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

Unit and Constant Definition

cycle := 2·π·rad

Hz := cycle·sec⁻¹

Air Density : ρ := 1.21·kg·m⁻³

Speed of Sound : c := 342·m·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·watt (Input Power, Applied Voltage Referenced to 8 ohm Driver)

Extended Range Driver Thiele / Small Parameters : Lowther PM2A

f_d := 56.3·Hz V_{ad} := 50.5·liter

R_e := 6.9·Ω Q_{ed} := 0.22

L_{vc} := 0.0·mH Q_{md} := 2.42

Bl := 10.18· $\frac{\text{newton}}{\text{amp}}$ Q_{td} := $\left(\frac{1}{Q_{ed}} + \frac{1}{Q_{md}}\right)^{-1}$

S_d := 206·cm² Q_{td} = 0.202



Bass Driver Thiele / Small Parameters : Parts Express Dayton 15" High Efficiency

f_d := 39.9·Hz V_{ad} := 164·liter

R_e := 5.9·Ω Q_{ed} := 0.405

L_{vc} := 1.71·mH Q_{md} := 4.366

Bl := 19.82· $\frac{\text{newton}}{\text{amp}}$ Q_{td} := $\left(\frac{1}{Q_{ed}} + \frac{1}{Q_{md}}\right)^{-1}$

S_d := 856.3·cm² Q_{td} = 0.371



Crossover Definition

For Even Order Crossovers :
Type 0 = No Crossover
Type 1 = Linkwitz-Riley
Type 2 = Bessel
Type 3 = BEC
Type 4 = Butterworth

Low Pass Filter

$$f_{LP} := 100 \cdot \text{Hz}$$

$$LP_{order} := 2$$

$$LP_{type} := 1$$

High Pass Filter

$$f_{HP} := 100 \cdot \text{Hz}$$

$$HP_{order} := 4$$

$$HP_{type} := 1$$

(Filter Frequency)

(Filter Order : 0, 1, 2, 3, or 4)

(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

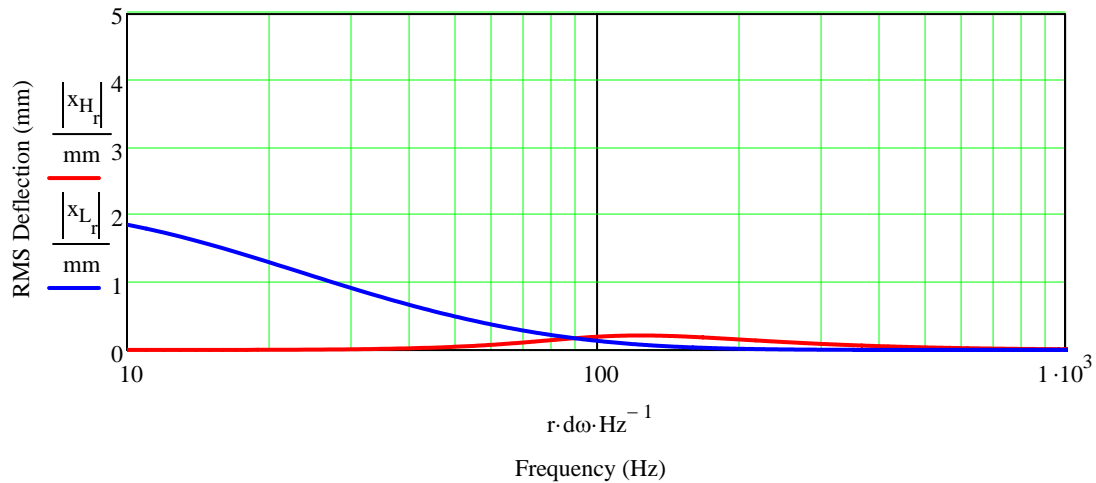
$$LP_{boost} := 3.5 \text{ dB}$$



End of Detailed Input

End of Part 1 Input

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



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
- x = horizontal direction
- y = 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.

