MF 2.1 System

2.1 System for Mixing Monitor Usage

Designed by: Matthew Fisher

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1.0 Functional Description

This system will function as a near-field monitor setup intended for music listening and mixing. It will consist of two smaller loudspeakers vertically mounted on either side of a desk and a subwoofer placed on the floor below the desk. Given the close proximity, SPL output requirements are minimal and will be determined based on SPL standards for music listening and mixing.

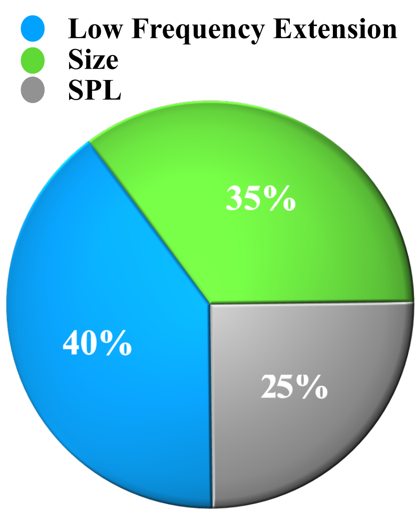
The focus of the sound quality will be a listening back design, which intends to accurately represent what was recorded and how it was mixed[1]. Looking at the range rule, this system will not represent consumer-grade setups, but rather provide an accurate and 'pure' listening experience, so it will be important to test mixes on other systems that more accurately represent consumer-grade loudspeakers and follow the listening forward approach[1].

A flat frequency response, transient clarity, and low distortion sound quality will be necessary attributes of this system. Fluctuation in these requirements will only occur to enhance listenability and decrease listener fatigue.

Durability to withstand transport between homes necessitates some level of physical protection, but not at the detriment of sound quality. The system should be able to be moved and set up by one person.

The ideal budget for this system is $800.00, but this can be flexible to an extent due to the fluctuation in consumer prices.

Based on John L. Murphy's recommended three point design tradeoffs, this system will prioritize first low frequency extension, second size, and third SPL output[2].



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[1]Moulton, David, *Total Recording*, p. 315-319.

[2] Murphy, John, *Introduction to Loudspeaker Design.* p. 55.

2.0 Reference Systems

2.1 Overview for L/R Loudspeakers

The next section contains a review of near-field monitors to compare performance and operating specifications. The table below contains a summary of specifications for loudspeakers in that category.

Speaker	F3	Sensitivity (2.83V/1m)	Weight (lb)	Dimensions (in) H x W x D	Price Per Speaker (US$)
JBL 305P MKII	50	92	10.43	11.7 x 7.3 x 9.1	$149.00
Polk Reserve R200	55	86	19.1	14.1 x 7.5 x 13.9	$350.00
Totem Kin Monitor	39	89	8.25	10.62 x 5.11 x 7.48	$550.00
Revel M55XC	125	88	8.2	9.3 x 7.4 x 5.8	$600.00
Neumann KH150	39	87	17.63	18.9 x 11.9 x 15.9	$1750.00

The table above reviews speakers ranging from around $150 to more than $1,700 in order to gauge a diverse selection. The F3 measurements of these speakers is relatively comparable, with a clear outlier at 125Hz. There is no correlation between overall data and price for each speaker, but an important note is the largest speaker is also the most expensive.The sensitivities are all within a 6dB range with a majority falling within 3dB of each other. The sensitivities are all measured at 1 meter and in many studio applications near field monitors are closer than this, so this measurement will be looked at more closely during placement in my room.

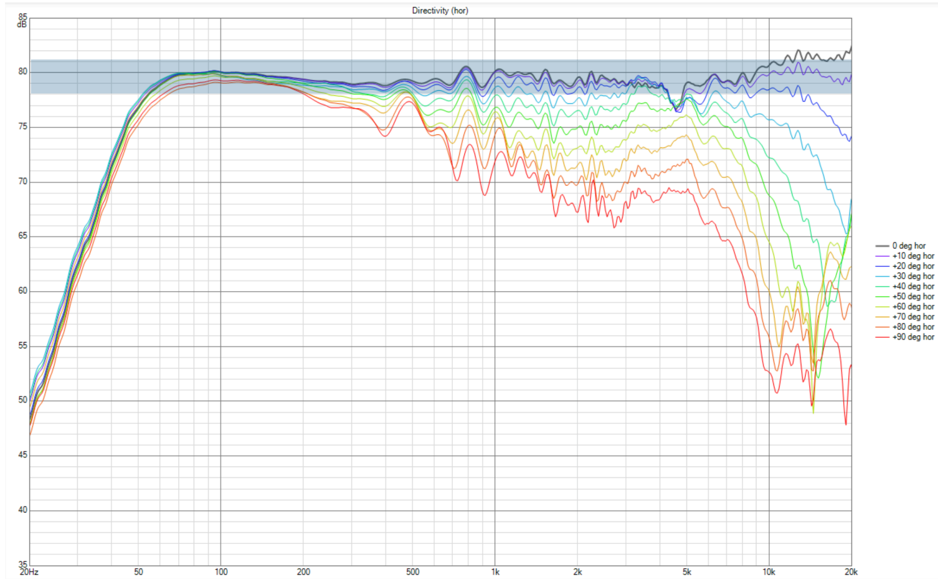
2.2 Specific L/R Loudspeakers

Polk Reserve R200[3]

The Polk Reserve R200 has an attractive price point, but it is the second largest speaker dimensionally on the list. It also has the highest listed weight. The sleek finish and rectangular design make it attractive in appearance, and the unique design on the woofer helps it stand out in a unique way. It has a relatively flat response, with a significant dip around 4.7kHz, but the off-axis response drops off quickly. A review on Audio Science Review reveals that this speaker has excellent

[3] https://www.polkaudio.com/en-us/, accessed September 30, 2023.

measurements for the price point, but it is sensitive to the placement angle[4]. The review also notes the beaming from the tweeter above 5kHz as represented in the frequency response chart.



+/- 3dB Line

Totem Kin Monitor[5]

Representing the midrange in price point, the Totem Kin Monitor has excellent measurements on paper. The F3 point is 39Hz, which is impressive considering the dimensions and weight of this speaker. The other speakers on the chart above require more weight and larger dimensions to provide a similar F3. Likewise, this speaker also produces one of the highest listed SPL measurements. Similar to the Polk R200, this speaker has a sleek black finish and a standard rectangular shape with rounded edges to prevent diffraction off the faceplate. A review of this speaker reveals that there is a slight boost in the high frequency content of this speaker, so that should be taken into consideration if a flat response is desired[6]. The manufacturer does not provide a frequency response chart, and I did not locate a review that contained measurements.

