

# Ultimate Speaker Project

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# Idea

- The speaker achieves detail, clarity, and dynamics with a natural sounding high frequency reproduction while maintaining a flat frequency response.
- Gives the user options to excite low and high frequencies for pleasure listening.

# Intended Users

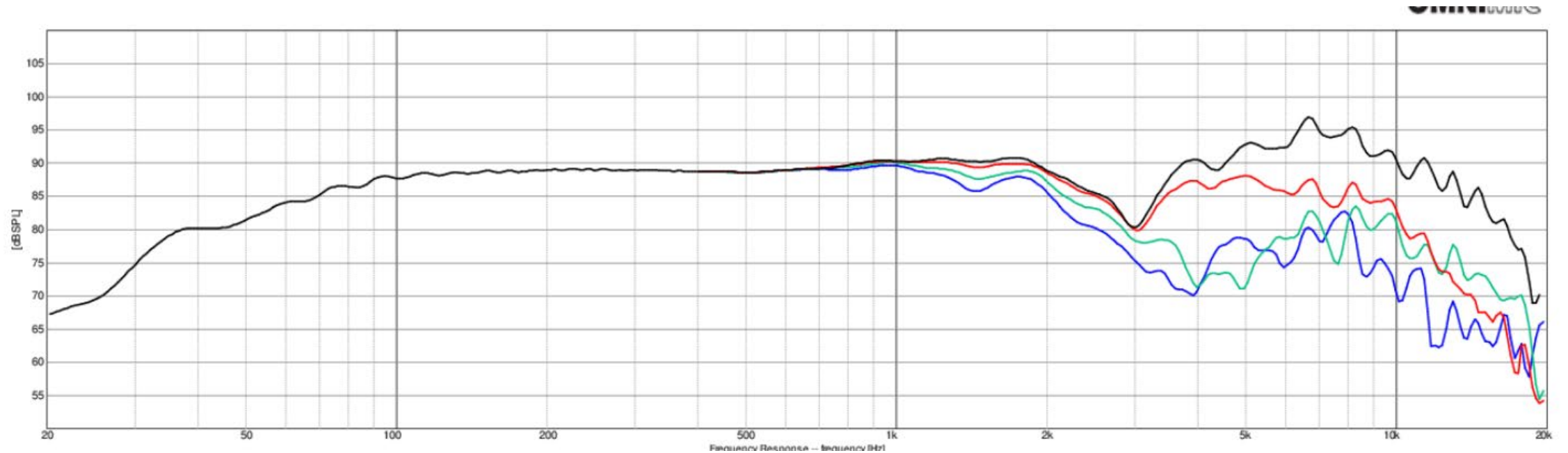
- This speaker is intended for people who seek faithful, unaltered frequency and dynamic reproduction in consumer studio monitors.
- Mixing and mastering engineers
- Artists and producers

# Woofer – Dayton Audio RS255 8”

- \$79.98
- Aluminum Cone Material
- Rubber Surround Material
- Copper Voice Coil
- Ferrite Magnet
- Low distortion



# Woofer Frequency Response Graph



35 Hz – 5500 Hz

# Woofers Thiele Small Parameters

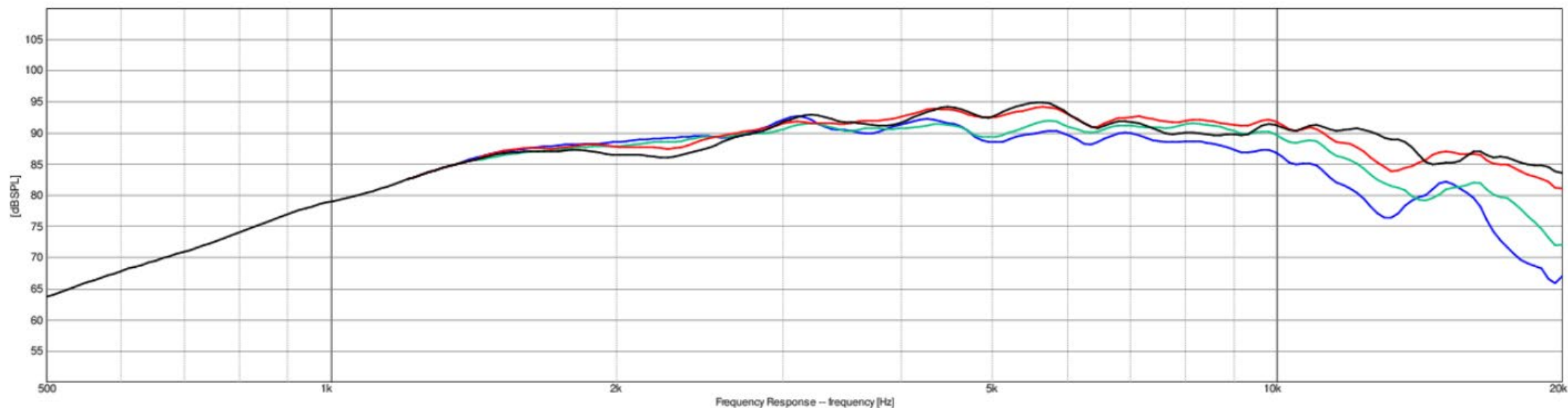
- Resonant Frequency ( $F_s$ ): 28.3Hz
- DC Resistance ( $R_e$ ): 6.5 $\Omega$
- Voice Coil Inductance ( $L_e$ ): 0.86mH
- Mechanical Q ( $Q_{ms}$ ): 1.46
- Electromagnetic Q ( $Q_{es}$ ): 0.51
- Total Q ( $Q_{ts}$ ): 0.38
- Compliance Equivalent Volume ( $V_{as}$ ): 2ft<sup>3</sup>
- Mechanical Compliance of Suspension ( $C_{ms}$ ): 0.88mm/N
- BL Product (BL): 9.05T·m
- Diaphragm Mass Inc. Airload ( $M_{ms}$ ): 35.8g
- Maximum Linear Excursion ( $X_{max}$ ): 7mm
- Surface Area of Cone ( $S_d$ ): 213.8cm<sup>2</sup>

