Open Baffle w/ 3 Drivers - Acoustic Response

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Configuration : Extended Range Driver w/ Two Bass Drivers Mounted on an Open Baffle

Unit and Constant Definition

$cycle := 2 \cdot \pi \cdot rad$

$Hz := cycle \cdot sec^{-1}$

Air Density : $\rho := 1.205 \cdot kg \cdot m^{-3}$

Speed of Sound : $c := 344 \cdot m \cdot sec^{-1}$

Part 1 : Thiele-Small Consistent Calculation

Detailed User Input (Edit This Section and Input the Parameters for the System to be Analyzed)

$Power := 1 \cdot watt$ (Input Power) Applied Voltage Reference ---> $R_{ref} := 8 \cdot \Omega$

Extended Range Driver Thiele / Small Parameters : Wildburro Audio Betsy

$f_d := 49.63 \cdot Hz$ $V_{ad} := 86.387 \cdot liter$

$R_e := 5.9 \cdot \Omega$ $Q_{ed} := 0.945$

$L_{vc} := 0.0 \cdot mH$ $Q_{md} := 4.567$

$Bl := 4.166 \cdot \frac{newton}{amp}$ $Q_{td} := \left(\frac{1}{Q_{ed}} + \frac{1}{Q_{md}} \right)^{-1}$

$S_d := 229.66 \cdot cm^2$ $Q_{td} = 0.783$

Bass Driver Thiele / Small Parameters : Eminence Alpha 15" High Efficiency

$f_d := 41 \cdot Hz$ $V_{ad} := 260 \cdot liter$

$R_e := 5.88 \cdot \Omega$ $Q_{ed} := 1.53$

$L_{vc} := 0.84 \cdot mH$ $Q_{md} := 7.23$

$Bl := 7.7 \cdot \frac{newton}{amp}$ $Q_{td} := \left(\frac{1}{Q_{ed}} + \frac{1}{Q_{md}} \right)^{-1}$

$S_d := 856.3 \cdot cm^2$ $Q_{td} = 1.263$

Crossover Definition

For Even Order Crossovers : Type 1 = Linkwitz-Riley
Type 2 = Bessel
Type 3 = BEC
Type 4 = Butterworth

Low Pass Filter	High Pass Filter	
$f_{LP} := 200 \cdot Hz$	$f_{HP} := 200 \cdot Hz$	(Filter Frequency)
$LP_{order} := 4$	$HP_{order} := 1$	(Filter Order : 0, 1, 2, 3, or 4)
$LP_{type} := 1$	$HP_{type} := 1$	(Filter Type : 1, 2, 3, or 4 for even order only, for odd order this entry is ignored)

Crossover Phase Connection

$LP_{phase} := 1$	$HP_{phase} := 1$	(1 = in phase, -1 = out of phase)

Low Frequency Boost

$LP_{boost} := 0$ dB

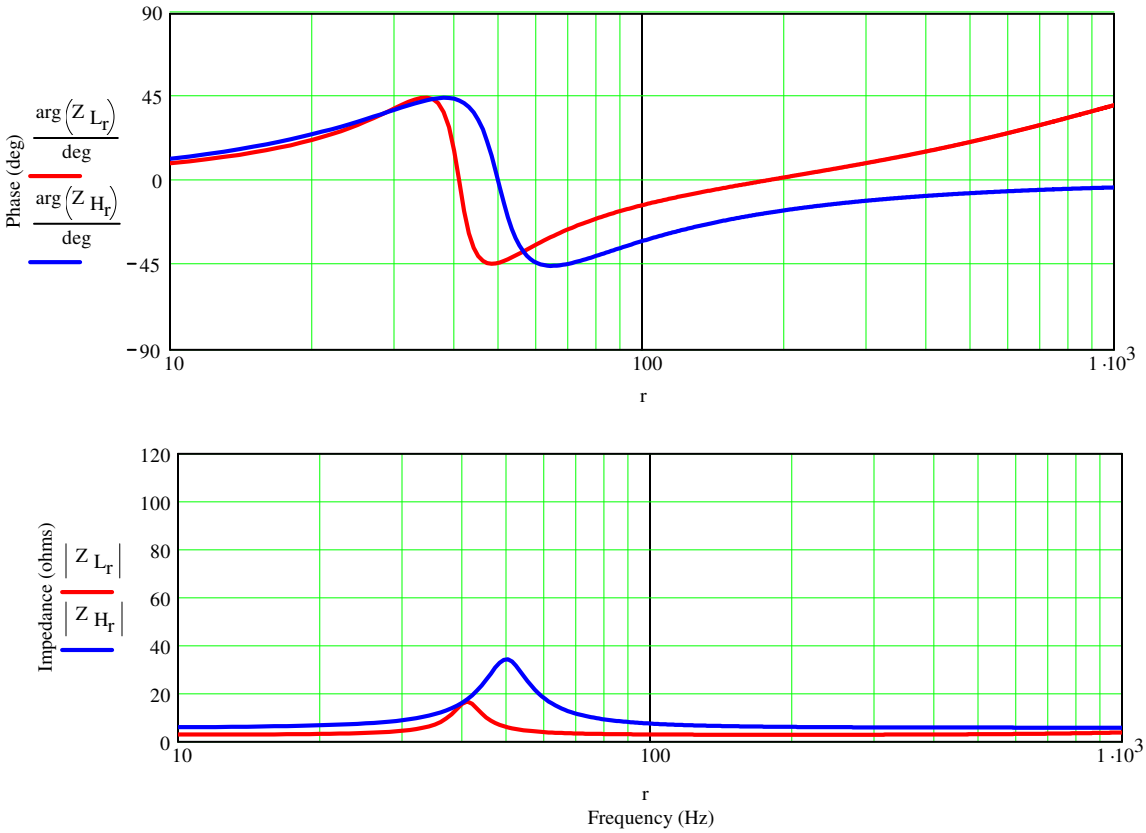
Sub High Pass Filter (Use to Limit Low Frequency Woofer Displacement)