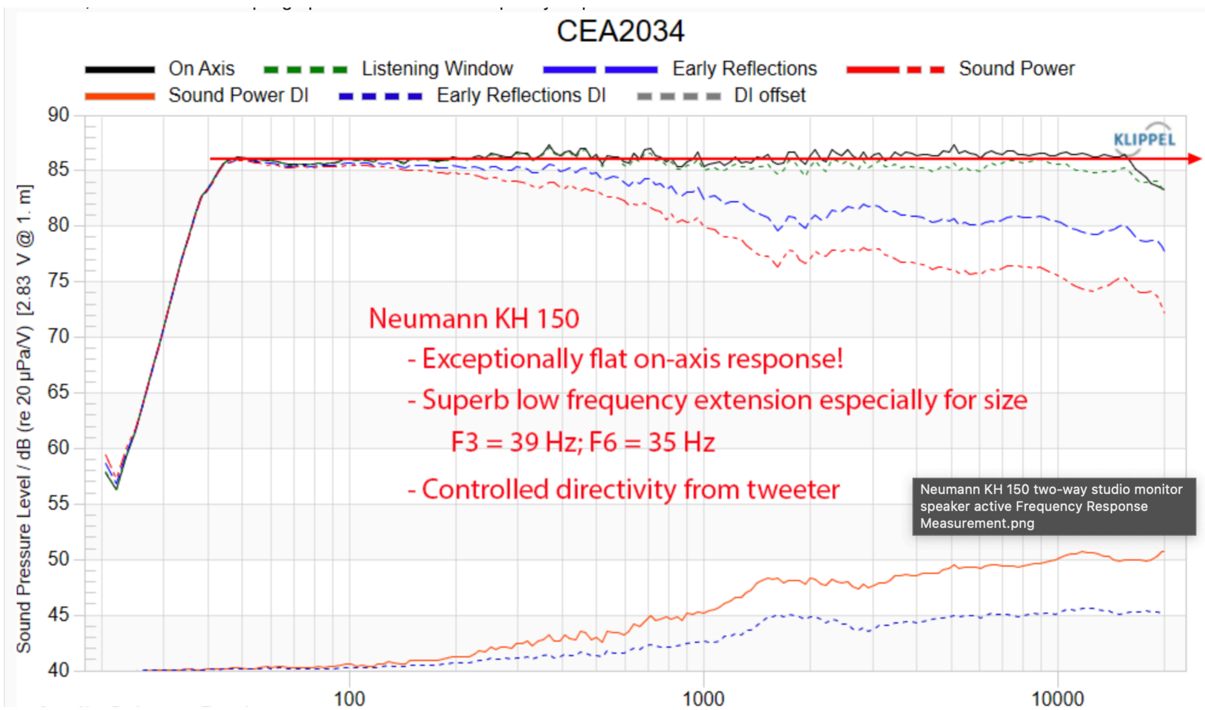
[4] Audio Science Review, "Polk Reserve R200: Spinorama and measurements (a really nice surprise!)," accessed September 30, 2023, https://www.audiosciencereview.com/forum/index.php?threads/polk-reserve-r200-spinorama-and-measurements-a-really-nice-surprise.23502/.

[5] https://totemacoustic.com/product/kin-monitor/, accessed September 30, 2023.

[6] Price, Simon, "Totem KIN Play Powered Bookshelf Speakers," 13th Note HiFi Reviews, accessed September 30, 2023.

Neumann KH150[7]

A clear outlier in price, the Neumann KH150 is characterized by a simple rectangular design, a large waveguide for the tweeter, and two front ports evident of its bass-reflex design. This speaker achieves an impressive 39Hz F3 using the bass reflex design and the 6.5" woofer[7]. A key feature of this speaker is the built-in DSP control that allows for adjustment to different room environments and a linear phase response. A review on Audio Science Review reveals that this speaker has an impressively flat on-axis frequency response from about 40Hz to over 10kHz[8]. The review also notes other impressive features of this speaker, including low distortion and excellent horizontal directionality.



[7] https://www.neumann.com/en-en/products/monitors/kh-150/, accessed September 30, 2023.

[8] Audio Science Review, "Neumann KH 150 Monitor Review," accessed September 30, 2023, https://www.audiosciencereview.com/forum/index.php?threads/neumann-kh-150-monitor-review.39922/.

2.3 Overview for Subwoofers

This section contains a review of subwoofers to compare performance and operating specifications. The table below contains a summary of specifications for subwoofers in the range of what I am building.

Speaker	F3	Peak SPL @ 1m	Driver Size (in)	Weight (lb)	Dimensions (in) H x W x L	Price Per Speaker (US$)
Klipsch R-120SW	29	116	12	31	16.5 x 14 x 19.2	$500.00
Alto Professional TS12S	44	130	12	57.1	17.9 x 18.1 x 19.9	$500.00
Neumann KH 750	17	105	10	43	19.25 x 16.5 x 20.25	$1695.00
QSC KS118	46	136	18	104	25.2 × 20.5 × 30.9	$2000.00
Focal Sub12	28	124.5	13	127.8	23.63 x 19.13 x 22.38	$3000.00

The table above reviews speakers ranging from $500 to $3,000 with two subwoofers at the minimum value and the rest falling above $1,000. The F3 measurements for these subwoofers vary, and the at 17Hz is notably the subwoofer with the smallest driver on the list. There is no correlation between overall data and price for each speaker, but there is a correlation between the F3, Peak SPL, and Driver Size measurements. The size of the driver dictates peak SPL values, where as some subwoofers sacrifice peak SPL for F3 and vice versa. For instance, the QSC KS118 achieves the highest peak SPL and has the largest driver, but it produces the highest F3 value.

2.4 Specific Subwoofers

Klipsch R-120SW[9]

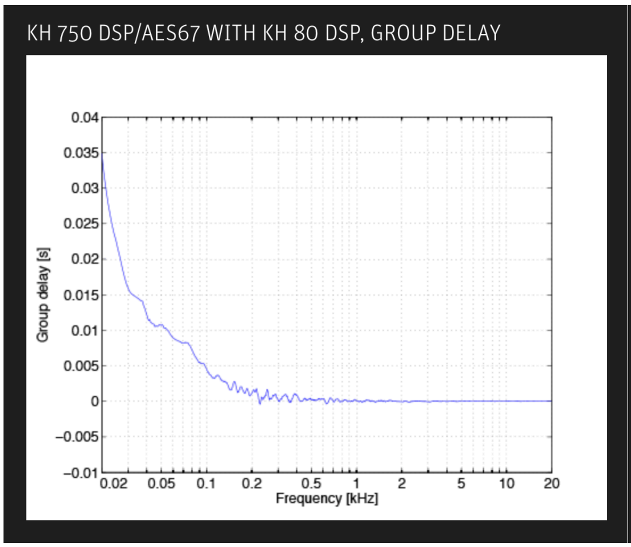
This speaker is both the smallest and one of the cheapest on the list. For its value, it is able to compete with the other subwoofers on the list with impressive measurements. A review on Perfect Acoustic commends the speaker in nearly all areas including low distortion, aesthetically appealing, and clarity[10]. The only drawbacks noted by the review are weight and poorly produced frequencies below 29Hz. I did not find a review or manufacturer specifications regarding frequency response chart or other graphs.

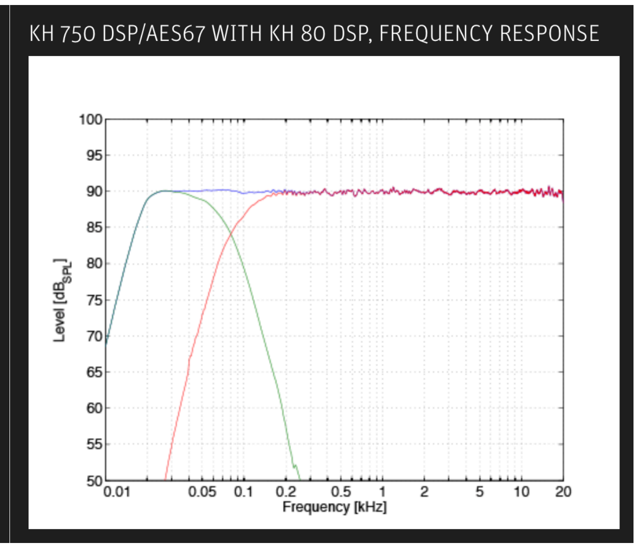
[9] https://www.klipsch.com/products/r-120sw-subwoofer, accessed October 3, 2023.

[10] G.H., Klipsch R-120SW Active Subwoofer Review," Perfect Acoustic, accessed October 3, 2023.

Neumann KH 750[11]

At midrange value according to the chart above, this subwoofer comes with several features that allow for better integration with different sound systems and improved overall sound quality. Some of these features are intended for use with other speakers on the Neumann KH line, so that is a limiting factor in some cases. The measurements are impressive with an F3 of 17Hz from a 10-inch driver. It sacrifices SPL output to produce that, but 105dB is still more than most consumers will use regularly. The charts below are manufacturer specifications when paired with the Neumann KH 80 loudspeakers. Note that the group delay is low, which improves the transient response of the system. This subwoofer does not visually stand out, but the straightforward design maintains neutrality and matches well in most environments.