Open Baffle Geometry Input

- width := 60·in (Front Baffle Width)
- height := 48·in (Front Baffle Height)
- dist := 24·in (Front Baffle Distance from Rear Wall, to Eliminate Rear Wall use 100 m)
- num_r := 9 (Number of Points per Quadrant of Baffle Edge)

Extended Range Driver Geometry Input

- x_{dc} := 30·in (Driver Center x Coordinate)
- y_{dc} := 40·in (Driver Center y Coordinate)
- n_high := 5 (Number of Points Across Diameter)

Woofers Driver Geometry Input

- x_{w1} := 30·in (Lower Driver Center x Coordinate)
- y_{w1} := 10·in (Lower Driver Center y Coordinate)
- x_{w2} := 30·in (Upper Driver Center x Coordinate)
- y_{w2} := 26·in (Upper Driver Center y Coordinate)
- n_low := 10 (Number of Points Across Diameter)

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

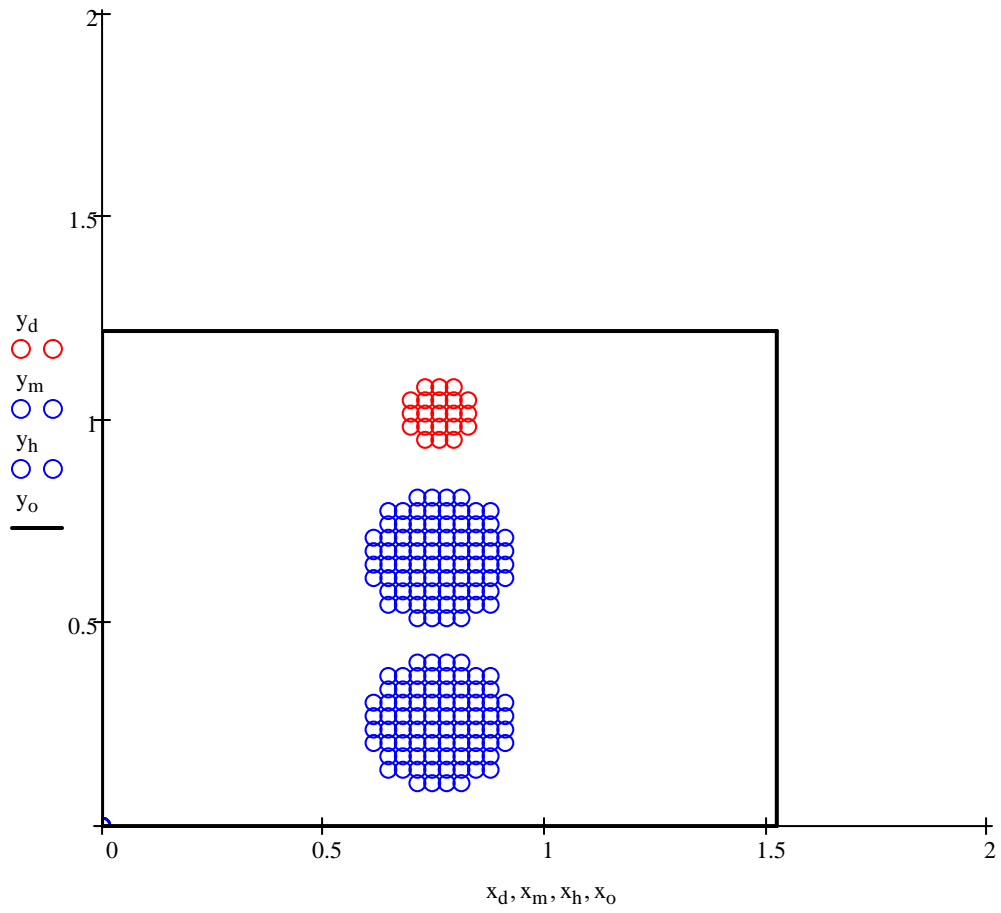
- radius := 1·m (Calculation Radius, Effective Radius is Greater if y_p is Changed from Default)
- θ := 0·deg (0 deg is along the Driver's Axis, -80 deg < θ < 80 deg)
- y_p := y_{dc} (Default Height is equal to Driver Height)

