

Brines

Acoustics

Quarter Wave Generators

Transmission Lines

Negative Taper Transmission Lines

Tapered Quarter Wave Tubes

‘Voigt Pipes’

Mass-Loaded Transmission Lines

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Simulations

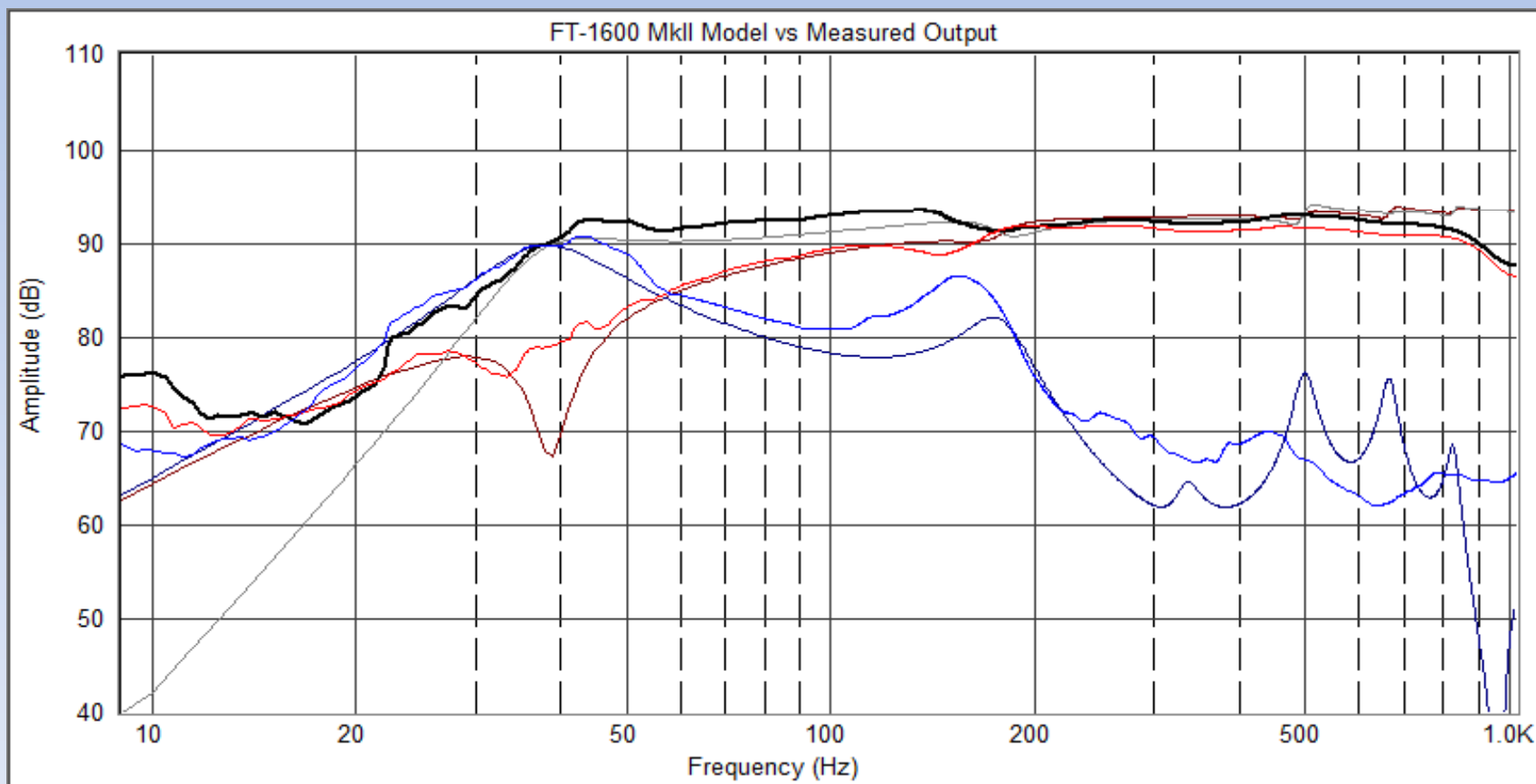
Martin J. King MathCAD Worksheets

Fostex FE167E



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Modeled Vs Measured



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Simulation Rules

$$F_p = F_s = 50\text{Hz}$$

$$V_p \sim V_{as} = 32 \text{ Liters}$$

Driver position to cancel first or second overtone

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Transmission Line

(Straight End-Loaded Lines)