Focal Sub12[12]

As the heaviest and most expensive subwoofer on the list, the Focal Sub12 appears on paper as an excellent subwoofer. The striking auburn color and front port enhance the visual aesthetic, and the carrying handles are a practical addition. A review on Recording Magazine praises the sound quality for its low distortion and raw power, along with its

[11] https://www.neumann.com/en-en/products/monitors/kh-750-dsp/, accessed October 3, 2023.

[12] https://www.focal.com/us/monitoring-speakers/st6/sub12, accessed October 3, 2023.

integration into 2.1 or Dolby Atmos setups[13]. The reviewer commented on the weight of the subwoofer, recognizing the fact that mobility is limited, as well as the fact that a subwoofer with this much power does not perform well in smaller rooms. Overall, the consensus is this subwoofer packs a punch and is an excellent low-end addition if it is within the budget. The manufacturer did not provide charts on frequency or phase response, nor was I able to locate any.

3.0 Technical Specifications

3.1 Cabinet Design

The overall size of this system is relatively flexible. The most important size is the depth and height of the monitors, which will be restricted by their location. I will be placing the speakers on either side of a desk, and the current restriction is the size of the corresponding bookshelves they will be placed in until I build appropriate stands. The dimensions of the bookshelves restrict the height to no more than 17 inches and the depth to no more than 16 inches. As long as my dimensions don't exceed these the size is flexible. The subwoofer is not restricted in size other than that which will ensure the best quality sound with the chosen driver. To calculate the internal volume using the dimensions below, the face plate will be 1 1/2" thick and the other walls will be 3/4" thick.

The weight of each speaker is also flexible so long as one person can lift each component without assistance. Ideally, the speakers will be about 12 pounds each and the subwoofer will be around 30 pounds. Once in place, the speakers will rarely be moved, so weight is not a huge concern.

The internal volume of the monitors will be determined by removing 1.5" from each dimension (to account for wall thickness using 3/4" material) and multiplying the solutions together. Therefore, target dimensions of 14 x 8 x 12 would become 12.5 x 6.5 x 10.5, resulting in an internal volume of 853.125 cubic inches (0.49 cubic feet, 13.9 liters). The internal volume of the subwoofer will be determined by removing 1.5" from the height and width and 2.25" from the depth. The target dimensions of 19 x 16 x 20 would become 17.5 x 14.5 x 17.75, resulting in an internal volume of 4504.063 cubic inches (2.6 cubic feet, 47.3 liters).

Target Dimensions: 14" height, 8" width, 12" depth
Flexibility: Height should not exceed 17 inches. Depth should not exceed 16 inches.
Max Dimensions: 16" height, 12" width, 15" depth
Target Volume: 0.49 ft^3 or 13.9 L
Max Volume: 1.67 ft^3 or 47.3 L

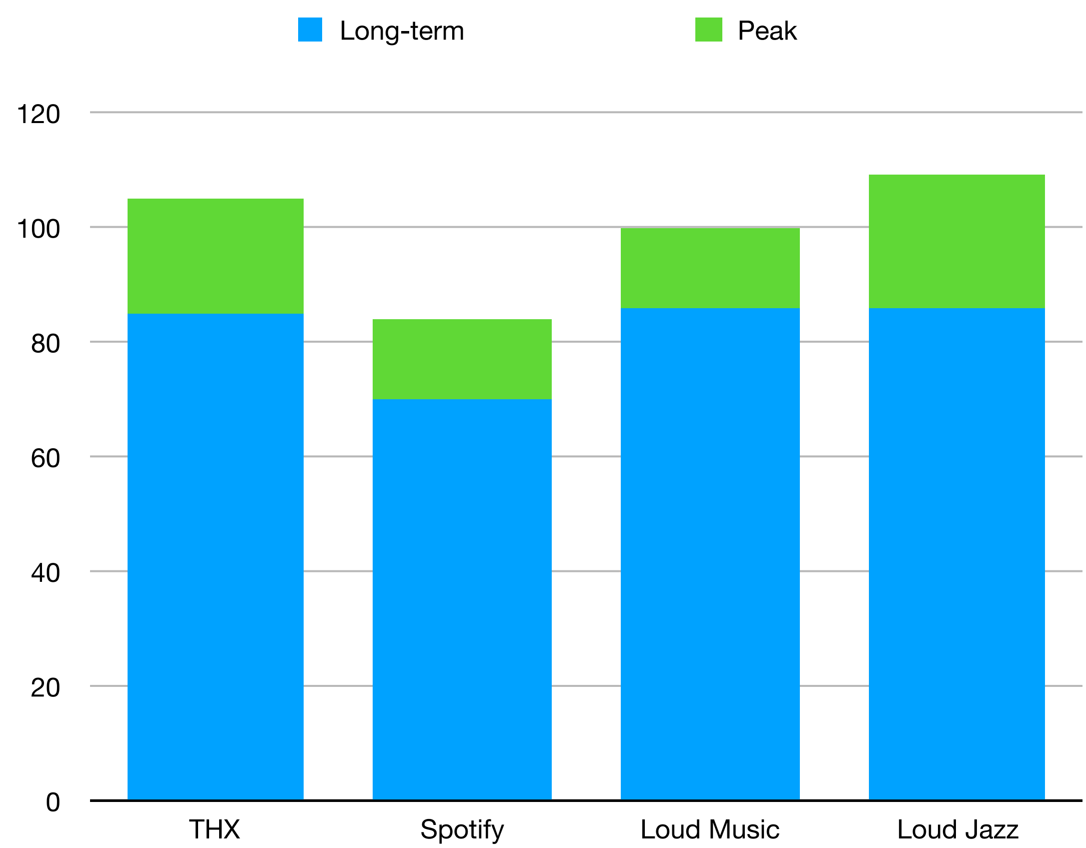
[13] Vnuk, Paul, "FOCAL SUB6, SUB ONE AND SUB12," Recording Magazine, accessed October 3, 2023.

Target Subwoofer Dimensions: 19” height, 16” width, 20” depth
Target Subwoofer Volume: 2.6 ft^3 or 73.6 L

The monitors will be vented cabinets to improve the low end, which will limit excursion on the subwoofer in higher frequencies. The subwoofer cabinet will be a bass reflex style ported cabinet to improve the low end. This will impact the transient response, but low frequency extension is more important in this system.

3.2 SPL Requirements

The monitoring standards used for this system are the THX and K-System standards. The K-System calls for a reference level at 83dB SPL with three different types of metering: K-20, K-14, and K-12[14]. For my purposes, I will reference the K-20 system to allow for the most dynamic range at 20dB of headroom. THX standards dictate a sustained level of 85dB SPL with a headroom of 20dB SPL[15]. My system should be able to meet the standard of 85dB SPL with 20dB of headroom. My average music listening level is around 70dB SPL, and I rarely exceed



[14] Katz, Bob, “Levels Practices (Part 2),” accessed September 30, 2023, https://www.digido.com/portfolio-item/level-practices-part-2/.

[15] https://www.thx.com/questions/what-is-the-reference-level/, accessed September 30, 2023.

85dB SPL average at my highest listening level. Adding the Spotify headroom of 14dB to my highest listening level results in a 99dB SPL peak. If I calculate using the dynamic range of jazz music (around 23dB max), the peak would be 108dB SPL[16].

However, I do not listen to jazz at that level, so my system will aim for the standard of 85dB SPL continuous with peaks at 105db SPL. My listening position currently consists of a listening axis of about 44 inches and approximately 1 meter from the speakers. If I choose to build stands for the speakers (excluding the subwoofer), they will be placed half a meter closer, resulting in a 6dB increase due to the inverse square law. Taking this into consideration, the minimum SPL target is therefore 6dB less with peaks at 99dB. My calculations will attempt to meet the 1 meter standard for SPL measuring to match my current setup at 1 meter, which will allow for extra headroom when it changes.