$f_{sub} := 0 \cdot Hz$	(Filter Frequency)
$SHP_{order} := 0$	(Filter Order : 0, 1, 2, 3, or 4)
$SHP_{type} := 4$	(Filter Type : 1, 2, 3, or 4 for even order only, for odd order this entry is ignored)

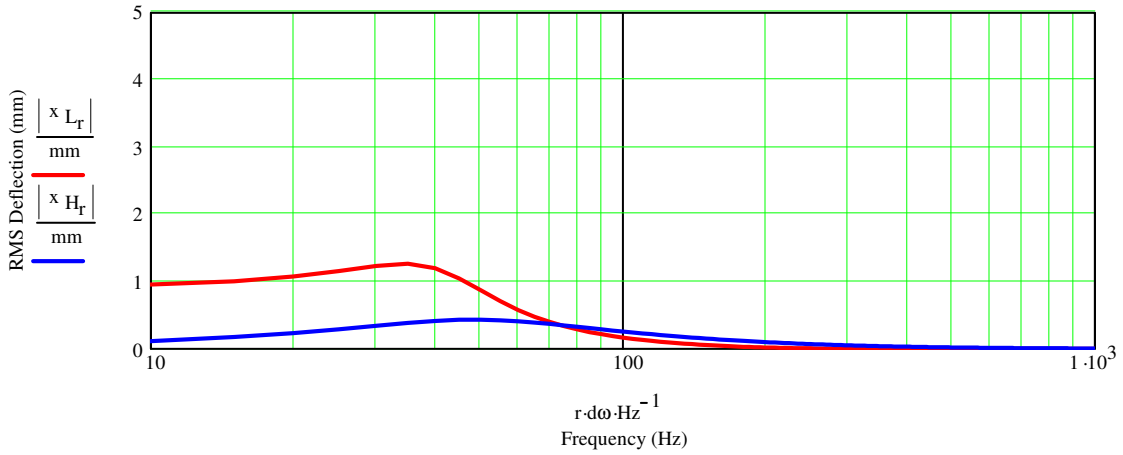
End of Detailed Input

End of Part 1 Input

OB Driver Impedances (Red Curve - Woofer, Blue Curve - Extended Range Driver)



Driver RMS Displacements (Red Curve - Woofer, Blue Curve - Extended Range Driver)



Part 2 : Detailed SPL Response Calculation

Calculation Includes :
Position of Drivers on the Baffle.
Open Baffle Defraction for the Drivers.
Floor Reflection for the Drivers.

Geometry

Coordinate System :
Origin is the lower left corner of the front baffle
y = horizontal direction
z = vertical direction

The variables num_r, n_low, and n_high control the number of simple sources used in the calculations. Increasing each will improve accuracy at the expense of longer calculation times. Increase each variable until final plotted SPL stops changing at which point the solution has converged.

Enclosure Geometry Input

$X_0 := 2 \cdot ft$ (Front Baffle Distance from Rear Wall > Depth of Enclosure)

$Y_0 := 1.5 \cdot ft$ (Front Baffle Distance from Side Wall)

$\theta_0 := 45 \cdot deg$ (Rotation Towards Room Center)

$Z_0 := 8 \cdot ft$ (Floor to Ceiling Distance)

$stand := 0 \cdot m$ (Height from Floor to Bottom Edge of Front Baffle)

$num\_r := 10$ (Number of Points per Unit Length of Baffle Edge)

Corner Coordinates

X coordinate	Y coordinate	
$y_{o_0} := 17.7 \cdot in$		(Bottom Right Corner)
$y_{o_1} := 17.7 \cdot in$	$z_{o_1} := 41.3 \cdot in$	(Top Right Corner)
$y_{o_2} := 0 \cdot in$	$z_{o_2} := 41.3 \cdot in$	(Top Left Corner)
$y_{o_3} := 0 \cdot in$		(Bottom Left Corner)