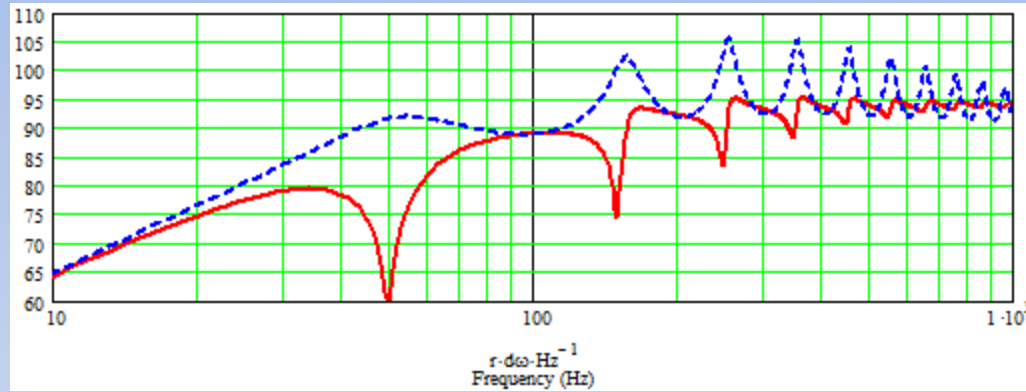
$$L = 62\frac{1}{2}''$$

$$S_0 = S_L = 3 * S_d (62\text{in}^2)$$

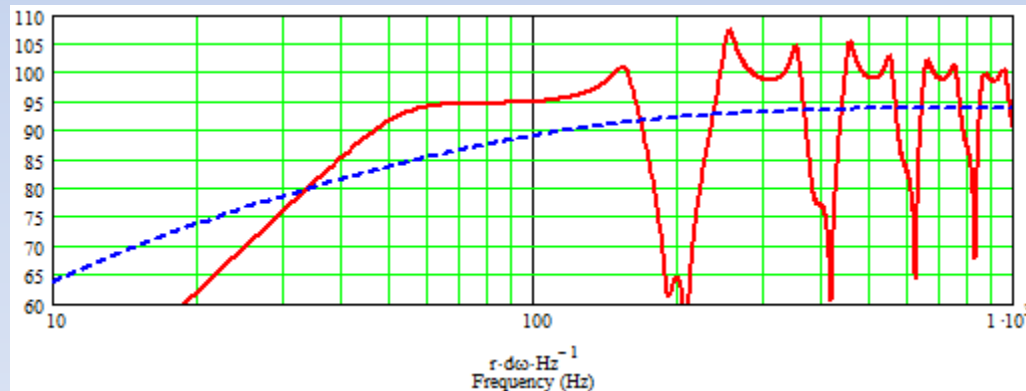
Driver at closed end of pipe

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Transmission Line (unstuffed)



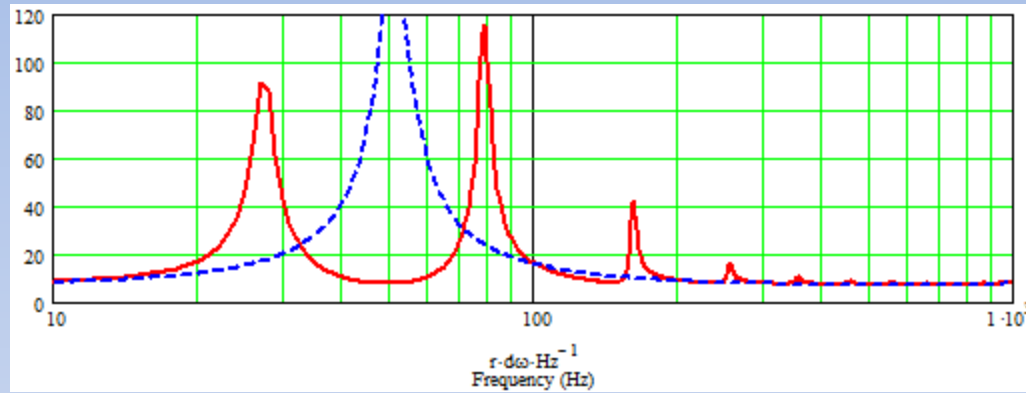
Driver(red) and Port(blue) Output



Combined Driver and Port Output(red)
Infinite Baffle Output(blue)

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**Transmission Line
(unstuffed)**



TL Impedance(red) and Infinite Baffle Impedance(blue)

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Characteristics of a Transmission Line