Target SPL: 85dB SPL, 105dB SPL peak
Flexibility: Minimum acceptable is 77dB SPL, 99dB peak

3.3 Power

To meet the desired SPL specifications, the monitors can be powered using a 100-watt amplifier. As evidenced by the equation below, an amplifier of that wattage will provide 20dBw, which matches the 20dB of headroom as per the aforementioned monitoring standards.

$$\text{dBw} = 10\text{Log}_{10}(\text{Watts})$$
$$20\text{dBw} = 10\text{Log}_{10}(100\text{W})$$

With that 20dB of extra SPL added to the 85dB sensitivity, the sum matches my desired 105dB SPL peak limit at 1 meter. The system will not often reach this peak SPL measurement, so the system will likely use less than 100 watts consistently.

Since the subwoofer will be placed on the floor underneath my desk, the quarter-space loading effect will theoretically add about 12dB to my subwoofer level[17]. To calculate the necessary wattage for my subwoofer, I will subtract 12dB from the peak level of 105dB, which is 93dB. Subtract from that my desired sensitivity of 85dB and the result is 8dB. Using the calculations on the next page, my subwoofer theoretically needs only about 6 Watts to produce an 85dB sensitivity with 105dB SPL peaks. However, due to room characteristics and its location under a desk, the quarter-space loading effect will not likely add 12dB, so my subwoofer will need more power.

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[16] Kirckberger, Martin, et. al., “Dynamic Range Across Music Genres and the Perception of Dynamic Compression in Hearing-Impaired Listeners,” National Library of Medicine, accessed September 30, 2023.

[17] Newell, Philip, et. al., *Loudspeakers*, p. 216.

$$dBw = 10Log_{10}(Watts)$$
$$8dBw = 10Log_{10}(Watts)$$
$$0.8 = Log_{10}(Watts)$$
$$6.31 = Watts$$

Considering the ways loudspeaker drivers can be damaged, whether by extended excursion or overheating, the thermal rating is an important consideration. The thermal rating for this system will remain close to the average output considering the fact that the speakers will not be playing a significantly high volume for extended periods of time. A 90dB thermal capability should provide a large enough safety for the listening I will do on this system.

Target Sensitivity: 85dB, 77dB minimum
Target Peak Power Handling: 105dB peak
Target Long Term Power Handling: 90dB, 5dBw @ 85dB sensitivity

3.4 Frequency Response

In accordance with the listening back design, this system will strive for a flat frequency response to maintain accuracy in sound reproduction. The goal is +/- 3dB to allow for fluctuations that might improve listenability and decrease fatigue. This system should be able to produce flat on-axis response up to 25kHz and, based on listening in a calibrated setting, should extend easily down to 35Hz using the subwoofer.

Target Shape: +/- 3dB, flat response
High Frequency Extension: flat up to 25kHz
Low Frequency Extension: 35Hz target, 40Hz minimum

4.0 Speaker Kit Selection

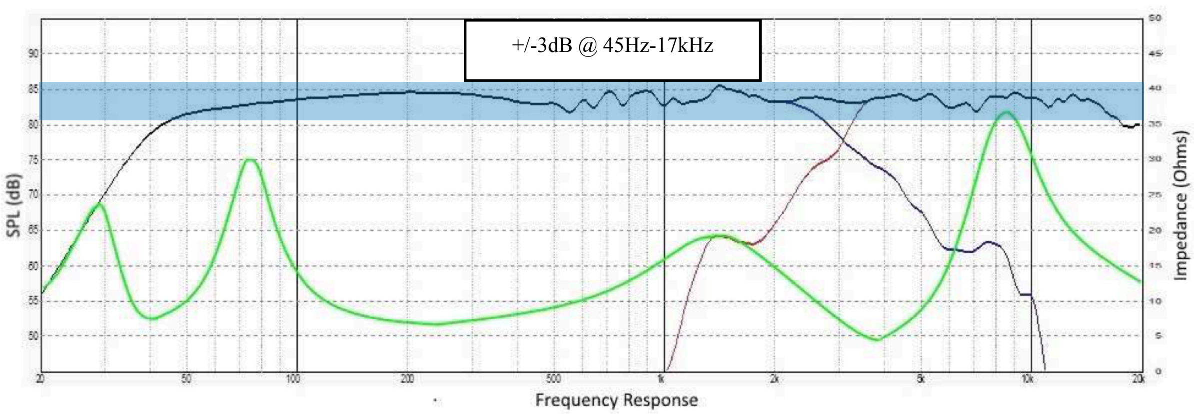
4.1 Overview

Due to unforeseen budget impacts early on, I opted to purchase speaker kits for this system. The kits were cheaper than a custom system, and they dramatically reduced the required build time. This decrease in build time allowed me to focus specifically on the quality of my work to ensure proper cabinet adherence and driver functionality without rushing the process. For the monitors, I purchased the Dayton Audio C-Note speaker kit. For the subwoofer, I purchased the Dayton Audio 12” Ultimax Subwoofer Kit. Both purchases were made through Parts Express[18].

[18] https://www.parts-express.com/, accessed October 9, 2023.

4.2 Dayton Audio C-Note Kit[19]

The Dayton Audio C-Note Kit is a budget friendly solution for my 2.1 system. As depicted in the frequency response below, this speaker is relatively flat from around 80Hz to about 15kHz. My system will be fully active, so I decided to forego the passive crossover parts and wire the drivers straight to the binding posts. The size and power rating of these speakers fit within my desired specifications. Overall, these speakers are capable of accomplishing my major goals for this system within my budget, so I will need to be conscious of the limitations upon construction and performance testing.



4.2 Dayton Audio 12" Ultimax Subwoofer Kit[20]

The Dayton Audio 12" Ultimax Subwoofer Kit provides a low frequency extension for my system that both meets my desired specification and limits the excursion on the woofers in my C-Notes. The driver has two voice coils, so I wired each separately for the greatest control in my system. As noted by the frequency response below, this subwoofer is capable of performing in the range between 20Hz to 1kHz comfortably. I plan on crossing over well before 1kHz,

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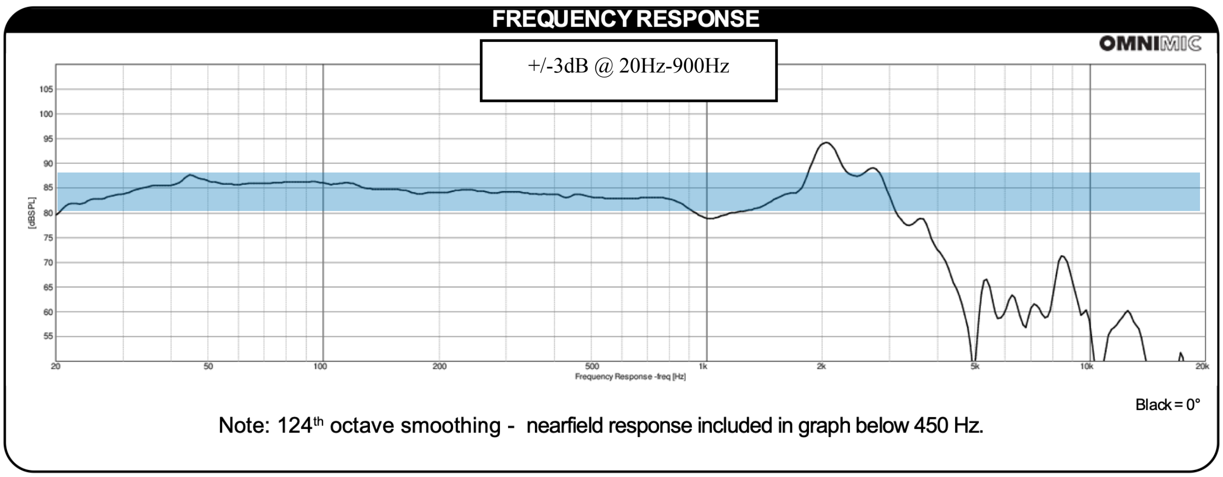
[19] https://www.parts-express.com/C-Note-MT-Bookshelf-Speaker-Kit-Pair-with-Knock-Down-Cabinets-300-7140?quantity=1, accessed October 9, 2023.

