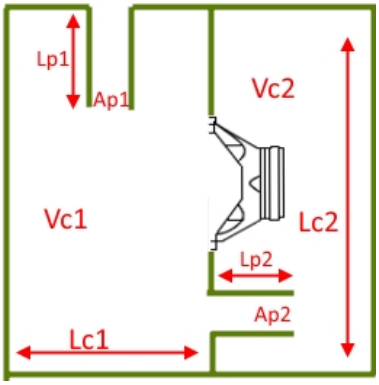


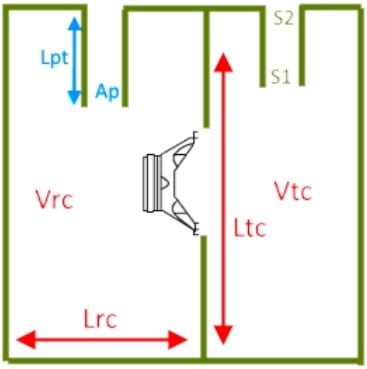

To select an alternative external port in the BP6P, BPB, BPC or ABC systems, double-click on the Ap label for the other port.
To remove the "Passive Radiator" option and restore to a door tube, double-click on the Mma label in "Edit" mode.
Press F5 or click the "Wizard" button to open the "Loudspeaker Wizard". Set the "Chamber", "Port", "Amplifier" and "Filter" bars with the mouse or by typing the value directly and then pressing "Enter" when the respective control is in focus.
The rules Lo1 and Lo2 specify the position of the element in an "Offset Driver"
The "manual" option allows the offset in each chamber to be adjusted separately.
To select the "Auto" option, double-click on the "Manual" option.
If the "Auto" option is selected, the other rules are automatically set to the same value.
Acoustical Power, Electrical Impedance and Diaphragm Displacement! Can be exported for use in other speaker design programs, by either clicking the "Export" button in the "memory" window or pressing the F9 key when the relevant diagram is displayed. The box is modeled as it appears in the "Schematic" and "System Model" windows



# 6th order series or parallel BandPass box



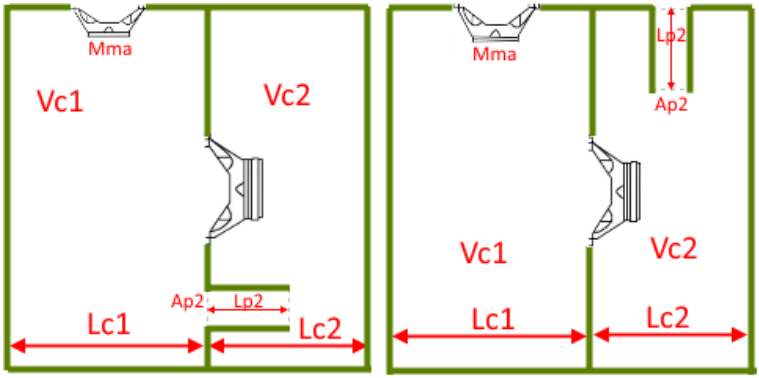




Select the BP6S or BP6P option from the "Loudspeaker Configuration" menu, or Press "Ctrl" and double-click the BP4 label in "Edit" mode to set the BP6 flag.

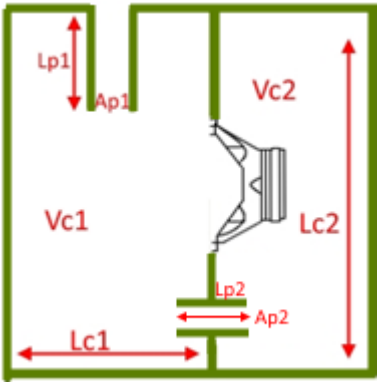
To replace an external port with a slave base element, double-click the Ap1, Ap2 or Ap3 label for that port. The label name is then changed to Mma and the Mma text

box then becomes the mass in grams added to each Slavbas cone.




To select an alternative external port in the BP6P, BPB, BPC or ABC systems, double-click on the Ap label for the other port.
To remove the "Passive Radiator" option and restore to a door tube, double-click on the Mma label in "Edit" mode.
By default, a series of bandpass drawers are selected. To select a parallel bandpass box, double-click on the "series band pass enclosure" label in "Edit" mode.
Press F5 or click the "Wizard" button to open the "Loudspeaker Wizard".
Set the "Chamber", "Port", "Amplifier" and "Filter" bars with the mouse or by typing the value directly and then pressing "Enter" when the respective control is in focus.
Double-click the “Series” or “Parallel” label just below the Lpt rule to change the box type. This is not applicable when a slave base element is selected.
Set the Ap2 rule to zero to remove the base reflex tube 2 and simplify the box to a BP4 box.
Double-click the Lp2 label in a BP6S box to specify port 2 as without protruding edges at both ends.To select an alternative external port in the BP6P, BPB, BPC or ABC systems, double-click on the Ap label for the other port.
To remove the "Passive Radiator" option and restore to a door tube, double-click on the Mma label in "Edit" mode.
By default, a series of bandpass drawers are selected. To select a parallel bandpass box, double-click on the "series band pass enclosure" label in "Edit" mode.
Press F5 or click the "Wizard" button to open the "Loudspeaker Wizard".
Set the "Chamber", "Port", "Amplifier" and "Filter" bars with the mouse or by typing the value directly and then pressing "Enter" when the respective control is in focus.
Double-click the “Series” or “Parallel” label just below the Lpt rule to change the box type. This is not applicable when a slave base element is selected.
Set the Ap2 rule to zero to remove the base reflex tube 2 and simplify the box to a BP4 box.

Double-click the Lp2 label in a BP6S box to specify port 2 as without protruding edges at both ends




The rules Lo1 and Lo2 specify the position of an "offset driver" in the "manual" option, so the "offset" in each chamber can be specified separately.

Double-click on the "Lpt on manual" label to change to the "Auto" option, then the second rule automatically follows when you set one of them.

Acoustical power (BP6S), total acoustical power (BP6P), electrical

The "impedance" and "driver diaphragm displacement" values can be exported for use in any other speaker design program.

, this by either clicking on "Export" in the "memory window" button or by pressing the F9 key when the relevant window appears.

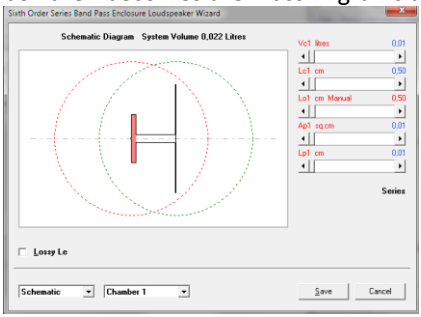
The speaker box is modeled as the “Schematic” diagram and the “System model” diagram.

Select the BP8S (series) or BP8P (parallel) option from the Loudspeaker

Configuration "tool or trycl" Ctrl "and double click on the BP6 label in" Edit "mode to set the BP8 flag.

To replace an external port with a slave base element, double-click the Ap1, Ap2 or Ap3 label for that port. The label name is then changed to Mma and the Mma text

box then becomes the mass in grams added to each Slavbas cone.




The rules Lo1 and Lo2 specify the position of an "offset driver" in the "manual" option, so the "offset" in each chamber can be specified separately.

Double-click on the "Lpt on manual" label to change to the "Auto" option, then the second rule automatically follows when you set one of them.

Acoustical power (BP6S), total acoustical power (BP6P), electrical

The "impedance" and "driver diaphragm displacement" values can be exported for use in any other speaker design program.

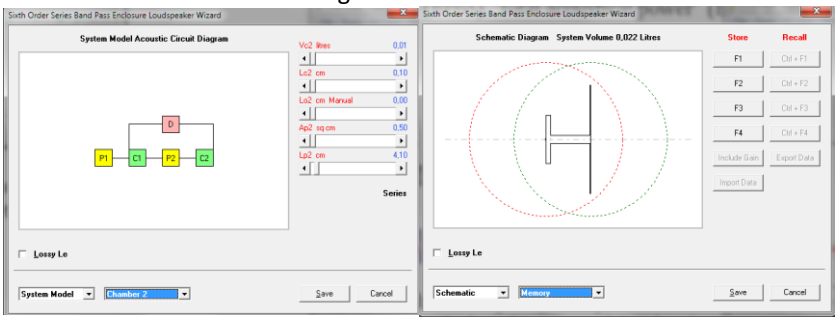
, this by either clicking on "Export" in the "memory window" button or by pressing the F9 key when the relevant window appears.

The speaker box is modeled as the “Schematic” diagram and the “System model” diagram.

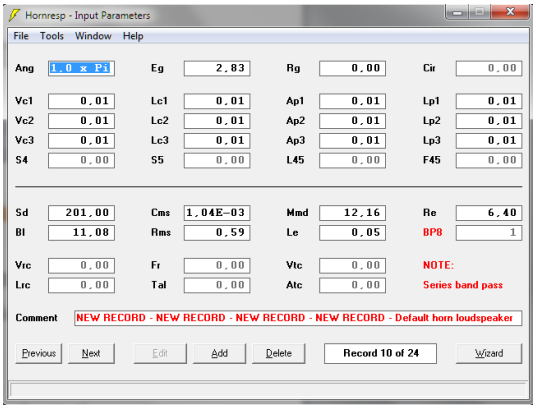
Select the BP8S (series) or BP8P (parallel) option from the Loudspeaker

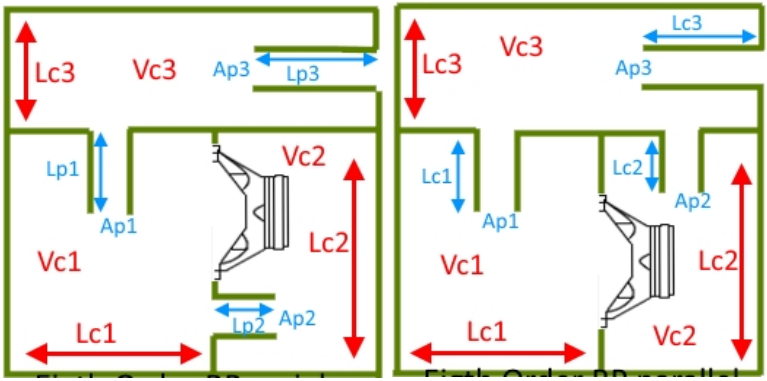
Configuration "tool or trycl" Ctrl "and double click on the BP6 label in" Edit "mode to set the BP8 flag.

To replace an external port with a slave base element, double-click the Ap1, Ap2 or Ap3 label for that port. The label name is then changed to Mma and the Mma text box then becomes the mass in grams added to each Slavbas cone.



# 8th order series or parallel BandPass box




The rules Lo1 and Lo2 specify the position of an "offset driver" in the "manual" option, so the "offset" in each chamber can be specified separately.

Double-click on the "Lpt on manual" label to change to the "Auto" option, then the second rule automatically follows when you set one of them.

Acoustical power (BP6S), total acoustical power (BP6P), electrical

The "impedance" and "driver diaphragm displacement" values can be exported for use in any other speaker design program.

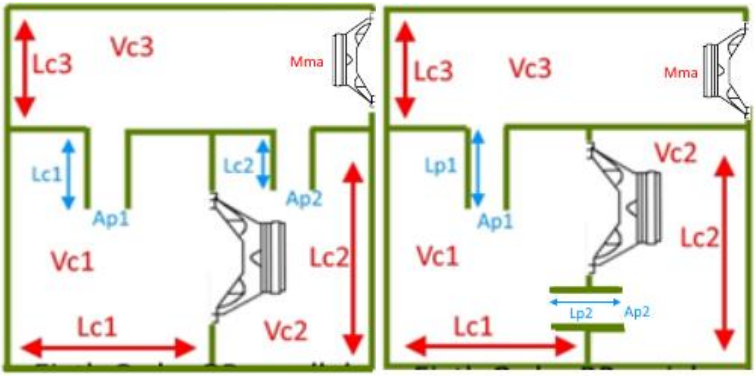
, this by either clicking on "Export" in the "memory window" button or by pressing the F9 key when the relevant window appears.

The speaker box is modeled as the “Schematic” diagram and the “System model” diagram.

Select the BP8S (series) or BP8P (parallel) option from the Loudspeaker

Configuration "tool or trycl" Ctrl "and double click on the BP6 label in" Edit "mode to set the BP8 flag.

To replace an external port with a slave base element, double-click the Ap1, Ap2 or Ap3 label for that port. The label name is then changed to Mma and the Mma text box then becomes the mass in grams added to each Slavbas cone.




To select an alternative external port in the BP6P, BPB, BPC or ABC systems, double-click on the Ap label for the other port.

To remove the "Passive Radiator" option and restore to a door tube, double-click on the Mma label in "Edit" mode.

By default, a series of bandpass drawers are selected. To select a parallel bandpass box, double-click on the red label "series band pass enclosure" in "Edit" mode.

Press F5 or click the "Wizard" button to open the "Loudspeaker Wizard".

Set the "Chamber", "Port", "Amplifier" and "Filter" bars with the mouse or by typing the value directly and then pressing "Enter" when the respective control is in focus.

Double-click the “Series” or “Parallel” label just below the Lpt rule to change the box type. This is not applicable when a slave base element is selected.

Double-click the Lp2 or Lp3 label in a BP8S box to specify port 2 or 3 as without protruding edges at both ends.

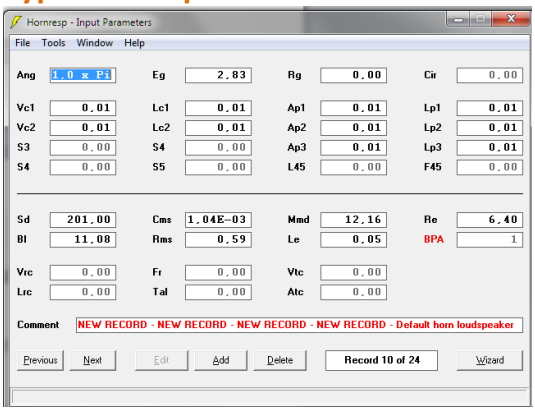
Acoustical power (BP8S), total acoustical power (BP8P), electrical

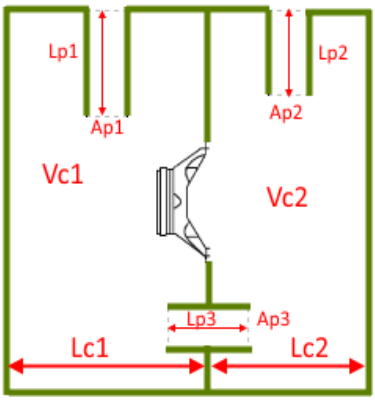
The impedance and driver diaphragm displacement values can be exported for use in any other speaker design program.

, this by either clicking on "Export" in the "memory window" button or by pressing the F9 key when the relevant window appears.

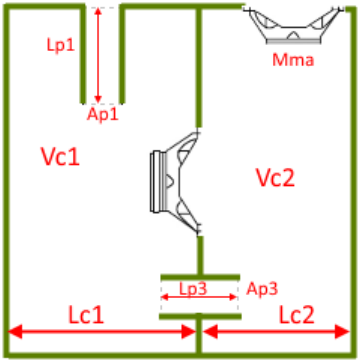
The speaker box is modeled as the “Schematic” diagram and the “System model” diagram.

## Type A Bandpass box




Select the BPA option from the “Loudspeaker Configuration” tool or press “Ctrl” and double-click the BP8 label in “Edit” mode to set the BPA flag.
To replace an external port with a slave base element, double-click the Ap1, Ap2 or Ap3 label for that port. The label name is then changed to Mma and the Mma text box then becomes the mass in grams added to each Slavbas cone.

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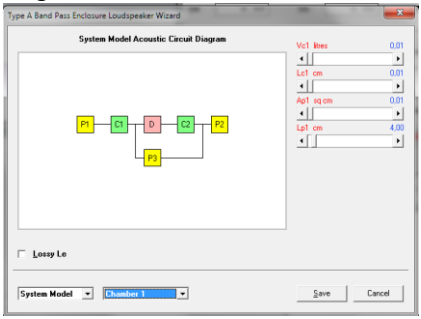
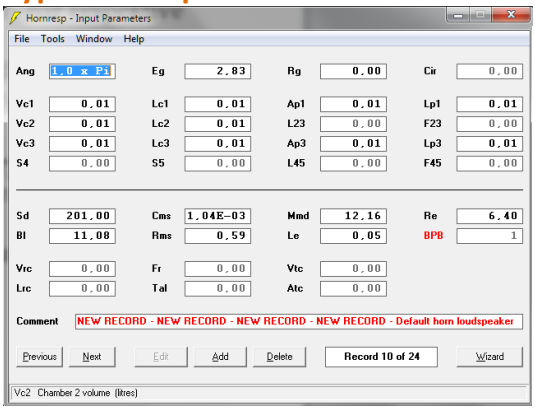
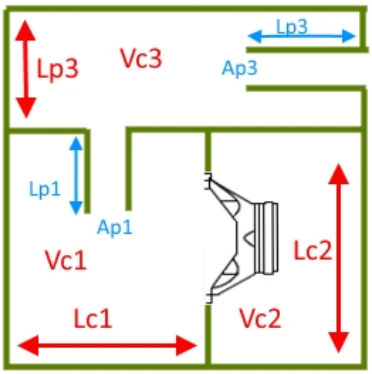
Displacement ”values can be exported for use in any other speaker design program , this by either clicking on "Export" in the "memory window" button or by pressing the F9 key when the relevant window appears.
The speaker box is modeled as the “Schematic” diagram and the “System model” diagram.

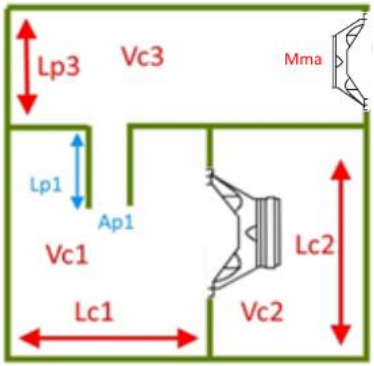


## Type B Bandpass box



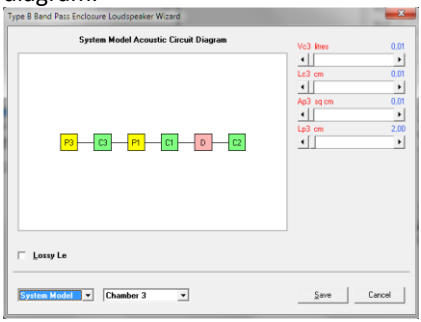




Select the BPB option from the "Loudspeaker Configuration" tool or press "Ctrl" and double-click the BPA label in "Edit" mode to set the BPB flag.
To replace an external port with a slave base element, double-click the Ap1, Ap2 or Ap3 label for that port. The label name is then changed to Mma and the Mma text box then becomes the mass in grams added to each Slavbas cone.

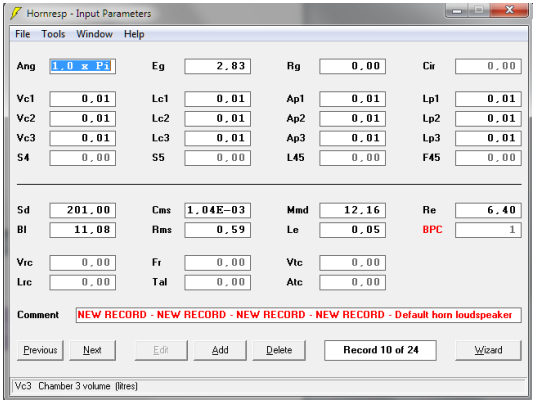


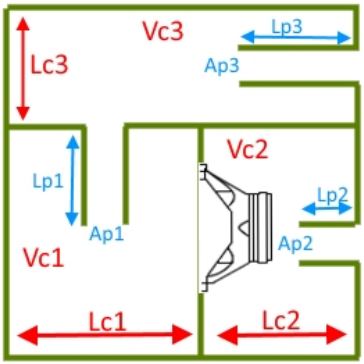

To select an alternative external port in the BP6P, BPB, BPC or ABC systems, double-click on the Ap label for the other port.
To remove the "Passive Radiator" option and restore to a door tube, double-click the Mma label in "Edit" mode.
Press F5 or click the "Wizard" button to open the "Loudspeaker Wizard".
Set the "Chamber", "Port", "Amplifier" and "Filter" bars with the mouse or by typing the value directly and then pressing "Enter" when the respective control is in focus.
"Total acoustical power", "electrical impedance" and "driving diaphragm"

Displacement ”values can be exported for use in any other speaker design program , this by either clicking on "Export" in the "memory window" button or by pressing the F9 key when the relevant window appears.
The speaker box is modeled as the “Schematic” diagram and the “System model” diagram.

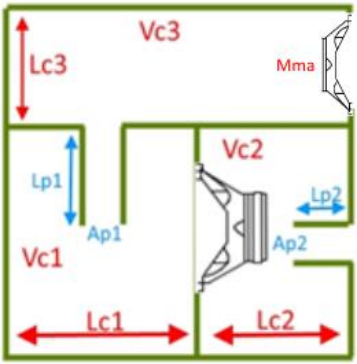


## Type C Bandpass box



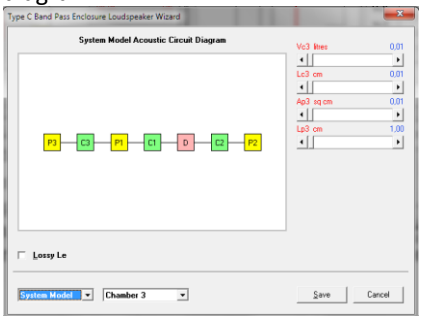




Select the BPC option from the "Loudspeaker Configuration" tool or press "Ctrl" and double-click the BPB label in "Edit" mode to set the BPC flag.
To replace an external port with a slave base element, double-click the Ap1, Ap2 or Ap3 label for that port. The label name is then changed to Mma and the Mma text box then becomes the mass in grams added to each Slavbas cone.

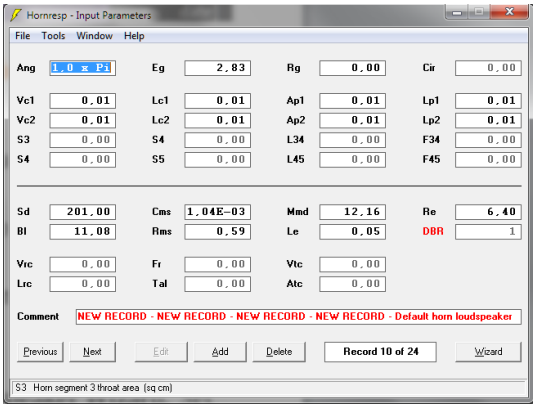


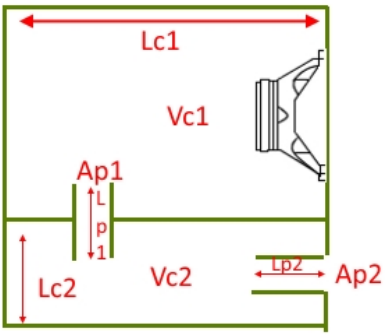

To select an alternative external port in the BP6P, BPB, BPC or ABC systems, double-click on the Ap label for the other port.
To remove the "Passive Radiator" option and restore to a door tube, double-click the Mma label in "Edit" mode.
Press F5 or click the "Wizard" button to open the "Loudspeaker Wizard".
Set the "Chamber", "Port", "Amplifier" and "Filter" bars with the mouse or by typing the value directly and then pressing "Enter" when the respective control is in focus.
"Total acoustical power", "electrical impedance" and "driving diaphragm"

The displacement values can be exported for use in any other speaker design program by either clicking "Export" in the "memory window" button or by pressing the F9 key when the relevant window is available.
The speaker box is modeled as the “Schematic” diagram and the “System model” diagram.To select an alternative external port in the BP6P, BPB, BPC or ABC systems, double-click on the Ap label for the other port.
To remove the "Passive Radiator" option and restore to a door tube, double-click the Mma label in "Edit" mode.
Press F5 or click the "Wizard" button to open the "Loudspeaker Wizard".
Set the "Chamber", "Port", "Amplifier" and "Filter" bars with the mouse or by typing the value directly and then pressing "Enter" when the respective control is in focus.
"Total acoustical power", "electrical impedance" and "driving diaphragm"
The displacement values can be exported for use in any other speaker design program by either clicking "Export" in the "memory window" button or by pressing the F9 key when the relevant window is available.
The speaker box is modeled as the “Schematic” diagram and the “System model” diagram.



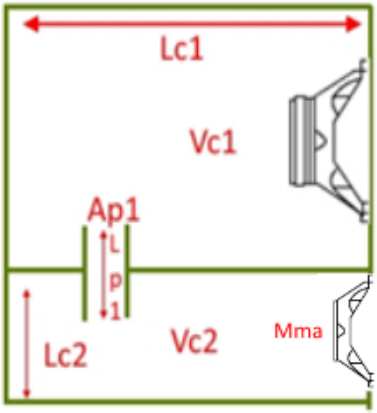
# The speaker element in a double bass reflex box




Select the DBR option from the “Loudspeaker Configuration” tool or press “Ctrl” and double-click the BPC label in “Edit” mode to set the DBR flag.

To replace an external port with a slave base element, double-click the Ap1, Ap2 or Ap3 label for that port. The label name is then changed to Mma and the Mma text box then becomes the mass in grams added to each Slavbas cone.




To select an alternative external port in the BP6P, BPB, BPC or ABC systems, double-click on the Ap label for the other port.

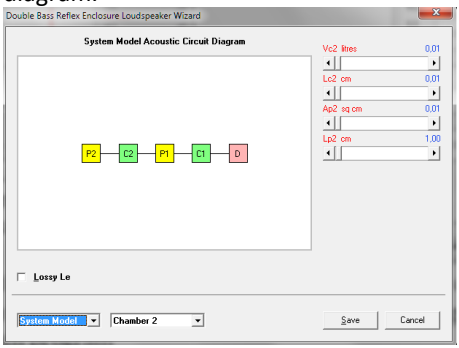
To remove the "Passive Radiator" option and restore to a door tube, double-click the Mma label in "Edit" mode.

Press F5 or click the "Wizard" button to open the "Loudspeaker Wizard".

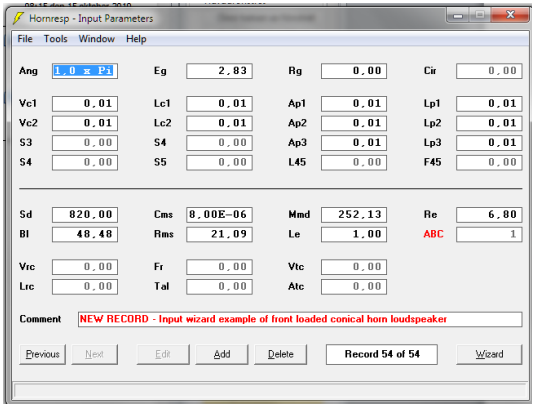
Set the "Chamber", "Port", "Amplifier" and "Filter" bars with the mouse or by typing the value directly and then pressing "Enter" when the respective control is in focus.