# Tweeter – Dayton Audio DC25T 1”

- \$16.98
- Titanium Dome
- Aluminum Voice Coil
- Rubber Surround Material
- Natural high end frequency reproduction



# Tweeter Frequency Response Graph



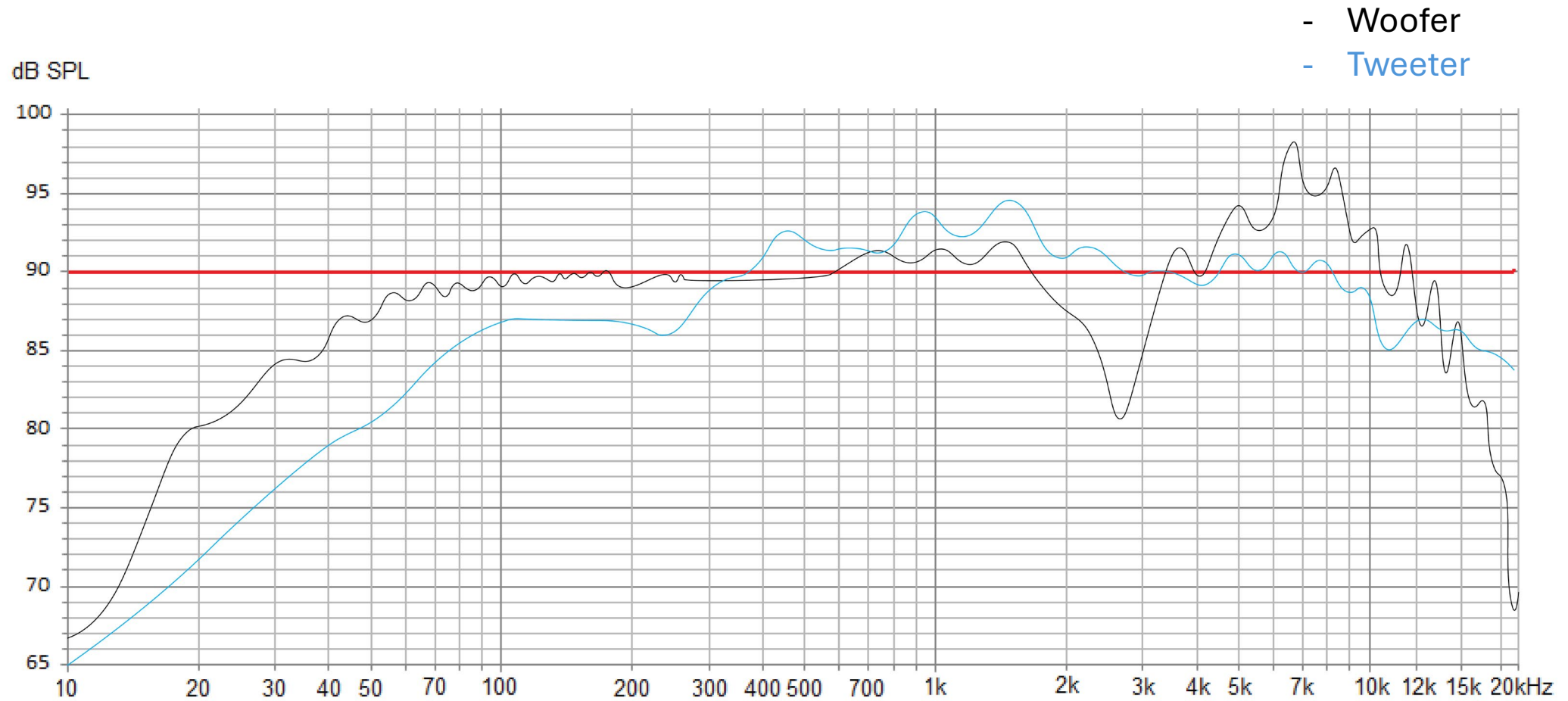
3000 Hz – 20,000 Hz



# Tweeter Thiele Small Parameters

- Resonant Frequency ( $F_s$ ): 1468Hz