Extended Range Driver Geometry Input

$y_{dc} := 5.9 \cdot in$ (Driver Center y Coordinate)

$z_{dc} := 41 \cdot in$ (Driver Center z Coordinate)

$n\_high := 5$ (Number of Points Across Diameter)

Woofer Driver Geometry Input

$y_{w1} := 8.8 \cdot in$ (Lower Driver Center y Coordinate)

$z_{w1} := 8 \cdot in$ (Lower Driver Center z Coordinate)

$y_{w2} := 8.8 \cdot in$ (Upper Driver Center y Coordinate)

$z_{w2} := 22 \cdot in$ (Upper Driver Center z Coordinate)

$n\_low := 10$ (Number of Points Across Diameter)

Listening Position (Default Location is at 1 m Distance Along the Driver's Axis)

n_listen = 0	(Listening Position Relative to Speaker)
$radius := 1 \cdot m$	(Calculation Radius, Effective Radius is Greater if y_p is Changed from Default)
$\theta := 0 \cdot deg$	(0 deg is along the Driver's Axis, -80 deg < θ < 80 deg)
$z_p := z_{dc}$	(Default Height is Equal to Driver Height)
n_listen = 1	(Listening Position Relative to the Room Corner)
$X_p := 10\ ft$	
$Y_p := 7 \cdot ft$	
$Z_p := z_{dc} + stand$	(Default Height is Equal to Driver Height)
$n\_listen := 0$	(Method Selection)

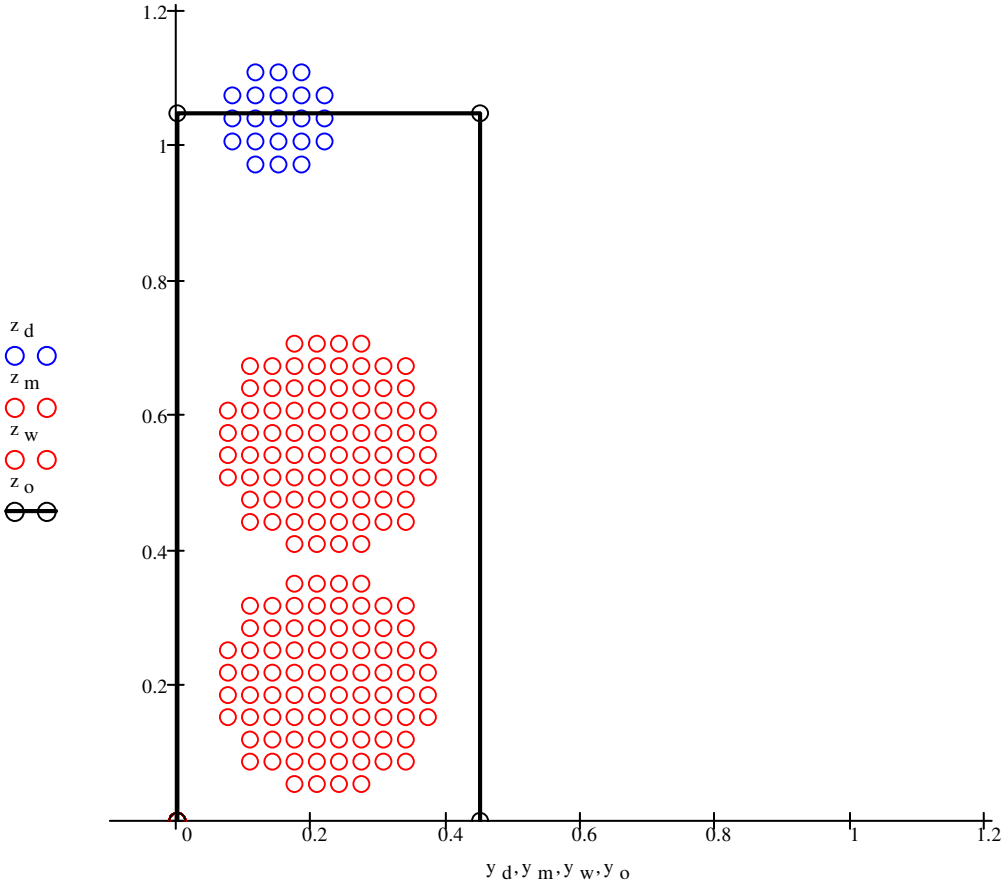
Floor Condition

$Reflect := 1$	(0 = hardwood or concrete, 1 = carpeted)

Refective Surface Selections (if 1 reflective surface is included, if 0 reflective surface is removed)

$Inc\_floor := 1$	(Floor, Z = 0)
$Inc\_rear := 0$	(Rear Wall, X = 0)
$Inc\_side := 0$	(Left Side Wall, Y = 0)
$Inc\_ceiling := 0$	(Ceiling)