[20] https://www.parts-express.com/Dayton-Audio-12-Ultimax-Subwoofer-and-Cabinet-Package-300-7096?quantity=1, accessed October 9, 2023.

so the flat response until that point is a positive factor in this subwoofer. Dayton's Ultimax design is manufactured intentionally to extend low and perform with excellent, punchy transient response. That will factor in with my desire for music listening, and it will be a point to note for mixing purposes.



5.0 Tweeter Analysis

5.1 Overview

The next section contains an analysis of tweeters that would meet my expected specifications. The table below includes several designs in a slightly varying price range to gauge what will best suit my needs without exceeding the budget.

	Tweeter Type	Outside Diameter	Impedance (ohms)	Price	Sensitivity (2.83V/m)	Short Term Power	Long Term Power	Peak SPL Limit	Thermal SPL Limit
SB Acoustics SB19ST	Soft Dome	3.50	4	$23.60	88.5	-	30	-	103.3
Dayton Audio ND25FW	Soft Dome	4.09	4	$27.99	91	-	20	-	104.0
Dayton Audio DC28F-8	Soft Dome	4.33	8	$30.00	89	100	50	-	106.0
SB Acoustics SB26STCN	Soft Dome	2.80	4	$37.90	92.5	-	120	-	113.3
HiVi RT1.3WE	Planar	4.72	4	$50.00	92	30	10	106.8	102.0
SB Acoustics SB26CDC	Aluminum/ Ceramic Dome	3.90	4	$61.40	89	-	100	-	109.0
GRS RT3.0-8	Ribbon	N/A*	8	$156.00	96	60	30	113.8	110.8

*The GRS RT3.0-8 is a rectangular tweeter dimensioned at 5.7h x 2.7w x 3.2d.

5.2 Specific Tweeters

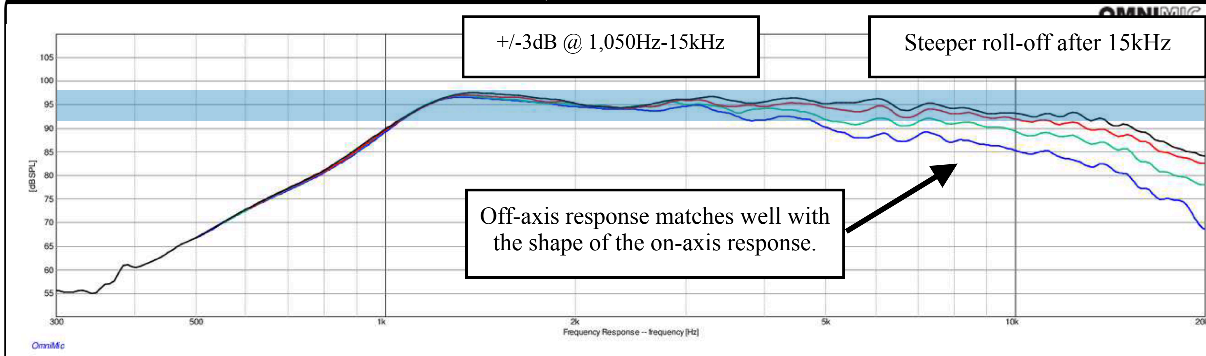
Dayton Audio ND25FW[21]

This is the tweeter that comes in the Dayton Audio C-Note speaker kit that I will be purchasing for this system. As one of the cheapest on the table above, this tweeter appears on paper to be an excellent choice in that price range. After listening to these tweeters, I found that they sounded appropriate to what I am looking for, and the SPL measurement fits with my desired specifications.

- SPL
  - At 91dB, this tweeter works with my 85dB target sensitivity. This being one of the higher sensitivities on the chart above, the power handling is impressive as one of the lowest rated on the chart.
- Off-Axis
  - In the chart provided by the manufacturer, off-axis response was measured at 15, 30, and 45 degrees. At around 2,500 Hz, the first noteworthy deviation from on-axis response appears in the 45 degree measurement. Since these speakers will be intended for a fixed listening position, the overall off-axis response is excellent. The measurements line up closely with the dips and bumps in the on-axis response, so generally equalization will flow smoothly with this driver and correlate in both on-axis and off-axis responses.
- Frequency Response
  - With a crossover point at around 2,500 Hz, this tweeter will be +/- 3dB from 2,500 Hz to about 15 kHz. With equalization, this can be adjusted to improve the range and flatten out the response. This tweeter rolls off significantly after 15 kHz, so reaching my target of 25 kHz is most likely not feasible with this tweeter. However, this tweeter is well on its way to a flat response, which is more useful in this system.
- Visual Aesthetics
  - A straightforward and low-profile design fits this tweeter, and its waveguide provides a smooth, rounded look that is pleasing to look at. The tweeter does not draw attention to itself, providing functionality over visual design.

[21] https://www.daytonaudio.com/product/1280/nd25fw-4-1-soft-dome-neodymium-tweeter-with-waveguide-4-ohm, accessed October 9, 2023.

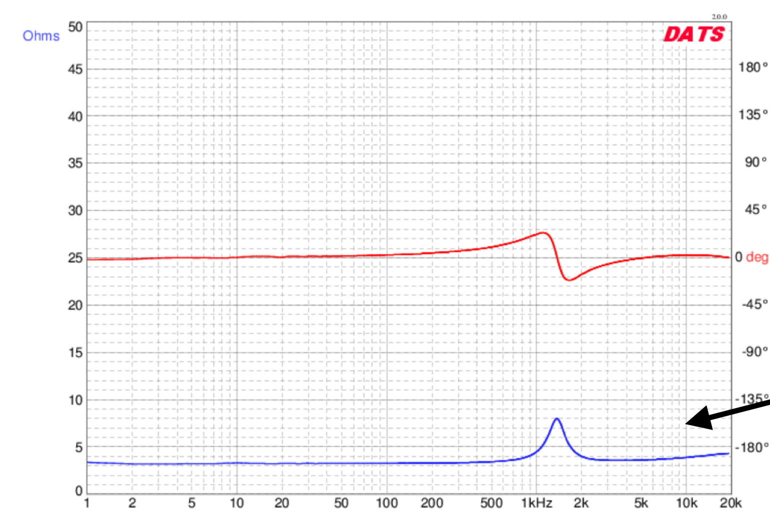
FREQUENCY RESPONSE



Note: 1/24th octave smoothing - nearfield response included in graph below 450 Hz.