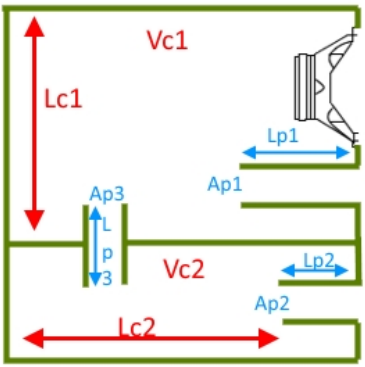
"Total acoustical power", "electrical impedance" and "driving diaphragm"

The displacement values can be exported for use in another speaker design program, either by clicking on "Export" in the "memory window" button or by pressing the F9 key when the relevant window is available.
The speaker box is modeled as the “Schematic” diagram and the “System model” diagram.



# The speaker element in an Aperiodic Bi-chamber box




Select the ABC option from the “Loudspeaker configuration” tool or press “ctrl” and double click on the DBR label to set the ABC flag:

To replace an external port with a slave base element, double-click the Ap1, Ap2 or Ap3 label for that port.

To remove the "Passive Radiator" option and restore to a door tube, double-click the Mma label in "Edit" mode.

Press F5 or click the "Wizard" button to open the "Loudspeaker Wizard".

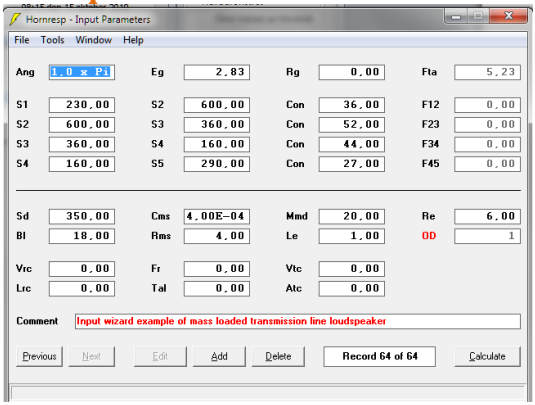
Set the "Chamber", "Port", "Amplifier" and "Filter" bars with the mouse or by typing the value directly and then pressing "Enter" when the respective control is in focus.

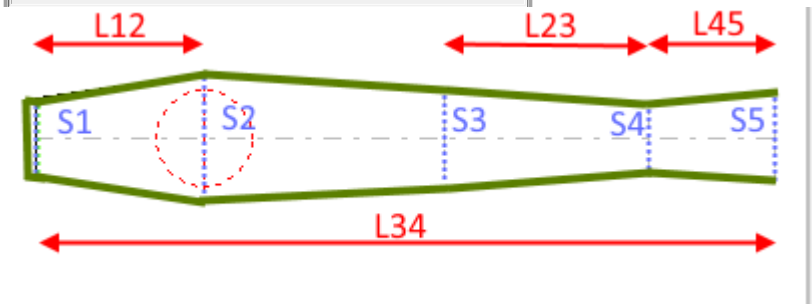
"Total acoustical power", "electrical impedance" and "driving diaphragm"

The displacement values can be exported for use in another speaker design program, either by clicking on "Export" in the "memory window" button or by pressing the F9 key when the relevant window is available.

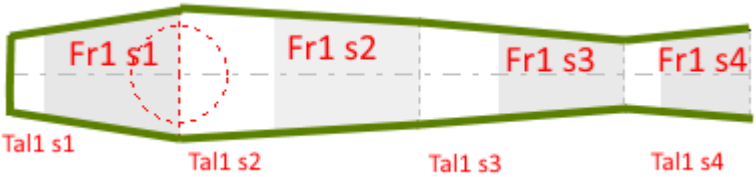
The speaker box is modeled as the “Schematic” diagram and the “System model” diagram.

# The speaker element in a muted transmission



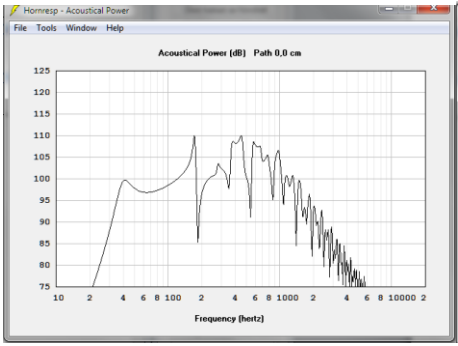



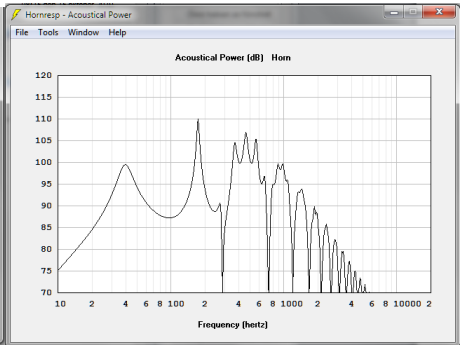

Select the OD or OD1 offset driver option and use the “Loudspeaker Wizard” to add muted material to the desired segments.

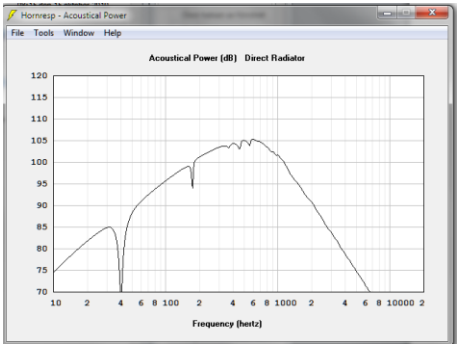



Set L12 = 0.01 if the element is not offset.

By default, the acoustic output power of the transmission line and the direct radiation of elements together are calculated. The "Output tool" tool can be used to decide whether the excavation should show transmission line or elements' direct radiation.


Hornresp - Acoustical Power
File Tools Window Help
Acoustical Power (dB) Path 0,0 cm
125 120 115 110 105 100 95 90 85 80 75
10 2 4 6 8 100 2 4 6 8 1000 2 4 6 8 10000 2
Frequency (hertz)

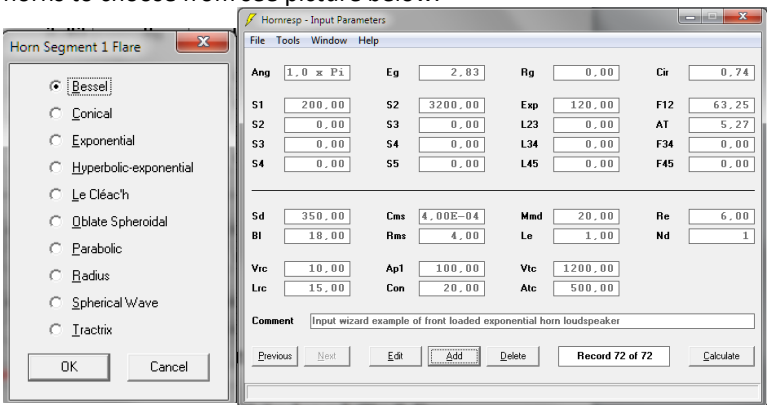

Hornresp - Acoustical Power
File Tools Window Help
Acoustical Power (dB) Horn
120 115 110 105 100 95 90 85 80 75 70
10 2 4 6 8 100 2 4 6 8 1000 2 4 6 8 10000 2
Frequency (hertz)


Hornresp - Acoustical Power
File Tools Window Help
Acoustical Power (dB) Direct Radiator
120 115 110 105 100 95 90 85 80 75 70
10 2 4 6 8 100 2 4 6 8 1000 2 4 6 8 10000 2
Frequency (hertz)

# HORN

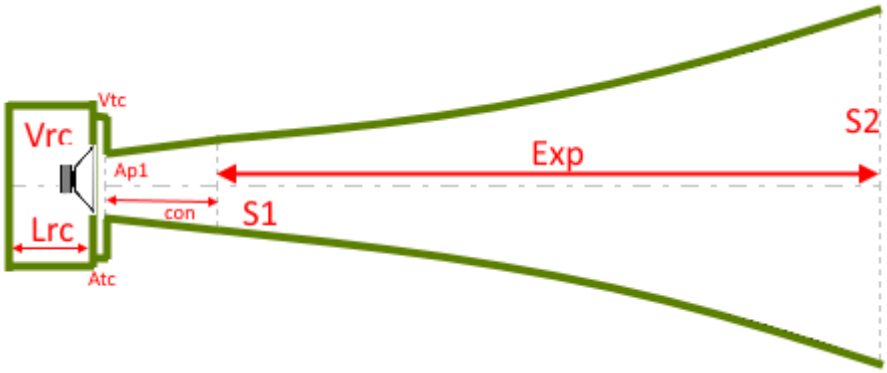
## Normal Horn (Single segment)

This is Hornresp's main function to simulate horns. There are many different types of horns to choose from see picture below.

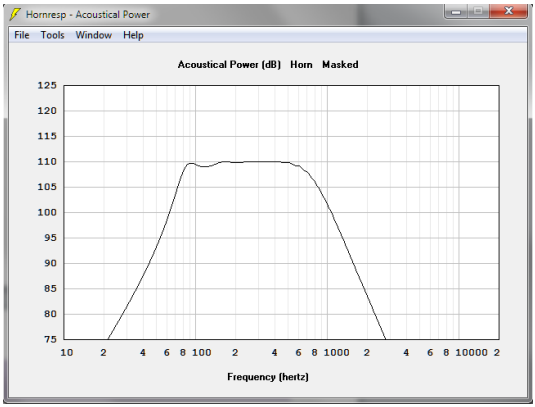



Select this window by zeroing all S # values and all L # values then double-clicking in L12's input box.

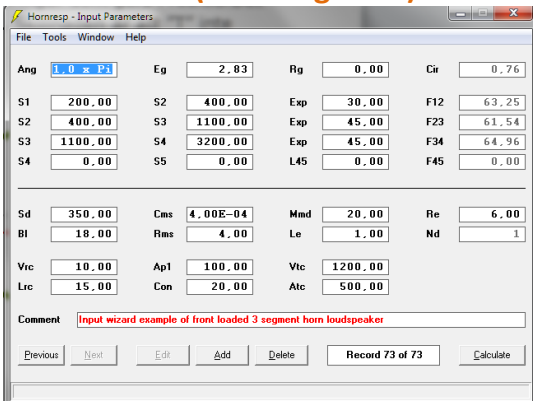
All these horn types are a little different and will change the Cir & Fr values. All profiles except Con, Exp and parabolic can only be used for single segment horns. The horns follow the same pattern as the basic profile below.



We will now go through the hyperbolic design as an example.
Start with a blank window and select Hyp flare either by double-clicking the L12 label or clicking in the L12 input box and pressing the letter "H". Now enter a number in the L12 box, eg 500 to lock
Hyp profiken. Now you need to enter a preliminary horn. Select Sd / 2
as S1 and Sd * 10 as S2. If you look at the Cir parameter, it now shows ".24". This is the length of the parameter arc of the S2 mouth compared to the wavelength of the lower limit of the horn. In this case, the length of the muzzle is compared with the wavelength .24 or 24%. The lower frequency limit is obtained from F12. This is the frequency at which the horn stops charging the speaker element. Also note the red warning text. It tells you that your element does not match the horn as it is. This means that you need to add a neck adapter. Which means a neck chamber is also added. Go to Tools> Chamber and select "Throat adapter". Ap1 then becomes equal to S1, and lpt becomes the same as the material thickness. We use 1.8cm as thickness. The neck chamber is a little more tricky, but we can guess a value. Use SD as Atc and try to estimate the height of the distance between the Cone's base and the edge of the Speaker element then divide this value by 3 and for our example we get about 2.72. Remember, this is just a quick guess. It would be best to accurately measure the cone's volume in cc.
Now a red warning pops up with a reminder to enter the T value. The T value is the "slope" profile for the horn, and is entered where the F23 value is normally entered. In our example we use the value .6. When Nd is selected, the Loudspeaker Wizard cannot be used. With the settings Con, Exp and Par you can cheat by adding an extra segment that is 1 cm2 larger than S3 and about 1 cm longer, this gives access to "Wizaed" without problems. Normally you add the back chamber before the simulation.

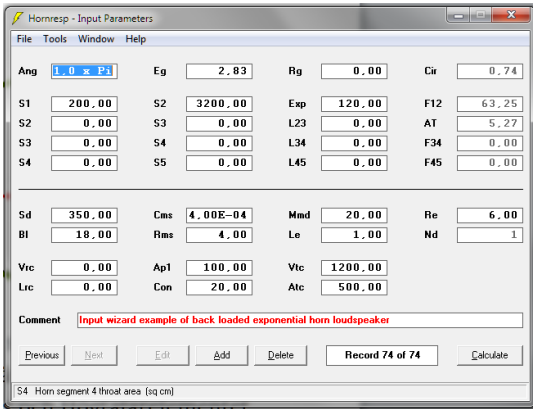


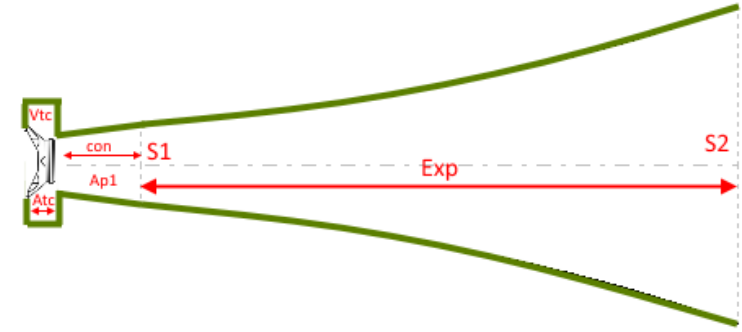
## Normal horn (Multisegment)



With Con, Exp and Par you can make multi-segment horns. It works in exactly the same way as for the single segment Ns horn. But this also gives the opportunity to use the "Loudspeaker wizard" where you can see all the changes that are made in real time. There is not much to add to the single segment horns. The difference is that "T" is not entered but you define it with the section Sd.

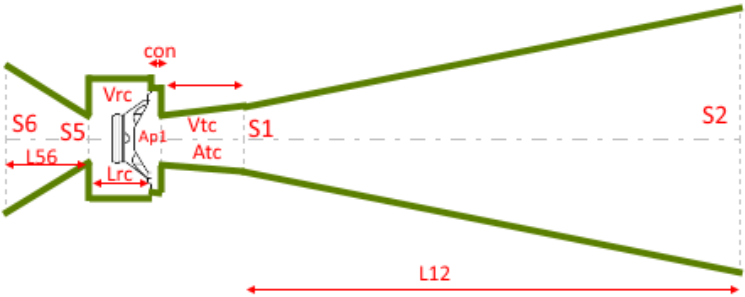
## Backloaded horn




Simply put, a back-charged horn is the same as a Normal horn but without a back chamber. Instead of a rear chamber, the speaker element is mounted externally. And you get the sum of the hornets and the speaker element response. To simulate a back-charged horn, let the values for the rear chamber be = 0. You must use the "combined response graph" to see the true frequency response.

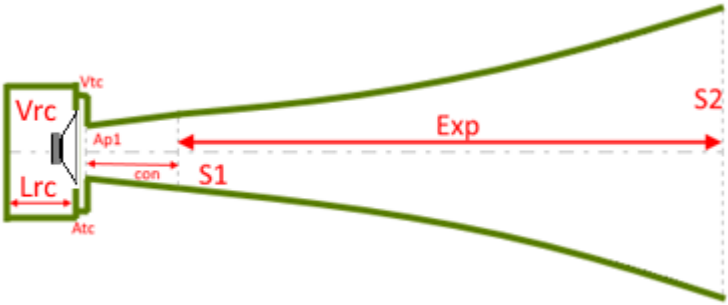
## Compound Horn



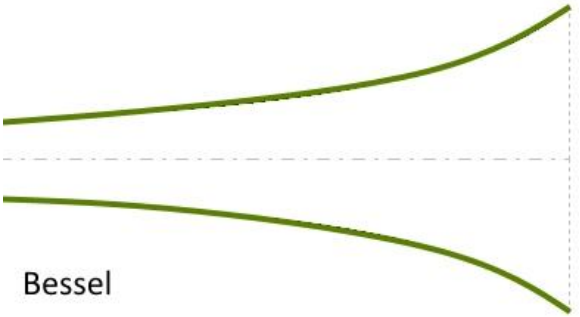

A compound horn is a cabinet with horns on both sides of the speaker element. It is selected by changing Nd to CH. When you choose this option, there will be some major changes in the program. First, S1-S4 reserve the first three segments for the main horn, but you do not need to use more than one segment. You can also use a neck chamber (Vtc & Atc) and a neck adapter (Ap1 & Lpt). The other horn uses the S4-S5 segment and the rear chamber (Vrc & Lrc) becomes its neck chamber. Here you can not use "Loudspeaker Wizard" and you must use "combined Respons" The graph with Compoundhorn and the graph then only shows the curve of the main horn.

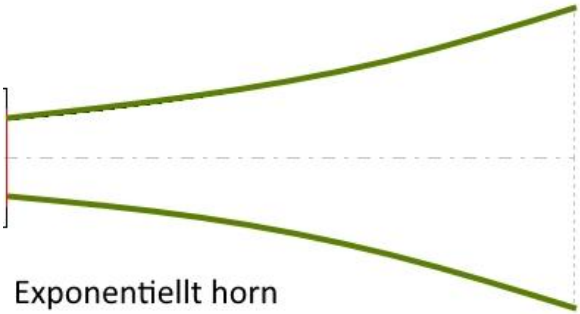
# The speaker element in a Frontloaded Horn

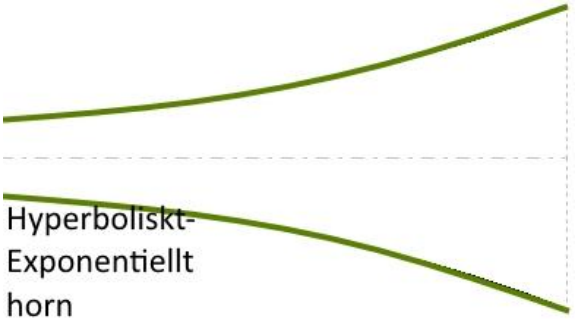
## Single segment

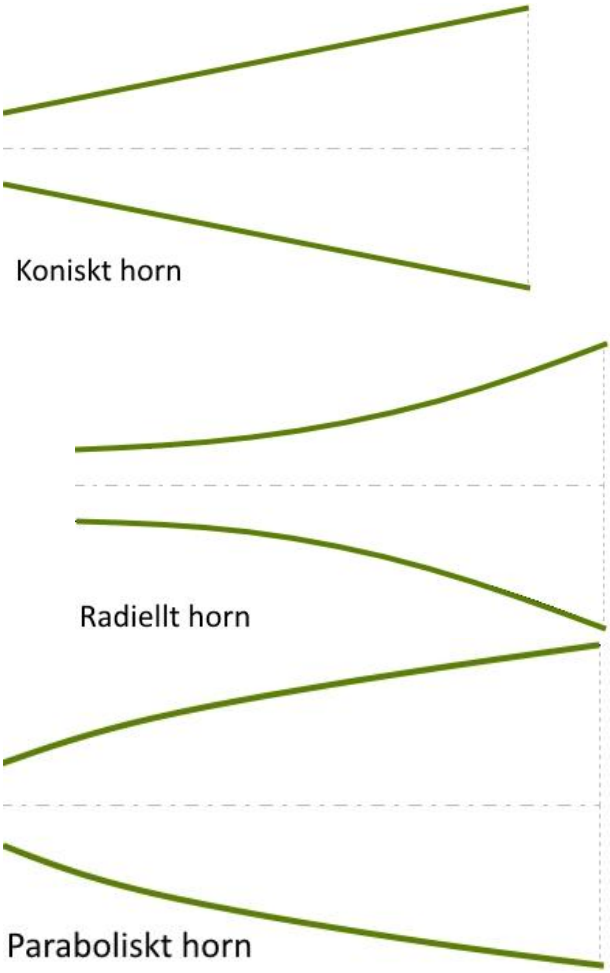



Set Vrc and Lrc> 0.
Select the "Rear lined" option from the "Chamber type" tool if you want damping material in the back chamber, set Fr and Tal> 0.
Select "Throat adapter" from the "Chamber type" tool if you want a Throat adapter between the front chamber and the horn neck and set Ap1, Lp, Vtc and Atc> 0.
Double-click the Lp label in “Edit” mode or press C, E or P when the Lp text box is in focus to specify whether it should be a conical, cylindrical, exponential or parabolic neck adapter.
If no rear chamber has been specified, the acoustic output of the combined horn and element is calculated. With the "Output" tool, either the acoustic output of the horn or the element can be selected.
Front-loaded single-segment horns can have several different types of expansion.


Bessel


Exponentiellt horn


Hyperboliskt-
Exponentiellt
horn


Koniskt horn
Radiellt horn
Paraboliskt horn

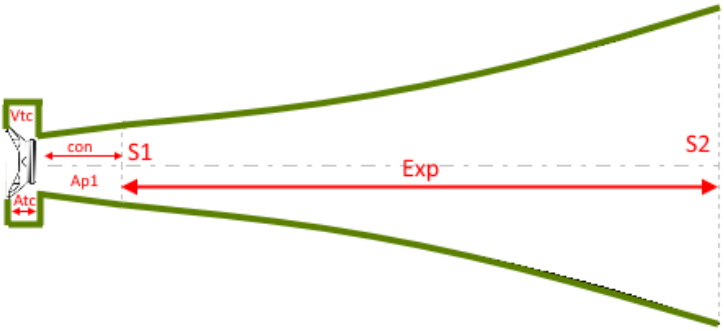
Sfäriskvåg horn

TracTrix horn

Le Cleác´ horn

### Halsadaptern former

# The speaker element in a backloaded horn

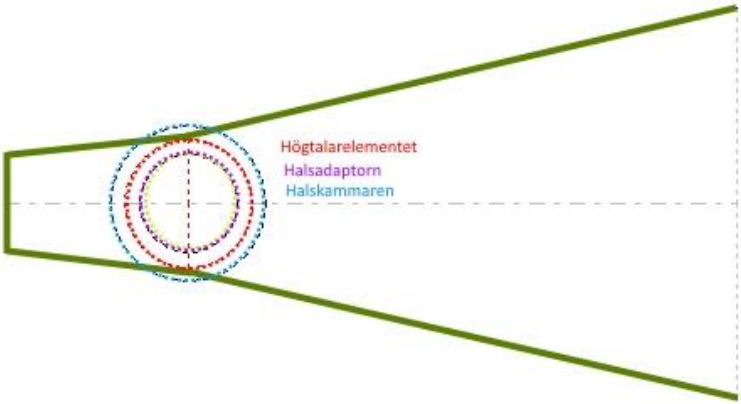



Set Vrc and / or Lrc = 0.
Select the "Rear lined" option from the "Chamber type" tool if you want damping material in the back chamber, set Fr and Tal> 0.
Select "Throat adapter" from the "Chamber type" tool if you want a Throat adapter between the front chamber and the horn neck and set Ap1, Lp, Vtc and Atc> 0.
Double-click the Lp label in “Edit” mode or press C, E or P when the Lp text box is in focus to specify whether it should be a conical, cylindrical, exponential or parabolic neck adapter.
By default, the acoustic output of the combined horn and element is calculated. With the "Output" tool, either the acoustic output of the horn or the element can be selected.Set Vrc and / or Lrc = 0.
Select the "Rear lined" option from the "Chamber type" tool if you want damping material in the back chamber, set Fr and Tal> 0.
Select "Throat adapter" from the "Chamber type" tool if you want a Throat adapter between the front chamber and the horn neck and set Ap1, Lp, Vtc and Atc> 0.
Double-click the Lp label in “Edit” mode or press C, E or P when the Lp text box is in focus to specify whether it should be a conical, cylindrical, exponential or parabolic neck adapter.
By default, the acoustic output of the combined horn and element is calculated. With the "Output" tool, either the acoustic output of the horn or the element can be selected.

## Högtalarelementet i ett massladdat horn

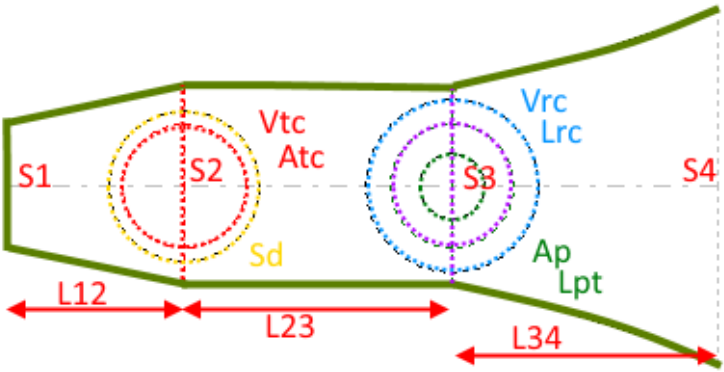
Specify the corneal cover plate as a conical segment with negative expansion. (Munar area <Neck area) with a length of 0.01 cm, and the mouth's mass loading 'ports port tube area as a cylindrical exponential segment with zero expansion. (Munarean = Neckarean)

# Speaker element in horn with offset element




Position the element over S2 by specifying at least two conical, exponential and / or parabolic horn segments connected in series, and select the OD option from the “Loudspeaker configuration” tool or double-click on the Nd label in “Edit” mode. Position the element over S3 by specifying at least three conical, exponential and / or parabolic horn segments connected in series, and select the OD1 option from the “Loudspeaker configuration” tool or double-click on the OD label in “Edit” mode.
Vtc and Atc Can be used to specify a chamber between the entry point and the element cone. Ap1 and Lp can be used to specify a door opening between the chamber and the horn.
If no rear chamber is specified, the combined horn acoustic output plus the element or gate acoustic output is calculated. The "Output" tool can be used to calculate the acoustic output of the horn or port or element. A correction to the LPT rear chamber door length when needed.
The Loudspeaker wizard can be used to change the position of the element without changing the length of the horn or its extension.

# The speaker element in a "Tapped horn"




Specify three or four conical, exponential and / or parabolic female segments connected in series, set Vrc and / or Lrc = 0 and select the TH or TH1 "tapped" horn option from the "Loudspeaker Configuration" tool or double-click the OD1 label in "Edit" mode.

Element entry point In the horn, S2 or S3 for the 3 segment TH horn, and S2 and S4 for the 4 segment TH horn and S2 and S3 for the 4 segment TH1 horn.

Vtc and Atc can be used to specify a chamber between the speaker cone and the horn neck.