- DC Resistance ( $R_e$ ):  $7.7\Omega$
- Voice Coil Inductance ( $L_e$ ): 0.59mH
- Mechanical Q ( $Q_{ms}$ ): 0.58
- Electromagnetic Q ( $Q_{es}$ ): 2.55
- Total Q ( $Q_{ts}$ ): 0.47

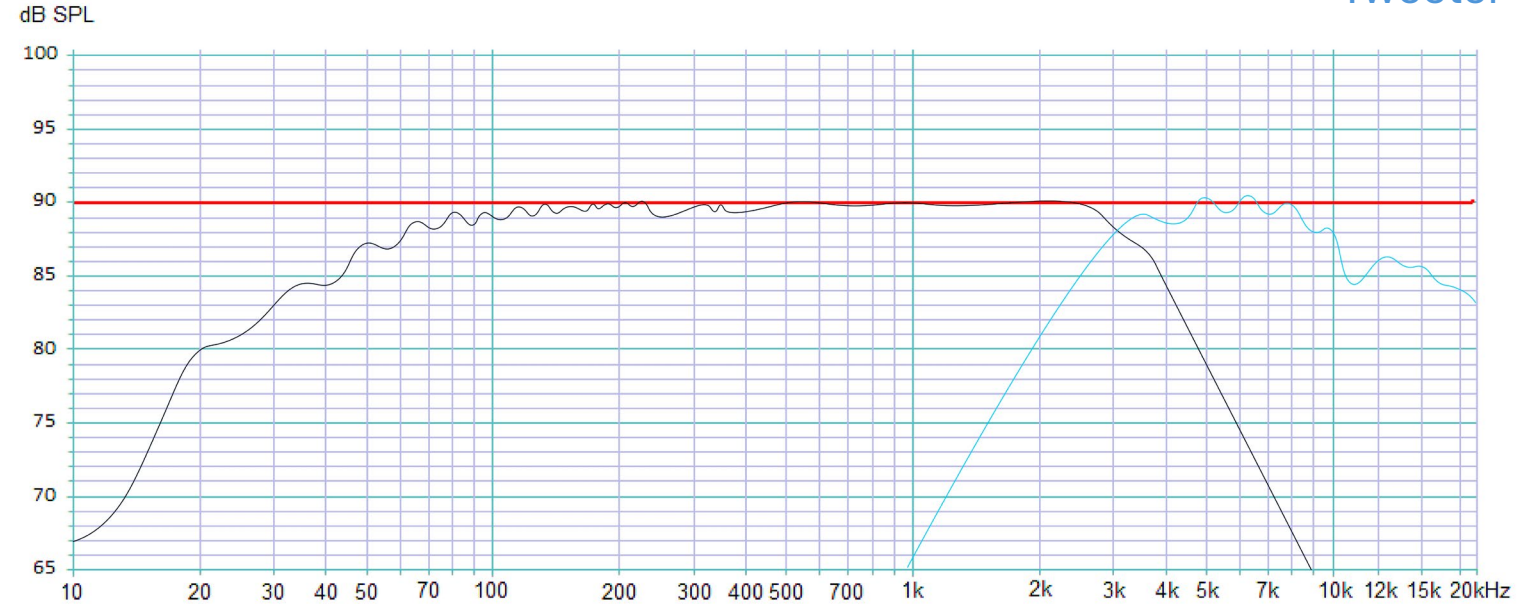
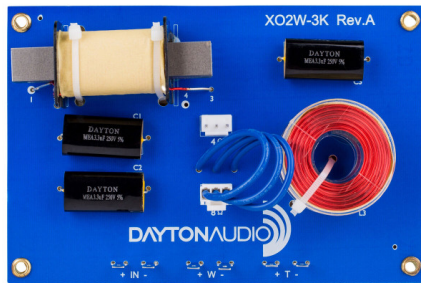
# Combined Frequency Response