Black = 0°
Red = 15°
Green = 30°
Blue = 45°

IMPEDANCE/PHASE



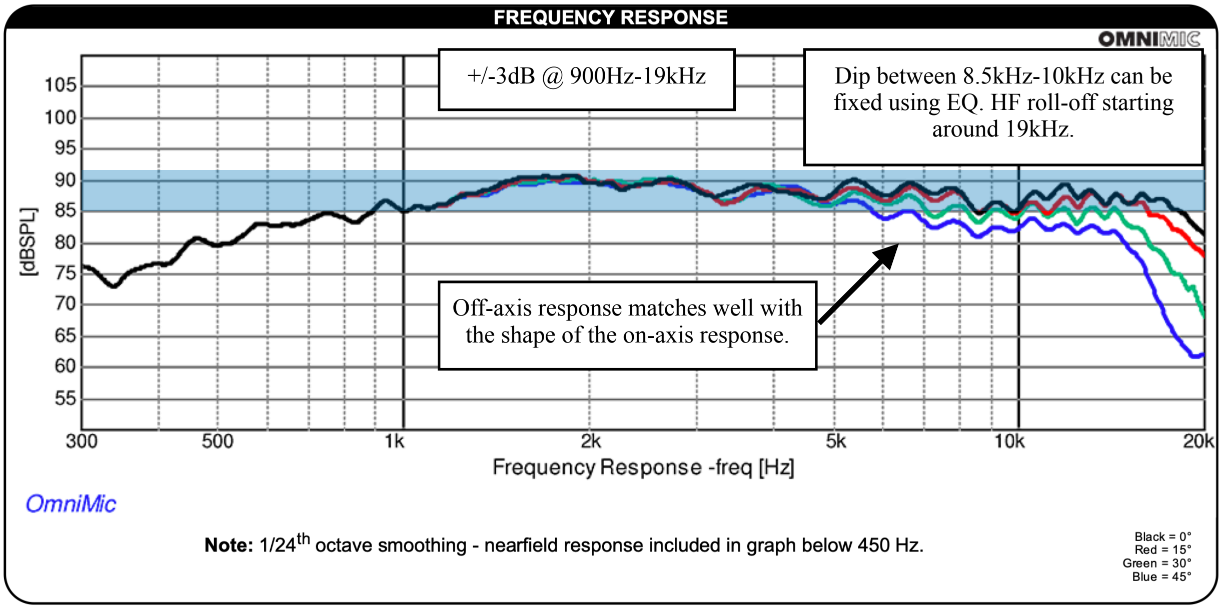
The impedance stays smooth and relatively flat up to 20 kHz

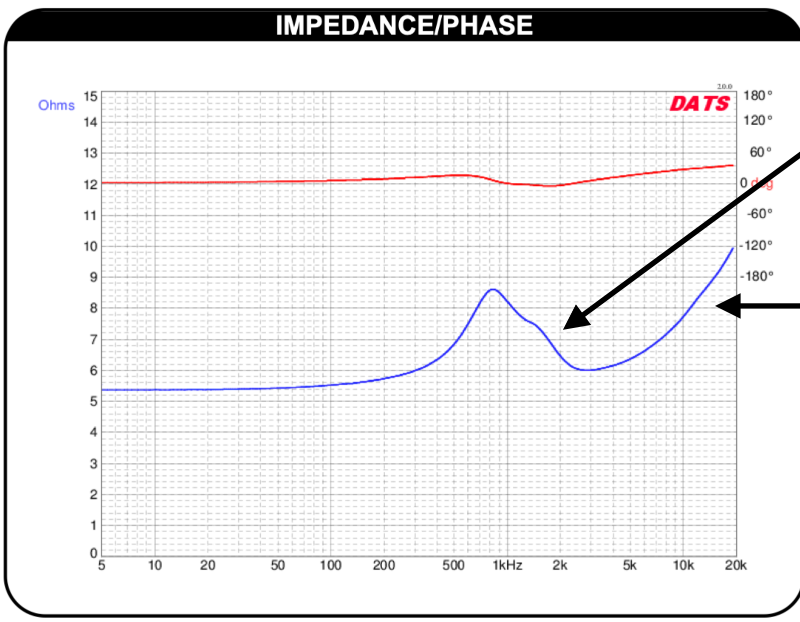
Dayton Audio DC28F-8[22]

This tweeter is closer to my desired frequency response and fits within my price range, hence its inclusion in this analysis. The specifications are comparable to other tweeters in this price range, but the power difference is my main concern with this tweeter.

- SPL
  - The 89dB sensitivity fits within my target specifications. The only draw back is this is an 8 ohm tweeter, so it will have a higher resistance to amplifier power.
- Off-Axis
  - The off-axis measurements line up well with the on-axis response, making equalization during tuning convenient. The response at 45 degrees off-axis flattens out after about 7kHz, so overall the off-axis response is within about a 5dB difference from on-axis until about 15kHz.
- Frequency Response
  - The frequency response is relatively flat up to about 19kHz, with a +/-3dB response from 900Hz to 19kHz. Looking at a crossover point of about 2,500Hz, the frequency response has quite a few bumps and dips, with a large dip at around 8.5kHz-10kHz. With the off-axis response similar in shape, equalization can remedy some of these and improve the response.
- Visual Aesthetics
  - This tweeter's triangular screw pattern and the reflective cone are notable, but otherwise it is not visually striking. There is no waveguide on this tweeter, so it appears flat and utilitarian.

[22] https://www.daytonaudio.com/product/29/dc28f-8-1-1-8-silk-dome-tweeter-8-ohm, accessed October 9, 2023.





There is a bump in the impedance worth noting here, but it is below the crossover point, so the effect is negligible.

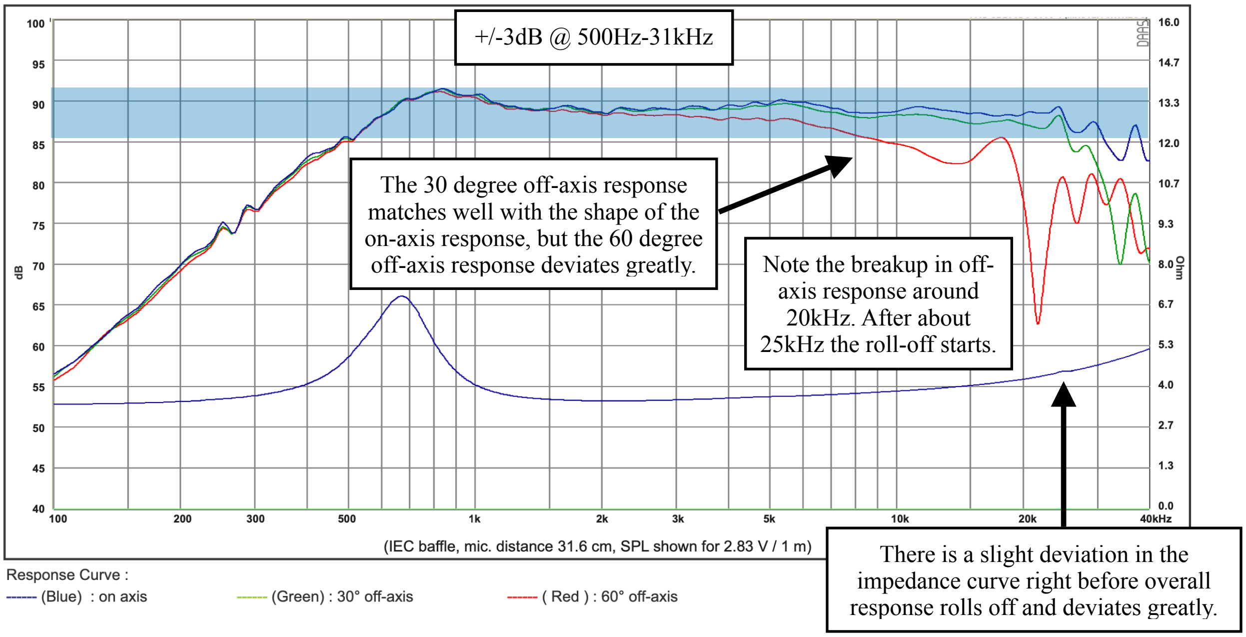
The impedance has a steep incline starting at 2,500Hz. To avoid a more expensive amplifier, this is not my top choice. However, this is an 8 ohm driver, which is higher than the 4 ohm drivers in the chart.

SB Acoustics SB26CDC[23]

This tweeter is nearly double the price of the previous two analyzed in this section, but the on-axis frequency response is much more desirable. With a response at +/-3dB up to around 31kHz, on paper it appears to surpass my target response. However, when looking at the frequency response chart, there is breakup around 25kHz that could affect that. This tweeter can also achieve a lower crossover point, which may or may not be useful in this design.