Sharp 24dB/octave cut-off

A double humped impedance curve

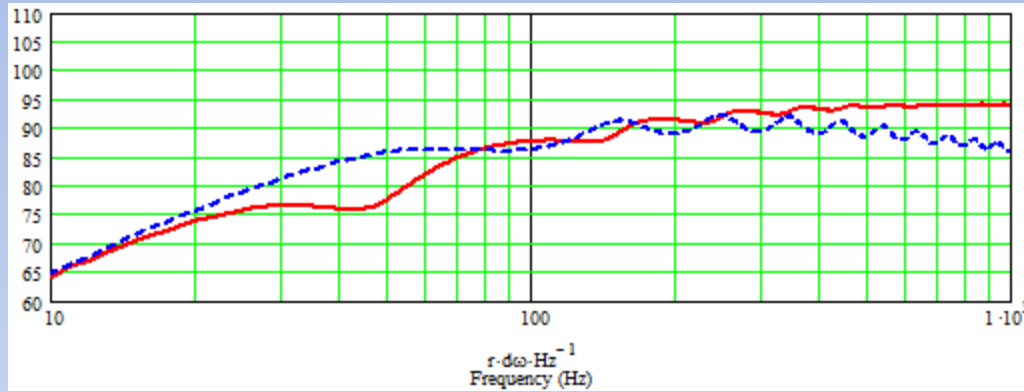
Strong combined output at the bottom end

Driver and port out of phase every other harmonic

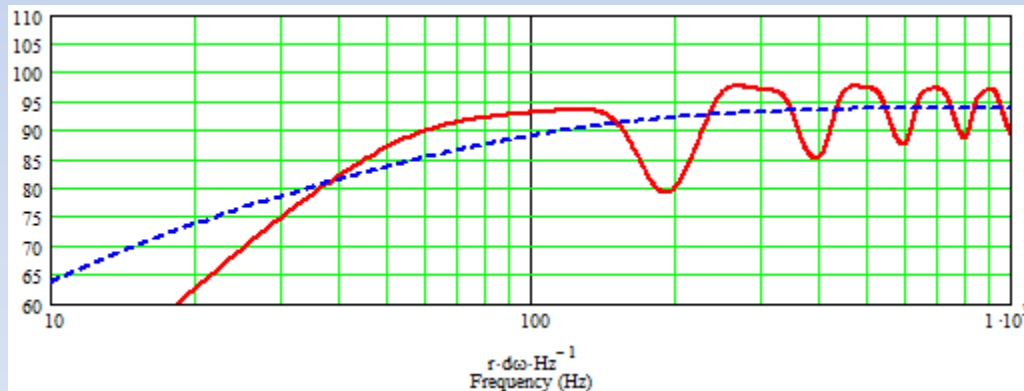
Flat to cut-off response will be boomy in-room

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Transmission Line (lightly stuffed)