Floor Condition

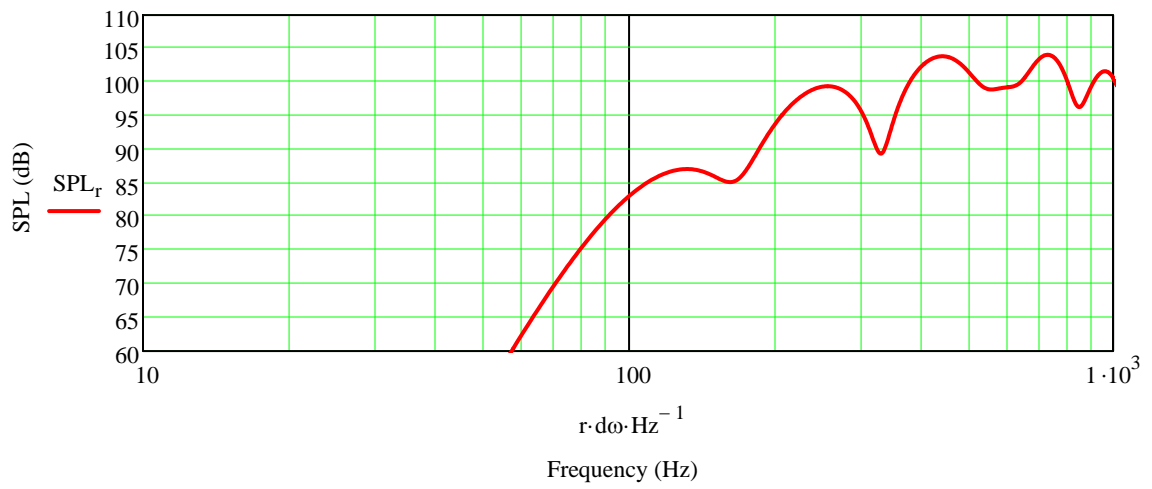
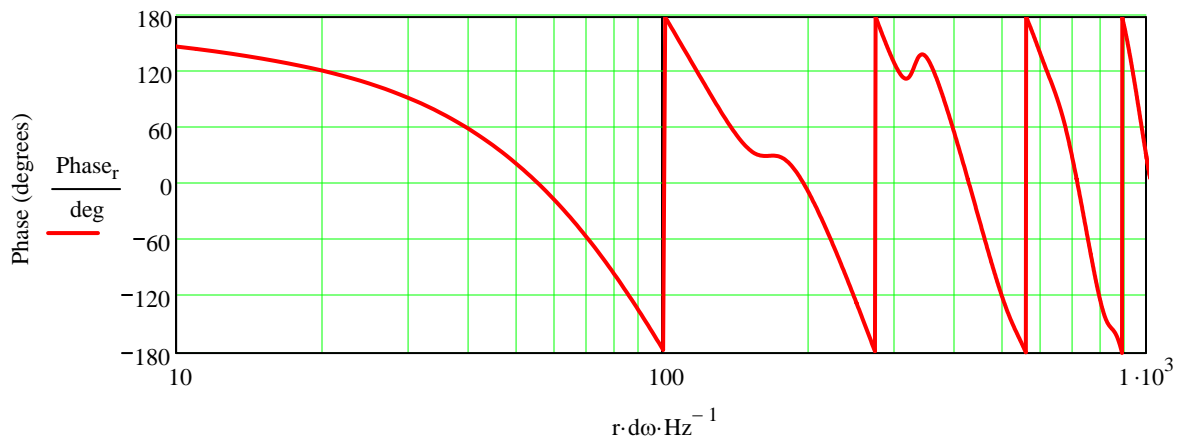
- Reflect := 1 (0 = hardwood or concrete, 1 = carpeted)



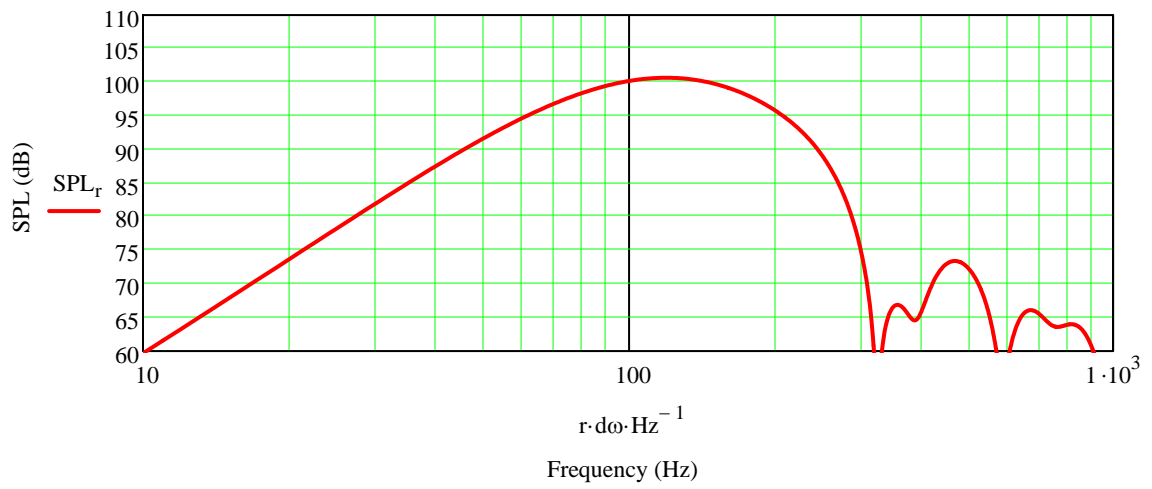
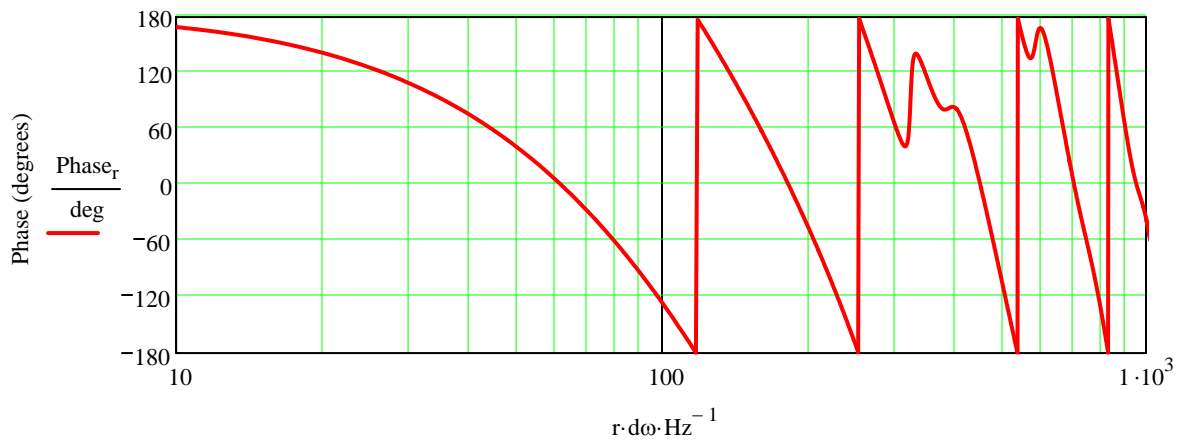
Extended Range Driver and Two Woofers : Simple Source Pattern with Baffle Edge Outline