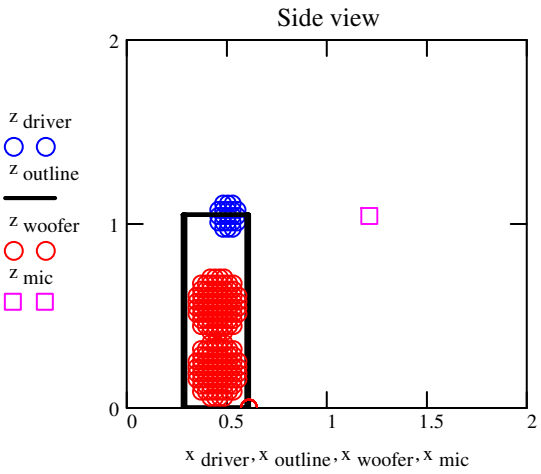
Extended Range Driver and Two Woofers : Simple Source Pattern with Baffle Edge Outline



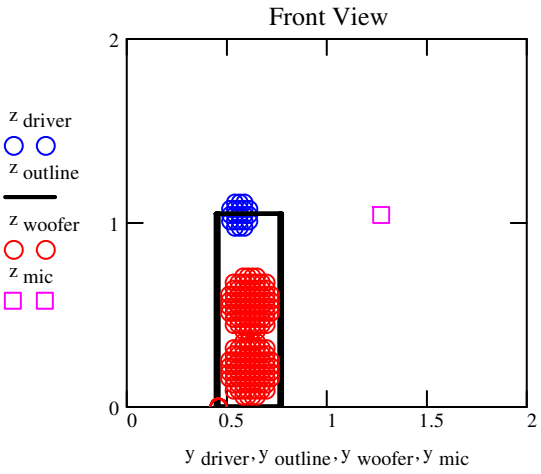
Three Dimensional View

Axis Length (m) axis := 2 <---- Change value of "axis" to rescale plots

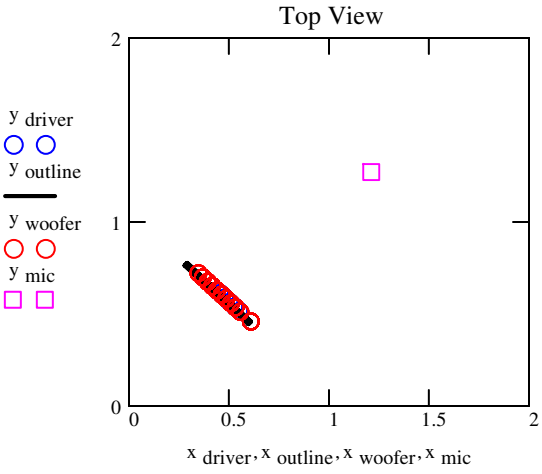
Room Corner is the Origin



Side View - looking out from side wall



