

Driver in a ML TQWT - Acoustic and Electrical Response

End of
Abbreviated

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User Input

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Unit and Constant Definition

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

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

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

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

Part 1 : Thiele-Small Consistent Calculation

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

Series Resistance

$$R_{\text{add}} := 0.0 \cdot \Omega$$

Driver Thiele / Small Parameters : 21W38 Average Driver Properties

$$f_d := 64 \cdot \text{Hz}$$

$$V_{\text{ad}} := 20.6 \cdot \text{liter}$$

Adjustments

$$R_e := 3.7 \cdot \Omega$$

$$Q_{\text{ed}} := 1.15$$

$$R_e := R_e + R_{\text{add}}$$

$$L_{\text{vc}} := 0 \cdot \text{mH}$$

$$Q_{\text{md}} := 3.05$$

$$Q_{\text{ed}} := Q_{\text{ed}} \cdot R_e \cdot (R_e - R_{\text{add}})^{-1}$$

$$Bl := 5.65 \frac{\text{newton}}{\text{amp}}$$

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

$$S_d := 240.52 \cdot \text{cm}^2$$

$$Q_{\text{td}} = 0.838$$

Enclosure Geometry Definition : Model of Internal Air Volume

$$L := 60 \cdot \text{in}$$

(Internal Height)

$$z_{\text{driver}} := 30 \cdot \text{in}$$

(Driver Internal Distance From Top < Height)

$$z_{\text{port}} := 56 \cdot \text{in}$$

(Port Internal Distance From Top < Height)

$$S_0 := 8.5 \cdot \text{in} \cdot 10 \cdot \text{in}$$

(Internal Area of the Top End, $z = 0$)

$$S_L := 8.5 \cdot \text{in} \cdot 10 \cdot \text{in}$$

(Internal Area of the Bottom End, $z = L$)

$$\text{Density} := 0.25 \cdot \text{lb} \cdot \text{ft}^{-3}$$

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

$$r_{\text{port}} := 2 \cdot \text{in}$$

(Inside Radius of the Port)

$$L_{\text{port}} := 0.75 \cdot \text{in}$$

(Length of the Port)

$$\text{Power} := 6 \cdot \text{watt}$$

(Input Power, Applied Voltage Referenced to 8 ohm Driver)

End of Abbreviated User Input

Pre Formated Geometry and Stuffing Location Input (Only Edit Details Below to Change Defaults)

Ported Box Definition

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

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

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

$$x_{\text{top}} := z_{\text{drive1}}$$

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

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

$$x_{\text{open}} := z_{\text{port}} - z_{\text{drive1}}$$

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

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

$$x_{\text{bottom}} := L - z_{\text{port}}$$

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

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

$$x_{\text{port}} := L_{\text{port}} + 0.6 r_{\text{port}}$$

Geometry Definition

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

$$TR = 0 \text{ m}$$

$$S_D := S_0 + TR \cdot z_{\text{drive1}}$$

$$S_D = 0.055 \text{ m}^2$$

$$S_P := S_0 + TR \cdot z_{\text{port}}$$

$$S_P = 0.055 \text{ m}^2$$

Top Section of Enclosure

(Driver ---> Top of Enclosure)

Section Length

Initial Area

Final Area

Stuffing Density

$$L_{c_0} := x_{\text{top}} \cdot (n_{\text{top}} + 1)^{-1}$$

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

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

$$D_{c_0} := 4 \text{ Density}$$

$$L_{c_1} := x_{\text{top}} \cdot (n_{\text{top}} + 1)^{-1}$$

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

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

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

$$L_{c_2} := x_{\text{top}} \cdot (n_{\text{top}} + 1)^{-1}$$

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

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

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

$$L_{c_3} := x_{\text{top}} \cdot (n_{\text{top}} + 1)^{-1}$$

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

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

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

$$L_{c_4} := x_{\text{top}} \cdot (n_{\text{top}} + 1)^{-1}$$

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

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

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

Open Section of Enclosure

(Driver ---> Port Position)

Section Length

Initial Area

Final Area

Stuffing Density

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

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

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

$$D_{o_0} := 4 \text{ Density}$$

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

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

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

$$D_{o_1} := 0.5 \cdot \text{Density}$$

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

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

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

$$D_{o_2} := 0.0 \text{ lb} \cdot \text{ft}^{-3}$$

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

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

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

$$D_{o_3} := 0.0 \text{ lb} \cdot \text{ft}^{-3}$$

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

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

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

$$D_{o_4} := 0.0 \text{ lb} \cdot \text{ft}^{-3}$$

Bottom Section of Enclosure

(Port Position ---> Bottom of Enclosure)