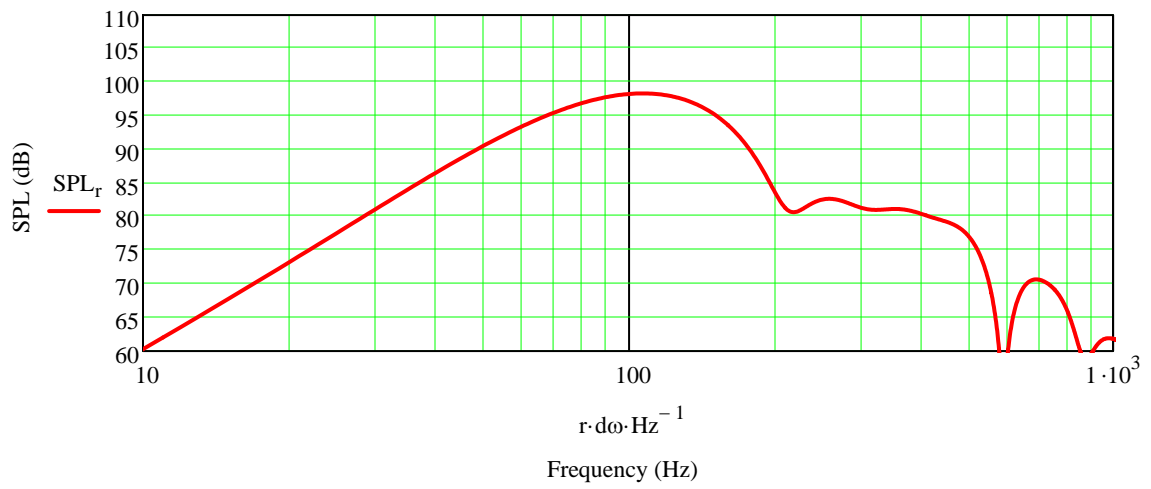
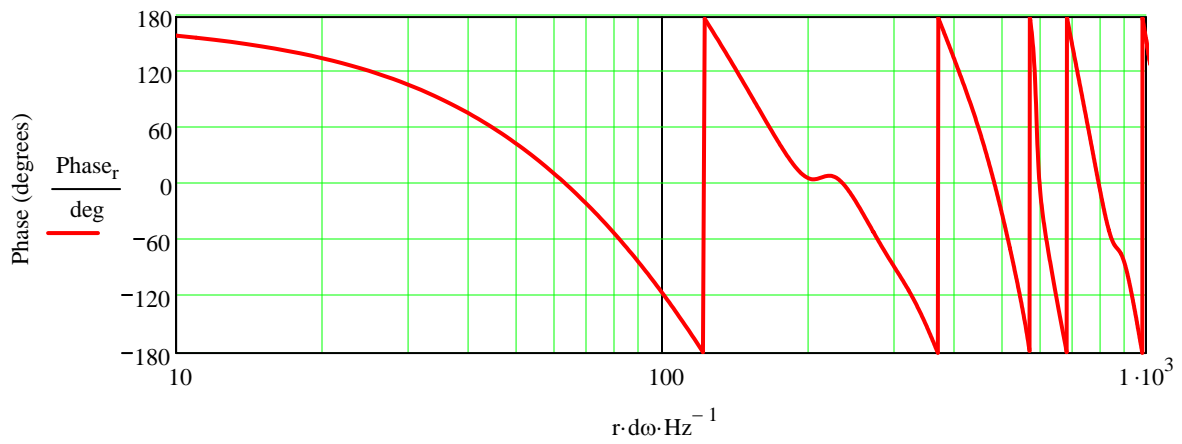
Plotted Response for the Extended Range Driver