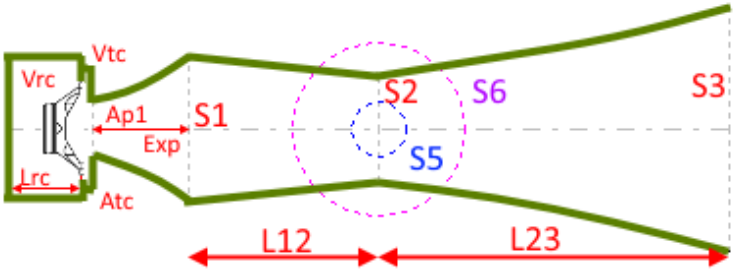
Ap1 and Lp can be used to indicate a gate opening between the neck chamber and the horn

Vrc and Lrc can be used to specify a port opening between the speaker cone and the horn mouth.

Ap and Lpt can be used to specify a door opening between the mouth chamber and the horn.

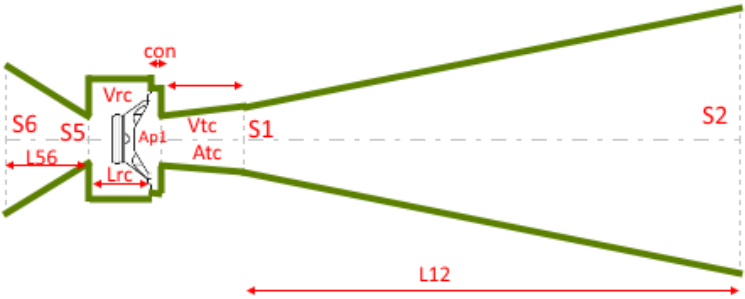
The "Loudspeaker Wizard" tool can be used to change the position of the element without changing the horn length or the extension.

## The speaker element in a "Stubbed horn"




Select SH1, SH2, SH3 or SH4 "" Stubbed horn "option from the" Loudspeaker Configuration "tool or double click on the CH1 label in" Edit "mode. Double-click again to select the SH2, SH3 or SH4 flag.
A "Stubbed horn" can have up to three segments with "Stub" or the absorption chamber, specified with segment 4 and the absorption port is indicated by Ap2 and Lp.
Select SH1 to position the stump or absorption chamber at S1. Select SH2 for position S2. SH3 for position S3 (at least 2 segments must be specified) and SH4 for position S4 (at least 3 segments must be specified)

# The speaker element in a compound horn




A compound horn is a cabinet with horns on both sides of the speaker element. It is selected by changing Nd to CH. When you choose this option, there will be some major changes in the program. First, S1-S4 reserve the first three segments for the main horn, but you do not need to use more than one segment. You can also use a neck chamber (Vtc & Atc) and a neck adapter (Ap1 & Lpt). The other horn uses the S4-S5 segment and the rear chamber (Vrc & Lrc) becomes its neck chamber. Here you can not use "Loudspeaker Wizard" and you must use "combined Respons" The graph with Compoundhorn and the graph then only shows the curve of the main horn.

# The result windows

### Schematic Diagram

Speaker drawing and volume. The design is assumed to be axially symmetrical. Use the mouse pointer to identify the parts and the scale.

### Acoustical Impedance

Acoustic resistance and reactance of the horn in normalized ohms in relation to the frequency in Hz. The current acoustic resistance and reactance can be obtained by multiplying the diagram value but given scale factor. For "tapped horn", the air load of the neck side membrane is displayed.

### SPL Response

The sound pressure produced At a point at a distance of 1 meter where the Speaker element is operated with a voltage of a certain voltage in relation to the frequency. The sound level is presented in decibels relative to the standard reference sound pressure of 20 uPascal. The result presupposes a constant direct effect. “

### Electrical Impedance

Speaker electrical impedance size (ohms) in relation to Frequency (Hz)

### Displacement

The distance of movement of the diaphragm in one direction in relation to the zero position in millimeters for a specified input signal, in relation to the frequency in Hz. The actual movement distance can be obtained by dividing the chart value by the scale factor. All input voltage levels are assumed to be linear. No account has been taken of low frequency high power amplitude compression.

### Phase Response
The phase angle is the difference between the voltage Eg the speaker's system sound pressure in relation to the frequency in Hz.

### Group Delay
Negative derivatives In milliseconds of the speaker system phase response In relation to the frequency I Hz.

## “File” menyn

### Copy Driver
Copies the parameter values of the current element.

### Paste Driver
Pastes the most recently saved and copied element parameter values.

### Find
Looking for saved files that match a particular text. When the "Input parameter" window is displayed, you can scroll with the "page up", "page down", "Home", End ", and" Enter "keys.

### Sort
Sorts the files in ascending alphanumeric order.

### Import
Loads “Input Parameter” data from an exported file

### Export
When "Export" is selected from the "Input Parameter" window, the data values for the current simulation are saved in the AkAbak script file. All values must be valid.
When “Export” is selected from the “Schematic Diagram” window, the drawing values are saved in tab split text and come separated value file.
SPL & Ze magnitude for phase files can also be exported for use in other speaker calculation programs. Frequency values increase logarithmically from 10Hz TO 20,000Hz.

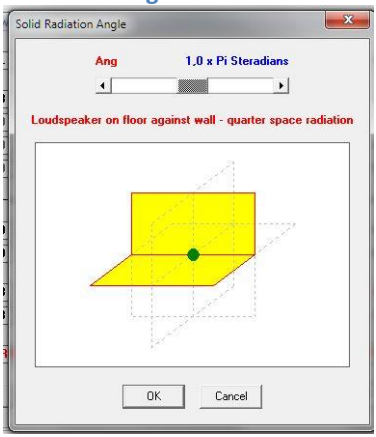
### Print
Prints the "input parameter" values and shows a schematic diagram or table.

### Exit
Closes the Hornresp program.

# 1 Input parameters

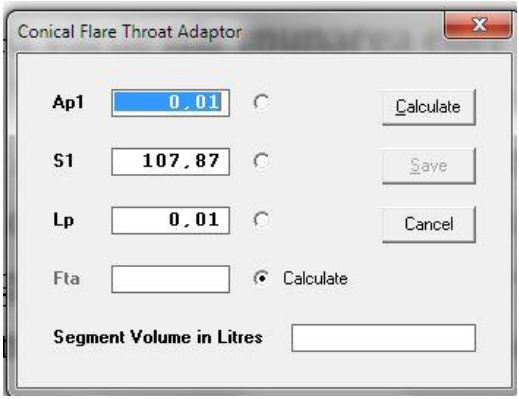
## “Tools” menu

### Radiation Angel




Specifies the location of the speakers, and the angle at which the speaker radiates. The angle is measured in steradians. If the value is set to zero, it is an infinite horn. The menu command can be accessed when Ang is in focus. It can also be selected by double-clicking the Ang text box in "Edit" mode.

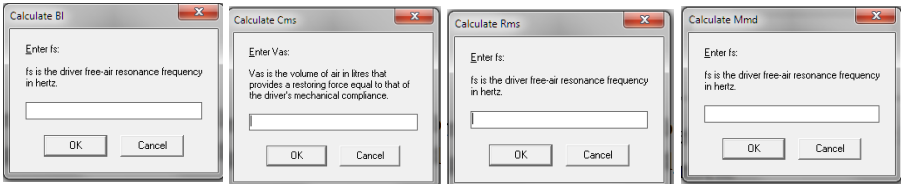
### Horn Segment Wizard



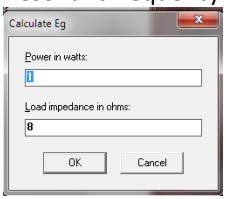
Calculates either the neck area, the mouth area, the horn length, the cut-off frequency, the expansion parameters, the half angle of the neck entrance, the circumference of the mouth in the wavelength of the cut-off frequency or the mouth exit angle that gives the parameters of the other relevant horn segments.
Cir or Fta can be given a specific value when mouth area or when "cut-off" frequency calculations are selected. The tool command any horn segment parameter or Ap1 neck adapter parameters have focus.
The tool can also be selected by double-clicking these parameters in "edit" mode.
Munar area calculations can also be used to obtain the area at any horn length.
For system volume, double-click the volume segment.

## Calculate Parameter

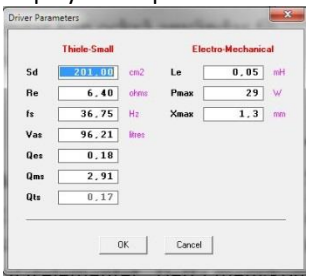
Calculates BL, Cms, Rms and Mms values from the relevant Thiele-Small parameters.



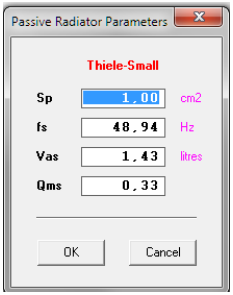

Calculates Eg from input power at a specific load and determines Helmholtz 'resonant frequency.




Selected from Sd, the speaker element Thiele-Small parameters Sd, Re, fs, Vas, Qes, Qms and Qts, and the electromechanical parameters Le, Pmax and Xmax are displayed. All parameters except Qts can be edited.



Selected from Sp1, the Thiele-Small parameters Sp, fs, Vas and Qms are displayed.




All the displayed parameters can be edited. The menu command can be accessed when Eg, Sd, Bl, Cms, Rms, Mmd, Sp1 to Sp9, Cmp, Rmp, Mmp or Lpt have focus. The tool can also be accessed by double-clicking on the respective parameter in "Edit" mode.

## Chamber Type

Specifies whether the rear chamber should be a closed or bass reflex chamber, a Slavbas rear chamber or a neck chamber connected to the horn via a conical neck adapter.
The tool is available when the “Input Parameter” window is in “Edit” mode.
The tool can also be selected by double-clicking the Fr, Ap, Ap1, Ap2 or Sp1 label.
The tool command is available when the "input parameter" window is in "Edit" mode.

### Rear lined

Selects closed back chamber

### Rear vented

Selects Basreflex rear chamber

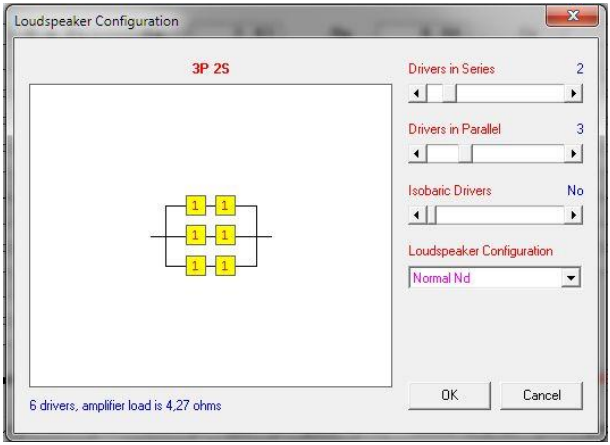
### Rear passive radiator

Press Ctrl and double-click the Fr, Ap, or Ap1 label to specify a slave base. Press Ctrl and double-click the Sp1 label to select multiple slave bases. Double-click the Sp1 to Sp9 label to return to the Fr label.

### Throat adaptor

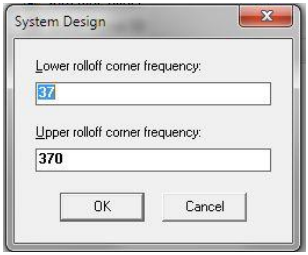
Double-click the Lp label to select the conical, exponential, parabolic expansion on the neck adapter or "absorber" chamber. Or press C, E or P when the Lp text box is in focus.

## Loudspeaker configuration



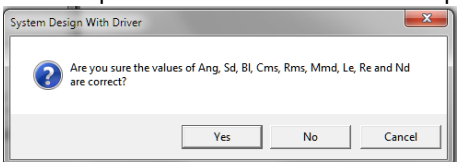

Specifies the system configuration and the number and position of the speaker elements electrically connected in series / parallel connection.
A speaker element module can contain a single or up to 9 speaker elements in series or parallel isobaric connection.
"Multiple driver equivalent" allows a simple element to be exchanged for an array of elements with the same performance.
Multiple speaker elements divide the horn system, the neck chamber and the rear chamber as defined in the input parameters and as shown in the diagram.
An offset horn, a tapped horn, a compound horn, a multiple entry horn, a 4th order, a 6th order series, a 6th order parallel or an 8th order bandpass speaker box can be specified.
The tool can be accessed by double-clicking the Nd, OD, OD1, TH, TH1, CH, CH1, SH1, SH2, SH3, SH4, ME1, ME2, BP4, BP6, BP8, BPA, BPB, BPC, DBR, or ABC text box in "Edit" mode.
Double-clicking on the label Nd steps through OD, OD1, TH, TH1, CH, CH1, SH1, SH2, SH3, and SH4 speaker options.
"Ctrl" and double-click the speaker configuration label through the ME1, ME2, BP4, BP6, BP8, BPA, BPB, BPC, DBR or ABC speaker options.

## System design



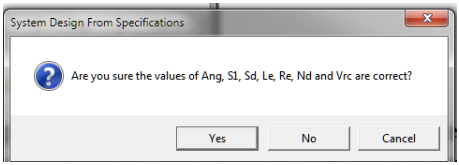

### With drive

Determines the optimal design for a hyperbolic-exponential horn. From the speaker element parameters and the desired frequency range.



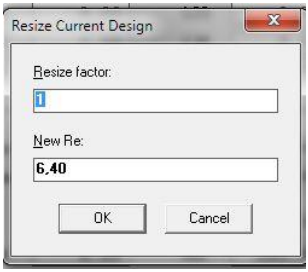

### From specefications

Determines the optimal design for a hyperbolic-exponential horn. From the speaker element parameters and the desired frequency range.

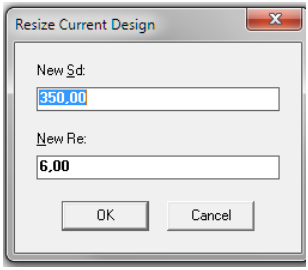



The tool is available when the "input parameter" window is in "Edit" mode.

## Resize wizard




Scales the size of a specified speaker system and the element's Sd value.
Double-click on the "Resize factor" label to change to the Sd option.
The value of the DC resistance Re can also be changed.




The response of the speaker system can be shifted up or down in frequency without changing the curve shape by increasing or decreasing the size of the system.
The tool is available when the "Input parameter" window is in "Edit" mode, but cannot be used in ME1 and ME2 mode, nor when the speaker element has "lossy" inductance, semi inductance or frequency dependent attenuation.

## Loudspeaker wizard

Automatically recalculates the results of the speaker system in real time as the input parameters change.

The tool can be used for closed speaker systems, single-segment conical and parabolic horns, single-segment exponential horns with closed mouths and all multi-segment horns.

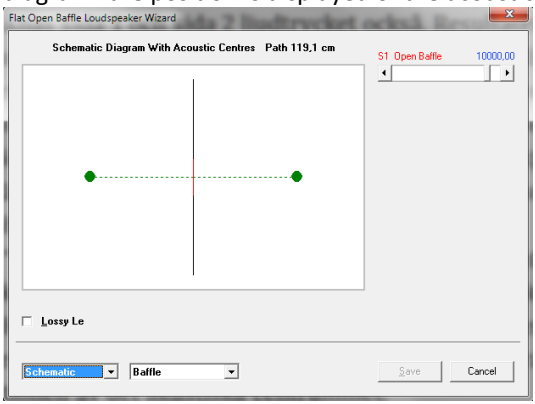
When "loudspeaker Wizard" is used on multisegment horns, the last segment at the horn mouth can be either conical, exponential or parabolic.

Other segments will be cylindrical regardless of their specified expansion numbers.

The value of the mouth area rule is set separately if the "manual" option is selected, or "automatically" if a cylindrical mouth segment is desired.

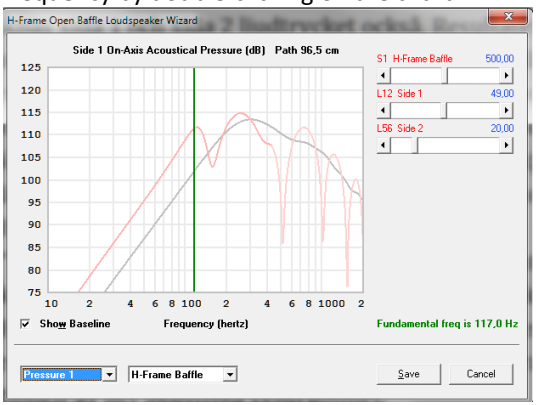
In addition to the standard power response diagram, when “Wizard” is used with a direct beam element without a baffle, a direct beam element in a flat open beam, a direct beam element in an H-shaped open beam or a direct beam element in a U-shaped open beam, page 1 is calculated and page 2 the sound pressure as well. The result is shown by the fact that a brighter part of the line of the acoustic sound expression diagram is only approximate and becomes progressively less accurate as the frequency increases. This is because the dipole point model used in this calculation begins to dissolve as the frequency increases and the source increases in size compared to the wavelength. Page 1 and page 2 the sound pressure also takes into account the combined pressure.

When "Wizard" is used with a direct beam element without baffle, A direct beam element in a flat open beam, a direct beam element in an H-shaped open beam or a direct beam element in a U-shaped open beam and you double-click on "schematic diagram" the position is displayed of the acoustic center.

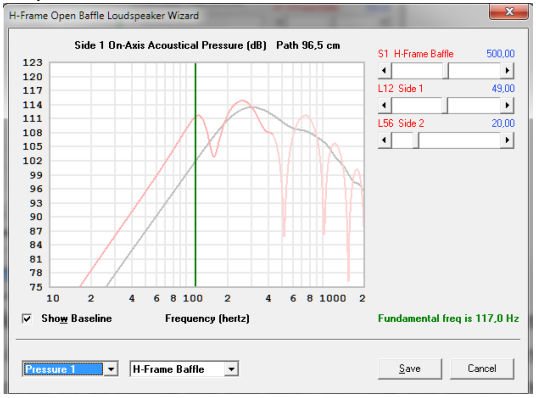



To hide the acoustic center again, press “ESC”

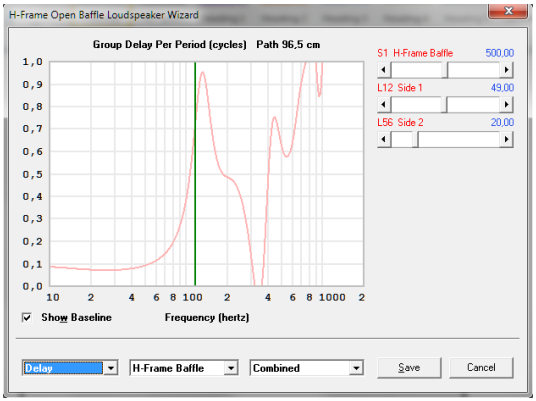
A green check mark can be added to all the charts to show the fundamental resonant frequency by double-clicking on the chart.




The selection is removed if you press the "Esc" key.
If the mouse pointer is moved over the selection line, the resonant frequency is displayed.
Double-clicking on the Y-axis changes the scale from 5 dB steps to either 3 dB or 6 dB steps.



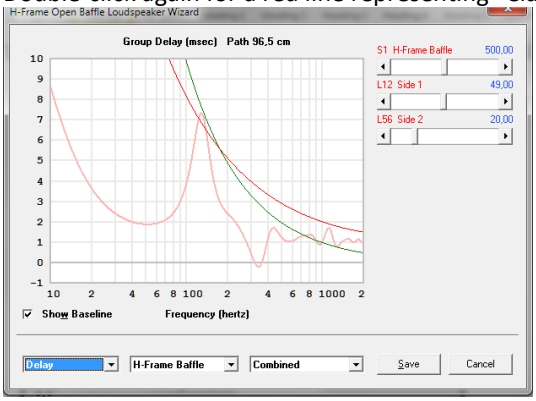

Press "Ctrl" and double-click on the "group delay" chart to switch to "group delay" per period chart.




Press "Ctrl" and double-click on the "group delay" per period chart to return to the "group delay" chart.

Double-click on the "group delay"'s Y-axis to add a green line representing the 1 / f limit.

Double-click again for a red line representing "Claus Futtrup" boundary line.



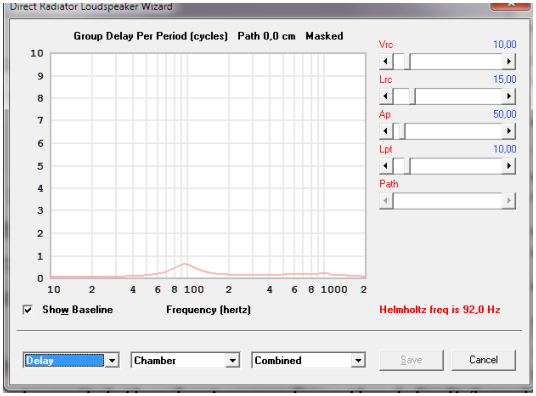

Press “Esc” to delete the 1 / f line and again to delete the “Claus Futtrup” line.

"Claus Futtrup audible group delay threshold limit guideline" In milliseconds, the following formula is obtained:

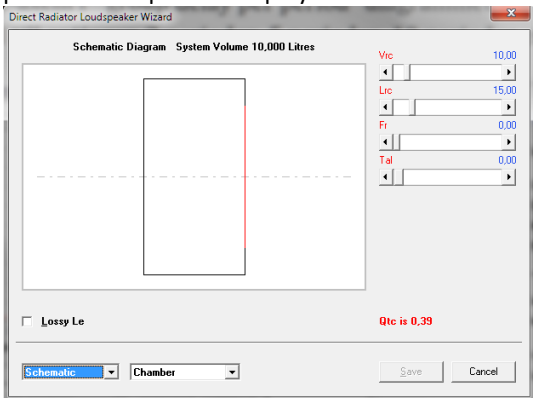
$$GDlimit = \frac{1000 * 1{,}1606}{(5{,}6413 * f^{0{,}81511} - f)}$$

Where f is the frequency in Hz

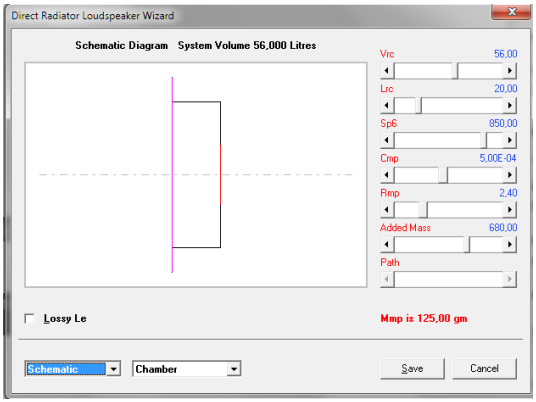
Double-click on the y-axis in the "group delay per period" diagram to change from period to either 2 periods, 5 periods, 10 periods or 20 periods.



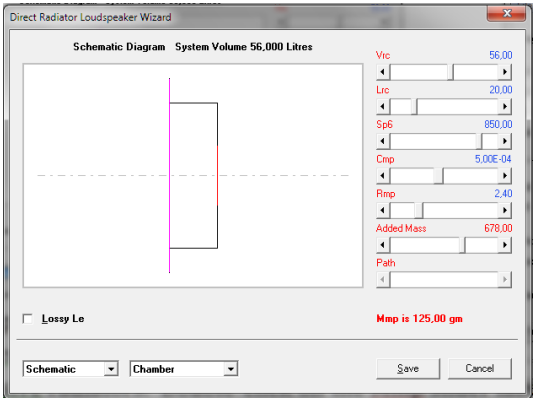

For direct beam closed boxes, the value of Qtc is displayed when the "Chamber inpu parameter" option is displayed.




For slave base systems, double-click the Sp1 rule label repeatedly to add up to 9 new slaves.

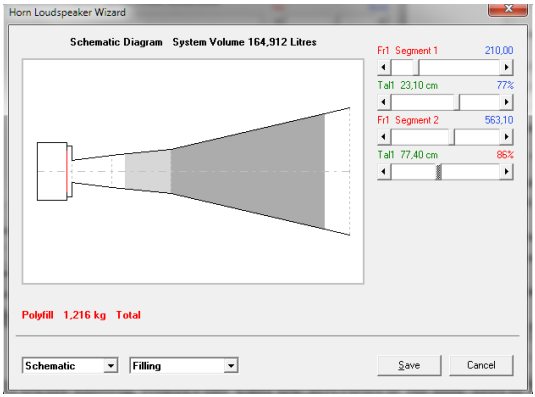



Double-click the Mmp rule label to specify the weight in grams to add to each slave element.

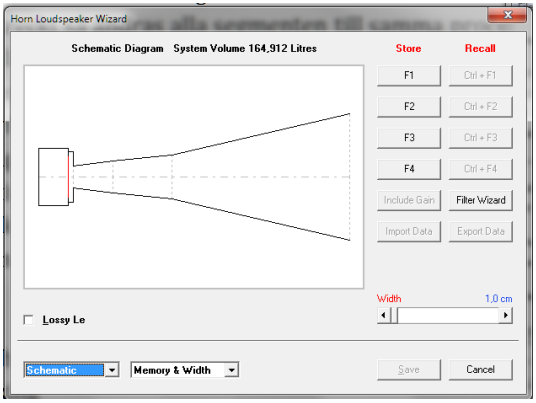



Double-click again to return to the Mmp rule.

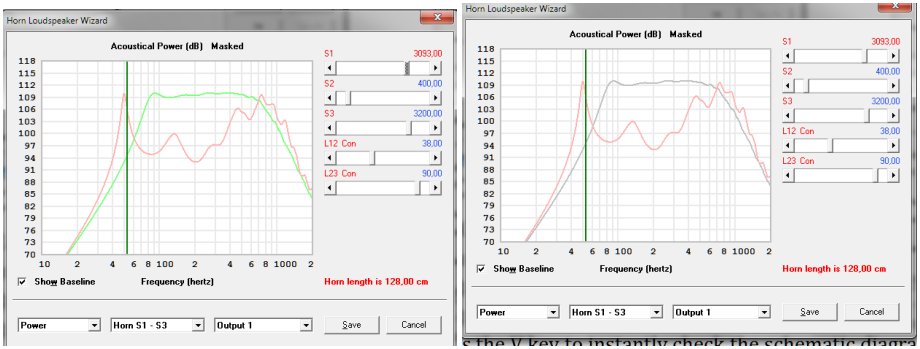
Damping material can be added to a horn segment with the "filling" option.




The travel stiffness of the air flow in the damping material in each segment is stated in mks rayls / m by using the Fr1 rule.
If the value of the Fr1 rule changes when the "Ctrl" key is pressed, the value for all segments changes.
The number 1 rule is used to partially fill the segment with damping material, the first half of the rule fills the segment from the end while the second fills from the mouth end.
For compound horn systems, the first half fills the segment from the mouth end and the second half fills the segment from the neck end.
If the value of the Tal1 rule changes when the "Ctrl" key is held down, all segments change to the same percentage value.
When the airflow resistivity is less than 1000 mks rayls / m and the "schematic" and "filling" options are selected, the total amount of polyfill damping material is displayed in kilograms.
Double-click on the total value to get the quantity for the current segment.
The starting value of the rules is saved as a baseline when the tool is selected.
Up to four different values can be saved and recalled temporarily as long as the "wizard" is open by clicking the appropriate memory function key.