- SPL
  - A sensitivity of 89dB meets my target specifications. However, this tweeter has one of the higher rated power measurements, so it could lead to a more expensive amplifier.
- Off-Axis
  - The 30 degree off-axis response is tight up to 20kHz and only begins to roll off quicker after 25kHz. The 60 degree off-axis response deviates quickly with an increase in frequency, ultimately starting strong deviation at the 19kHz mark. As aforementioned, these speakers are not intended for off-axis listening in that position, so the off-axis response is not a direct concern unless it adds unwanted reflections.
- Frequency Response
  - The frequency response is mostly flat on-axis up to about 25kHz, where it begins to roll off significantly. The off-axis response at 30 degrees generally follows the on-axis response until that point as well. With some light equalization, this tweeter can produce an impressive flat response.
- Visual Aesthetics
  - The white center is the most prominent visual aspect of this tweeter. The three-point piece in the middle contrasted with the four-point screw placement also provides an interesting aesthetic. My only reservation regarding the visual aesthetic is the contrast between the sharp lines of the center three-point piece and the smooth roundness of the faceplate.

[23] https://sbacoustics.com/product/sb26stcn-c000-4/, accessed October 9, 2023.



+/-3dB @ 500Hz-31kHz
The 30 degree off-axis response matches well with the shape of the on-axis response, but the 60 degree off-axis response deviates greatly.
Note the breakup in off-axis response around 20kHz. After about 25kHz the roll-off starts.
There is a slight deviation in the impedance curve right before overall response rolls off and deviates greatly.
dB
Ohm
100
200
300
500
1k
2k
3k
5k
10k
20k
40kHz
(IEC baffle, mic. distance 31.6 cm, SPL shown for 2.83 V / 1 m)
Response Curve :
(Blue) : on axis
(Green) : 30° off-axis
(Red) : 60° off-axis

6.0 Woofer & Subwoofer Selection

6.1 Overview

After an analyzing woofers and subwoofers comparable to my desired specifications[24], I decided to go with the Dayton Audio DSA135-8 5” woofer included in Dayton Audio’s C-Note speaker kit and the Dayton Audio UM12-22 12” Ultimax subwoofer included in its corresponding speaker kit. The leading factor in both of these choices is cost, but the following analysis reveals quality specifications that will meet my needs for this system.

6.2 Dayton Audio DSA135-8

This 5” woofer comes with the Dayton Audio C-Note speaker kit that I am building. It is part of Dayton Audio’s Designer series, which is an affordable line of drivers designed for performance a step below Dayton Audio’s reference series[25].

- SPL
    - A sensitivity of 87dB meets my target specifications. This woofer is an 8 ohm driver, so it will have a higher resistance. At 50 watts, combined with a tweeter requiring 20 watts, I will be able to use a lower-rated amplifier with no concerns.
- Off-Axis
    - The off-axis response remains within 1dB up to about 2.2kHz. Slight variation begins at around 900Hz, but it remains in the 1dB range up to the stated frequency prior. Above 2.5kHz, the 45º off-axis response drops significantly, and the 30º off-axis response begins to drop as well. The 15º off axis-response remains tight until 10kHz, but this driver will be rolled off well before that.
- Frequency Response
    - The frequency response is mostly flat on-axis between 100Hz and 1kHz. At 1kHz the frequency response dips about 2-3dB and rises almost 5dB at 1.5kHz. This will need to be addressed during crossover and EQ design.
- Visual Aesthetics
    - A straightforward-looking woofer, this driver remains standard and pleasing to look at. The slightly reflective aluminum dome provides a sleek visual design that is overall aesthetically pleasing.

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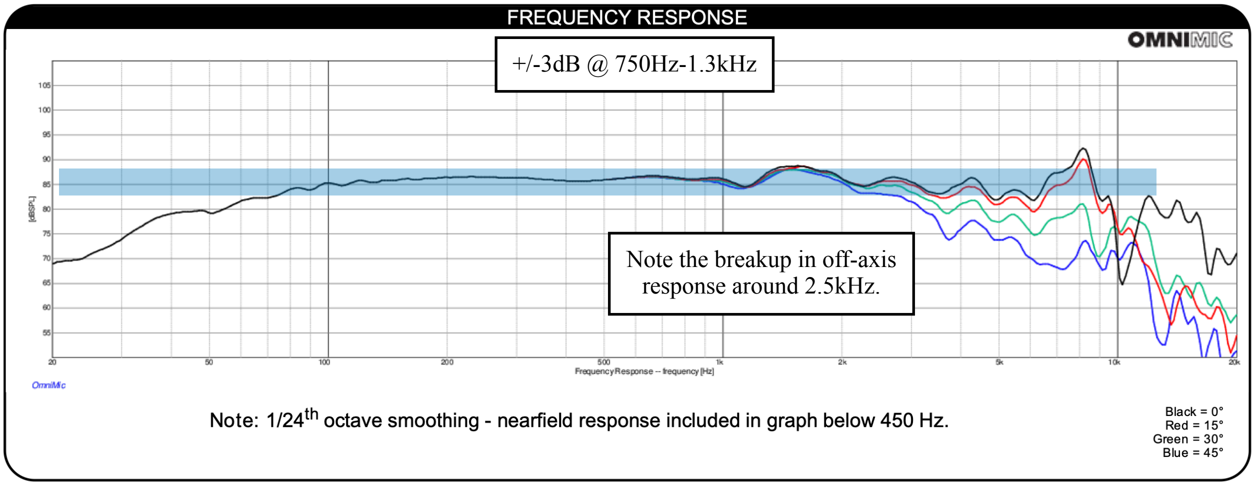
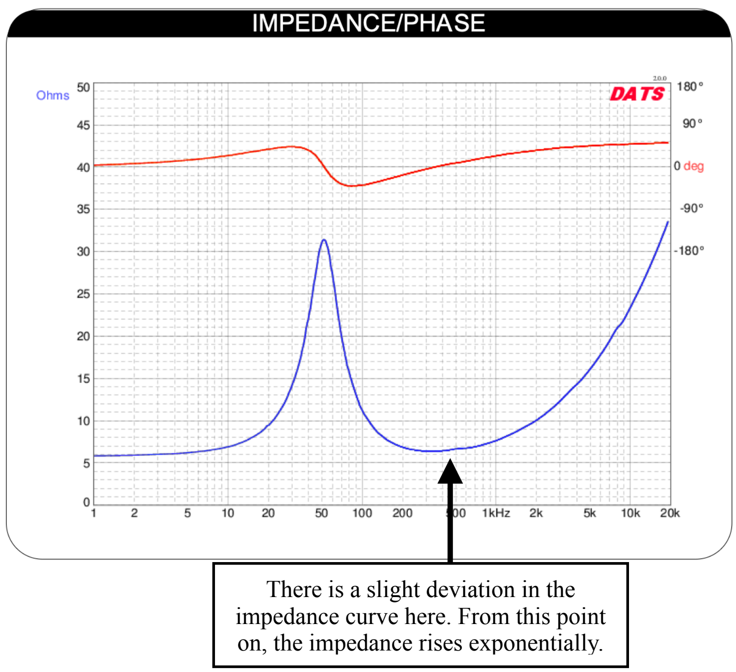
[24] See Appendix I for data regarding woofer analyses.

[25] https://www.daytonaudio.com/category/170/designer-series, accessed November 3, 2023.