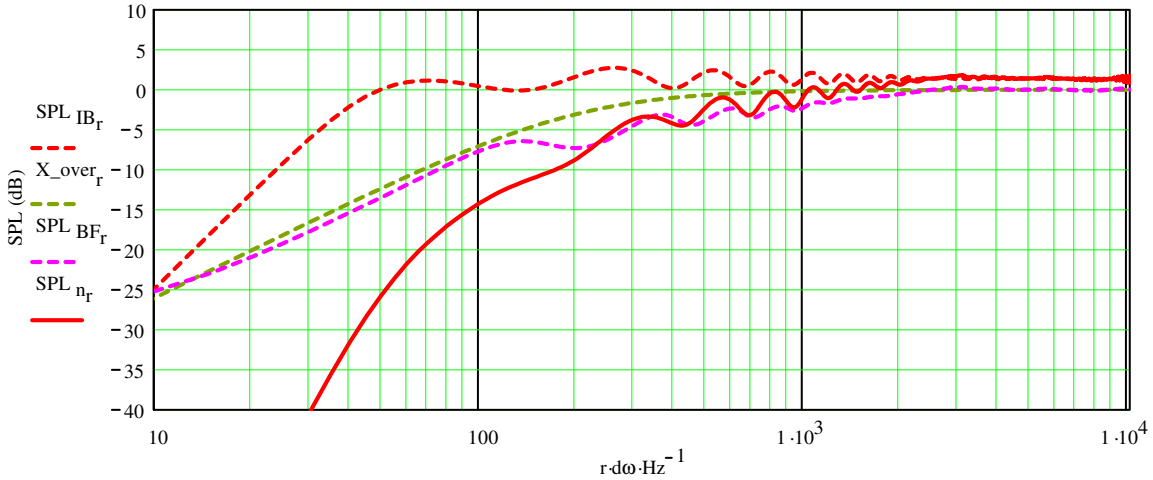
Front View - looking towards rear wall

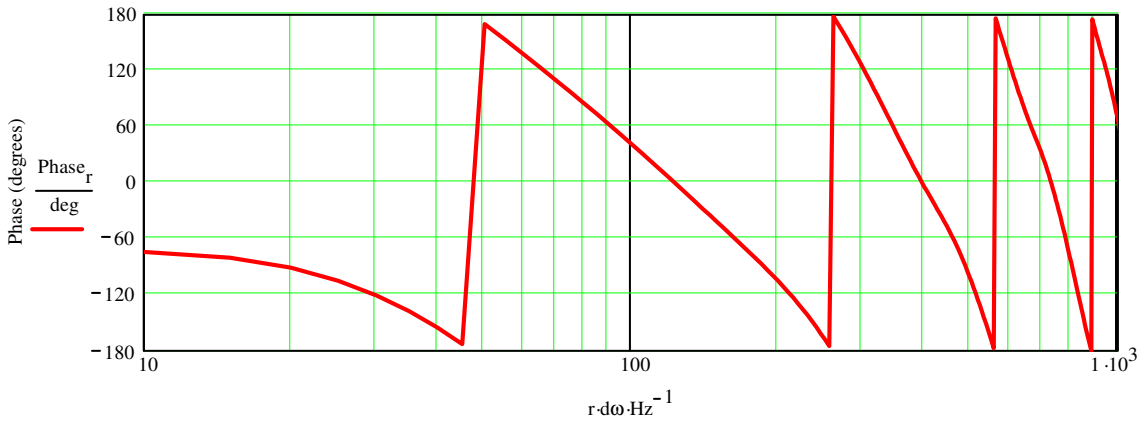


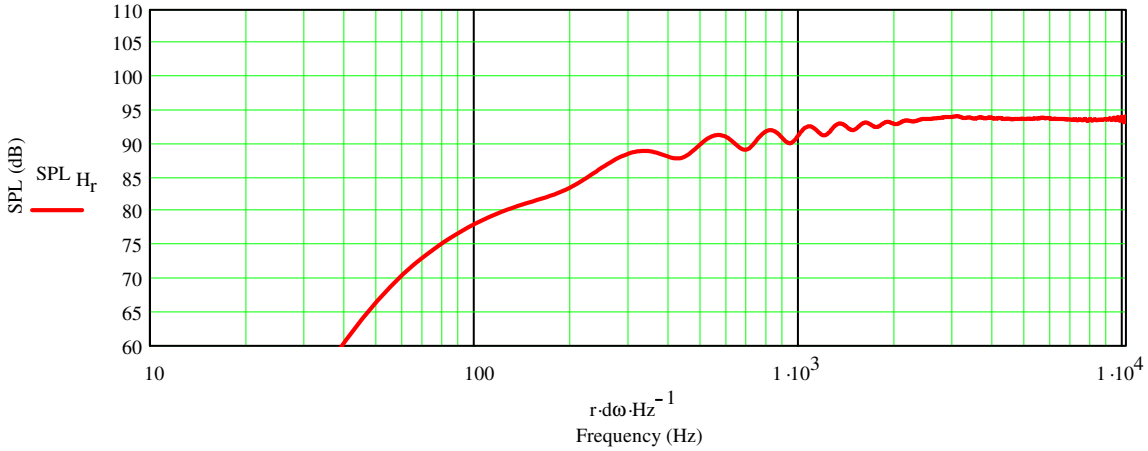
Top View - looking down from ceiling

Plotted Response for the Extended Range Driver

Dashed Red - Infinite Baffle Response
Dashed Magenta - Baffle Response
Dashed Brown - Crossover Response
Solid Red - Combined Response