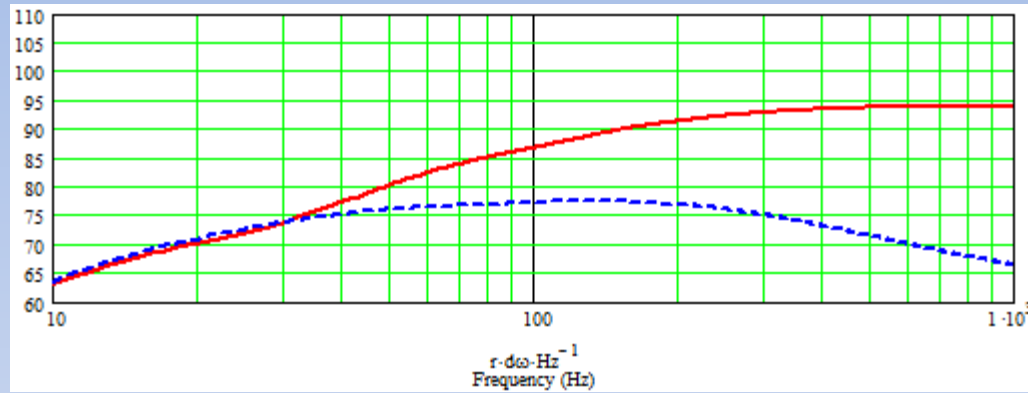
Driver(red) and Port(blue) Output



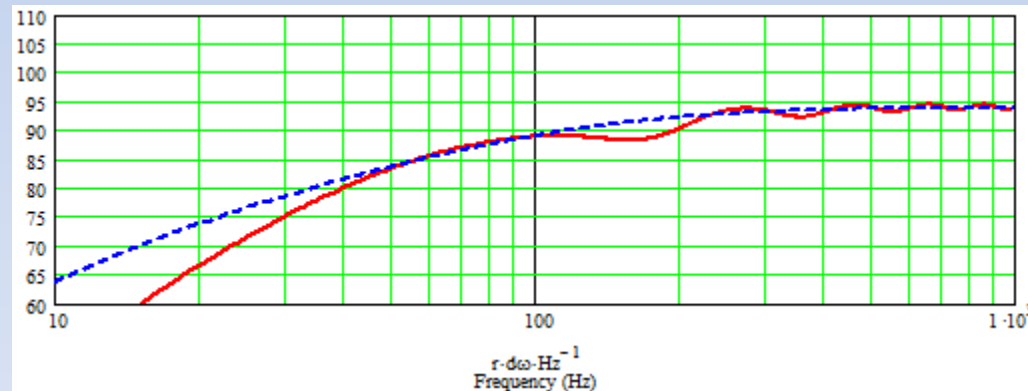
Combined Driver and Port Output(red)
Infinite Baffle Output(blue)

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Transmission Line (heavily stuffed)



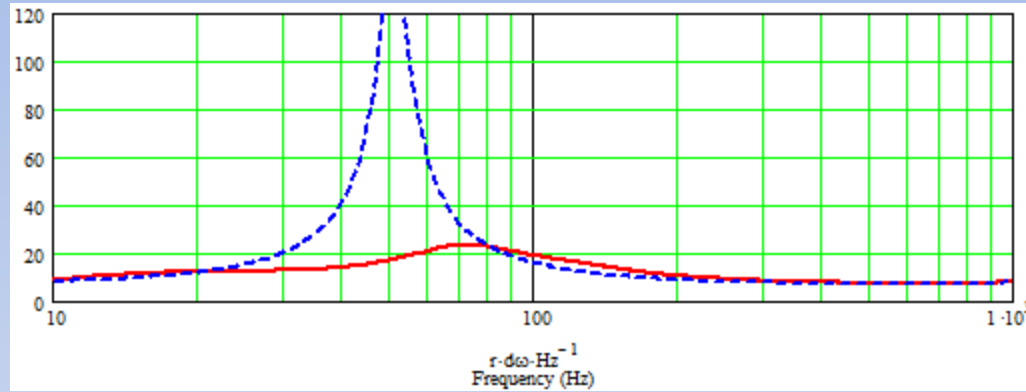
Driver(red) and Port(blue) Output



Combined Driver and Port Output(red)
Infinite Baffle Output(blue)

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**Transmission Line
(heavily stuffed)**



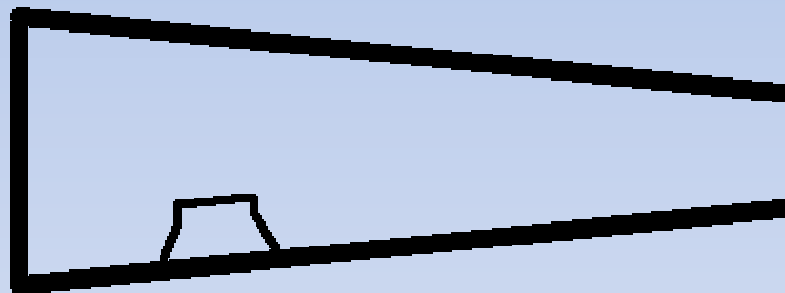
TL Impedance(red) and Infinite Baffle Impedance(blue)

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Transmission Line

(Negative Tapered Line)