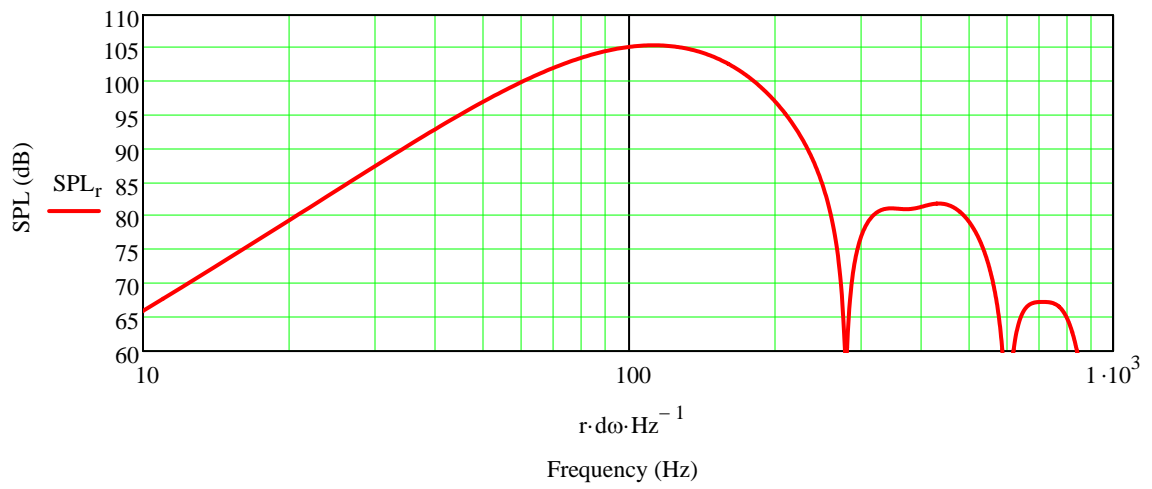
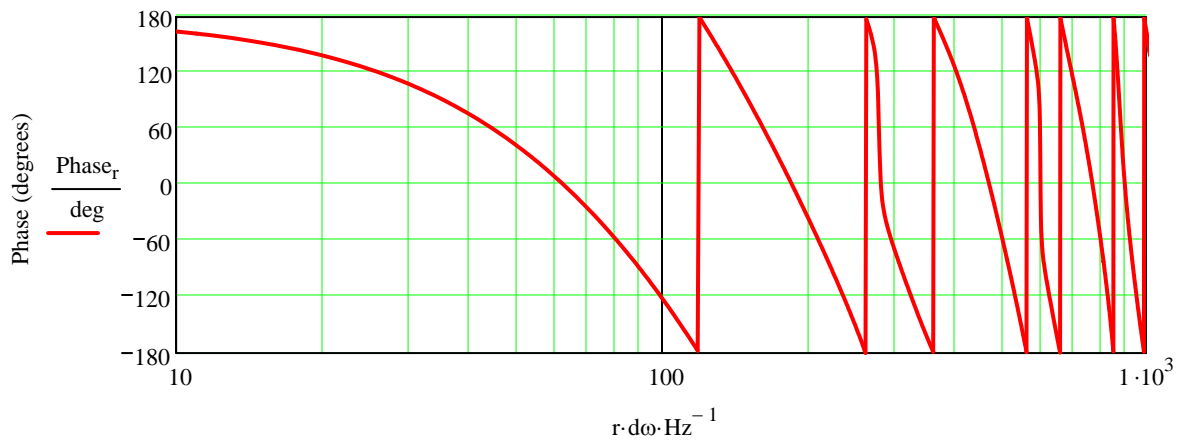
Plotted Response for the Lower Woofer Driver



Plotted Response for the Upper Woofer Driver



Plotted Combined Response for the Woofer Drivers



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