When the "power" or "pressure" diagrams are displayed and you press "Ctrl" + C, the current result is saved, and press "Ctrl" + V to show or hide the result.




Not applicable when room gain is included.

Press the v key to immediately display the "schematic" diagram and release the v key to return.

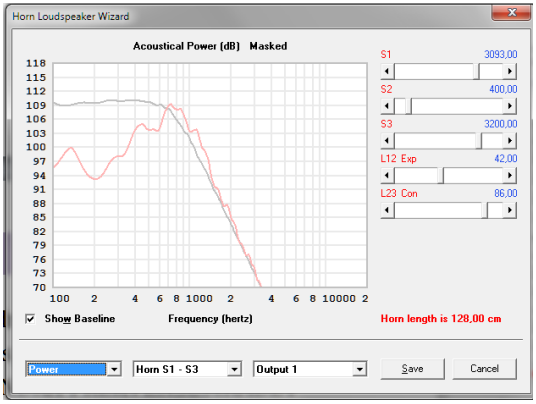
To change the extension for a segment, double-click the label above the respective rule.

To change between the auto / manual setting, double-click on the area label.

To change the extension for a neck adapter or absorption chamber port, double-click the label above the Lp rule.

To change the eg, vel or acc options, double-click on the label above the respective rule.

To change the frequency range to 100 to 20,000hz on a chart, double-clicking on the frequency label cannot be used when attenuation material is included.




To directly set a rule to a certain value, press the value and then "Enter" when the rule is in focus.
For the Tal1 rule, a positive value fills up the segment from the neck end and a negative one from the mouth end.
For horn 2 in a “compound horn”, a positive Tal1 value fills the segment from the mouth end and a negative one from the neck end.
To quickly move a rule, press the "Home" or "End" key and hold it down to the desired value, when the rule is in focus.
To reset a rule to its "baseline" value, press key B when the rule is in focus.
To reset all the bars to the "baseline" value, press "Alt" + B.
To save the values from bars and charts as a new "baseline", press "Ctrl" + "Alt" + B.
Imported “room gain” can be included in the “Loudspeaker wizard acoustical power” by clicking either the “Include gain” button in the “Memory & width” window or by pressing the F7 key. not applicable when the frequency range is set to 1 to 2000 Hz.
Data exported from the boxplan workbook can be imported into the "loudspeaker wizard" by clicking either the "import data" button in the "Memory & width" window or by pressing the F6 key
The active or parametric equalizer in the "Filter Wizard" can be selected either by clicking the "Filter Wizard" button in the "Memory & Width" window or by pressing the F8 key.
SPL magnitude and Phase values can be saved to a text file (.txt) or frequency response data file (.frd) that can be used in other speaker design programs. either by clicking the "Export data" button in the "Memory & width" window or by pressing F9 with the "Power output" option selected. The frequency values increase logarithmically from 10 Hz to 20,000Hz or from 1Hz to 2000Hz. Electrical impedance,

magnitude and phase can be saved as a text file (.txt) or an impedance response data file (.zma), which can be used in other speaker design programs either by clicking the "Export data" button in the "Memory & width" window or by pressing F9 with the "Impedance output" option selected. The frequency values increase logarithmically from 10 Hz to 20,000Hz or from 1Hz to 2000Hz.

The phase motion values phase can be saved as a text file (.txt) or an impedance response data file (.csv), which can be used in other speaker design programs either by clicking the "Export data" button in the "Memory & width" window or by pressing on F9 with the "Displacement output" option selected. The frequency values increase logarithmically from 10 Hz to 20,000Hz or from 1Hz to 2000Hz.

The constant width of a speaker element in a closed box or rectangular horn that has two parallel sides can be changed, with area height unchanged, by using the "Width" rule in the "Memory & width" window. First specify the start width with the rule, then double-click on the "width" rule label to change the rule to "width adjustment" mode.

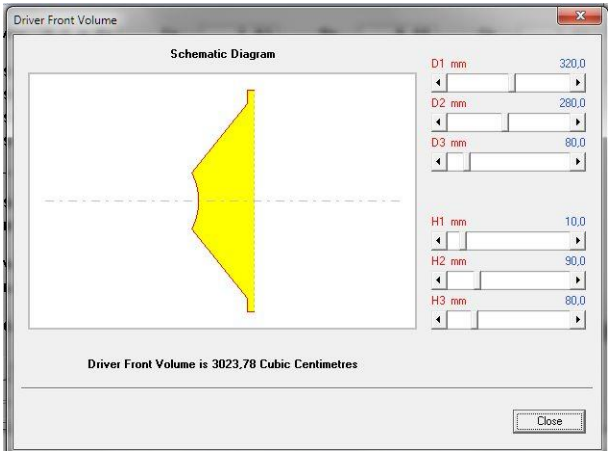
Adjust the rule to vary the horn width from the initial value. Double-click again to reset to the initial value.

Select the "Lossy Le" check box on the "schematic diagram" window to more accurately simulate the power response and "Diaphragm displacement" for systems with a large "motor". The "Lossy" impedance model is derived empirically from experimental data.

Select the “Semi-Inductance” model checkbox on the “schematic diagram” window

Select the FDD model check box on the "Schematic diagram" window to use the frequency dependent model.

## Drive front volume




A stand-alone tool for calculating the effective volume of the speaker element where D1 is the inside of the mounting hole and D2 the diameter of the inside of the cone and D3 is the diameter of the dust cover, H1 is the thickness of the mounting ring, H2 is the distance from the top of the cone down to the edge of the dust cover, H3 is from the top of the cone down to the center of the dust cover.
The calculated volume of the "Driver front volume" of the tool must be manually added to the Vtc value as this is not done automatically.
Double-click on the front volume to bring up the area value.
The pocket of this tool can be reached when the "input parameter" preamp is in "Edit" mode.
The tool can also be accessed by double-clicking the Vtc or Atc label or its text box.

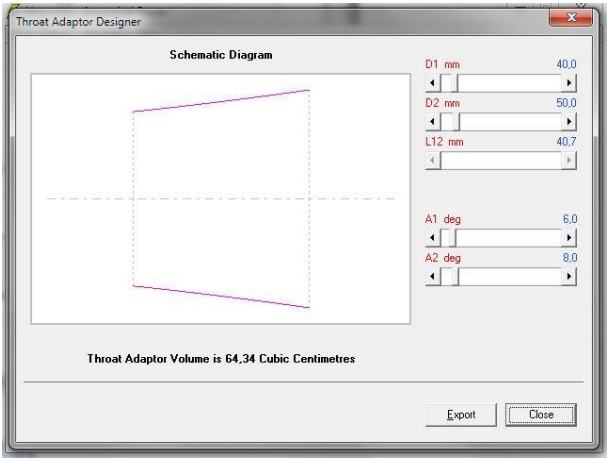
### View schematic

Displays the “Schematic Diagram” window and the system volume.

### Frequence range

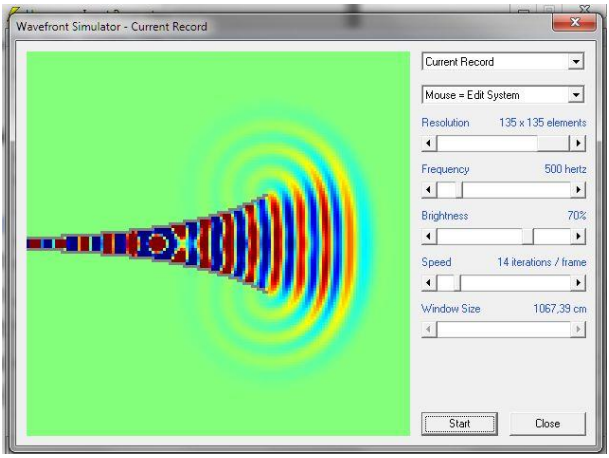
1 2 .2000Hz
10… .20 000 Hz
Changes the frequency range display on the charts from the default setting of 10 to 20,000Hz to 1 to 12,000Hz.

### Throat Adapter  Designer




A standalone tool that displays the expansion profile of a horn neck adapter. Where D1 is the input diameter and D2 the output diameter and A1 the input angle and A2 the output angle. The minimum length is also calculated all this data can be exported by clicking the "Export" button.

## Wavefront simulator




Models sound wave propagation in horn speakers. A warning message is displayed if the resolution, frequency, element size, and magnitude value generate an erroneous result due to wave distortion effects.

To add or delete walls, click and drag with the mouse when the "mouse = edit" system option is selected, or click with the mouse and use the Up, Down, Right and Left navigation keys.

To specify a straight wall, press "Shift" + click with the mouse on the end points of the line.

To specify a rectangular box, press "Ctrl" + click with the mouse on the diagonal corners.

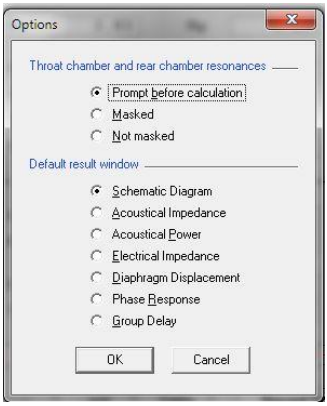
To specify a default point source, press "Alt" + click with the mouse twice in the same place.

To specify a point source with reverse polarity, a time-delayed point source or the acoustic output from a point source relative to the default value, press "Alt" + click with the mouse on the suggested source position, select "reversed polarity" check box set "power" and "Delay "The bars to the desired value and press" Alt "+ click with the mouse again on the suggested source position.

If the mouse pointer is moved over a point source, the selected polarity "power" and "Delay" setting in the Window shows the text at the top of the tool window. The default settings are not displayed. To add a point source, mouse over the source.

To specify the source of a standard speaker element, press "Alt" + click with the mouse on the cone endpoints.

## Options

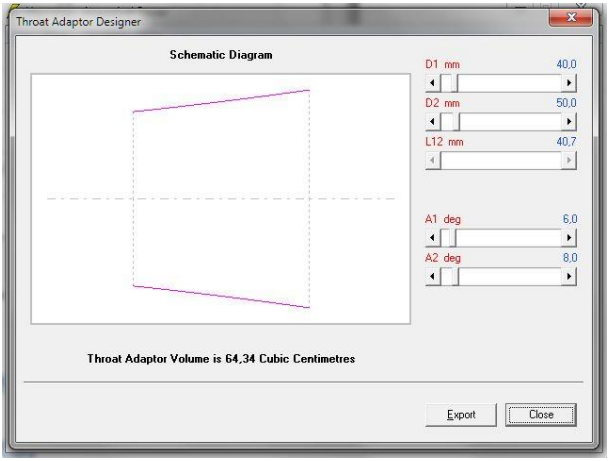



Sets whether the neck chamber and the rear chamber resonances are to be masked.
Sets which window should be the default display window.

# 2 Schematic diagram

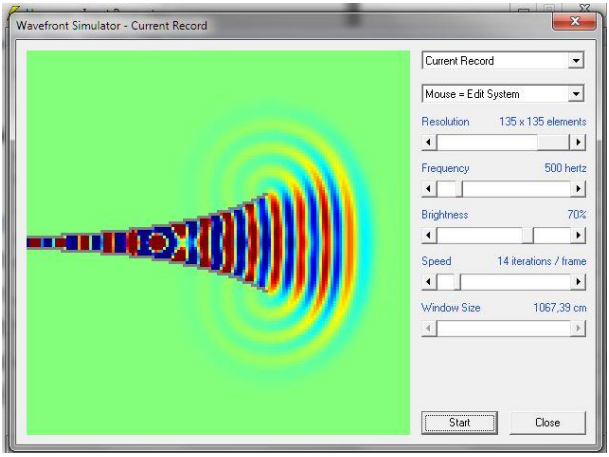
## Tools

### Throat Adapter Designer




A standalone tool that displays the expansion profile of a horn neck adapter. Where D1 is the input diameter and D2 the output diameter and A1 the input angle and A2 the output angle. The minimum length is also calculated all this data can be exported by clicking the "Export" button.

## Wavefront simulator




Models sound wave propagation in horn speakers. A warning message is displayed if the resolution, frequency, element size, and magnitude value generate an erroneous result due to wave distortion effects.

To add or delete walls, click and drag with the mouse when the "mouse = edit" system option is selected, or click with the mouse and use the Up, Down, Right and Left navigation keys.

To specify a straight wall, press "Shift" + click with the mouse on the end points of the line.

To specify a rectangular box, press "Ctrl" + click with the mouse on the diagonal corners.

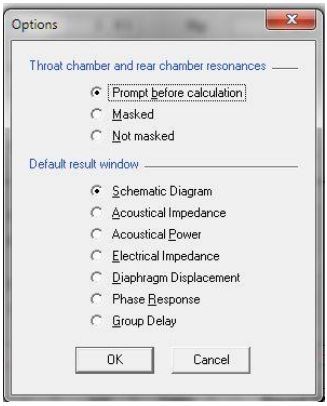
To specify a default point source, press "Alt" + click with the mouse twice in the same place.

To specify a point source with reverse polarity, a time-delayed point source or the acoustic output from a point source relative to the default value, press "Alt" + click with the mouse on the suggested source position, select "reversed polarity" check box set "power" and "Delay "The bars to the desired value and press" Alt "+ click with the mouse again on the suggested source position.

If the mouse pointer is moved over a point source, the selected polarity "power" and "Delay" setting in the Window shows the text at the top of the tool window. The default settings are not displayed. To add a point source, mouse over the source.

To specify the source of a standard speaker element, press "Alt" + click with the mouse on the cone endpoints.

## Options




Sets whether the neck chamber and the rear chamber resonances are to be masked.
Sets which window should be the default display window.

# 3 Acoustical impedans

## Tools

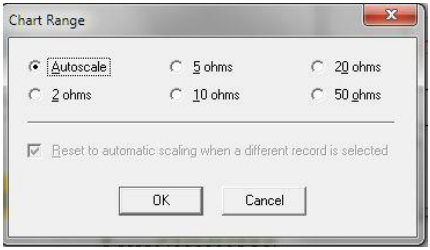
### Sample

Calculates the acoustic impedance, SPL sound pressure, electrical input power, acoustic output power, system efficiency, electrical impedance, cone motion, con acceleration, phase response, group delay or radiation angle at any frequency between 1 and 20,000Hz. When the sound pressure of a single segment's horn is calculated, the distortion of the second tone of the horn is calculated at the same time.
When the maximum sound pressure is calculated, either the power or the cone motion is displayed limited and the input voltage and the Pmax cone motion are displayed.
Press either "F3" or double-click the chart to select it.
A single click on a chart provides chart data at the frequency at which the mouse pointer is over at the mouse click. The sampling frequency can be changed by dragging the line with the mouse or by using the Up, Down, Left, Right Home or end keys. Press the "ESC" key to delete the sample line (red).
Calculates the constant direction-dependent sound pressure level, the electric input power, the acoustic output power, power conversion efficiency, the top sound pressure of the horn neck and the top particle speed of the horn neck at any frequency between 1 and 20,000Hz or between 0.1 and 2,000 Hz.
And for single segment horns the sampled second tone distortion. When the maximum spl sound pressure is sampled, the acoustic output is displayed as either power or cone displacement limited, and where the input voltage and Pmax cone displacement are given.
When the "power compression" response is displayed, the "thermal power compression" is also expressed in decibels.

### Compare previous

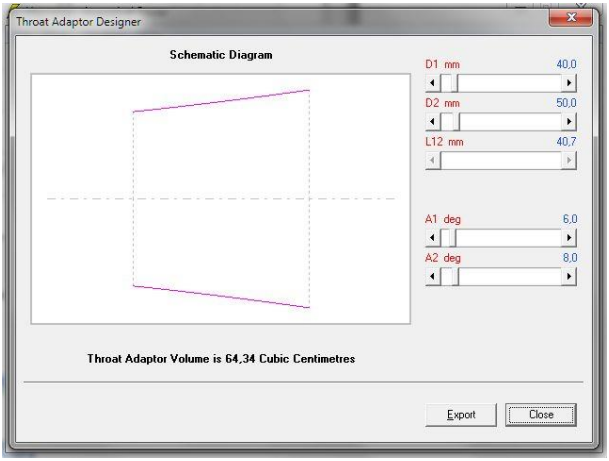
Shows the current and previous simulation regarding acoustic impedance in the same diagram.
The previous results are used as a basis for the comparison. Press "Ctrl + C" to capture current results or "Ctrl + X" to release captured results.
Press F4 to show or hide the previous or current result.

## Range



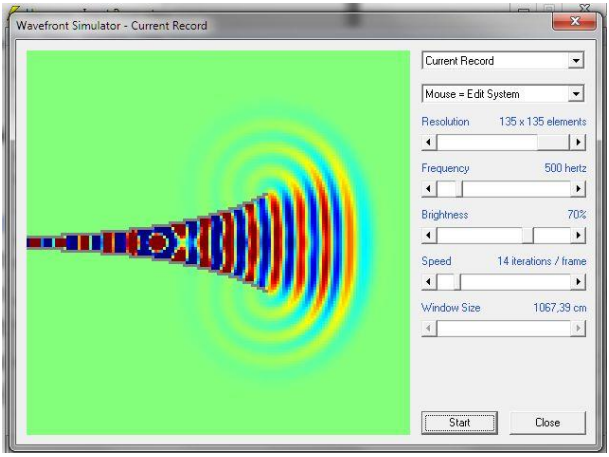

Sets the digram display area.

## Throat Adapter Designer




A standalone tool that displays the expansion profile of a horn neck adapter. Where D1 is the input diameter and D2 the output diameter and A1 the input angle and A2 the output angle. The minimum length is also calculated all this data can be exported by clicking the "Export" button.

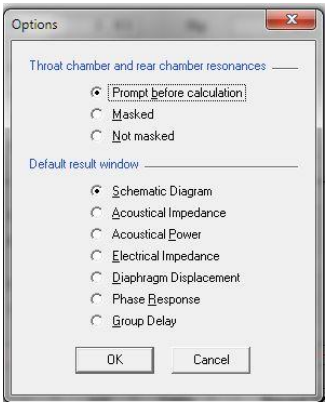
## Wavefront simulator




Models sound wave propagation in horn speakers. A warning message is displayed if the resolution, frequency, element size, and magnitude value generate an erroneous result due to wave distortion effects.

To add or delete walls, click and drag with the mouse when the "mouse = edit" system option is selected, or click with the mouse and use the Up, Down, Right and Left navigation keys.
To specify a straight wall, press "Shift" + click with the mouse on the end points of the line.
To specify a rectangular box, press "Ctrl" + click with the mouse on the diagonal corners.
To specify a default point source, press "Alt" + click with the mouse twice in the same place.
To specify a point source with reverse polarity, a time-delayed point source or the acoustic output from a point source relative to the default value, press "Alt" + click with the mouse on the suggested source position, select "reversed polarity" check box set "power" and "Delay "The bars to the desired value and press" Alt "+ click with the mouse again on the suggested source position.
If the mouse pointer is moved over a point source, the selected polarity "power" and "Delay" setting in the Window shows the text at the top of the tool window. The default settings are not displayed. To add a point source, mouse over the source.
To specify the source of a standard speaker element, press "Alt" + click with the mouse on the cone endpoints.

## Options




Sets whether the neck chamber and the rear chamber resonances are to be masked.
Sets which window should be the default display window.

# 4 Acoustic power

## Tools

### Sample

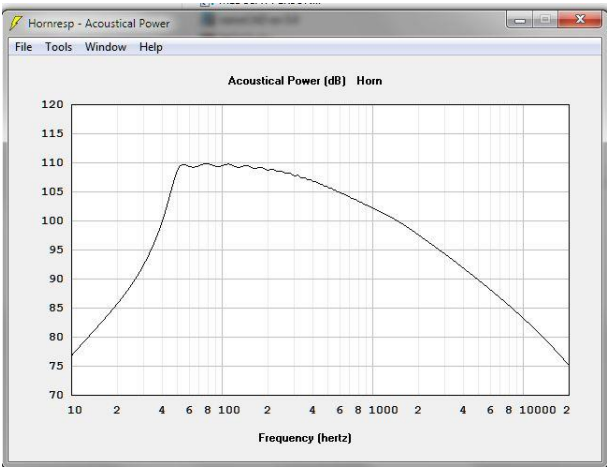
Calculates the acoustic impedance, SPL sound pressure, electrical input power, acoustic output power, system efficiency, electrical impedance, cone motion, con acceleration, phase response, group delay or radiation angle at any frequency between 1 and 20,000Hz. When the sound pressure of a single segment's horn is calculated, the distortion of the second tone of the horn is calculated at the same time.
When the maximum sound pressure is calculated, either the power or the cone motion is displayed limited and the input voltage and the Pmax cone motion are displayed.
Press either "F3" or double-click the chart to select it.
A single click on a chart provides chart data at the frequency at which the mouse pointer is over at the mouse click. The sampling frequency can be changed by dragging the line with the mouse or by using the Up, Down, Left, Right Home or end keys. Press the "ESC" key to delete the sample line (red).
Calculates the constant direction-dependent sound pressure level, the electric input power, the acoustic output power, power conversion efficiency, the top sound pressure of the horn neck and the top particle speed of the horn neck at any frequency between 1 and 20,000Hz or between 0.1 and 2,000 Hz.
And for single segment horns the sampled second tone distortion. When the maximum spl sound pressure is sampled, the acoustic output is displayed as either power or cone displacement limited, and where the input voltage and Pmax cone displacement are given.
When the "power compression" response is displayed, the "thermal power compression" is also expressed in decibels.

### Compare previous

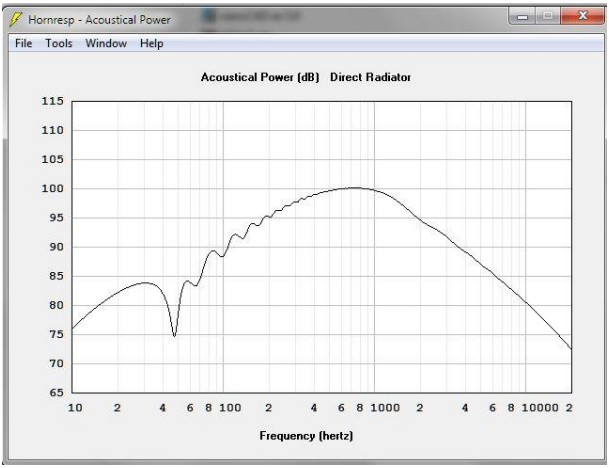
Shows the current and previous simulation regarding acoustic impedance in the same diagram.
The previous results are used as a basis for the comparison. Press "Ctrl + C" to capture current results or "Ctrl + X" to release captured results.
Press F4 to show or hide the previous or current result.

## Output

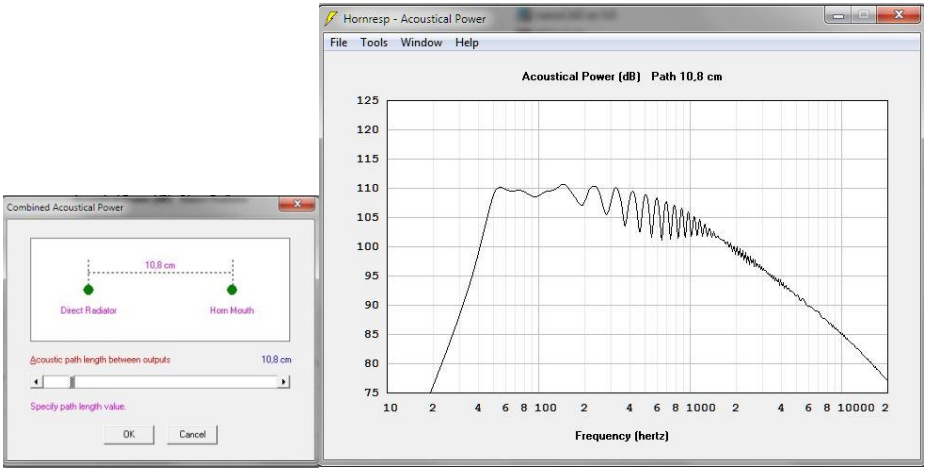
### Horn




### Direct radiation



## Combined




For a finally back-charged horn, the radiation from the speaker element is directly combined with the horn's SPL response.

For a finite horn-charged bass reflex system, the sound pressure from the port is combined with the horn's SPL response.

For a bass reflex system, the sound pressure from the port is combined with the sound pressure from the speaker element. The length from the back of the cone to the exit of the gate is assumed to be equal to Lrc plus Lpt as shown in the "schematic diagram". The distance between the port output and the listener can be adjusted if necessary by using the "path length difference parameter".

A positive value of "path length difference" increases listening distance.

Press F9 to permanently save entered length values.

For a finite transmission line speaker, the direct beam sound wave combines with the sound wave from the transmission line aperture.

To finally front-charge the horn speaker system without a rear chamber, the acoustic output power from the horn is combined with the acoustic power from the speaker element.

For a finally back-charged horn, the acoustic output from the horn is combined with the acoustic output from the speaker element. The speaker element can not be in the horn mouth.

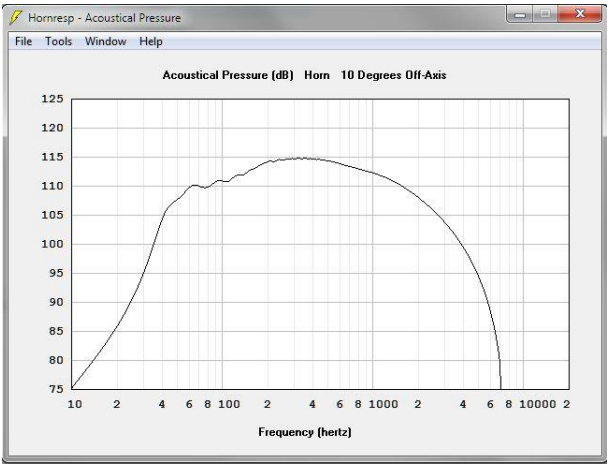
For a finite horn-charged bass reflex box horn, the acoustic output from the horn is combined with the acoustic output from the port.

To finally offset horn speaker system, the acoustic output from the horn is combined with the acoustic output from the speaker element or the acoustic output from the port.

For a finite compound horn, the acoustic output from horn one is combined with horn 2.

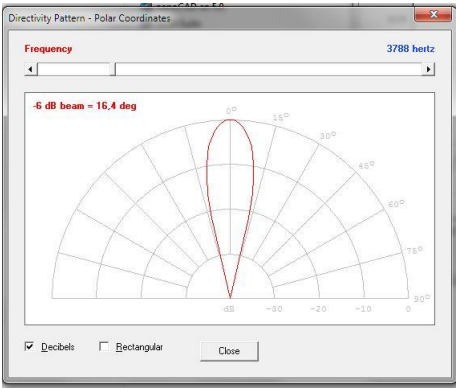
## Directivity

### Respons



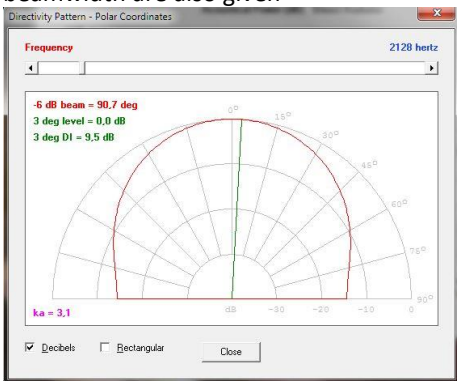

Displays the SPL pressure for a finite single-segment horn with positive expansion, at the specified "off-axis" angle, which takes into account the frequency-dependent directional characteristics. Select from the "acoustic pressure" window.