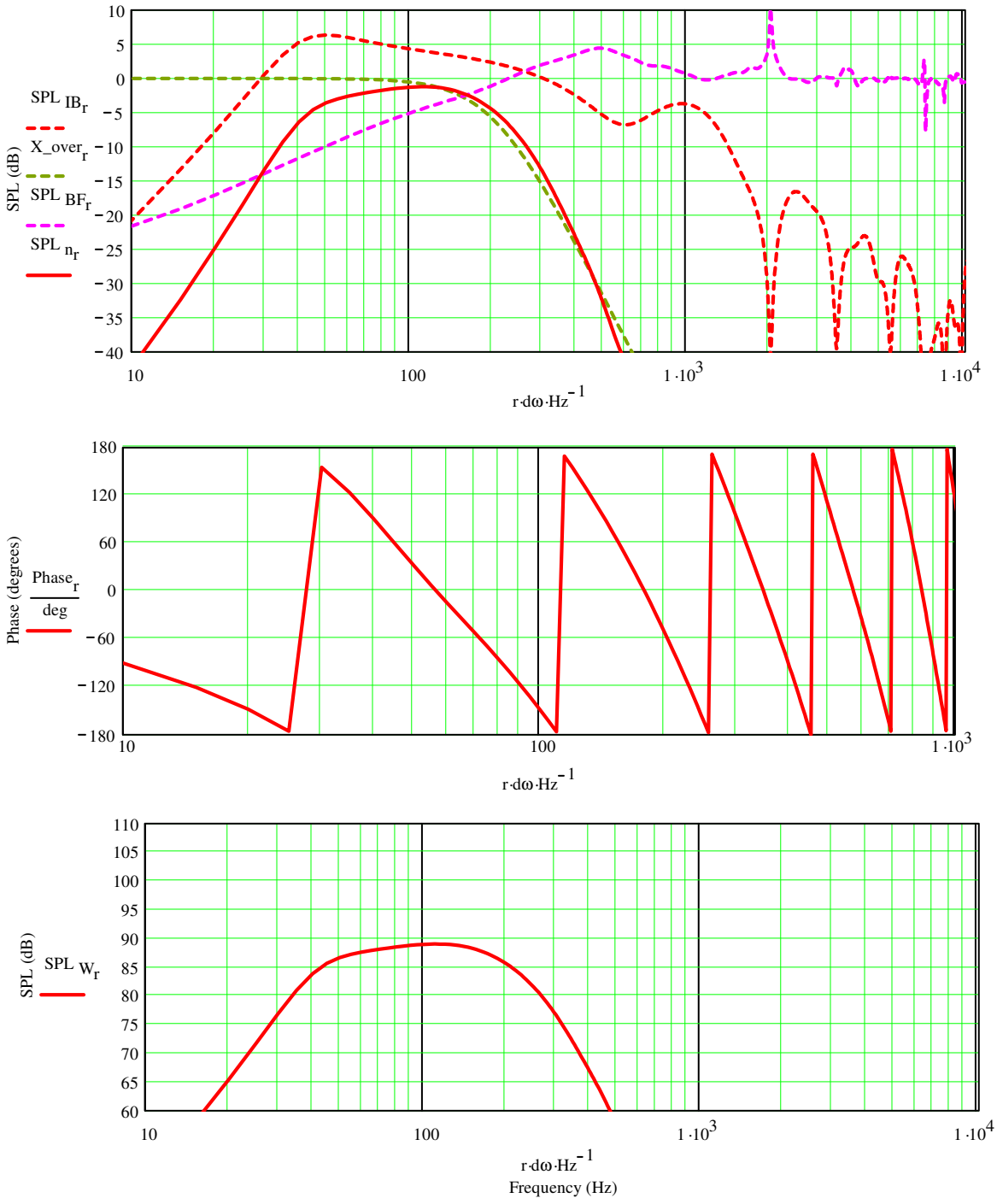






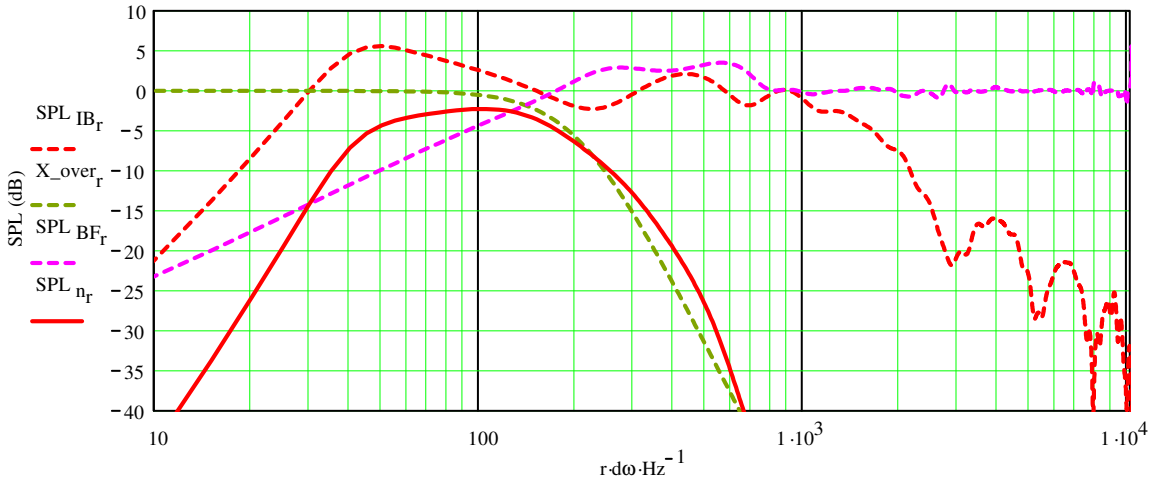
Plotted Response for the Lower Woofer Driver