Section Length	Initial Area	Final Area	Stuffing Density
$L_{b_0} := x_{\text{bottom}} \cdot (n_{\text{bottom}} + 1)^{-1}$	$S_{b_{0,0}} := S_p$	$S_{b_{0,1}} := S_{b_{0,0}} + TR \cdot L_{b_0}$	$D_{b_0} := 0.0 \cdot \text{lb} \cdot \text{ft}^{-3}$
$L_{b_1} := x_{\text{bottom}} \cdot (n_{\text{bottom}} + 1)^{-1}$	$S_{b_{1,0}} := S_{b_{0,1}}$	$S_{b_{1,1}} := S_{b_{1,0}} + TR \cdot L_{b_1}$	$D_{b_1} := 0.0 \cdot \text{lb} \cdot \text{ft}^{-3}$
$L_{b_2} := x_{\text{bottom}} \cdot (n_{\text{bottom}} + 1)^{-1}$	$S_{b_{2,0}} := S_{b_{1,1}}$	$S_{b_{2,1}} := S_{b_{2,0}} + TR \cdot L_{b_2}$	$D_{b_2} := 0.0 \cdot \text{lb} \cdot \text{ft}^{-3}$
$L_{b_3} := x_{\text{bottom}} \cdot (n_{\text{bottom}} + 1)^{-1}$	$S_{b_{3,0}} := S_{b_{2,1}}$	$S_{b_{3,1}} := S_{b_{3,0}} + TR \cdot L_{b_3}$	$D_{b_3} := 0.0 \cdot \text{lb} \cdot \text{ft}^{-3}$
$L_{b_4} := x_{\text{bottom}} \cdot (n_{\text{bottom}} + 1)^{-1}$	$S_{b_{4,0}} := S_{b_{3,1}}$	$S_{b_{4,1}} := S_L$	$D_{b_4} := 0.0 \cdot \text{lb} \cdot \text{ft}^{-3}$

Port Section of Enclosure

(Port Inside ---> Port Outside)

Section Length	Initial Area	Final Area	Stuffing Density
$L_{p_0} := x_{\text{port}} \cdot (n_{\text{port}} + 1)^{-1}$	$S_{p_{0,0}} := \pi \cdot r_{\text{port}}^2$	$S_{p_{0,1}} := \pi \cdot r_{\text{port}}^2$	$D_{p_0} := 0.1 \cdot \text{lb} \cdot \text{ft}^{-3}$
$L_{p_1} := x_{\text{port}} \cdot (n_{\text{port}} + 1)^{-1}$	$S_{p_{1,0}} := S_{p_{0,1}}$	$S_{p_{1,1}} := \pi \cdot r_{\text{port}}^2$	$D_{p_1} := 0.1 \cdot \text{lb} \cdot \text{ft}^{-3}$
$L_{p_2} := x_{\text{port}} \cdot (n_{\text{port}} + 1)^{-1}$	$S_{p_{2,0}} := S_{p_{1,1}}$	$S_{p_{2,1}} := \pi \cdot r_{\text{port}}^2$	$D_{p_2} := 0.1 \cdot \text{lb} \cdot \text{ft}^{-3}$
$L_{p_3} := x_{\text{port}} \cdot (n_{\text{port}} + 1)^{-1}$	$S_{p_{3,0}} := S_{p_{2,1}}$	$S_{p_{3,1}} := \pi \cdot r_{\text{port}}^2$	$D_{p_3} := 0.1 \cdot \text{lb} \cdot \text{ft}^{-3}$
$L_{p_4} := x_{\text{port}} \cdot (n_{\text{port}} + 1)^{-1}$	$S_{p_{4,0}} := S_{p_{3,1}}$	$S_{p_{4,1}} := \pi \cdot r_{\text{port}}^2$	$D_{p_4} := 0.1 \cdot \text{lb} \cdot \text{ft}^{-3}$

Total Amount of Stuffing

$$\sum_{r=0}^{n_{\text{top}}} \left(\frac{S_{c_{r,0}} + S_{c_{r,1}}}{2} \cdot L_{c_r} \cdot D_{c_r} \right) + \sum_{r=0}^{n_{\text{open}}} \left(\frac{S_{o_{r,0}} + S_{o_{r,1}}}{2} \cdot L_{o_r} \cdot D_{o_r} \right) \dots = 0.879 \text{lb}$$

$$+ \sum_{r=0}^{n_{\text{bottom}}} \left(\frac{S_{b_{r,0}} + S_{b_{r,1}}}{2} \cdot L_{b_r} \cdot D_{b_r} \right) + \sum_{r=0}^{n_{\text{port}}} \left(\frac{S_{p_{r,0}} + S_{p_{r,1}}}{2} \cdot L_{p_r} \cdot D_{p_r} \right)$$

End of Pre Formatted Default Input

End of Part 1 Input