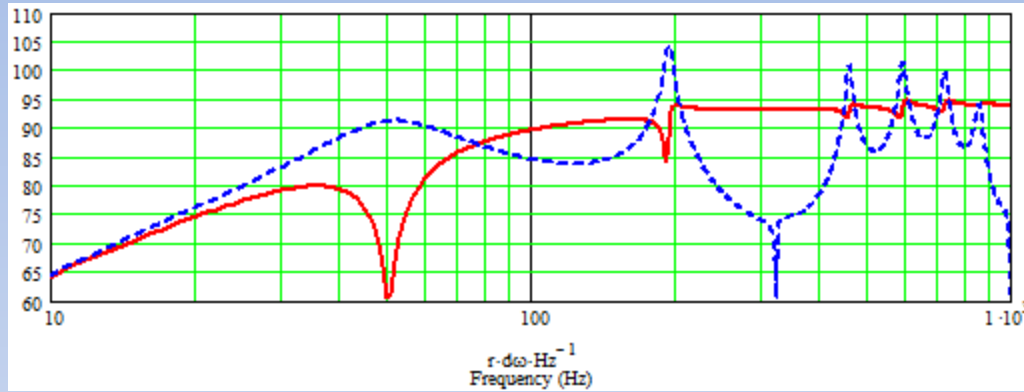
$$L = 48''$$

$$S_0 = 3 * S_d (62 \text{in}^2) \quad S_L = S_d (21 \text{in}^2)$$

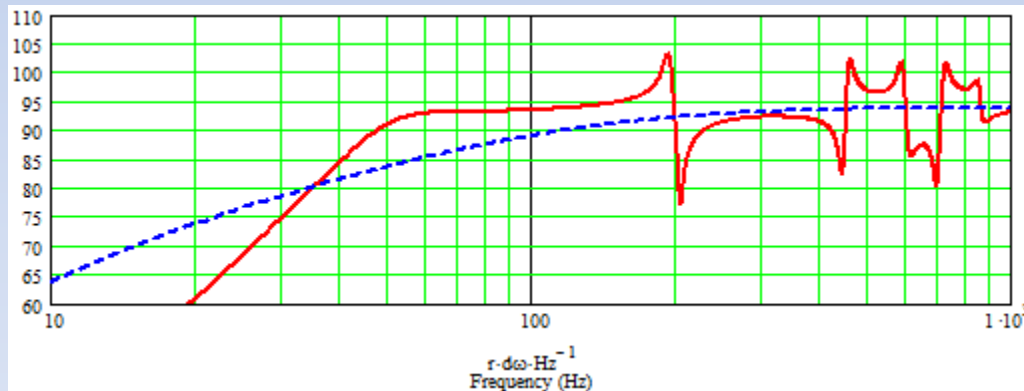
Driver at $0.21 * L$

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-ve Transmission Line (unstuffed)



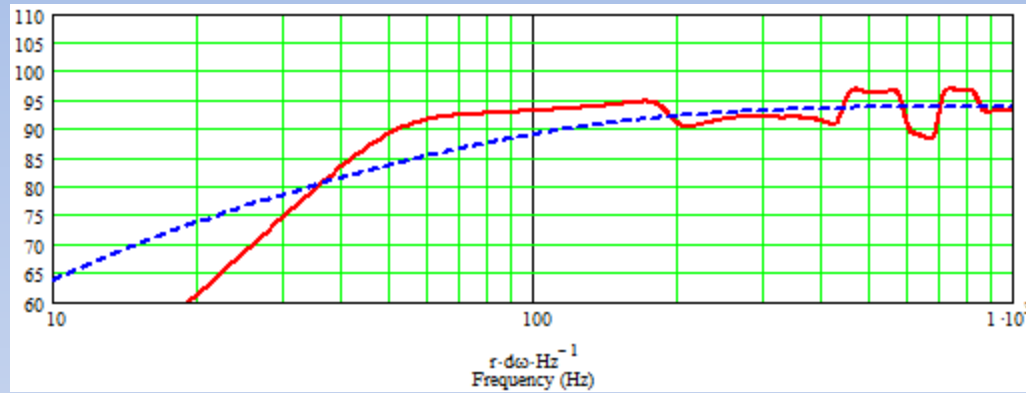
Driver(red) and Port(blue) Output



Combined Driver and Port Output(red)
Infinite Baffle Output(blue)

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-ve Transmission Line (lightly stuffed)



Combined Driver and Port
Output(red) Infinite Baffle
Output(blue)

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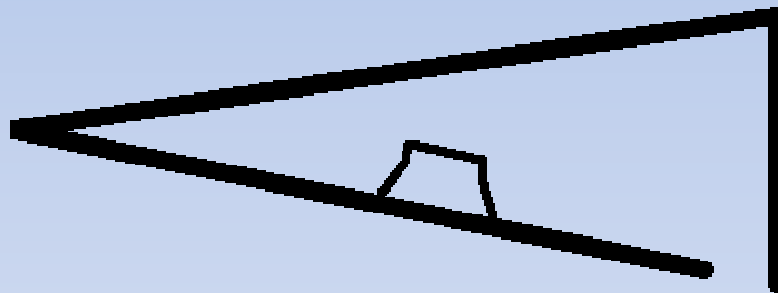


FTA-2000

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Tapered Quarter-Wave Tube ("Voigt Pipe")