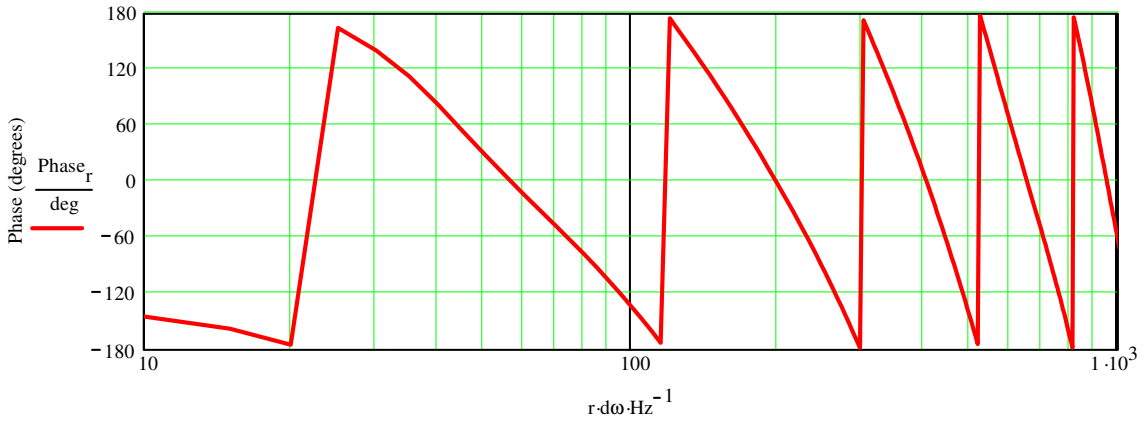
Dashed Red - Infinite Baffle Response
Dashed Magenta - Baffle Response
Dashed Brown - Crossover Response
Solid Red - Combined Response

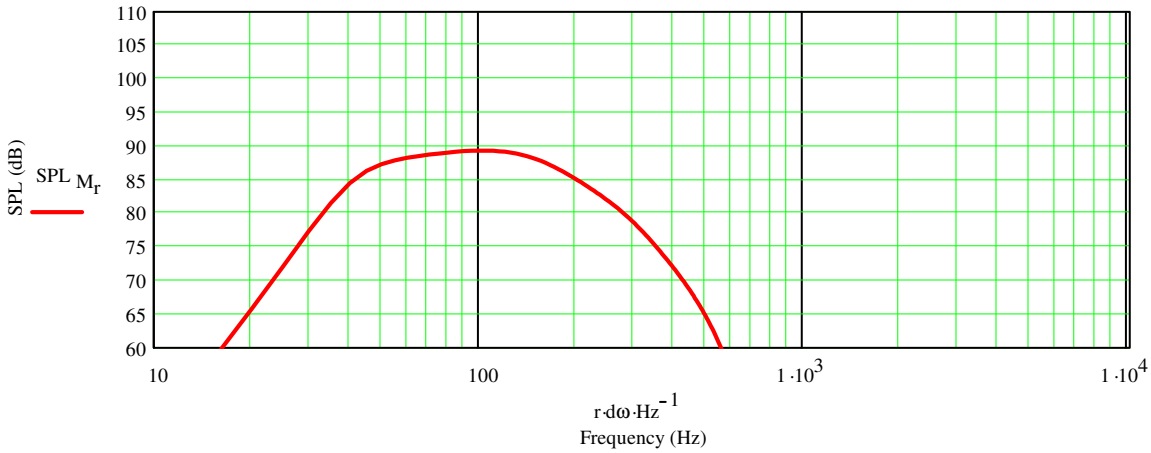


Plotted Response for the Upper Woofer Driver

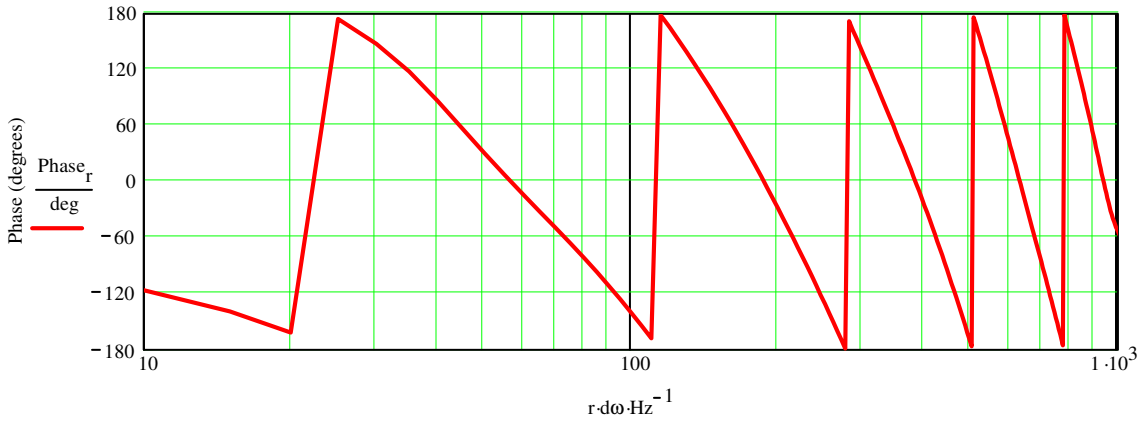
Dashed Red - Infinite Baffle Response
Dashed Magenta - Baffle Response
Dashed Brown - Crossover Response
Solid Red - Combined Response

