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Line Configuration : Near End Closed.
 Offset Driver.
 Far End Open.

Unit and Constant Definition

$$\text{cycle} := 2 \cdot \pi \cdot \text{rad}$$

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

$$\text{Air Density : } \rho := 1.21 \cdot \text{kg} \cdot \text{m}^{-3}$$

$$\text{Speed of Sound : } c := 342 \cdot \text{m} \cdot \text{sec}^{-1}$$



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

Driver Thiele / Small Parameters : Fostex Fe166E

$$f_d := 50 \cdot \text{Hz}$$

$$V_{ad} := 45.11 \cdot \text{liter}$$

$$R_e := 7.1 \cdot \Omega$$

$$Q_{ed} := 0.22$$

$$L_{vc} := 0.01 \cdot \text{mH}$$

$$Q_{md} := 3.89$$

$$Bl := 8.33 \cdot \frac{\text{newton}}{\text{amp}}$$

$$Q_{td} := \left(\frac{1}{Q_{ed}} + \frac{1}{Q_{md}} \right)^{-1}$$

$$S_d := 133 \cdot \text{cm}^2$$

$$Q_{td} = 0.208$$

Enclosure Geometry Definition

$$L := 64.9 \cdot \text{in}$$

(Length)

$$\xi := 25.6 \cdot \text{in} \cdot L^{-1}$$

(Driver Position Ratio)

$$S_0 := 0.5 \cdot S_d$$

(Area of the Top End)

$$S_L := 2.4 \cdot S_d$$

(Area of the Bottom End)

$$\text{Density} := 0.0000005 \cdot \text{lb} \cdot \text{ft}^{-3}$$

(Stuffing density : $0 \text{ lb/ft}^3 < D < 1 \text{ lb/ft}^3$)

Transmission Line Definition

$$(0 \text{ lb/ft}^3 < D < 1 \text{ lb/ft}^3)$$

$$n_{\text{closed}} := 4$$

$$(n_{\text{closed}} > 1)$$

$$n_{\text{open}} := 4$$

$$(n_{\text{open}} > 1)$$

Geometry Definition

$$TR := (S_L - S_0) \cdot L^{-1}$$

$$TR = 0.015 \text{ m}$$

Closed End of Transmission Line**(Driver ----> Closed End)****Section Length****Initial Area****Final Area****Stuffing Density**

$$L_{c_0} := L \cdot \xi \cdot (n_{\text{closed}} + 1)^{-1}$$

$$S_{c_{0,0}} := S_0 + TR \cdot \xi \cdot L$$

$$S_{c_{0,1}} := S_{c_{0,0}} - TR \cdot L_{c_0}$$

$$D_{c_0} := \text{Density}$$

$$L_{c_1} := L \cdot \xi \cdot (n_{\text{closed}} + 1)^{-1}$$

$$S_{c_{1,0}} := S_{c_{0,1}}$$

$$S_{c_{1,1}} := S_{c_{1,0}} - TR \cdot L_{c_1}$$

$$D_{c_1} := \text{Density}$$

$$L_{c_2} := L \cdot \xi \cdot (n_{\text{closed}} + 1)^{-1}$$

$$S_{c_{2,0}} := S_{c_{1,1}}$$

$$S_{c_{2,1}} := S_{c_{2,0}} - TR \cdot L_{c_2}$$

$$D_{c_2} := \text{Density}$$

$$L_{c_3} := L \cdot \xi \cdot (n_{\text{closed}} + 1)^{-1}$$

$$S_{c_{3,0}} := S_{c_{2,1}}$$

$$S_{c_{3,1}} := S_{c_{3,0}} - TR \cdot L_{c_3}$$

$$D_{c_3} := \text{Density}$$

$$L_{c_4} := L \cdot \xi \cdot (n_{\text{closed}} + 1)^{-1}$$

$$S_{c_{4,0}} := S_{c_{3,1}}$$

$$S_{c_{4,1}} := S_0$$

$$D_{c_4} := \text{Density}$$

Open End of Transmission Line**(Driver ----> Open End)****Section Length****Initial Area****Final Area****Stuffing Density**