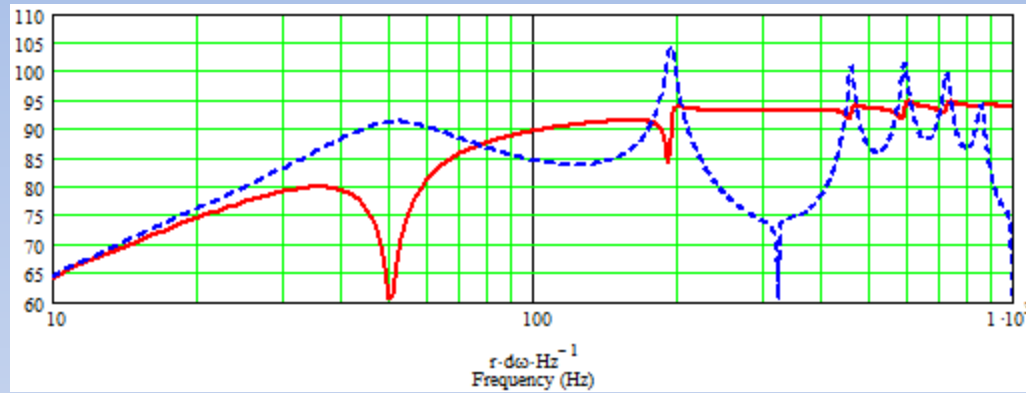
$$L = 84''$$

$$S_0 = 0.1 * S_d \text{ (2in}^2\text{)} \quad S_L = 3S_d \text{ (62in}^2\text{)}$$

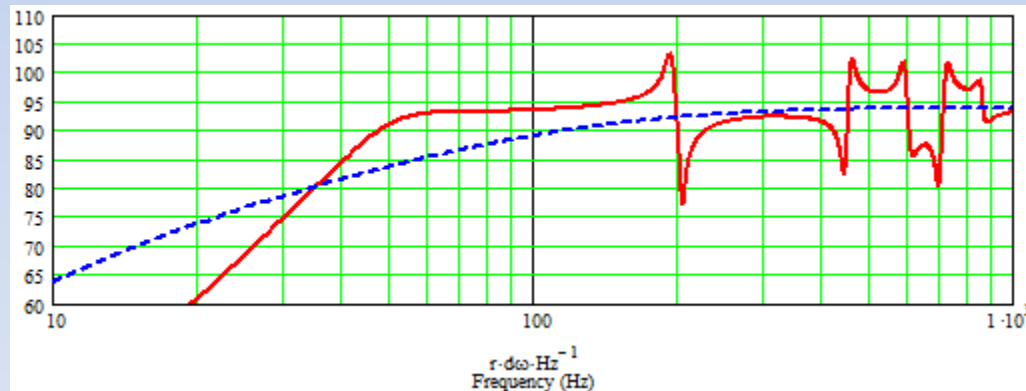
Driver at $0.45 * L$

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TQWP (unstuffed)



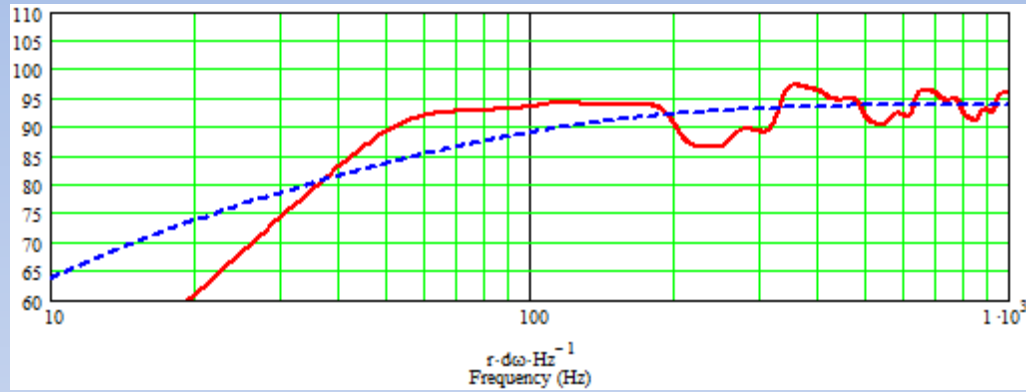
Driver(red) and Port(blue) Output



Combined Driver and Port Output(red)
Infinite Baffle Output(blue)

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TQWP
(lightly stuffed)

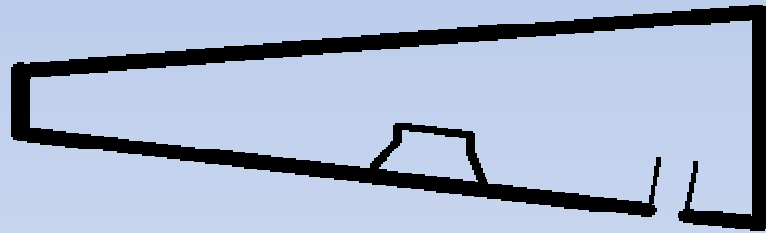


Combined Driver and Port
Output(red) Infinite Baffle
Output(blue)

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Mass Loaded Tapered Quarter-Wave Tube