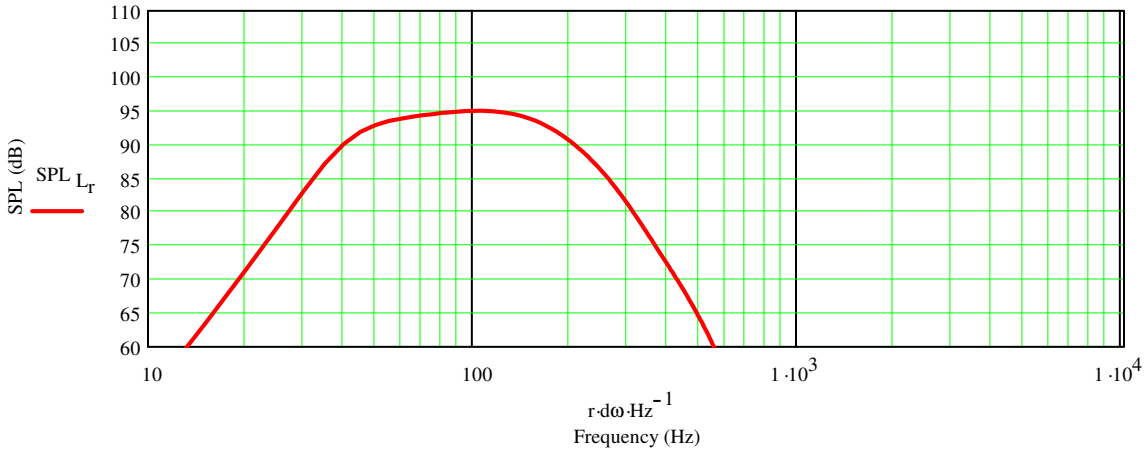




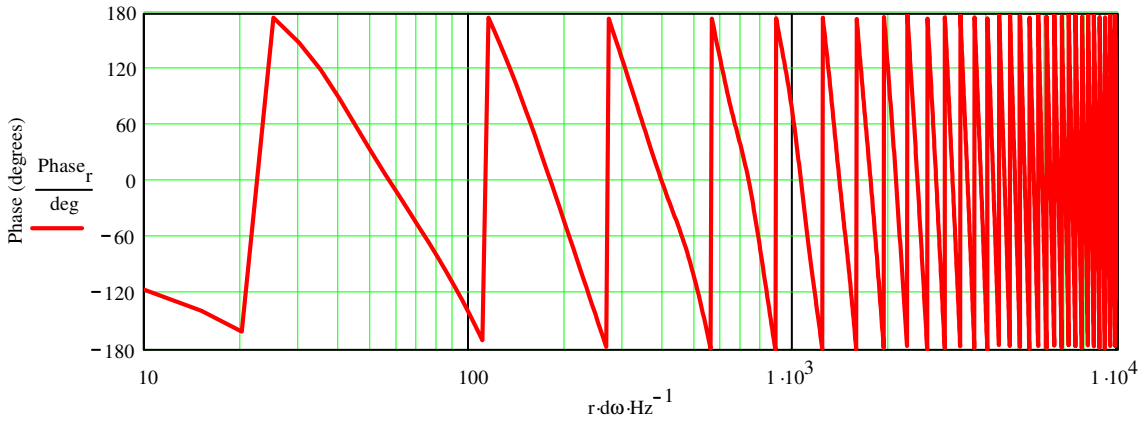


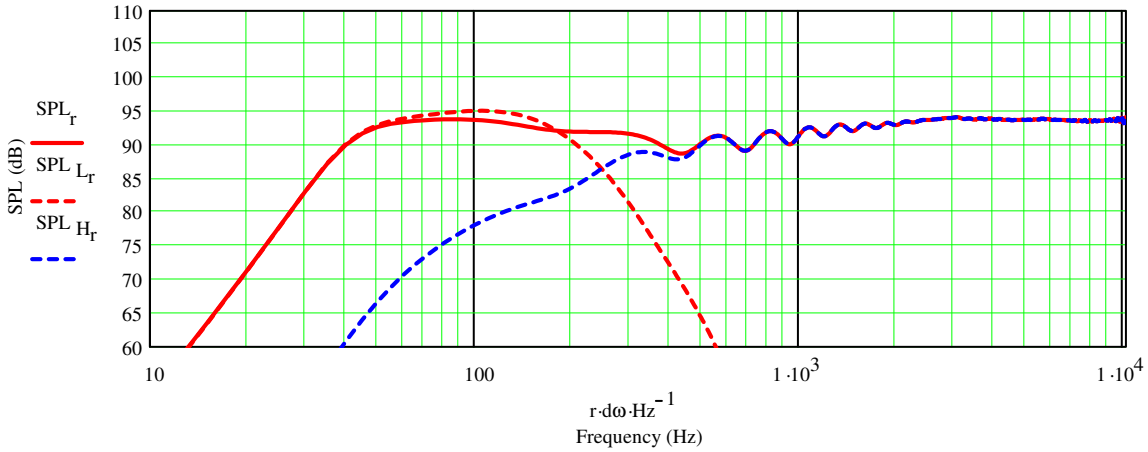
Plotted Combined Response for the Woofer Drivers





Plotted System Response for the Extended Range/Dual Woofer Open Baffle Design





System Time Response for an Impulse Input