### Pattern

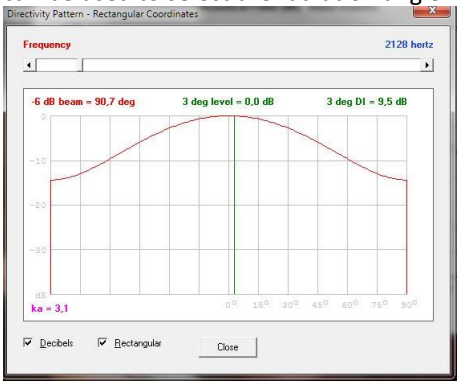



Select from the "Acoustic power" window or the "Beam width" window

Displays the “far-field” sound pressure at a fixed distance as a function of the “off-axis” angle expressed relative to the “on-axis” sound pressure with the maximum value normalized to 1.
Can be presented in direct numbers or in decibels. “On-axis” direction index and -6dB beamwidth are also given

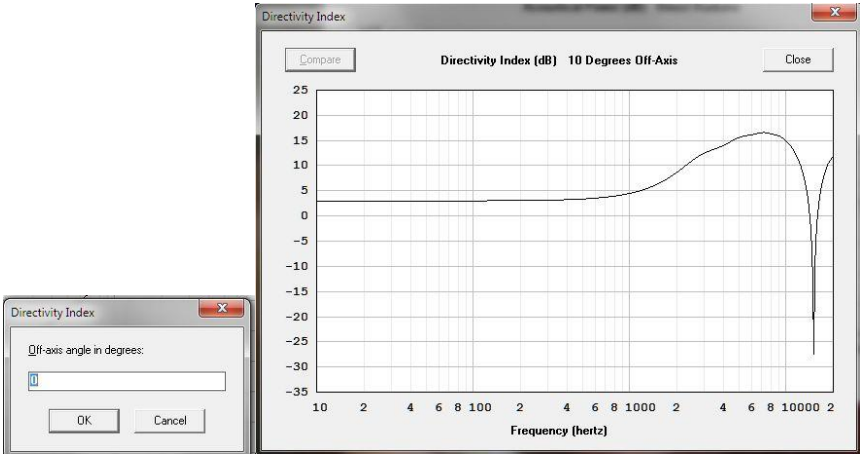



Click on the diagram to show the sound pressure at a certain angle. The arrow keys can be used to select the radiation angle.



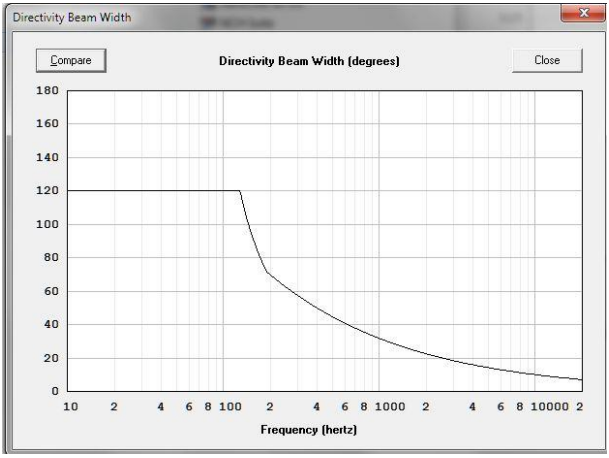

The direction pattern can be displayed as either polar or rectangular coordinates.

## Index




Displays direction index I decibels in relation to the frequency of a specified "off-axis" angle in degrees.
Direction index is 10 times Log of the direction factor.
The directional factor is the ratio between the intensity along a given axis from a sound generator at a given distance and the intensity from the same position that would be produced by a point source that radiates the same acoustic effect as the element.
Click directly on the chart to get the direction index for a specific frequency.
The arrow keys can also be used to select frequency.
Can be selected from the "acoustical power" window and the "Acoustical pressure" window.
Can only be applied to a speaker element, finite single segment horn without neck adapter, and ports.

## Beam width

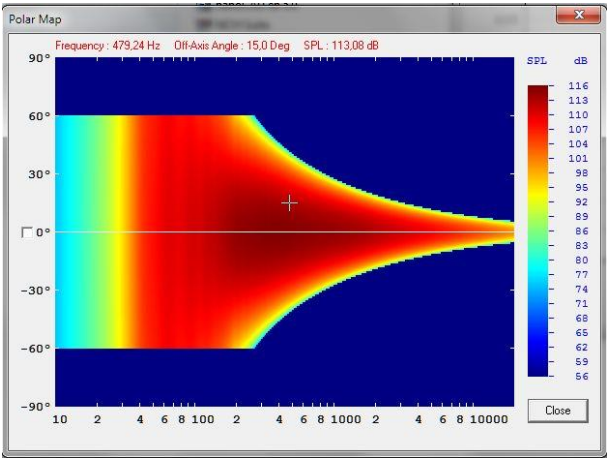



Shows the angular distance in degrees between two points on one side of the "on-axis" direction pattern where the sound pressure is -6dB in relation to the frequency. Only applicable to finite single segment horns.

### Sample

Calculates the directional pattern for the width of the -6 dB radiation at any frequency between 1 and 20,000Hz or between 0.1 and 2,000 Hz.

## Polar map

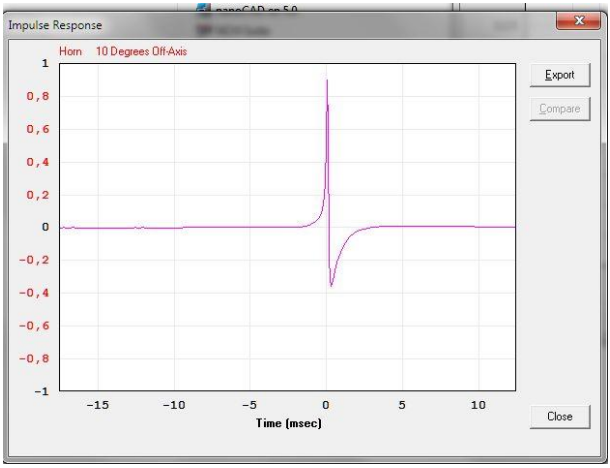



Displays the “far-field” sound pressure at a fixed distance as a function of the “off-axis” angle in degrees relative to the frequency.

Only applicable to finite single segment horns.
The result can be sampled by moving the mouse pointer over the diagram. A specific point can be selected by clicking on the chart with the mouse or with the keys "Up", "Down", "Left" and "Right". Press "ESC" to release the item:

## Impulse

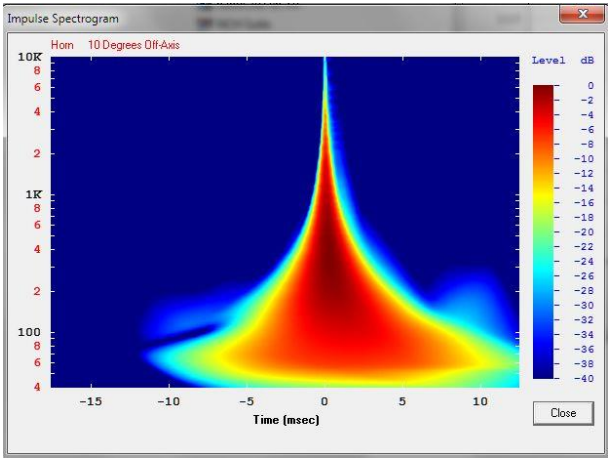
### Response




Displays the impulse sound pressure in relation to the time in a speaker system. The peak amplitude is normalized to 0.9. Select when the "Acoustic power" window is displayed.

Click the "Export" button to save the impulse response data values in a Wave Sound file (* -wav).

## Spectrogram




Displays the spectral intensity of the impulse response or normalized amplitude in decibels as a function of the frequency in relation to the time in milliseconds.

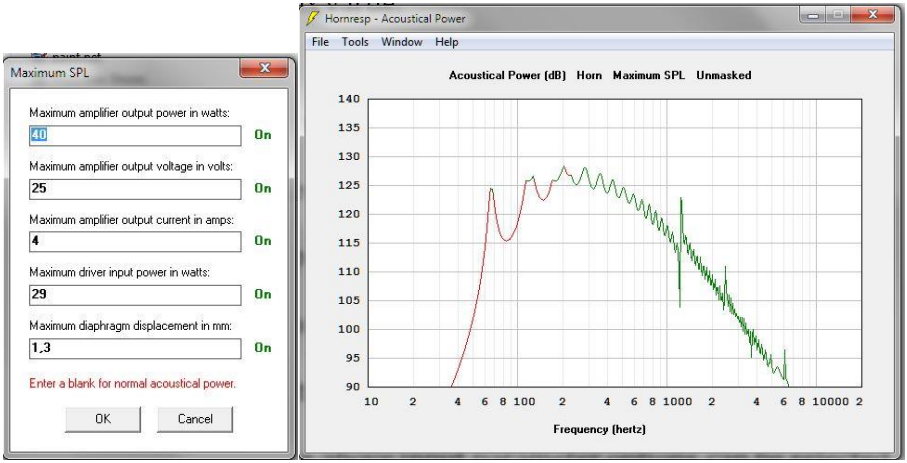
Select from the “Acoustical power” window or the “Acoustical pressure” window.

The result can be sampled by moving the mouse over the diagram.

A specific point can be selected by clicking on the chart with the mouse or with the keys "Up", "Down", "Left" and "Right". Press "ESC" to release the point.

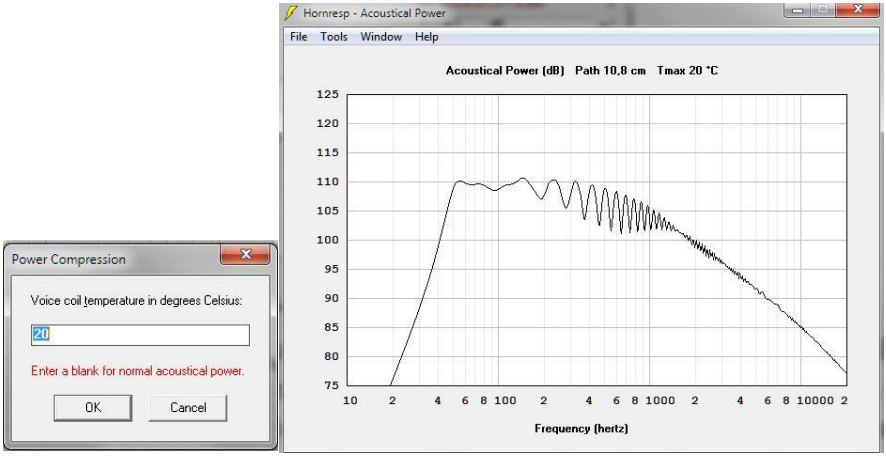
## Room generator

## Maximum SPL



Displays the maximum sound pressure that can be achieved at a distance of one meter without driving the speaker element outside the amplifier's maximum output power Pamp, the amplifier's maximum output voltage Uamp, the amplifier's maximum output power Iamp, the maximum electrical input power Pmax or the maximum convergence limit Xmax in relation to frequency.
The green line represents the power constraint and the red line cone motion constraint. Press "Ctrl" + "S" to permanently save the entered Pmax and Xmax value .One or more of the above input parameters can be selected by double-clicking the “On / Off” label. Press F9 to permanently save the Pamp, Uamp, Iamp, Pmax and Xmax values.

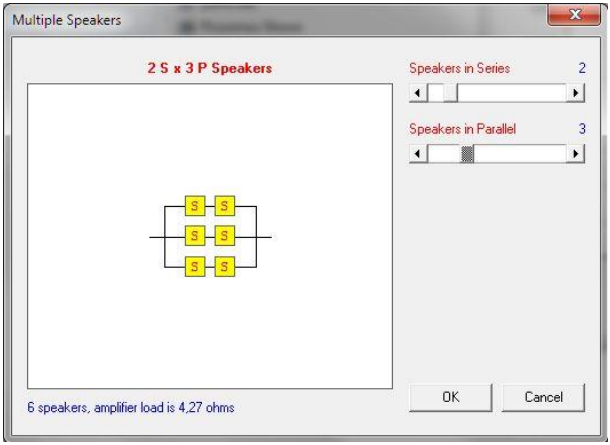
## Power compression




Shows the thermal power compression for a given input voltage and voice coil temperature, taking into account the increase in the voice coil resistance when the coil temperature is above the normal reference temperature of 20 degrees Celsius. The value of the increased speech coil resistance due to heating is displayed at the bottom of the input parameter window when the mouse pointer is moved over the Re text box

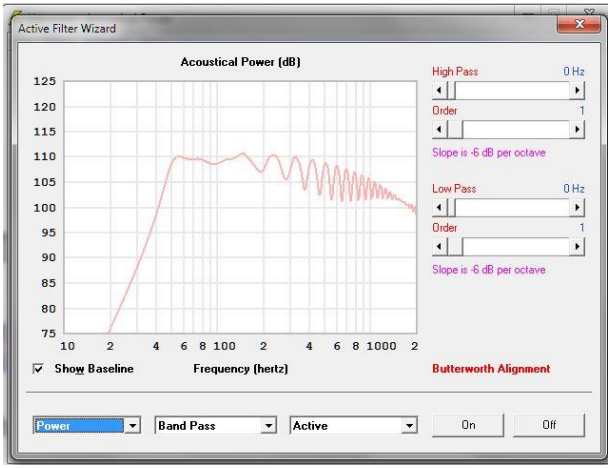
The maximum voice coil temperature is type 200 degrees Celsius.
The value of the re input parameter is assumed to be the value at 20 degrees Celsius. In most cases, the specified voice coil temperature is only an estimate due to the difficulty in specifying the exact temperature.
The response results should therefore be taken as an indication rather than as exact.

## Multiple speakers




Sets how many speaker elements are connected in series and / or in parallel.
In several element systems, the horn system, the neck chamber and the rear chamber are divided as the value of the input parameters is defined and as they are shown in the "schematic diagram" window.
An offset with a "tapped" horn or a compound horn can be selected by double-clicking on the Nd, OD, TH or CH label.

## Filter Wizard

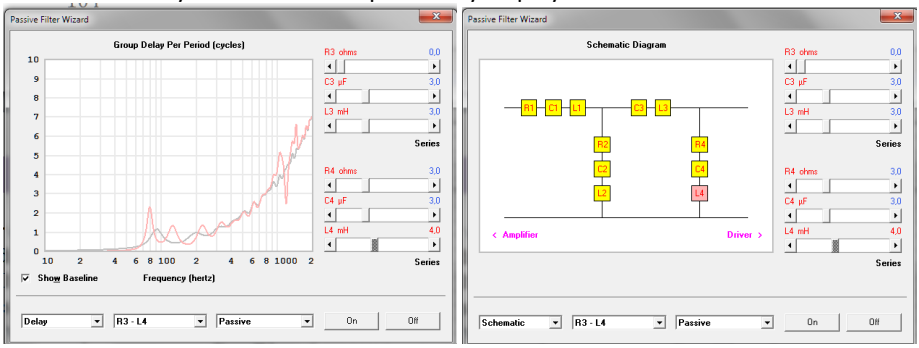


Automatically recalculates the result for a specific filter system in real time when the input parameters change. Le Cléac'h high-pass passive filter option for two-stage impedance equalization high-frequency lift.
The tool can be accessed from "Acoustical power", "Electrical impedance", "Diaphragm displacement", "Phase response" or "Group delay" windows.
Click the "ON" button to add the current active and parametric equalizer, passive or Le Cléac'h filter settings when calculating the result. Click the "Off" button to exclude the filter settings. The "Filter wizard" is not available when the "Vel constant" chart or the "velocity" or "Acc" constant chart acceleration option is selected or when the "room gain" profile is displayed.
Select the "Schematic" option to display a drawing of the specified filter.
Select the "Power" or "Pressure" option to display the acoustic output or acoustic pressure of the specified passive or active filter and speaker system.
Double-click the Y-axis on power or press the charts to change the default setting of 5 dB steps to 3dB or 6dB steps.
Select the Impedance option to display the size of the input impedance of the specified passive filter and speaker system.
Select the "Displacement" option to view the speaker element cone movements for the specified passive filter and speaker system.
Select the "Phase" option to display the phase response of the specified passive or active filter and speaker system
Select the "Delay" option to display "Group delay" or "Group delay per period" for the specified filter and speaker system.
Double-click anywhere on the "Group delay" chart to change to the "Group delay per period" chart. Double-click again to return to the "Group delay" diagram.
Double-click anywhere on the chart's Y-axis scale to add a green 1 / f line. Double-click again to add a Claus Futtrup boundary line. Press "Esc" to delete the 1 / f line and again "Esc" to remove the Claus Futtrup line. Claus Futtrup Audible group delay guideline in milliseconds is obtained from the expression:

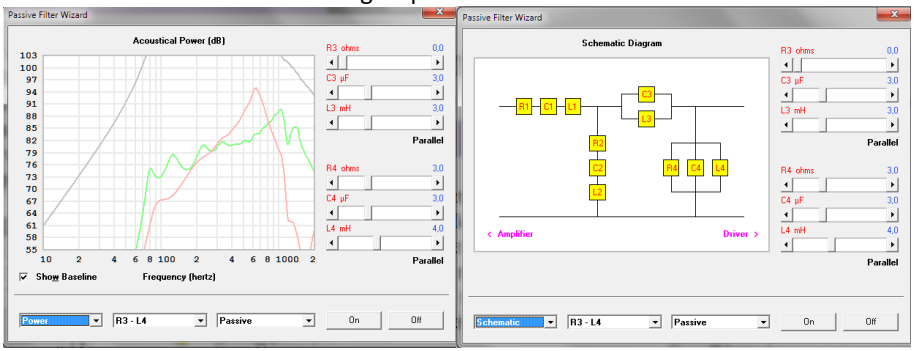
$$GD_{Limit} = \frac{1000 * 1{,}1606}{5{,}6413 * f^{0{,}81511} - f}$$

Where f is the frequency in Hz
Double-click anywhere on the Y-axis in the "Group delay" diagram to change the range to 2, 5, 10 or periods.
Select the "impulse" option to display the impulse response for a specific filter and speaker system.
Not applicable from "Loudspeaker wizard" or when "! Room gain" is included.
Select the "Filter gain" option to display the "! Gain" response for the specific filter

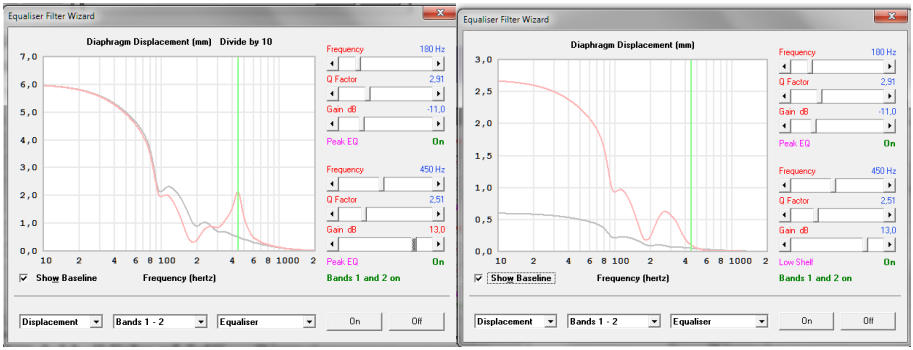
Select the "Filter phase" option to display the phase response for the specific filter.
Select the "Filter delay" option to display the group delay for specific filter.
Start chart results are saved as a reference baseline when the tool is selected. Up to four different sets of values can be temporarily saved and recalled when the Wizard is open, by clicking the appropriate memory button or pressing the equivalent function key.
"Ctrl" + C captures the current result for the "power" or "Pressure" charts. "Ctrl" + V shows or hides recently captured results.
Press the V key to display the passive or Le Cléac'h "Filter Schematic Chart", and release the V key to return to the previously displayed chart.




To change the components of a standard filter from series to parallel, double-click the label under the relevant rule group.




To change the type of active filter, double-click on the "alignment" label.
To change the steepness of the filter from dB per octave to dB per decade, double-click the "slope" label.




To turn a filter band on and off, double-click the On / Off label for that band. To select either a "peaking EQ filter", a "low"
shelving filter ", a" high shelving filter ", a" low pass filter "or a" high pass filter "for a given band double click on the label for this band.
Press "Esc" to remove the green frequency mark.
In some software for parametric equalizers, the "shelving filter" Q factor is instead a "shelf slope" parameter. The relationship between Q and S is as the following formula describes:

$$S=\frac{1}{\left[\left[\frac{\left[\left(\frac{1}{Q}\right)^2-2\right]}{\left[\frac{10^{\frac{G}{40}}+1}{10^{\frac{G}{40}}}\right]}\right]+1\right]}$$

Where

S = "shelf slope parameter"

Q = Q factor

G = "gain"

If the "Active" or "Equalizer filter" option is selected, the current active and perasmetric equalizer filter settings can be saved to a permanent data file by clicking the "Save" button in the "Memory" window or by pressing the F9 softkey.

If the passive or Le Cléac'h filter option is selected, these can be saved permanently in a data file by clicking on "Save" in "Memory"

To change the frequency range, double-click the chart's frequency label. Not available when mute material has been added to the speaker system.

To directly set a rule to a certain value, press the value and then "Enter" when the rule is in focus

To quickly move a rule, press the "Home" or "End" key and hold it down to the desired value, when the rule is in focus.

To reset a rule to its "baseline" value, press key B when the rule is in focus.

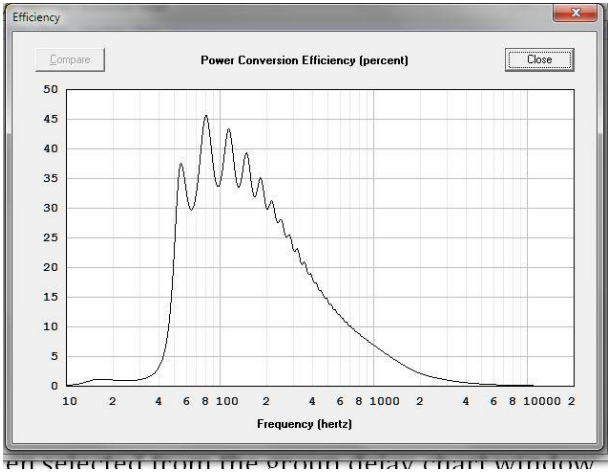
To reset all the bars to the "baseline" value, press "Alt" + B.

To save the values from bars and charts as a new "baseline", press "Ctrl" + "Alt" + B.

Click the reset button in the “Memory” window or press “Ctrl” + F9 to reset the current settings to the saved value.

Press F5 to reset all the bars to the starting value.

## Efficiency




Displays the acoustic output power divided by the electrical input power. Or the power conversion efficiency In percent vs. the frequency I Hz. Does not take into account the effect of filters.

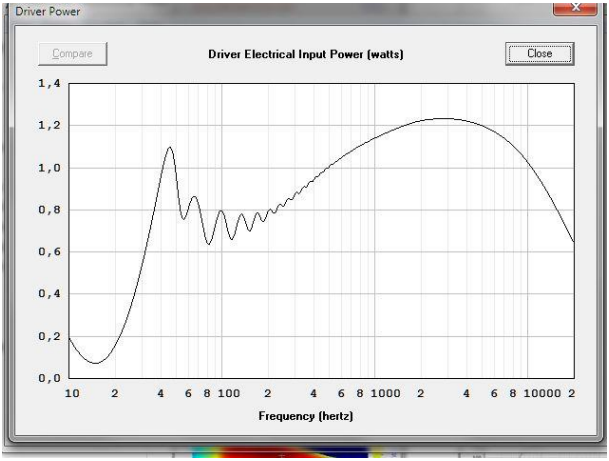
Click on the diagram to show the efficiency value at a certain frequency.

Select from the acoustic output chart window

Previous results are compared by default. Press "Ctrl" + C to capture the current result and press "Ctrl" + R to release the captured result.

The result can also be captured or hit by clicking on the chart and then pressing F4 to show or hide the previously captured result.

## Driver power

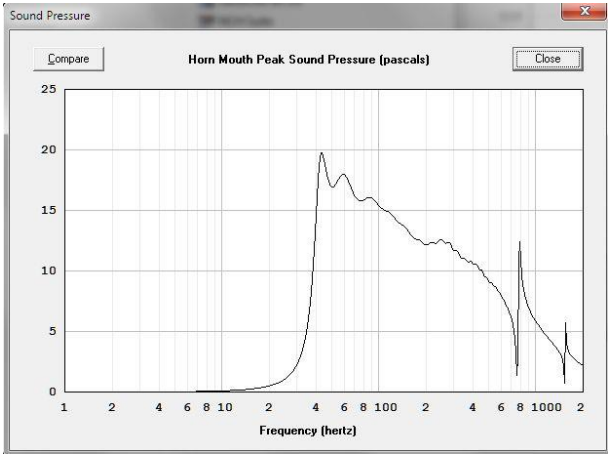



Displays the electrical input power of the speaker element in watts relative to the frequency in Hz.
Click on the diagram to show the effect at a certain frequency.

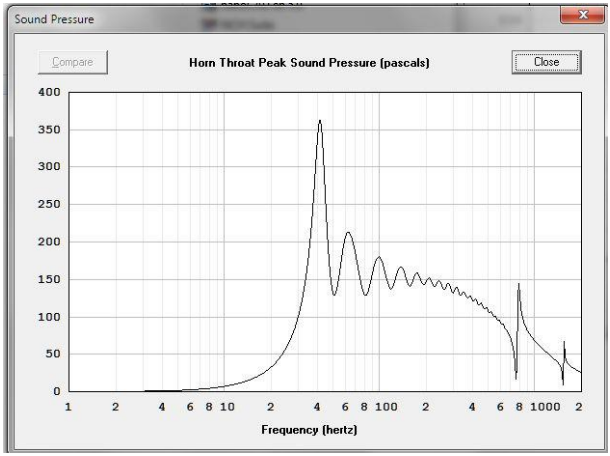
## Sound pressure

Displays the peak value of the sound pressure at the horn neck, horn mouth, port input, port output or sound pressure from the speaker element in Pascal in relation to the frequency in Hz. For a multi-segment horn or a compound horn, the peak value of the sound pressure is also displayed at the point with the least area.
Click on the diagram to show the sound pressure at a certain frequency.
The horn neck for an "offset drives horn" OD or a "tapped horn" is at S2. The horn neck for an "offset drives horn" OD1 is at S3
For an offset driver horn or a tapped horn, the sound pressure at the horn neck at S2 or S3 is calculated when there is no neck chamber, and for the horn side of the neck chamber when there is a neck chamber but no neck gate, and at the horn end of the neck gate when there is a neck chamber and a neck gate.
Select from the “Acoustical power” chart window. Not applicable for combined outputs.