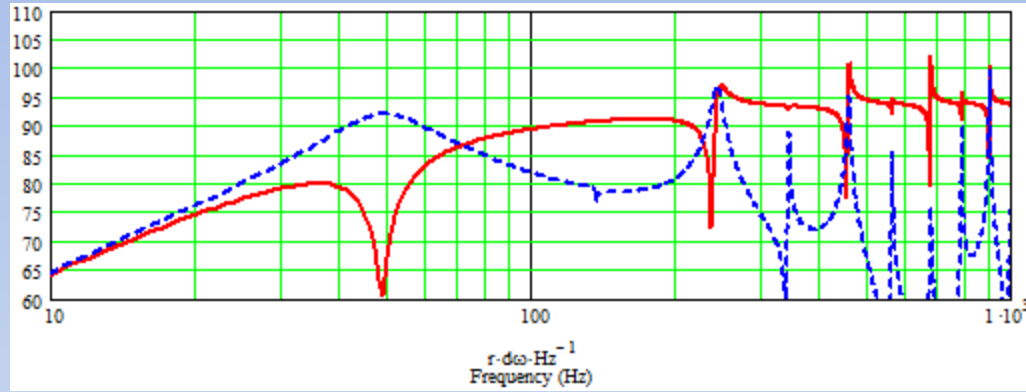
$$L = 60''$$

$$S_0 = 0.5 * S_d (10\text{in}^2) \quad S_L = 3S_d (62\text{in}^2)$$

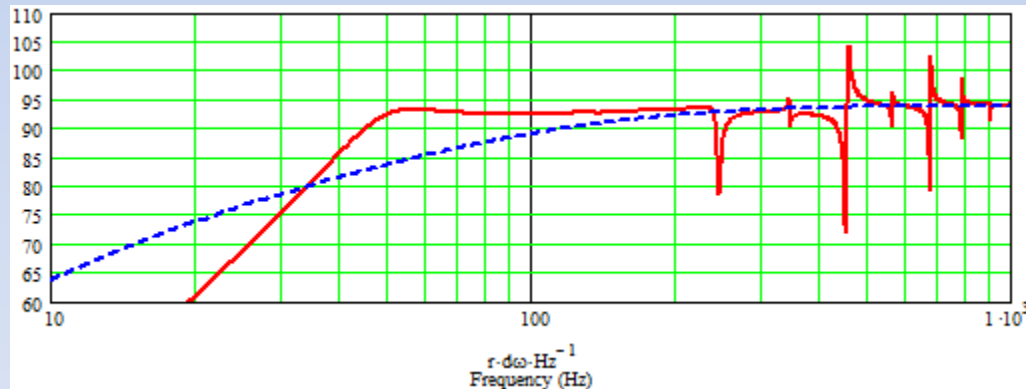
Driver at $0.54 * L$

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**ML-TQWP
(unstuffed)**



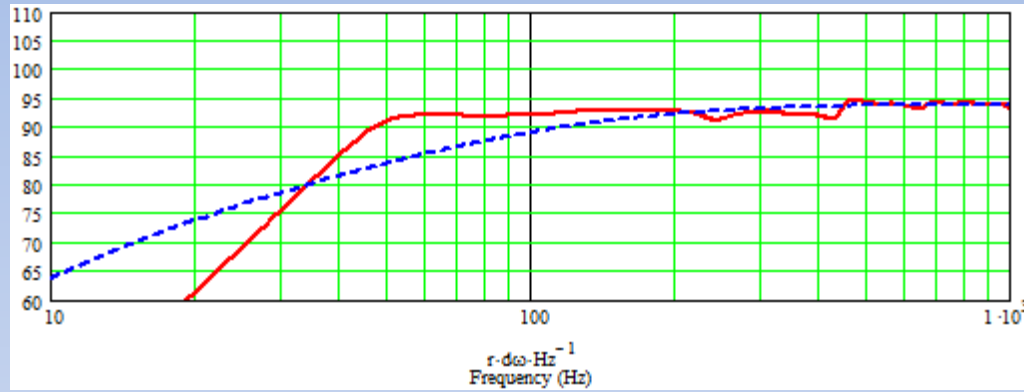
Driver(red) and Port(blue) Output



Combined Driver and Port Output(red)
Infinite Baffle Output(blue)

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**ML-TQWP
(lightly stuffed)**



Combined Driver and Port
Output(red) Infinite Baffle
Output(blue)

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Martin King's ML-TQWT

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Mass Loaded Transmission Line