$$L_{o_0} := L \cdot (1 - \xi) \cdot (n_{\text{open}} + 1)^{-1}$$

$$S_{o_{0,0}} := S_{c_{0,0}}$$

$$S_{o_{0,1}} := S_{o_{0,0}} + TR \cdot L_{o_0}$$

$$D_{o_0} := \text{Density}$$

$$L_{o_1} := L \cdot (1 - \xi) \cdot (n_{\text{open}} + 1)^{-1}$$

$$S_{o_{1,0}} := S_{o_{0,1}}$$

$$S_{o_{1,1}} := S_{o_{1,0}} + TR \cdot L_{o_1}$$

$$D_{o_1} := \text{Density}$$

$$L_{o_2} := L \cdot (1 - \xi) \cdot (n_{\text{open}} + 1)^{-1}$$

$$S_{o_{2,0}} := S_{o_{1,1}}$$

$$S_{o_{2,1}} := S_{o_{2,0}} + TR \cdot L_{o_2}$$

$$D_{o_2} := \text{Density}$$

$$L_{o_3} := L \cdot (1 - \xi) \cdot (n_{\text{open}} + 1)^{-1}$$

$$S_{o_{3,0}} := S_{o_{2,1}}$$

$$S_{o_{3,1}} := S_{o_{3,0}} + TR \cdot L_{o_3}$$

$$D_{o_3} := \text{Density}$$

$$L_{o_4} := L \cdot (1 - \xi) \cdot (n_{\text{open}} + 1)^{-1}$$

$$S_{o_{4,0}} := S_{o_{3,1}}$$

$$S_{o_{4,1}} := S_L$$

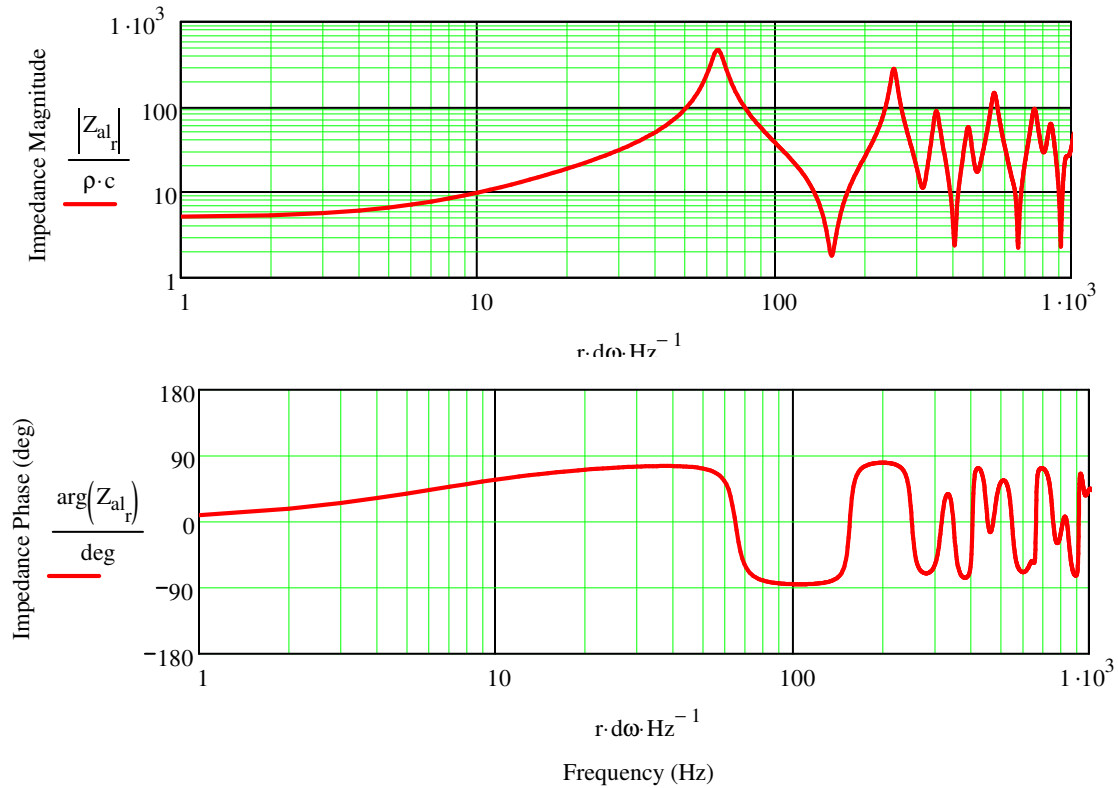
$$D_{o_4} := \text{Density}$$

Total Length of the Transmission Line

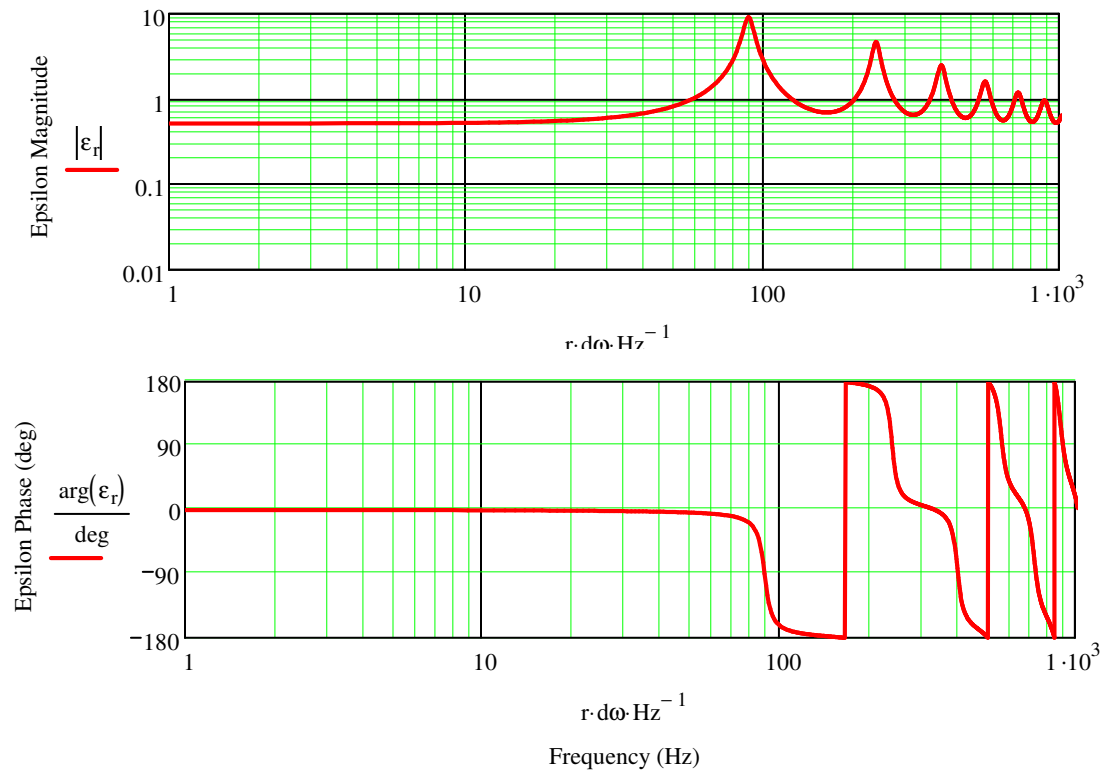
$$\sum_{i=0}^{n_{\text{closed}}} L_{c_i} + \sum_{i=0}^{n_{\text{open}}} L_{o_i} = 64.900 \text{ in}$$