### Horn mouth




### Horn throat

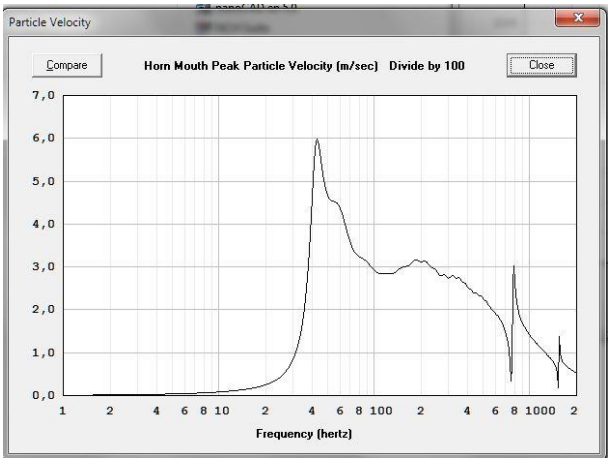



### Particle velocity

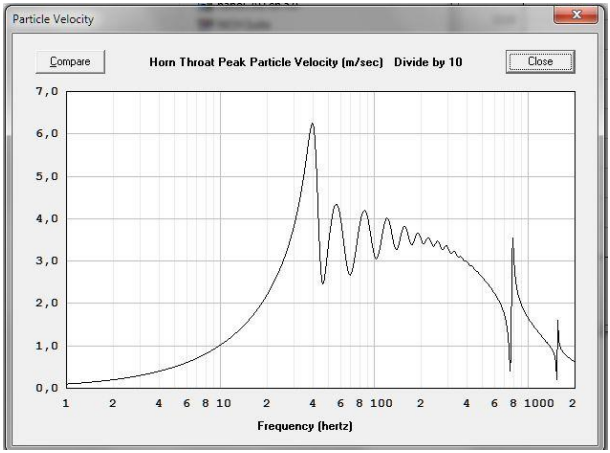
Displays the peak particle velocity value at the neck, horn mouth, port input, port output, or speaker element in meters per second relative to the frequency in Hz. For multiple segments Nd and CH horns, the particle velocity at the point with the least area is also displayed.
Click on the diagram to show the particle velocity at a certain frequency.

The horn neck for an OD (offset driver) or "Tapped horn" is at S2 and for an OD1 horn at S3.
For an offset driver horn or a tapped horn, the particle velocity at the horn neck at S2 or S3 is calculated when there is no neck chamber, and for the horn side of the neck chamber when there is a neck chamber but no neck gate, and at the horn end of the neck gate when there is a neck chamber and a neck gate.
Select from the “Acoustical power” chart window. Not applicable for combined outputs.
Previous results are used for comparison by default.
To save the current result, press "Ctrl" + C Or "Ctrl" + R to recover the previously saved result.
The results can also be saved by right-clicking on the chart. Press F4 to show or hide the previously saved result.

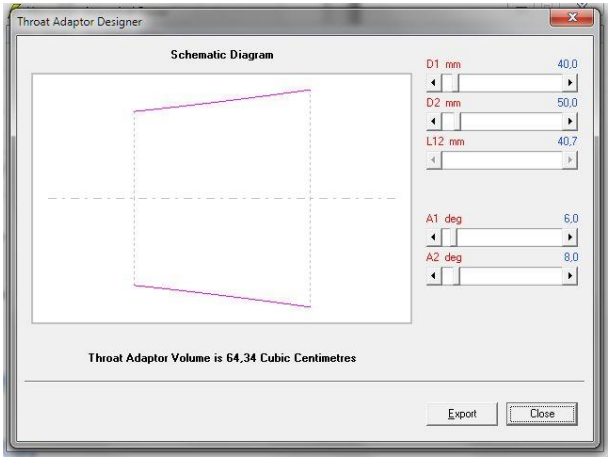
## Horn mouth



## Horn throat

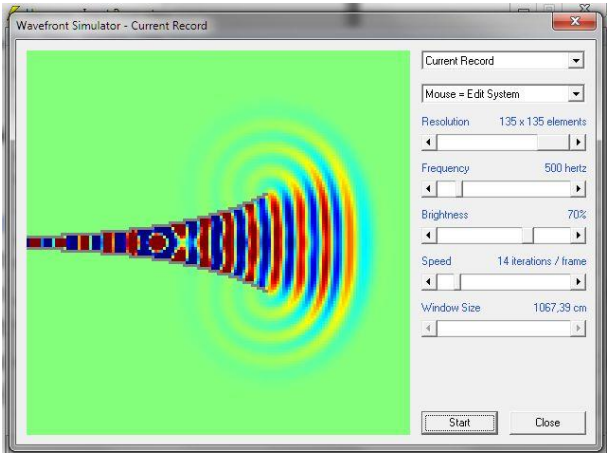



## Throat Adapter Designer




A standalone tool that displays the expansion profile of a horn neck adapter. Where D1 is the input diameter and D2 the output diameter and A1 the input angle and A2 the output angle. The minimum length is also calculated all this data can be exported by clicking the "Export" button.

## Wavefront simulator




Models sound wave propagation in horn speakers. A warning message is displayed if the resolution, frequency, element size, and magnitude value generate an erroneous result due to wave distortion effects.

To add or delete walls, click and drag with the mouse when the "mouse = edit" system option is selected, or click with the mouse and use the Up, Down, Right and Left navigation keys.

To specify a straight wall, press "Shift" + click with the mouse on the end points of the line.

To specify a rectangular box, press "Ctrl" + click with the mouse on the diagonal corners.

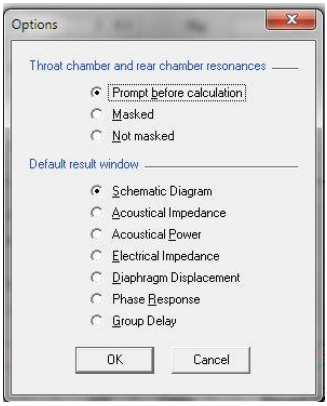
To specify a default point source, press "Alt" + click with the mouse twice in the same place.

To specify a point source with reverse polarity, a time-delayed point source or the acoustic output from a point source relative to the default value, press "Alt" + click with the mouse on the suggested source position, select "reversed polarity" check box set "power" and "Delay "The bars to the desired value and press" Alt "+ click with the mouse again on the suggested source position.

If the mouse pointer is moved over a point source, the selected polarity "power" and "Delay" setting in the Window shows the text at the top of the tool window. The default settings are not displayed. To add a point source, mouse over the source.

To specify the source of a standard speaker element, press "Alt" + click with the mouse on the cone endpoints.

## Options




Sets whether the neck chamber and the rear chamber resonances are to be masked.
Sets which window should be the default display window.

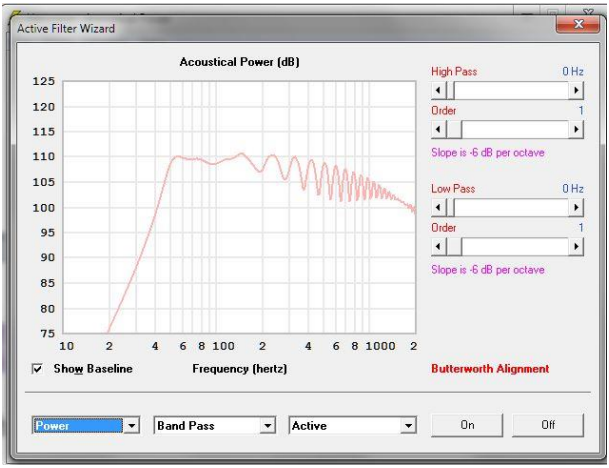
# 5. Electrical impedans

## Tools

### Sample

Calculates the acoustic impedance, SPL sound pressure, electrical input power, acoustic output power, system efficiency, electrical impedance, cone motion, con acceleration, phase response, group delay or radiation angle at any frequency between 1 and 20,000Hz. When the sound pressure of a single segment's horn is calculated, the distortion of the second tone of the horn is calculated at the same time.
When the maximum sound pressure is calculated, either the power or the cone motion is displayed limited and the input voltage and the Pmax cone motion are displayed.
Press either "F3" or double-click the chart to select it.
A single click on a chart provides chart data at the frequency at which the mouse pointer is over at the mouse click. The sampling frequency can be changed by dragging the line with the mouse or by using the Up, Down, Left, Right Home or end keys. Press the "ESC" key to delete the sample line (red).
Calculates the constant direction-dependent sound pressure level, the electric input power, the acoustic output power, power conversion efficiency, the top sound pressure of the horn neck and the top particle speed of the horn neck at any frequency between 1 and 20,000Hz or between 0.1 and 2,000 Hz.
And for single segment horns the sampled second tone distortion. When the maximum spl sound pressure is sampled, the acoustic output is displayed as either power or cone displacement limited, and where the input voltage and Pmax cone displacement are given.
When the "power compression" response is displayed, the "thermal power compression" is also expressed in decibels.

## Filter Wizard




Automatically recalculates the result for a specific filter system in real time when the input parameters change. Le Cléac'h high-pass passive filter option for two-stage impedance equalization high-frequency lift.

The tool can be accessed from "Acoustical power", "Electrical impedance", “Diaphragm displacement”, “Phase response” or “Group delay” windows.

Click the "ON" button to add the current active and parametric equalizer, passive or Le Cléac'h filter settings when calculating the result. Click the "Off" button to exclude the filter settings. The "Filter wizard" is not available when the "Vel constant" chart or the "velocity" or "Acc" constant chart acceleration option is selected or when the "room gain" profile is displayed.

Select the "Schematic" option to display a drawing of the specified filter.

Select the “Power” or “Pressure” option to display the acoustic output or acoustic pressure of the specified passive or active filter and speaker system.

Double-click the Y-axis on power or press the charts to change the default setting of 5 dB steps to 3dB or 6dB steps.

Select the Impedance option to display the size of the input impedance of the specified passive filter and speaker system.

Select the “Displacement” option to view the speaker element cone movements for the specified passive filter and speaker system.

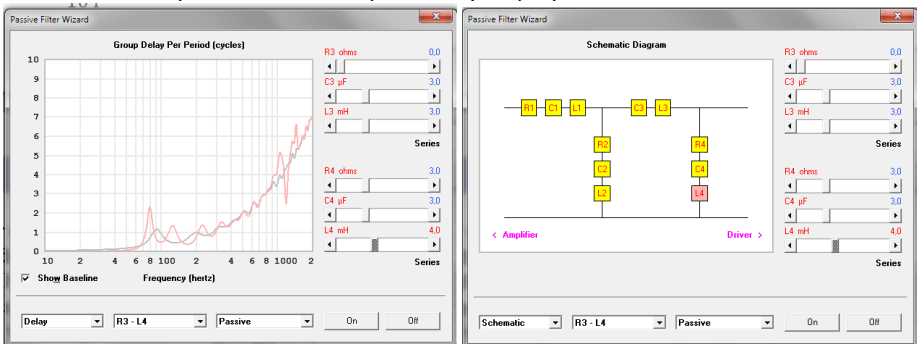
Select the "Phase" option to display the phase response of the specified passive or active filter and speaker system

Select the "Delay" option to display "Group delay" or "Group delay per period" for the specified filter and speaker system.

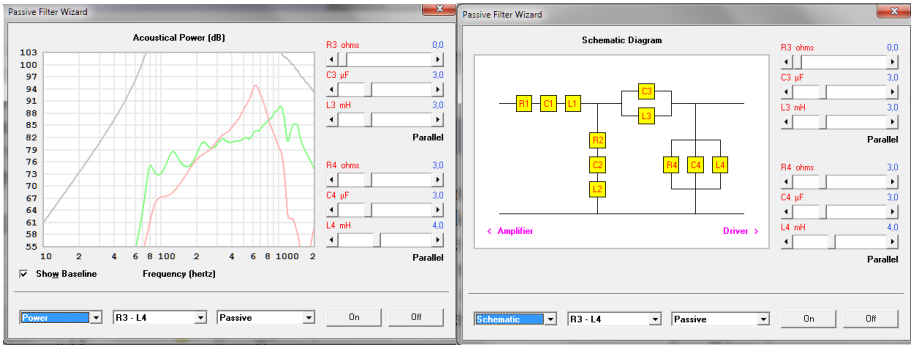
Double-click anywhere on the "Group delay" chart to change to the "Group delay per period" chart. Double-click again to return to the "Group delay" diagram.
Double-click anywhere on the chart's Y-axis scale to add a green 1 / f line. Double-click again to add a Claus Futtrup boundary line. Press "Esc" to delete the 1 / f line and again "Esc" to remove the Claus Futtrup line. Claus Futtrup Audible group delay guideline in milliseconds is obtained from the expression:

$$GD_{Limit} = \frac{1000 * 1{,}1606}{5{,}6413 * f^{0{,}81511} - f}$$

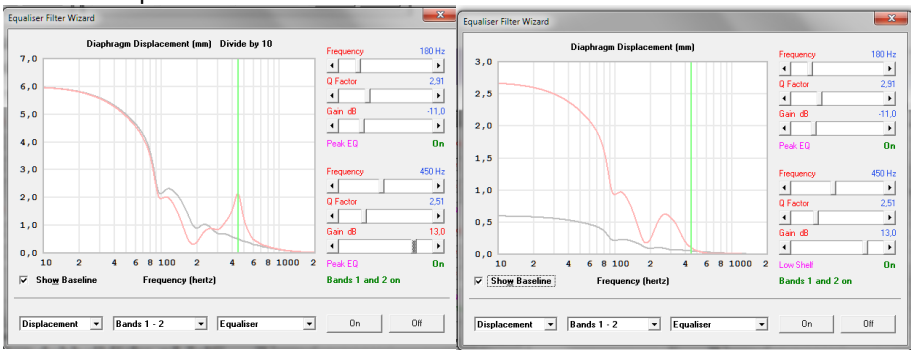
Where f is the frequency in Hz
Double-click anywhere on the Y-axis in the "Group delay" diagram to change the range to 2, 5, 10 or periods.
Select the "impulse" option to display the impulse response for a specific filter and speaker system.
Not applicable from "Loudspeaker wizard" or when "! Room gain" is included.
Select the "Filter gain" option to display the "! Gain" response for the specific filter
Select the "Filter phase" option to display the phase response for the specific filter.
Select the "Filter delay" option to display the group delay for specific filter.
Start chart results are saved as a reference baseline when the tool is selected. Up to four different sets of values can be temporarily saved and recalled when the Wizard is open, by clicking the appropriate memory button or pressing the equivalent function key.
"Ctrl" + C captures the current result for the "power" or "Pressure" charts. "Ctrl" + V shows or hides recently captured results.
Press the V key to display the passive or Le Cléac'h "Filter Schematic Chart", and release the V key to return to the previously displayed chart.




To change the components of a standard filter from series to parallel, double-click the label under the relevant rule group.




To change the type of active filter, double-click on the "alignment" label.
To change the steepness of the filter from dB per octave to dB per decade, double-click the "slope" label.

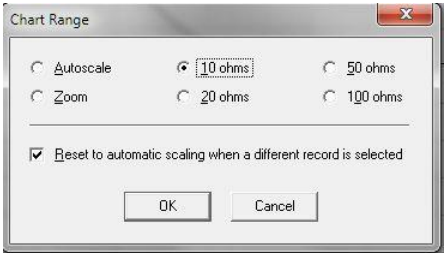



To turn a filter band on and off, double-click the On / Off label for that band. To select either a "peaking EQ filter", a "low"
shelving filter ", a" high shelving filter ", a" low pass filter "or a" high pass filter "for a given band double click on the label for this band.
Press "Esc" to remove the green frequency mark.
In some software for parametric equalizers, the "shelving filter" Q factor is instead a "shelf slope" parameter. The relationship between Q and S is as the following formula describes:

$$S=\frac{1}{\left[\frac{\left[\left(\frac{1}{Q}\right)^2-2\right]}{\left[\frac{10^{\frac{G}{40}}+1}{10^{\frac{G}{40}}}\right]}+1\right]}$$

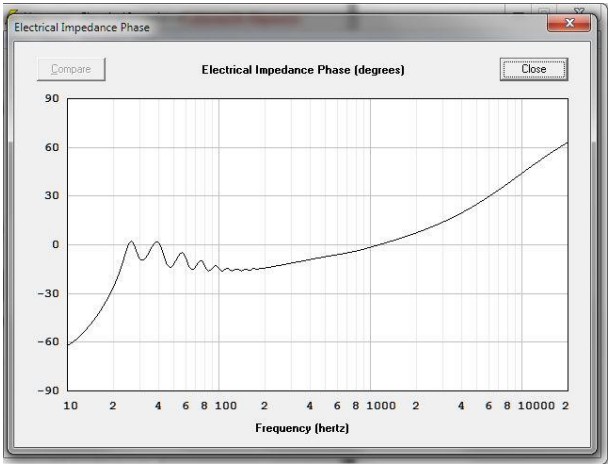
Where
S = "shelf slope parameter"
Q = Q factor
G = "gain"
If the "Active" or "Equalizer filter" option is selected, the current active and perasmetric equalizer filter settings can be saved to a permanent data file by clicking the "Save" button in the "Memory" window or by pressing the F9 softkey.
If the passive or Le Cléac'h filter option is selected, these can be saved permanently in a data file by clicking on "Save" in "Memory"
To change the frequency range, double-click the chart's frequency label. Not available when mute material has been added to the speaker system.
To directly set a rule to a certain value, press the value and then "Enter" when the rule is in focus
To quickly move a rule, press the "Home" or "End" key and hold it down to the desired value, when the rule is in focus.
To reset a rule to its "baseline" value, press key B when the rule is in focus.
To reset all the bars to the "baseline" value, press "Alt" + B.
To save the values from bars and charts as a new "baseline", press "Ctrl" + "Alt" + B.
Click the reset button in the “Memory” window or press “Ctrl” + F9 to reset the current settings to the saved value.
Press F5 to reset all the bars to the starting value.

### Range




Ställer in diagram visnings området. Välj zoom  för att optimera skalan för visning av resonans toppen.

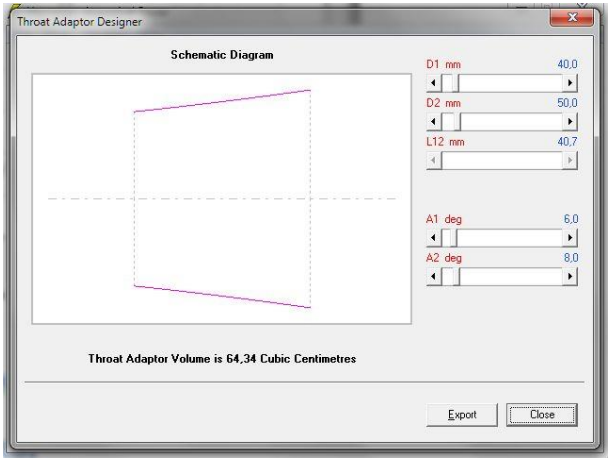
## Impedance phase




Displays the electrical impedance in degrees in relation to the frequency in Hz.
Click on the diagram to show the phase values for a certain frequency
Previous results are used for comparison.
Press "Ctrl" + C to capture the current result or "Ctrl" + R to display the captured result.

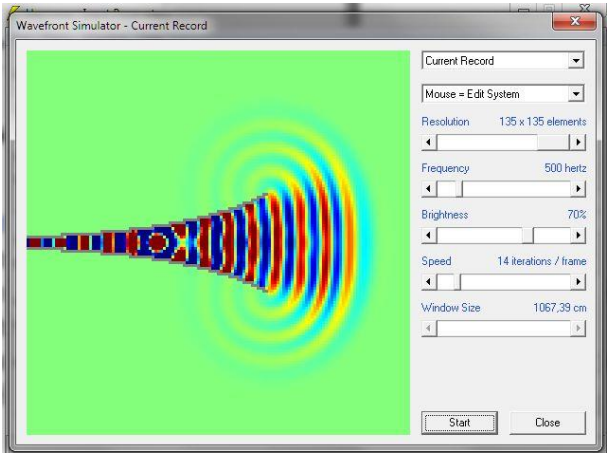
The result can also be captured by right-clicking on the chart.
Press F4 to show or hide the most recently captured result.

## Throat Adapter Designer



A standalone tool that displays the expansion profile of a horn neck adapter. Where D1 is the input diameter and D2 the output diameter and A1 the input angle and A2 the output angle. The minimum length is also calculated all this data can be exported by clicking the "Export" button.

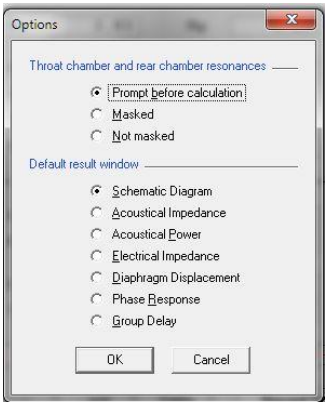
## Wavefront simulator




Models sound wave propagation in horn speakers. A warning message is displayed if the resolution, frequency, element size, and magnitude value generate an erroneous result due to wave distortion effects.
To add or delete walls, click and drag with the mouse when the "mouse = edit" system option is selected, or click with the mouse and use the Up, Down, Right and Left navigation keys.
To specify a straight wall, press "Shift" + click with the mouse on the end points of the line.
To specify a rectangular box, press "Ctrl" + click with the mouse on the diagonal corners.
To specify a default point source, press "Alt" + click with the mouse twice in the same place.
To specify a point source with reverse polarity, a time-delayed point source or the acoustic output from a point source relative to the default value, press "Alt" + click with the mouse on the suggested source position, select "reversed polarity" check box set "power" and "Delay "The bars to the desired value and press" Alt "+ click with the mouse again on the suggested source position.

If the mouse pointer is moved over a point source, the selected polarity "power" and "Delay" setting in the Window shows the text at the top of the tool window. The default settings are not displayed. To add a point source, mouse over the source. To specify the source of a standard speaker element, press "Alt" + click with the mouse on the cone endpoints.

## Options




Sets whether the neck chamber and the rear chamber resonances are to be masked.
Sets which window should be the default display window.

# 6. Diaphragm displacement

## Tools

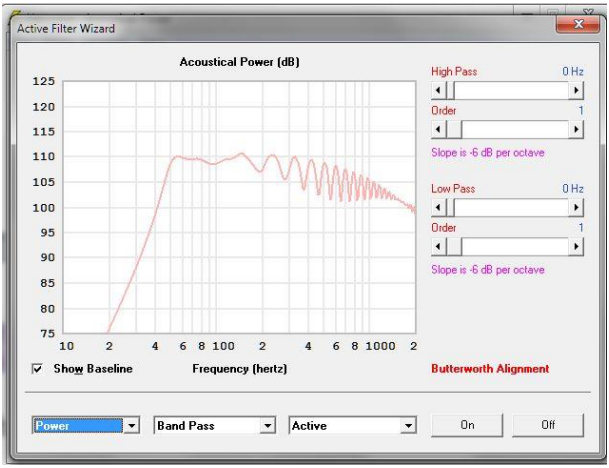
### Sample

Calculates the acoustic impedance, SPL sound pressure, electrical input power, acoustic output power, system efficiency, electrical impedance, cone motion, con acceleration, phase response, group delay or radiation angle at any frequency between 1 and 20,000Hz. When the sound pressure of a single segment's horn is calculated, the distortion of the second tone of the horn is calculated at the same time.
When the maximum sound pressure is calculated, either the power or the cone motion is displayed limited and the input voltage and the Pmax cone motion are displayed.
Press either "F3" or double-click the chart to select it.
A single click on a chart provides chart data at the frequency at which the mouse pointer is over at the mouse click. The sampling frequency can be changed by dragging the line with the mouse or by using the Up, Down, Left, Right Home or end keys. Press the "ESC" key to delete the sample line (red).
Calculates the constant direction-dependent sound pressure level, the electric input power, the acoustic output power, power conversion efficiency, the top sound pressure of the horn neck and the top particle speed of the horn neck at any frequency between 1 and 20,000Hz or between 0.1 and 2,000 Hz.
And for single segment horns the sampled second tone distortion. When the maximum spl sound pressure is sampled, the acoustic output is displayed as either power or cone displacement limited, and where the input voltage and Pmax cone displacement are given.
When the "power compression" response is displayed, the "thermal power compression" is also expressed in decibels.

### Compare previous

Shows the current and previous simulation regarding acoustic impedance in the same diagram.
The previous results are used as a basis for the comparison. Press "Ctrl + C" to capture current results or "Ctrl + X" to release captured results.
Press F4 to show or hide the previous or current result.

## Filter Wizard




Automatically recalculates the result for a specific filter system in real time when the input parameters change. Le Cléac'h high-pass passive filter option for two-stage impedance equalization high-frequency lift.

The tool can be accessed from "Acoustical power", "Electrical impedance", “Diaphragm displacement”, “Phase response” or “Group delay” windows.

Click the "ON" button to add the current active and parametric equalizer, passive or Le Cléac'h filter settings when calculating the result. Click the "Off" button to exclude the filter settings. The "Filter wizard" is not available when the "Vel constant" chart or the "velocity" or "Acc" constant chart acceleration option is selected or when the "room gain" profile is displayed.

Select the "Schematic" option to display a drawing of the specified filter.

Select the “Power” or “Pressure” option to display the acoustic output or acoustic pressure of the specified passive or active filter and speaker system.

Double-click the Y-axis on power or press the charts to change the default setting of 5 dB steps to 3dB or 6dB steps.

Select the Impedance option to display the size of the input impedance of the specified passive filter and speaker system.

Select the “Displacement” option to view the speaker element cone movements for the specified passive filter and speaker system.

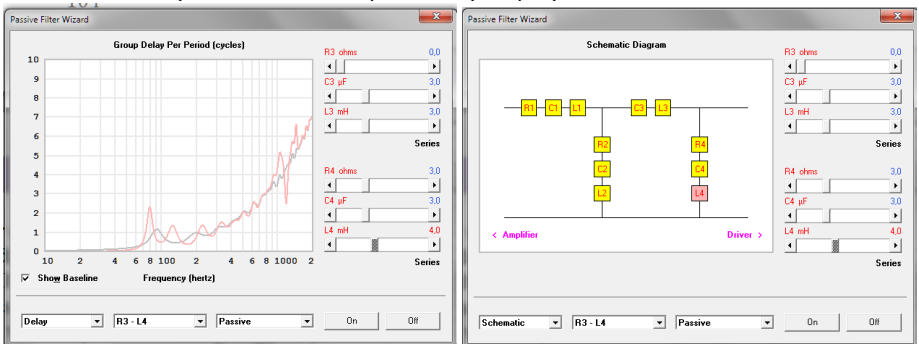
Select the "Phase" option to display the phase response of the specified passive or active filter and speaker system

Select the "Delay" option to display "Group delay" or "Group delay per period" for the specified filter and speaker system.