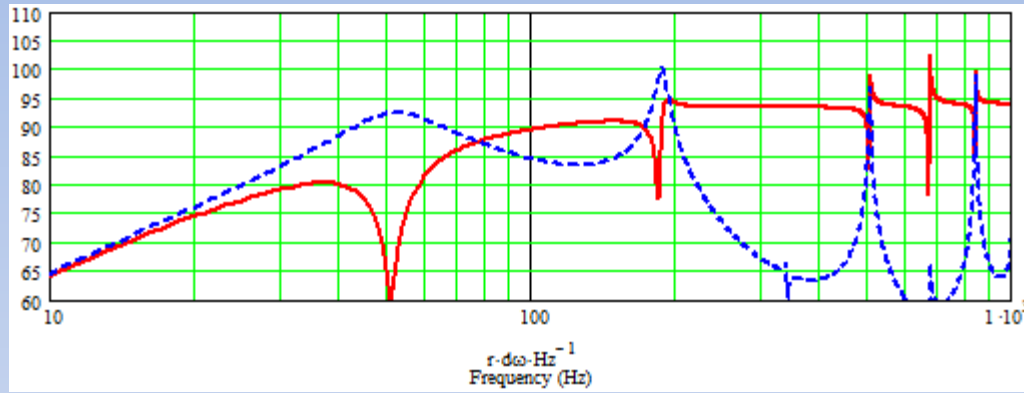
$$L = 40''$$

$$S_0 = 2.5 * S_d (47\text{in}^2) \quad S_L = 2.5 S_d (47\text{in}^2)$$

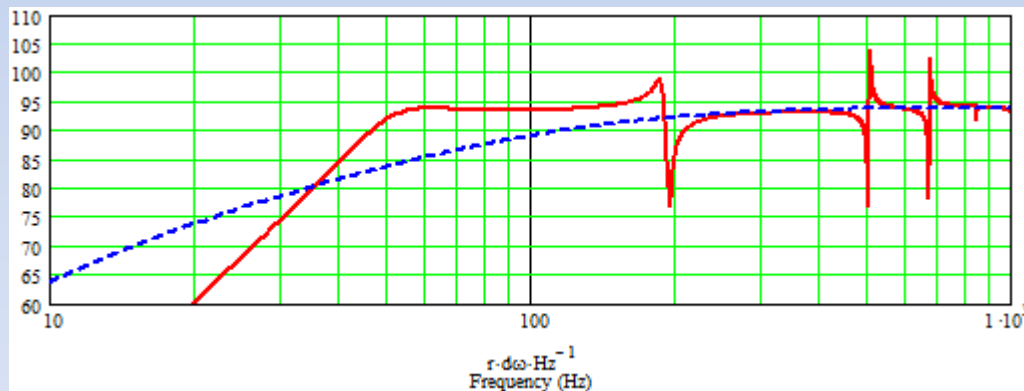
Driver at $0.25 * L$

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ML-TL
(unstuffed)



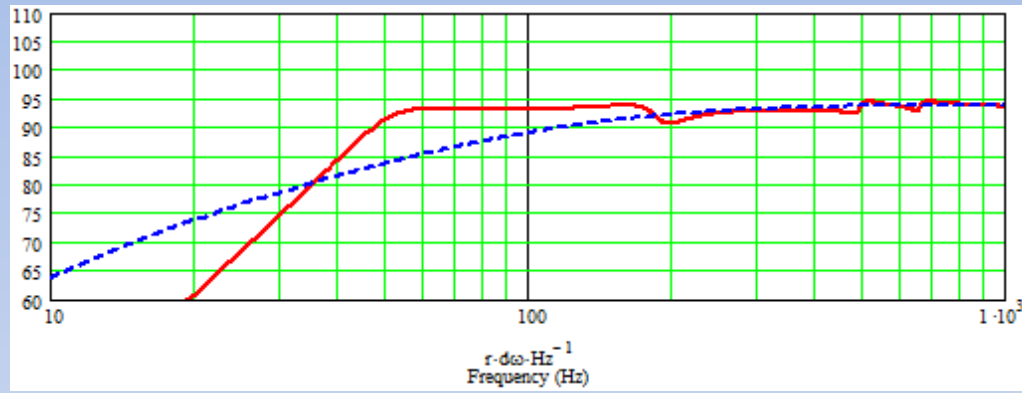
Driver(red) and Port(blue) Output



Combined Driver and Port Output(red)
Infinite Baffle Output(blue)

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ML-TL
(lightly stuffed)



Combined Driver and Port
Output(red) Infinite Baffle
Output(blue)

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FT-1600 MkII

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Straight End-Loaded Line	62½
Negative Tapered Line	48
Tapered Quarter-Wave Tube	84
ML Tapered Quarter-Wave Tube	60
ML Transmission Line	40