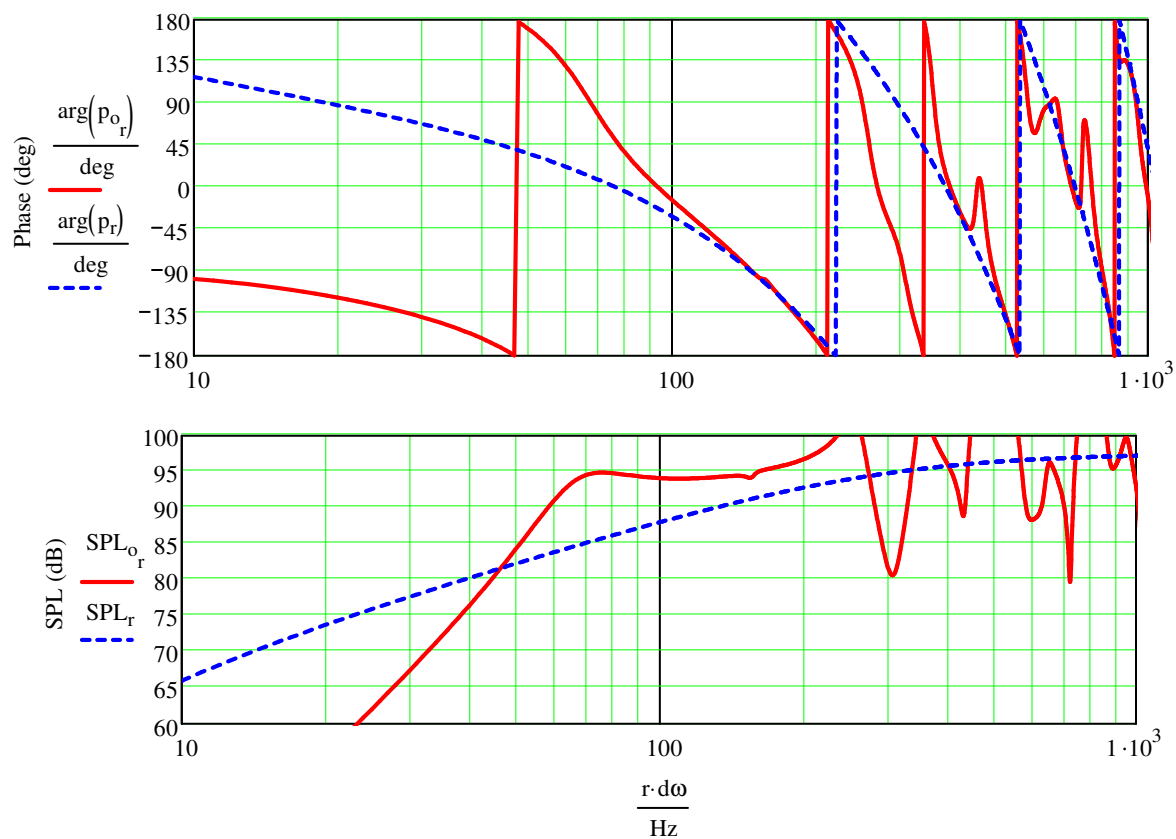
Resulting Acoustic Impedance for the Transmission Line