- Woofer
- Tweeter

# Crossover

- Linkwitz-Riley Filter

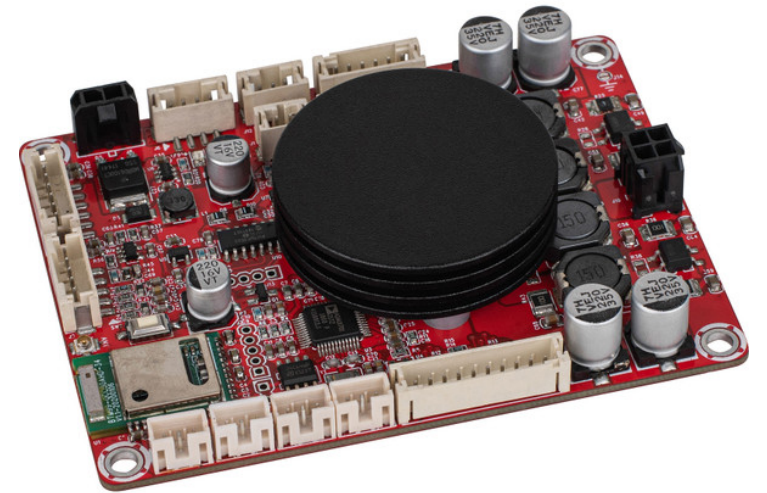
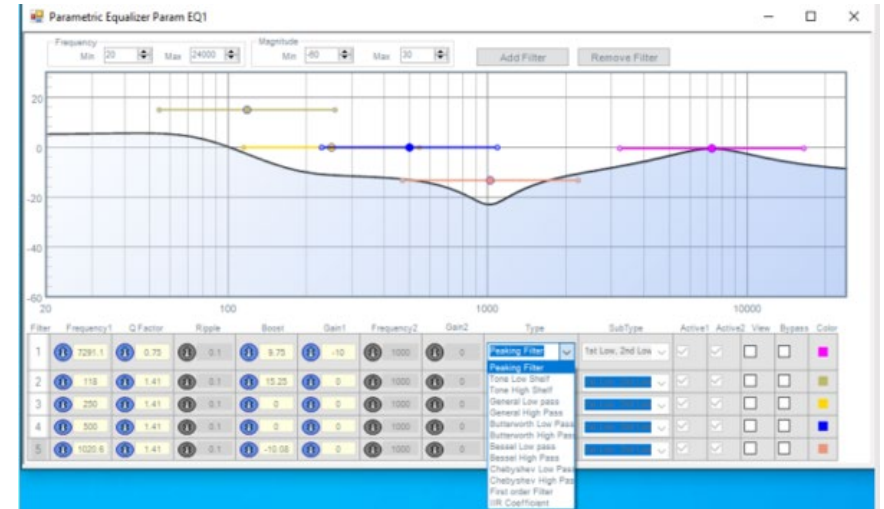


EQ Notch used  
at 7kHz

- Dayton Audio XO2W-3K 2-Way Speaker Crossover 3,000 Hz
- \$21.98

# Amplifier

- Dayton Audio KABD-250 2 x 50W
- \$57.98
- Class D
- EQ and Processing through Bluetooth



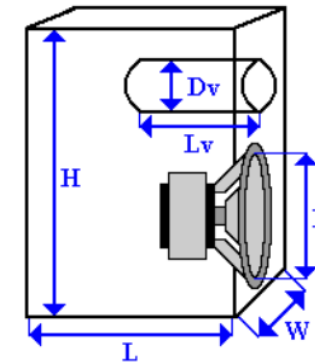
# Housing

- Sealed box
  - Tighter bass and more accurate transient response
- Wood
- Around \$160



## Speaker Box Volume Calculator Ported Box

$V_{as} = 56.8 \text{ lts}$   
 $f_s = 28.3 \text{ Hz}$   
 $Q_{ts} = 0.47$   
 $D = 8 \text{ in}$



### Dimensions

$V_b = 3.32 \text{ ft}^3 = 94.04 \text{ lts}$   
 $= L \times W \times H$   
 $f_3 = 22.67 \text{ Hz}$   
 $f_b = 24.21 \text{ Hz}$   
 $D_v = 3 \text{ in} = 7.5 \text{ cm}$   
 $L_v = 7.34 \text{ in} = 17.96 \text{ cm}$

$V_b$ : Speaker Box Internal Volume  
 $f_3$ : 3dB Cutoff Frequency  
 $f_b$ : Enclosure Resonant Frequency  
 $D_v$ : Port Diameter  
 $L_v$ : Port Length

# Summary

- Overall price to build is around **\$490** for both
- Active Two-Way Studio Monitors
- 35Hz – 20,000Hz