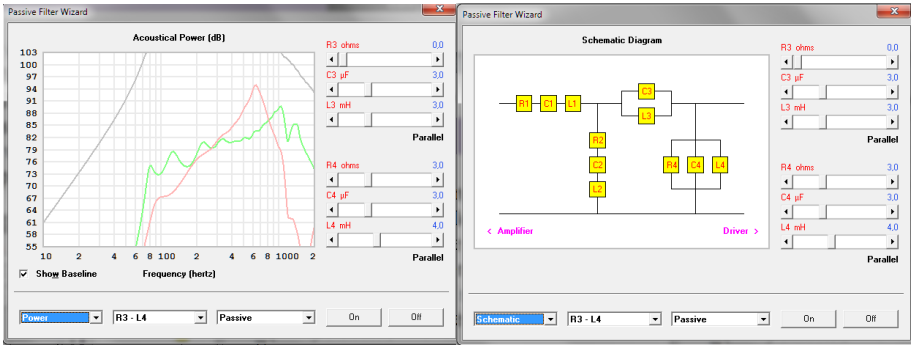
Double-click anywhere on the "Group delay" chart to change to the "Group delay per period" chart. Double-click again to return to the "Group delay" diagram.
Double-click anywhere on the chart's Y-axis scale to add a green 1 / f line. Double-click again to add a Claus Futtrup boundary line. Press "Esc" to delete the 1 / f line and again "Esc" to remove the Claus Futtrup line. Claus Futtrup Audible group delay guideline in milliseconds is obtained from the expression:

$$GD_{Limit} = \frac{1000 * 1{,}1606}{5{,}6413 * f^{0{,}81511} - f}$$

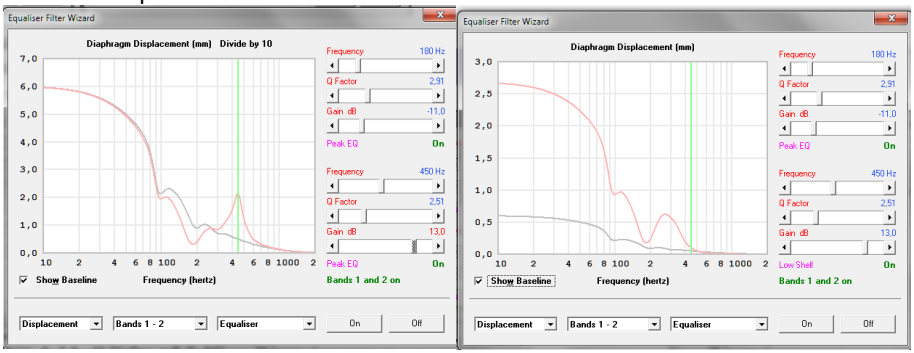
Where f is the frequency in Hz
Double-click anywhere on the Y-axis in the "Group delay" diagram to change the range to 2, 5, 10 or periods.
Select the "impulse" option to display the impulse response for a specific filter and speaker system.
Not applicable from "Loudspeaker wizard" or when "! Room gain" is included.
Select the "Filter gain" option to display the "! Gain" response for the specific filter
Select the "Filter phase" option to display the phase response for the specific filter.
Select the "Filter delay" option to display the group delay for specific filter.
Start chart results are saved as a reference baseline when the tool is selected. Up to four different sets of values can be temporarily saved and recalled when the Wizard is open, by clicking the appropriate memory button or pressing the equivalent function key.
"Ctrl" + C captures the current result for the "power" or "Pressure" charts. "Ctrl" + V shows or hides recently captured results.
Press the V key to display the passive or Le Cléac'h "Filter Schematic Chart", and release the V key to return to the previously displayed chart.




To change the components of a standard filter from series to parallel, double-click the label under the relevant rule group.




To change the type of active filter, double-click on the "alignment" label.
To change the steepness of the filter from dB per octave to dB per decade, double-click the "slope" label.




To turn a filter band on and off, double-click the On / Off label for that band. To select either a "peaking EQ filter", a "low"
shelving filter ", a" high shelving filter ", a" low pass filter "or a" high pass filter "for a given band double click on the label for this band.
Press "Esc" to remove the green frequency mark.
In some software for parametric equalizers, the "shelving filter" Q factor is instead a "shelf slope" parameter. The relationship between Q and S is as the following formula describes:

$$S=\frac{1}{\left[\frac{\left[\left(\frac{1}{Q}\right)^2-2\right]}{\left[\frac{\frac{G}{10^{\frac{40}{40}}}+1}{\frac{G}{10^{\frac{40}{40}}}}\right]}\right]+1}$$

Where

S = "shelf slope parameter"

Q = Q factor

G = "gain"

If the "Active" or "Equalizer filter" option is selected, the current active and perasmetric equalizer filter settings can be saved to a permanent data file by clicking the "Save" button in the "Memory" window or by pressing the F9 softkey.

If the passive or Le Cléac'h filter option is selected, these can be saved permanently in a data file by clicking on "Save" in "Memory"

To change the frequency range, double-click the chart's frequency label. Not available when mute material has been added to the speaker system.

To directly set a rule to a certain value, press the value and then "Enter" when the rule is in focus

To quickly move a rule, press the "Home" or "End" key and hold it down to the desired value, when the rule is in focus.

To reset a rule to its "baseline" value, press key B when the rule is in focus.

To reset all the bars to the "baseline" value, press "Alt" + B.

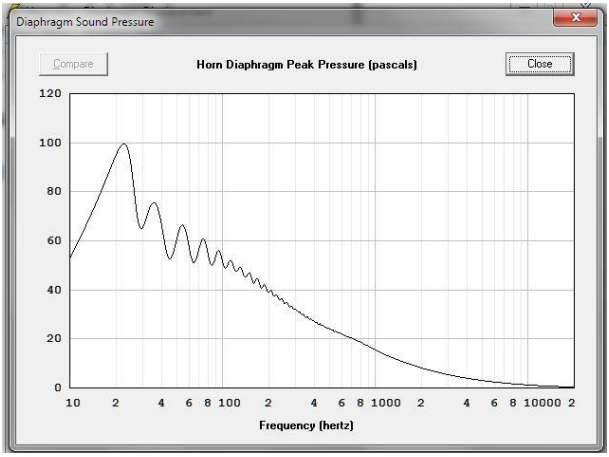
To save the values from bars and charts as a new "baseline", press "Ctrl" + "Alt" + B.

Click the reset button in the “Memory” window or press “Ctrl” + F9 to reset the current settings to the saved value.

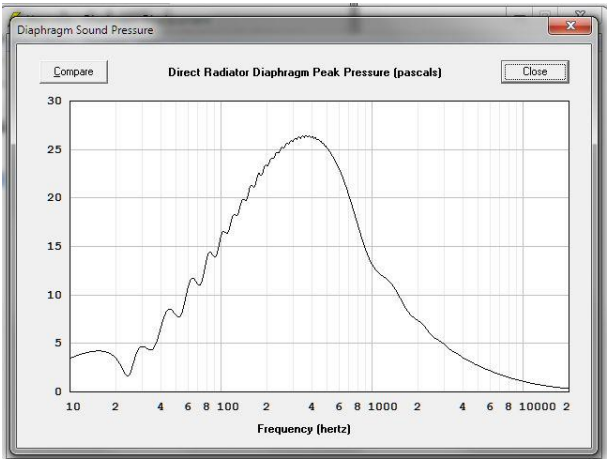
Press F5 to reset all the bars to the starting value.

## Diaphragm pressure

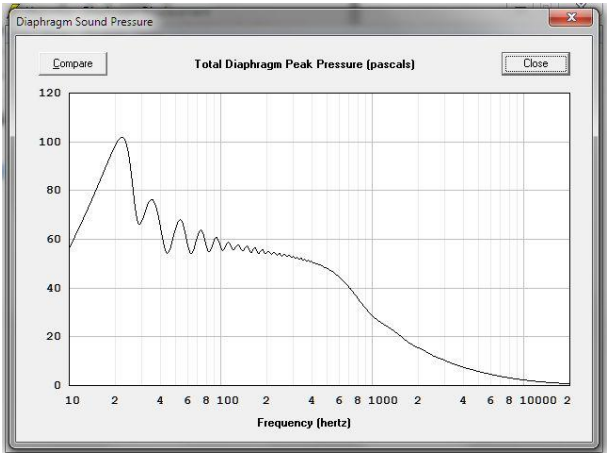
### Horn side




### Directradiation side

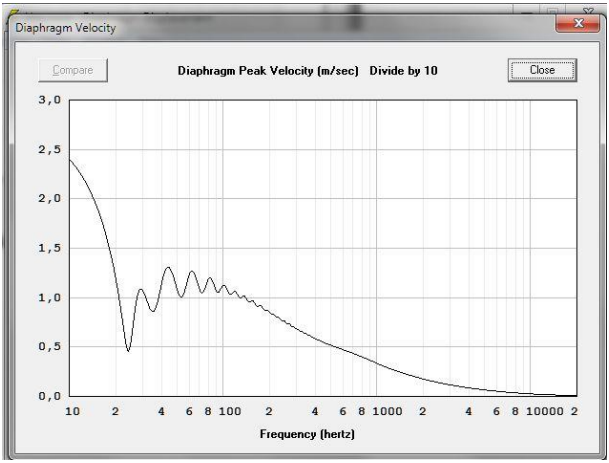


## Total



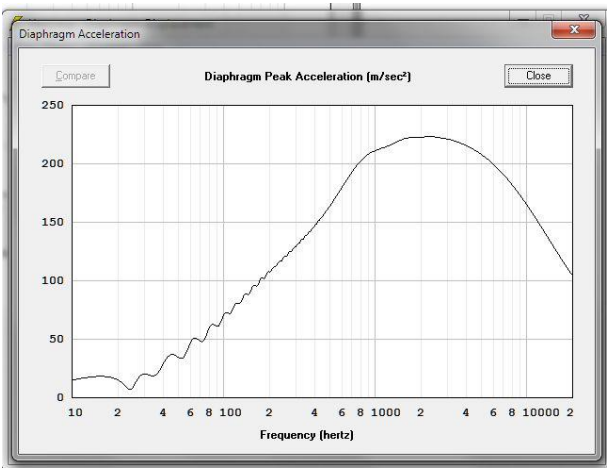

Displays the peak value of the sound pressure in Pascal in relation to the frequency in Hz.
Click on the diagram to show the pressure and force at a certain frequency.
The total pressure is the difference between the pressure on the front and on the back of the speaker cone, taking into account the phase.
Select from the "diaphragm displacement" window.
Previous results are used for comparison.
Press "Ctrl" + C to capture the current result or "Ctrl" + R to display the captured result.
The result can also be captured by right-clicking on the chart.
Press F4 to show or hide the most recently captured result.

## Velocity



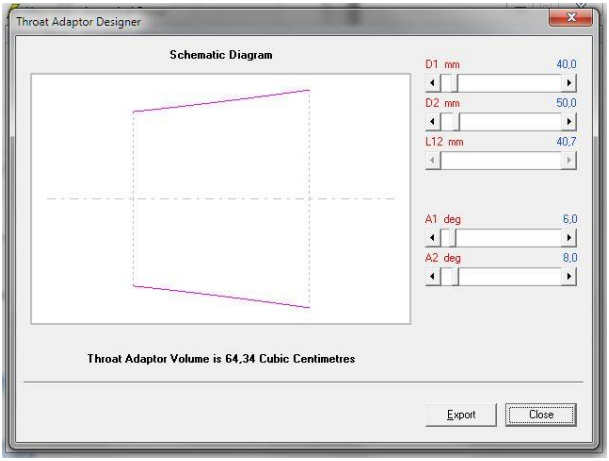

Shows the peak value of the cone speed of the speaker element in m / s in relation to the frequency in Hz.
Click on the diagram to display the speed at a certain frequency.
Select from the "diaphragm displacement" window.
Previous results are used for comparison.
Press "Ctrl" + C to capture the current result or "Ctrl" + R to display the captured result.
The result can also be captured by right-clicking on the chart.
Press F4 to show or hide the most recently captured result.

## Acceleration



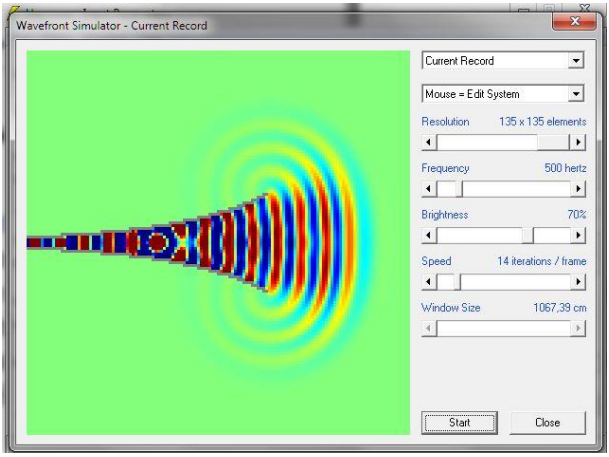

Displays the peak value of the speaker element's acceleration in m / s relative to the frequency in Hz.
Click on the diagram to show the acceleration at a certain frequency.
Select from the "diaphragm displacement" window.
Previous results are used for comparison.
Press "Ctrl" + C to capture the current result or "Ctrl" + R to display the captured result.
The result can also be captured by right-clicking on the chart.
Press F4 to show or hide the most recently captured result.

## Throat Adapter Designer




A standalone tool that displays the expansion profile of a horn neck adapter. Where D1 is the input diameter and D2 the output diameter and A1 the input angle and A2 the output angle. The minimum length is also calculated all this data can be exported by clicking the "Export" button.

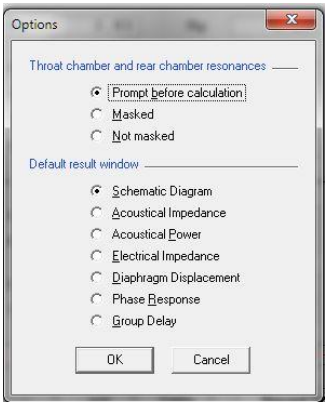
## Wavefront simulator




Models sound wave propagation in horn speakers. A warning message is displayed if the resolution, frequency, element size, and magnitude value generate an erroneous result due to wave distortion effects.

To add or delete walls, click and drag with the mouse when the "mouse = edit" system option is selected, or click with the mouse and use the Up, Down, Right and Left navigation keys.
To specify a straight wall, press "Shift" + click with the mouse on the end points of the line.
To specify a rectangular box, press "Ctrl" + click with the mouse on the diagonal corners.
To specify a default point source, press "Alt" + click with the mouse twice in the same place.
To specify a point source with reverse polarity, a time-delayed point source or the acoustic output from a point source relative to the default value, press "Alt" + click with the mouse on the suggested source position, select "reversed polarity" check box set "power" and "Delay "The bars to the desired value and press" Alt "+ click with the mouse again on the suggested source position.
If the mouse pointer is moved over a point source, the selected polarity "power" and "Delay" setting in the Window shows the text at the top of the tool window. The default settings are not displayed. To add a point source, mouse over the source.
To specify the source of a standard speaker element, press "Alt" + click with the mouse on the cone endpoints.

## Options




Sets whether the neck chamber and the rear chamber resonances are to be masked.
Sets which window should be the default display window.

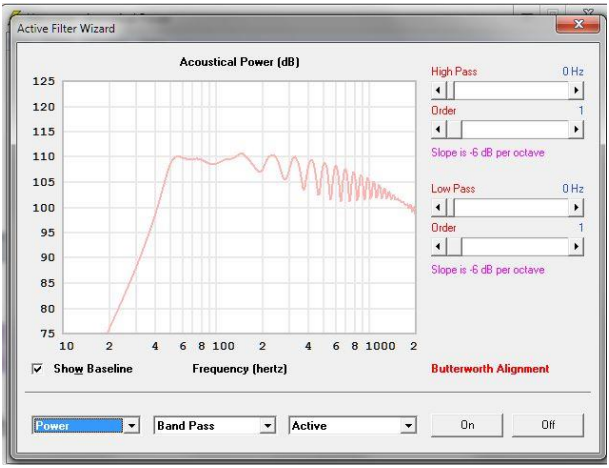
# 7. Phase response

## Tools

### Sample

Calculates the acoustic impedance, SPL sound pressure, electrical input power, acoustic output power, system efficiency, electrical impedance, cone motion, con acceleration, phase response, group delay or radiation angle at any frequency between 1 and 20,000Hz. When the sound pressure of a single segment's horn is calculated, the distortion of the second tone of the horn is calculated at the same time.
When the maximum sound pressure is calculated, either the power or the cone motion is displayed limited and the input voltage and the Pmax cone motion are displayed.
Press either "F3" or double-click the chart to select it.
A single click on a chart provides chart data at the frequency at which the mouse pointer is over at the mouse click. The sampling frequency can be changed by dragging the line with the mouse or by using the Up, Down, Left, Right Home or end keys. Press the "ESC" key to delete the sample line (red).
Calculates the constant direction-dependent sound pressure level, the electric input power, the acoustic output power, power conversion efficiency, the top sound pressure of the horn neck and the top particle speed of the horn neck at any frequency between 1 and 20,000Hz or between 0.1 and 2,000 Hz.
And for single segment horns the sampled second tone distortion. When the maximum spl sound pressure is sampled, the acoustic output is displayed as either power or cone displacement limited, and where the input voltage and Pmax cone displacement are given.
When the "power compression" response is displayed, the "thermal power compression" is also expressed in decibels.

## Filter Wizard




Automatically recalculates the result for a specific filter system in real time when the input parameters change. Le Cléac'h high-pass passive filter option for two-stage impedance equalization high-frequency lift.

The tool can be accessed from "Acoustical power", "Electrical impedance", “Diaphragm displacement”, “Phase response” or “Group delay” windows.

Click the "ON" button to add the current active and parametric equalizer, passive or Le Cléac'h filter settings when calculating the result. Click the "Off" button to exclude the filter settings. The "Filter wizard" is not available when the "Vel constant" chart or the "velocity" or "Acc" constant chart acceleration option is selected or when the "room gain" profile is displayed.

Select the "Schematic" option to display a drawing of the specified filter.

Select the “Power” or “Pressure” option to display the acoustic output or acoustic pressure of the specified passive or active filter and speaker system.

Double-click the Y-axis on power or press the charts to change the default setting of 5 dB steps to 3dB or 6dB steps.

Select the Impedance option to display the size of the input impedance of the specified passive filter and speaker system.

Select the “Displacement” option to view the speaker element cone movements for the specified passive filter and speaker system.

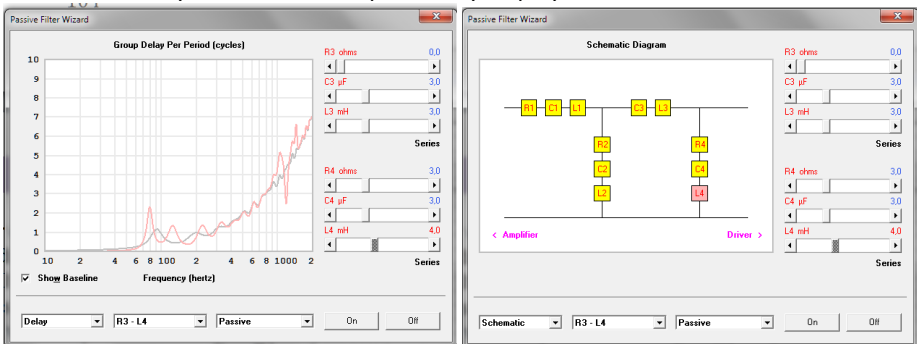
Select the "Phase" option to display the phase response of the specified passive or active filter and speaker system

Select the "Delay" option to display "Group delay" or "Group delay per period" for the specified filter and speaker system.

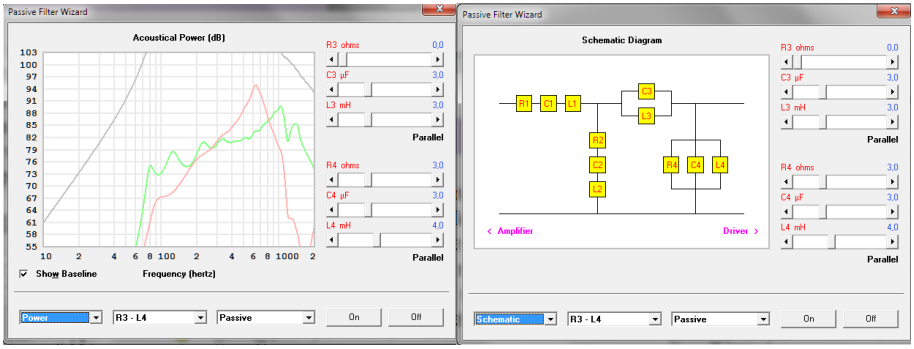
Double-click anywhere on the "Group delay" chart to change to the "Group delay per period" chart. Double-click again to return to the "Group delay" diagram.
Double-click anywhere on the chart's Y-axis scale to add a green 1 / f line. Double-click again to add a Claus Futtrup boundary line. Press "Esc" to delete the 1 / f line and again "Esc" to remove the Claus Futtrup line. Claus Futtrup Audible group delay guideline in milliseconds is obtained from the expression:

$$GD_{Limit} = \frac{1000 * 1{,}1606}{5{,}6413 * f^{0{,}81511} - f}$$

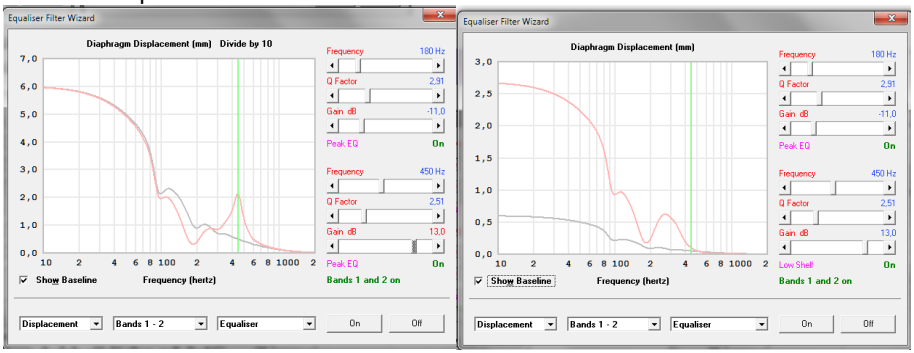
Where f is the frequency in Hz
Double-click anywhere on the Y-axis in the "Group delay" diagram to change the range to 2, 5, 10 or periods.
Select the "impulse" option to display the impulse response for a specific filter and speaker system.
Not applicable from "Loudspeaker wizard" or when "! Room gain" is included.
Select the "Filter gain" option to display the "! Gain" response for the specific filter
Select the "Filter phase" option to display the phase response for the specific filter.
Select the "Filter delay" option to display the group delay for specific filter.
Start chart results are saved as a reference baseline when the tool is selected. Up to four different sets of values can be temporarily saved and recalled when the Wizard is open, by clicking the appropriate memory button or pressing the equivalent function key.
"Ctrl" + C captures the current result for the "power" or "Pressure" charts. "Ctrl" + V shows or hides recently captured results.
Press the V key to display the passive or Le Cléac'h "Filter Schematic Chart", and release the V key to return to the previously displayed chart.




To change the components of a standard filter from series to parallel, double-click the label under the relevant rule group.




To change the type of active filter, double-click on the "alignment" label.
To change the steepness of the filter from dB per octave to dB per decade, double-click the "slope" label.

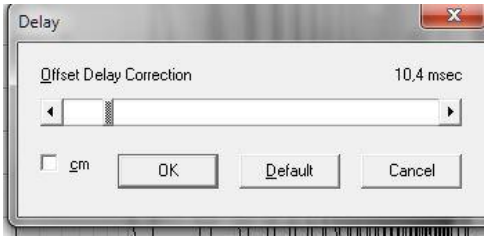



To turn a filter band on and off, double-click the On / Off label for that band. To select either a "peaking EQ filter", a "low"
shelving filter ", a" high shelving filter ", a" low pass filter "or a" high pass filter "for a given band double click on the label for this band.
Press "Esc" to remove the green frequency mark.
In some software for parametric equalizers, the "shelving filter" Q factor is instead a "shelf slope" parameter. The relationship between Q and S is as the following formula describes:

$$S=\frac{1}{\left[\left[\frac{\left[\left(\frac{1}{Q}\right)^2-2\right]}{\left[\frac{\frac{G}{10^{40}}+1}{\frac{G}{10^{40}}}\right]}\right]+1\right]}$$

Where
S = "shelf slope parameter"
Q = Q factor
G = "gain"
If the "Active" or "Equalizer filter" option is selected, the current active and perasmetric equalizer filter settings can be saved to a permanent data file by clicking the "Save" button in the "Memory" window or by pressing the F9 softkey.
If the passive or Le Cléac'h filter option is selected, these can be saved permanently in a data file by clicking on "Save" in "Memory"
To change the frequency range, double-click the chart's frequency label. Not available when mute material has been added to the speaker system.
To directly set a rule to a certain value, press the value and then "Enter" when the rule is in focus
To quickly move a rule, press the "Home" or "End" key and hold it down to the desired value, when the rule is in focus.
To reset a rule to its "baseline" value, press key B when the rule is in focus.
To reset all the bars to the "baseline" value, press "Alt" + B.
To save the values from bars and charts as a new "baseline", press "Ctrl" + "Alt" + B.
Click the reset button in the “Memory” window or press “Ctrl” + F9 to reset the current settings to the saved value.
Press F5 to reset all the bars to the starting value.

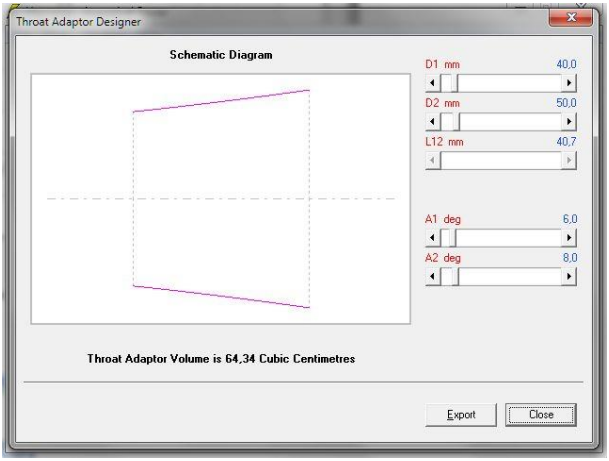
## Delay




Sets the phase response diagram's "offset delay correction".
Select zero delay to display "wrapped" phase.