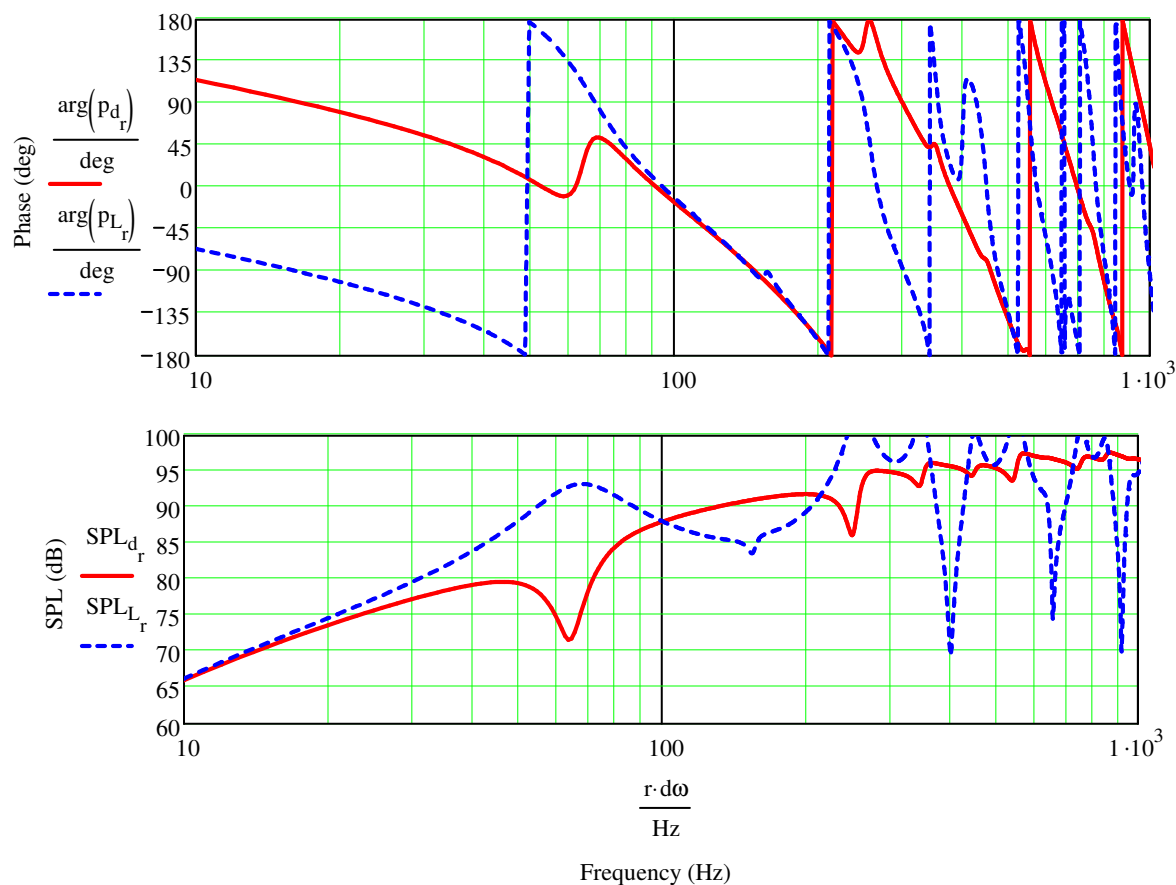
Velocity at the Terminus of the Transmission Line for a 1 m/sec Driver Excitation



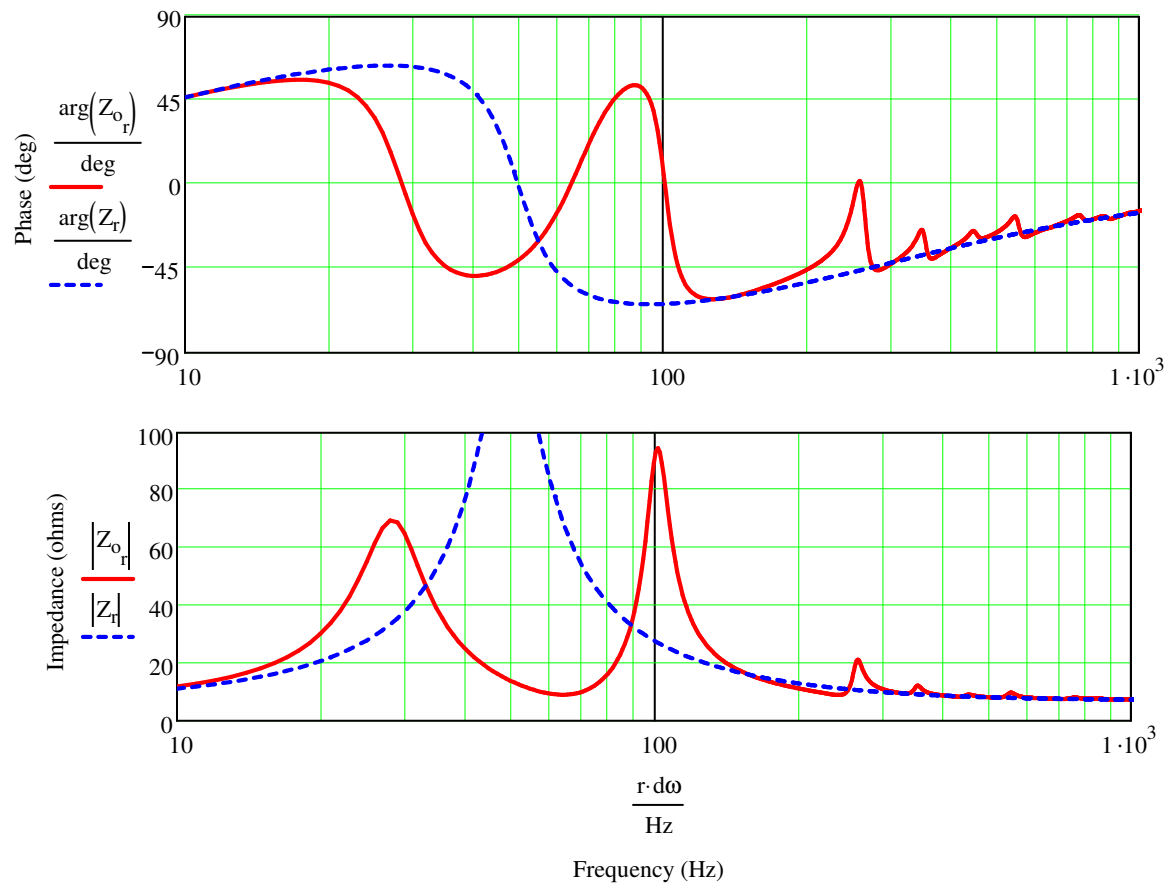
Far Field Transmission Line System and Infinite Baffle Sound Pressure Level Responses



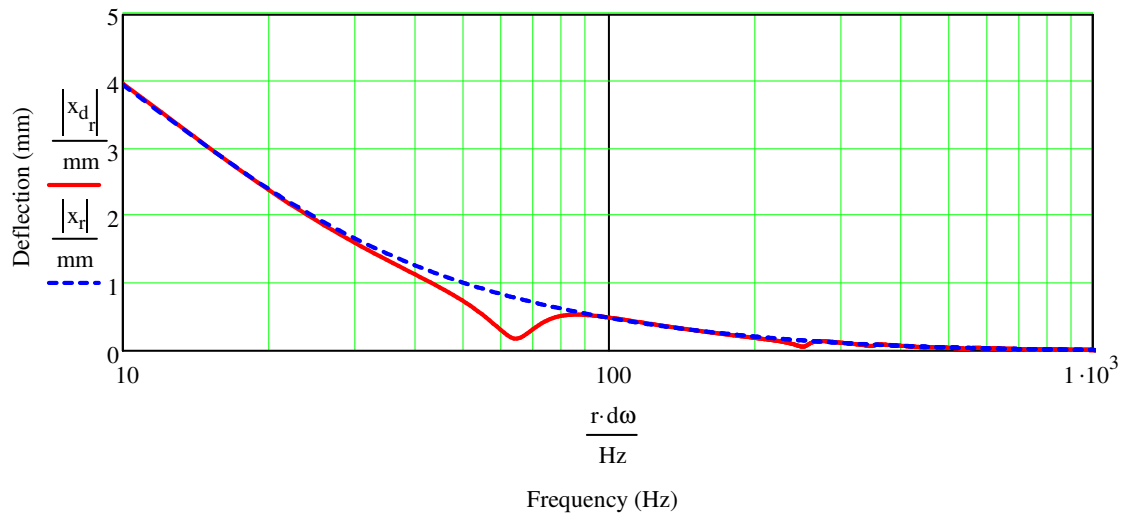
Woofer and Terminus Far Field Sound Pressure Level Responses



Transmission Line System and Infinite Baffle Impedance



Woofer Displacement



System Time Response for an Impulse Input