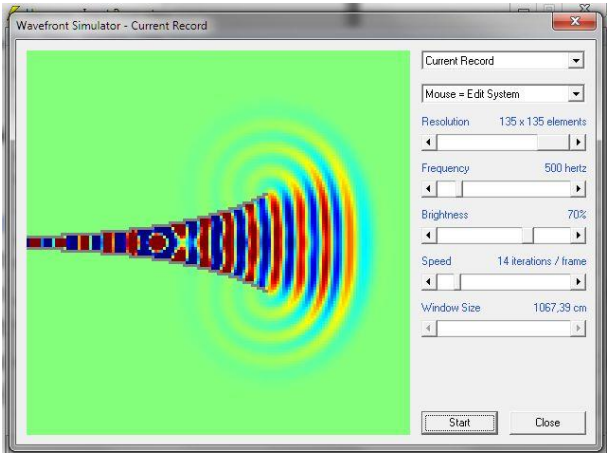
Move the rule to minimum to display the default phase.
Select from the "Phase response" window.

## Throat Adapter Designer



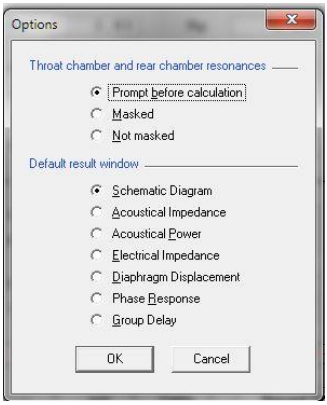

A standalone tool that displays the expansion profile of a horn neck adapter. Where D1 is the input diameter and D2 the output diameter and A1 the input angle and A2 the output angle. The minimum length is also calculated all this data can be exported by clicking the "Export" button.

## Wavefront simulator



Models sound wave propagation in horn speakers. A warning message is displayed if the resolution, frequency, element size, and magnitude value generate an erroneous result due to wave distortion effects.
To add or delete walls, click and drag with the mouse when the "mouse = edit" system option is selected, or click with the mouse and use the Up, Down, Right and Left navigation keys.
To specify a straight wall, press "Shift" + click with the mouse on the end points of the line.
To specify a rectangular box, press "Ctrl" + click with the mouse on the diagonal corners.
To specify a default point source, press "Alt" + click with the mouse twice in the same place.
To specify a point source with reverse polarity, a time-delayed point source or the acoustic output from a point source relative to the default value, press "Alt" + click with the mouse on the suggested source position, select "reversed polarity" check box set "power" and "Delay "The bars to the desired value and press" Alt "+ click with the mouse again on the suggested source position.
If the mouse pointer is moved over a point source, the selected polarity "power" and "Delay" setting in the Window shows the text at the top of the tool window. The default settings are not displayed. To add a point source, mouse over the source.
To specify the source of a standard speaker element, press "Alt" + click with the mouse on the cone endpoints.

## Options




Sets whether the neck chamber and the rear chamber resonances are to be masked.
Sets which window should be the default display window.

# 8. Group delay

## Tools

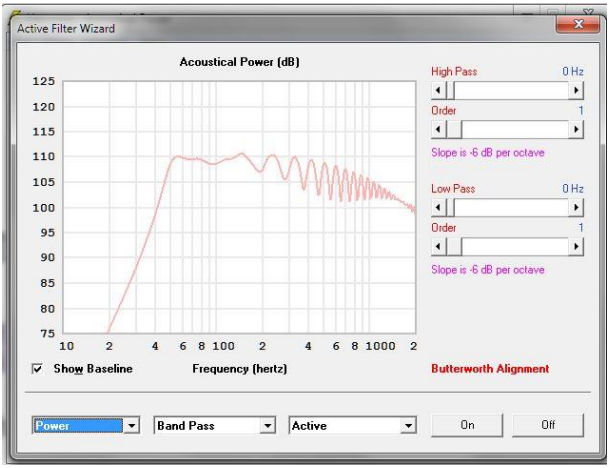
### Sample

Calculates the acoustic impedance, SPL sound pressure, electrical input power, acoustic output power, system efficiency, electrical impedance, cone motion, con acceleration, phase response, group delay or radiation angle at any frequency between 1 and 20,000Hz. When the sound pressure of a single segment's horn is calculated, the distortion of the second tone of the horn is calculated at the same time.
When the maximum sound pressure is calculated, either the power or the cone motion is displayed limited and the input voltage and the Pmax cone motion are displayed.
Press either "F3" or double-click the chart to select it.
A single click on a chart provides chart data at the frequency at which the mouse pointer is over at the mouse click. The sampling frequency can be changed by dragging the line with the mouse or by using the Up, Down, Left, Right Home or end keys. Press the "ESC" key to delete the sample line (red).
Calculates the constant direction-dependent sound pressure level, the electric input power, the acoustic output power, power conversion efficiency, the top sound pressure of the horn neck and the top particle speed of the horn neck at any frequency between 1 and 20,000Hz or between 0.1 and 2,000 Hz.
And for single segment horns the sampled second tone distortion. When the maximum spl sound pressure is sampled, the acoustic output is displayed as either power or cone displacement limited, and where the input voltage and Pmax cone displacement are given.
When the "power compression" response is displayed, the "thermal power compression" is also expressed in decibels.

### Compare previous

Shows the current and previous simulation regarding acoustic impedance in the same diagram.
The previous results are used as a basis for the comparison. Press "Ctrl + C" to capture current results or "Ctrl + X" to release captured results.
Press F4 to show or hide the previous or current result.

## Filter Wizard




Automatically recalculates the result for a specific filter system in real time when the input parameters change. Le Cléac'h high-pass passive filter option for two-stage impedance equalization high-frequency lift.

The tool can be accessed from "Acoustical power", "Electrical impedance", “Diaphragm displacement”, “Phase response” or “Group delay” windows.

Click the "ON" button to add the current active and parametric equalizer, passive or Le Cléac'h filter settings when calculating the result. Click the "Off" button to exclude the filter settings. The "Filter wizard" is not available when the "Vel constant" chart or the "velocity" or "Acc" constant chart acceleration option is selected or when the "room gain" profile is displayed.

Select the "Schematic" option to display a drawing of the specified filter.

Select the “Power” or “Pressure” option to display the acoustic output or acoustic pressure of the specified passive or active filter and speaker system.

Double-click the Y-axis on power or press the charts to change the default setting of 5 dB steps to 3dB or 6dB steps.

Select the Impedance option to display the size of the input impedance of the specified passive filter and speaker system.

Select the “Displacement” option to view the speaker element cone movements for the specified passive filter and speaker system.

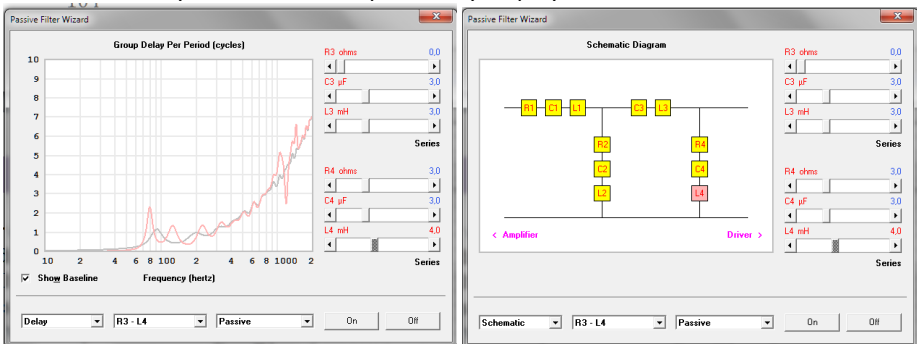
Select the "Phase" option to display the phase response of the specified passive or active filter and speaker system

Select the "Delay" option to display "Group delay" or "Group delay per period" for the specified filter and speaker system.

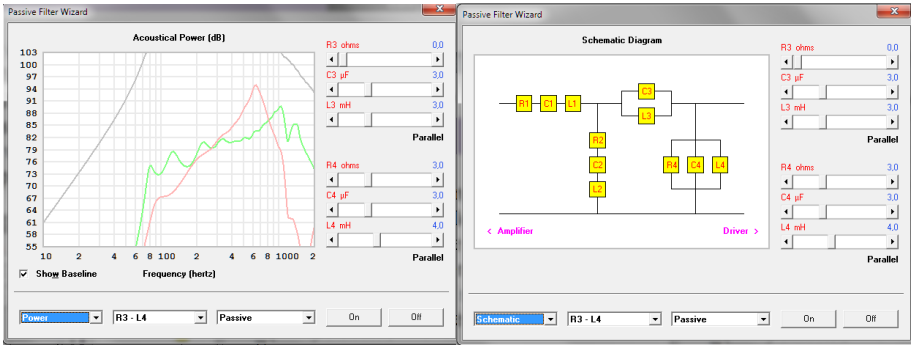
Double-click anywhere on the "Group delay" chart to change to the "Group delay per period" chart. Double-click again to return to the "Group delay" diagram.
Double-click anywhere on the chart's Y-axis scale to add a green 1 / f line. Double-click again to add a Claus Futtrup boundary line. Press "Esc" to delete the 1 / f line and again "Esc" to remove the Claus Futtrup line. Claus Futtrup Audible group delay guideline in milliseconds is obtained from the expression:

$$GD_{Limit} = \frac{1000 * 1{,}1606}{5{,}6413 * f^{0{,}81511} - f}$$

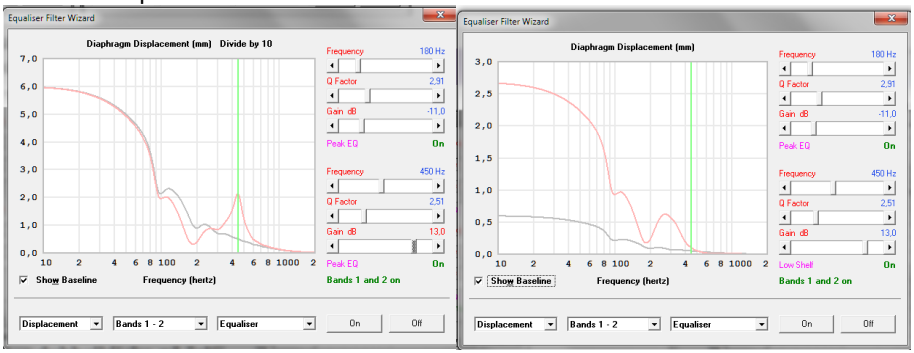
Where f is the frequency in Hz
Double-click anywhere on the Y-axis in the "Group delay" diagram to change the range to 2, 5, 10 or periods.
Select the "impulse" option to display the impulse response for a specific filter and speaker system.
Not applicable from "Loudspeaker wizard" or when "! Room gain" is included.
Select the "Filter gain" option to display the "! Gain" response for the specific filter
Select the "Filter phase" option to display the phase response for the specific filter.
Select the "Filter delay" option to display the group delay for specific filter.
Start chart results are saved as a reference baseline when the tool is selected. Up to four different sets of values can be temporarily saved and recalled when the Wizard is open, by clicking the appropriate memory button or pressing the equivalent function key.
"Ctrl" + C captures the current result for the "power" or "Pressure" charts. "Ctrl" + V shows or hides recently captured results.
Press the V key to display the passive or Le Cléac'h "Filter Schematic Chart", and release the V key to return to the previously displayed chart.




To change the components of a standard filter from series to parallel, double-click the label under the relevant rule group.




To change the type of active filter, double-click on the "alignment" label.
To change the steepness of the filter from dB per octave to dB per decade, double-click the "slope" label.




To turn a filter band on and off, double-click the On / Off label for that band. To select either a "peaking EQ filter", a "low"
shelving filter ", a" high shelving filter ", a" low pass filter "or a" high pass filter "for a given band double click on the label for this band.
Press "Esc" to remove the green frequency mark.
In some software for parametric equalizers, the "shelving filter" Q factor is instead a "shelf slope" parameter. The relationship between Q and S is as the following formula describes:

$$S=\frac{1}{\left[\left[\frac{\left[\left(\frac{1}{Q}\right)^2-2\right]}{\left[\frac{10^{\frac{G}{40}}+1}{10^{\frac{G}{40}}}\right]}\right]+1\right]}$$

Where
S = "shelf slope parameter"
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G = "gain"
If the "Active" or "Equalizer filter" option is selected, the current active and perasmetric equalizer filter settings can be saved to a permanent data file by clicking the "Save" button in the "Memory" window or by pressing the F9 softkey.
If the passive or Le Cléac'h filter option is selected, these can be saved permanently in a data file by clicking on "Save" in "Memory"
To change the frequency range, double-click the chart's frequency label. Not available when mute material has been added to the speaker system.
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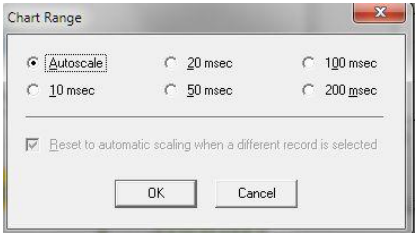
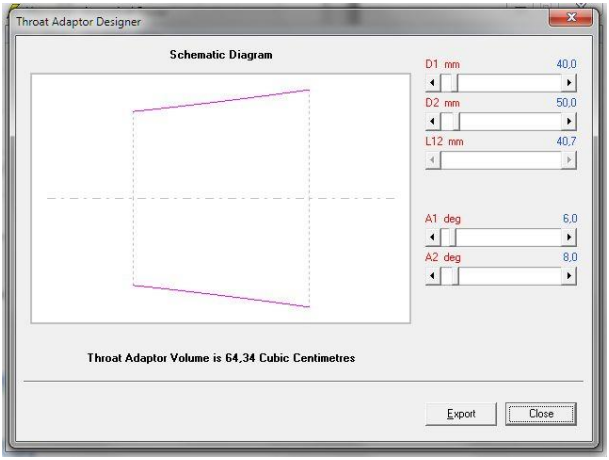
To quickly move a rule, press the "Home" or "End" key and hold it down to the desired value, when the rule is in focus.
To reset a rule to its "baseline" value, press key B when the rule is in focus.
To reset all the bars to the "baseline" value, press "Alt" + B.
To save the values from bars and charts as a new "baseline", press "Ctrl" + "Alt" + B.
Click the reset button in the “Memory” window or press “Ctrl” + F9 to reset the current settings to the saved value.
Press F5 to reset all the bars to the starting value.

## Range



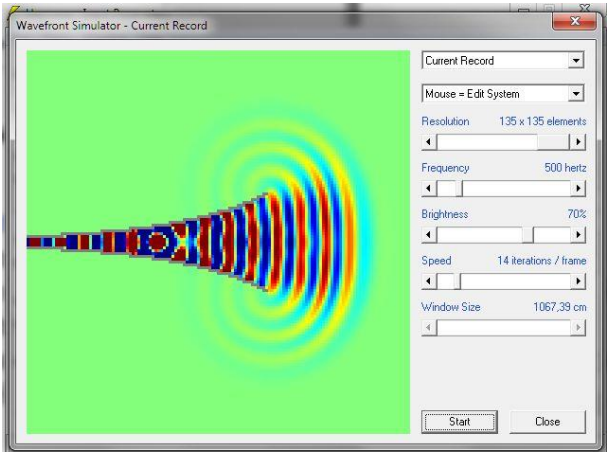

Ställer in skalan på diagrammet.

## Throat Adapter Designer



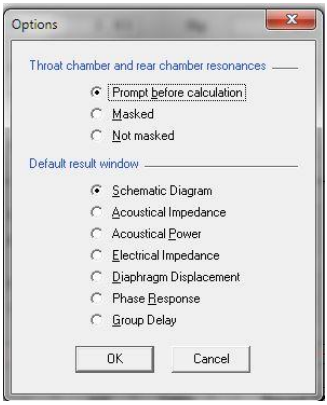

A standalone tool that displays the expansion profile of a horn neck adapter. Where D1 is the input diameter and D2 the output diameter and A1 the input angle and A2 the output angle. The minimum length is also calculated all this data can be exported by clicking the "Export" button.

## Wavefront simulator



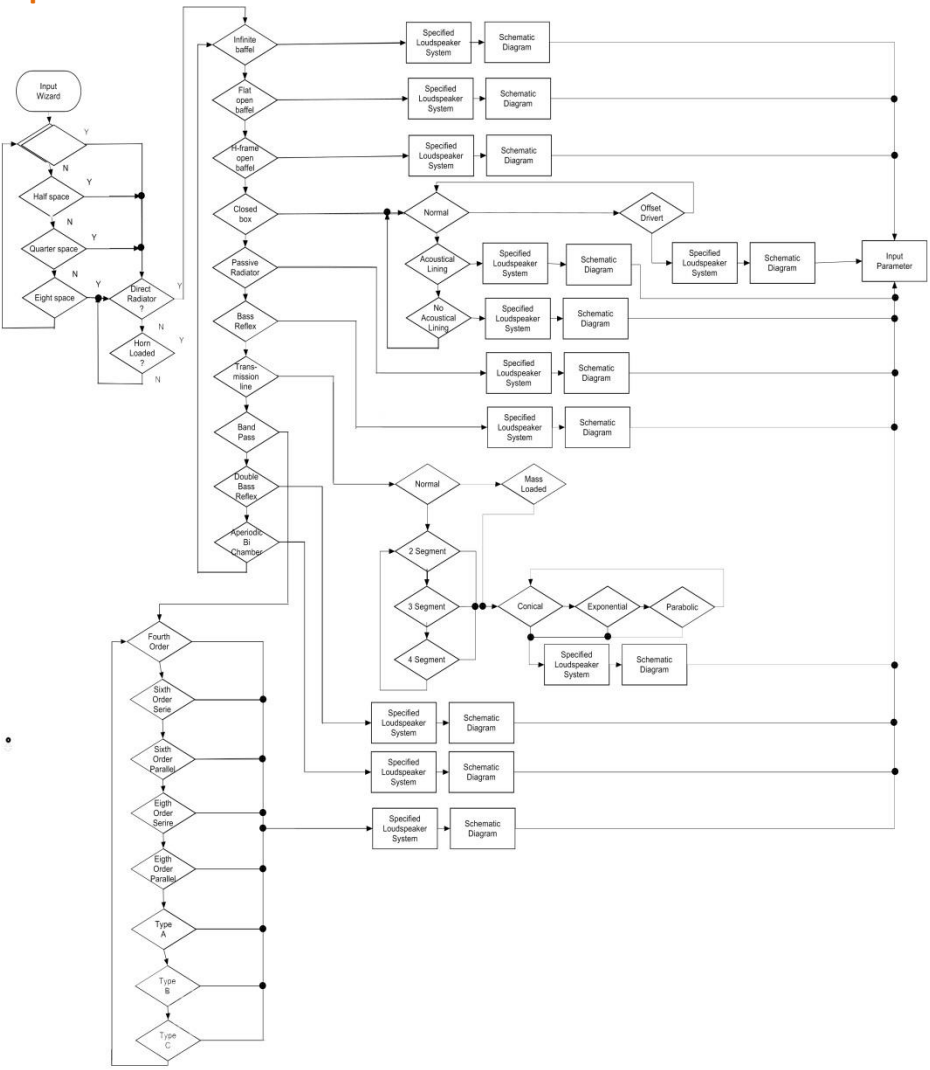
Models sound wave propagation in horn speakers. A warning message is displayed if the resolution, frequency, element size, and magnitude value generate an erroneous result due to wave distortion effects.
To add or delete walls, click and drag with the mouse when the "mouse = edit" system option is selected, or click with the mouse and use the Up, Down, Right and Left navigation keys.
To specify a straight wall, press "Shift" + click with the mouse on the end points of the line.
To specify a rectangular box, press "Ctrl" + click with the mouse on the diagonal corners.
To specify a default point source, press "Alt" + click with the mouse twice in the same place.
To specify a point source with reverse polarity, a time-delayed point source or the acoustic output from a point source relative to the default value, press "Alt" + click with the mouse on the suggested source position, select "reversed polarity" check box set "power" and "Delay "The bars to the desired value and press" Alt "+ click with the mouse again on the suggested source position.
If the mouse pointer is moved over a point source, the selected polarity "power" and "Delay" setting in the Window shows the text at the top of the tool window. The default settings are not displayed. To add a point source, mouse over the source.
To specify the source of a standard speaker element, press "Alt" + click with the mouse on the cone endpoints.

## Options




Sets whether the neck chamber and the rear chamber resonances are to be masked.
Sets which window should be the default display window.

# Input wizard



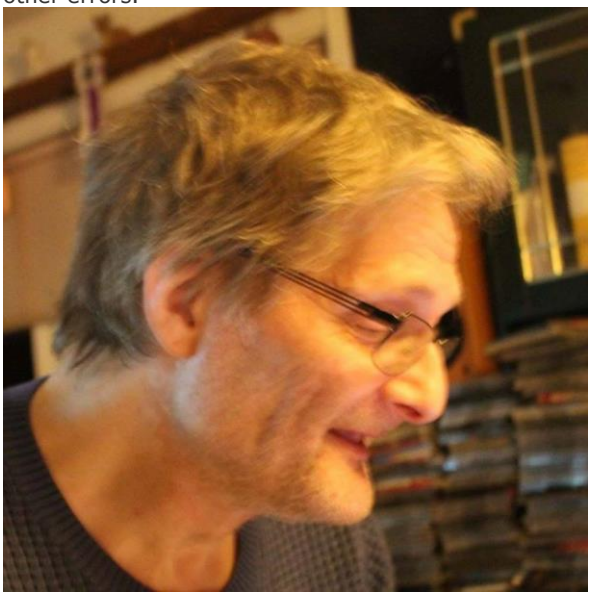
# Abbreviations and parameters

| | | | |
|---|---|---|---|
| A1, A2 | | | |
| ABC | | Aperiodic bi chamber horn | |
| Acc | $m/s^2$ | Driver diaphragm constant rms acceleration | |
| Ams | n/N | Admittans | |
| $A_{ng}$ | Ster rad | Radiation angle | 0.0*pi=infinite<br>0.5*pi= Corner, wall & floor<br>1.0*pi= wall & floor<br>2.0*pi= floor<br>4.0*pi=free hanging |
| $A_p$ | $cm^2$ | Bakkammarens Basreflex ports area | |
| $A_p1$ | $cm^2$ | Neck port or neck adapter area | |
| Ap2 | $Cm^2$ | Absorber chamber port cross-sectional area | |
| $A_{rt}$ | Grader | The half angle of the horn neck | |
| $A_{ss}$ | Ns/m | Admitans | |
| $A_{tc}$ | $cm^2$ | The middle area of the neck chamber | |
| BL | Tesla m | Magnetiska flux densiteten x coil length | |
| BP4 | | Fourth Order Band Pass Enclosure | |
| BP6p | | Sixth Order Parallel Band Pass Enclosure | |
| BP6s | | Sixth Order Series Band Pass Enclosure | |
| BP8p | | Eighth Order Parallel Band Pass Enclosure | |
| BP8s | | Eighth Order Series Band Pass Enclosure | |
| BPA | | Type A Band Pass Enclosure | |
| BPB | | Type B Band Pass Enclosure | |
| BPC | | Type C Band Pass Enclosure | |
| CH, CH1 | | Compound Horn | |
| $C_{ir}$ | | Free space normalised horn mouth circumference in flare cutoff frequency wavelengths. | |
| $C_{mp}$ | m/N | Passive radiator suspension mechanical compliance | |
| $C_{ms}$ | m/N | The speaker element mechanical compliance | |
| D1-D3 | | | |
| DBR | | Double Bass Reflex Enclosure | |
| $E_g$ | V | Amps. Open circuit voltage | =0 |
| F12 | Hz | The lower frequency of the horn segment | |
| $F_r$ | Rayls/m | The airflow resistance of the rear chamber damping material | Available from tables |
| $F_r1$ | Rayls/m | | |
| $F_s$ | Hz | The speaker element resonant frequency freely hanging | |
| $F_{ta}$ | Grader | Corneal enlargement tangent | |
| G | | | |
| GDlimit | | | |
| H1-H3 | | | |
| Iamp | | | |
| Ke | Semi H | Semi-inductance | |
| L12 | cm | The length of the horn segment | To select the extension type Con, |

| | | | |
|---|---|---|---|
| | | | Exp and Par double click on the L12 label |
| $L_e$ | mH | The speaker element voice coil inductance, Bound inductance | |
| $L_{eb}$ | mH | Free inductance | |
| Leb | mH | Free inductance | |
| $L_p$ | cm | Neck port or neck adapter length | |
| $L_{pt}$ | cm | Length of the base reflex port of the rear chamber | |
| $L_{rc}$ | cm | Average length of the rear chamber | |
| m | | Bessel horn flaring index | 0= Cylindrical<br>1=Parabolic<br>2=conical<br>99999= exponential<br>-2=Gabriels horn |
| ME1, ME2 | | Two-Way or Three-Way Multiple Entry Horn | |
| $M_{md}$ | Gram | Speaker element cone & voice coil weight | |
| $M_{mp}$ | Gram | Passive speaker element variable dynamic weight | |
| Namn | Sort | Meaning | Anm |
| $N_d$ | | Number & position of elements | |
| OD, OD2 | | Offset Driver Horn/Damped Transmission Line Enclosure | |
| Pamp | | | |
| $P_{max}$ | W | The speaker element maximum thermal input power | |
| Q | | | |
| $Q_{es}$ | | Electrical Q value | |
| $Q_{ms}$ | | Mechanical Q value | |
| $Q_{ts}$ | | Total Q value | |
| R | Cm | The radius of the radius of the horn widening profile | |
| R´ | Ohm | Resistance | |
| $R_e$ | ohm | Driver voice coil dc resistance | |
| $R_e$` | Ohm | | |
| Rg | Ohm | Amps. Out resistance | |
| $R_{mp}$ | Ns/m | Passive speaker element mechanical resistance | |
| $R_{ms}$ | Ns/m | The speaker element mechanical resistance | |
| $R_{ss}$ | Semi H | Shunt resistans | |
| S | | | |
| S1–S5 | $cm^2$ | The neck area of the horn segment | |
| $S_d$ | $cm^2$ | Speaker element effective area | |
| SH1-SH4 | | Stubbed Horn | |
| Sp | | | |
| $S_p$1-9 | $cm^2$ | Passive speaker element membrane area | |
| T | | Hyperbolic-Exponential and Le Cléac´h horn expansion parameter | 0=catenoial<br><1=cosh<br>1=exponential<br>>1=sinh<br>99999.99=conical |
| $T_{al}$ | cm | The thickness of the damping material | |

| | | | |
|---|---|---|---|
| $T_{al}1$ | Cm eller % | | |
| TH, TH1 | | Tapped Horn | |
| Vamp | | | |
| $V_{as}$ | Liter | The air volume that gives a zero return of the power for Cms | |
| Vas | Liter | Volume of air that provides a restoring force equal to that of the driver's mechanical compliance | |
| Vel | m/s | Driver diaphragm constant rms velocity | |
| $V_{rc}$ | Liter | The volume of the back chamber | |
| $V_{tc}$ | c.c | Neck chamber volume | |
| $X_{max}$ | mm | The speaker element maximum linear movement length | |

This is a small manual for Hornresp. For better understanding. The English version is translated from Swedish via Google translate, so there can be some missspelling and other errors.



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