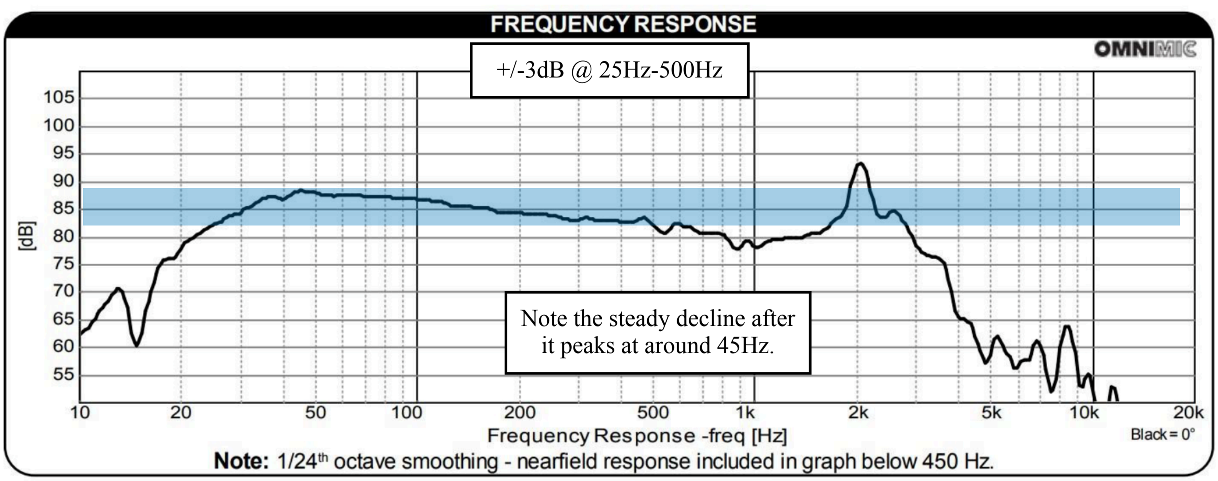

FREQUENCY RESPONSE
OMNIMIC
+/-3dB @ 750Hz-1.3kHz
Note the breakup in off-axis response around 2.5kHz.
Note: 1/24th octave smoothing - nearfield response included in graph below 450 Hz.
Black = 0°
Red = 15°
Green = 30°
Blue = 45°

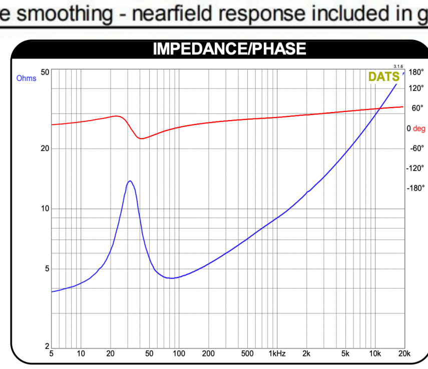

IMPEDANCE/PHASE
Ohms
DATS
0 deg
There is a slight deviation in the impedance curve here. From this point on, the impedance rises exponentially.

6.3 Dayton Audio UM12-22

This 12" subwoofer comes with a Dayton Audio kit that I purchased for this system. It is Dayton Audio's Ultimax design, which means it is a high excursion woofer designed to produce high SPLs and a lower response. This woofer also adds durability to its power, making it ideal for mobility.

- SPL
  - A sensitivity of 86.3dB meets my target specifications. This subwoofer is wired as a 2+2 ohm driver, so I wired each voice coil into separate channels on my DSP for maximum control.
- Off-Axis
  - Not provided.
- Frequency Response
  - The frequency response remains in the +/- 3dB range from 25-500Hz. It follows a steady incline from 25Hz to about 45Hz, where it starts to drop off.
- Visual Aesthetics
  - This subwoofer makes use of a woven honeycomb design, which provides a unique design. The lack of a dust cap sets it apart, and the design looks powerful and durable in comparison to other drivers.





This is a high excursion driver, so the impedance increases dramatically right from the start.

7.0 DSP Selection

7.1 Dayton Audio DSP-408

This system is designed to be fully active, including channels for both subwoofer voice coils. Therefore, I needed a DSP that could handle 6 outputs. Due to cost, I chose the Dayton Audio DSP-408 with 4 inputs and 8 outputs. It is a Windows-based DSP that has a bluetooth dongle that can be purchased separately for control from either Apple or Android smartphones. I downloaded Boot Camp on my MacBook Air to run this DSP. Overall, utilization is straightforward and user-friendly. The biggest downside is the increments allowed to set EQ, crossover, and delay are not standard and do not allow for specific numbers.

8.0 Construction

8.1 Dayton Audio C-Note Cabinet Construction

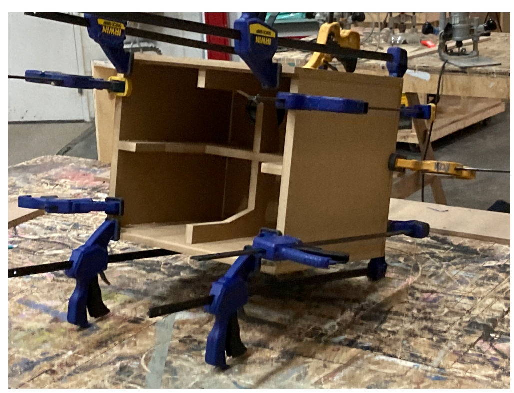
I began construction on my monitors focusing on the cabinet assembly. I ignored the passive crossover parts in this kit because I chose to go fully active in my design. The kit materials came pre-cut and the port holes came pre-drilled, so assembly went smoothly. I drilled holes for the binding posts (see left picture) and then used Tightbond III wood glue to attach the cabinet pieces together as depicted in the included instructions. I used C-clamps to keep the cabinets tight until they dried (see right picture). The instructions required the faceplate to be glued on after the rest of the cabinet, hence the lack of faceplates in the picture. I finished by sanding the cabinet edges smooth and ensuring my joints adhered correctly. I then sealed the interior with a clear sealant.

8.2 Dayton Audio C-Note Driver Installation

This step was straightforward because of my fully active design. I wired the drivers to my binding posts (remembering which is positive and negative), tested the drivers to ensure proper connection, and screwed them into the cabinet.

8.3 Dayton Audio Subwoofer Kit Cabinet Construction

According to my WinSpeakerz calculations, I purchased a 2-inch port that was not included in the kit. The first step therefore required cutting the hole for that port (see left picture). I dry-fitted the cabinet together to ensure my port location did not impact the driver or internal bracing. After cutting the port hole and ensuring the port fit properly, I drilled holes for the binding posts and glued the cabinet together using Tightbond III wood glue without the faceplate and used C-clamps to keep the seams tight (see right picture). After that dried, I glued on the faceplate. The final step included checking the seams for proper seal and sanding the edges for a smooth surface.



8.4 Dayton Audio Subwoofer Kit Driver Installation

I wired the subwoofer to be a 2+2 ohm design for complete control over both voice coils. I include binding posts for both voice coils, so this process involved wiring the driver to the proper binding posts. I then tested the driver and installed it into the enclosure.

8.5 Finished Construction

The construction time for all three speakers spanned approximately four days. Using kits kept the process simple and efficient in my limited build timeframe. The picture below is their last day in the shop before system tuning.

9.0 System Tuning

9.1 Overview

I completed all tuning and testing measurements in the McArdle Theatre at Michigan Technological University. For the C-Notes, I was able to place them on a tall stand away from walls, so the reflections from walls, ceiling, and floor were delayed enough to avoid coloration of the response. The subwoofer I placed on a wooden box with dampening material in between to remove the boundary effect from the floor. All tuning was done at a microphone placement of about 0.5 meters. For my system tuning process, I utilized Rational Acoustic's SMAART[26] software and a SoundID Reference Microphone with the speakers running at 83dB @ 1m. This reference level was chosen for two reasons: 1) to have a standard reference level for each of my testing sessions, and 2) to be able to compare my system with others completing similar projects who were also using 83dB as a reference level.

[26] https://www.rationalacoustics.com/pages/smaart-main-page, accessed December 14, 2023.

9.2 C-Note Tuning

Before beginning actual system tuning, I tested the response of my speaker without dampening material inside the cabinet. See the captions for explanation of each response.

Left Speaker Woofer Response, No Crossover, No EQ, Undamped, 83dB @ 1m

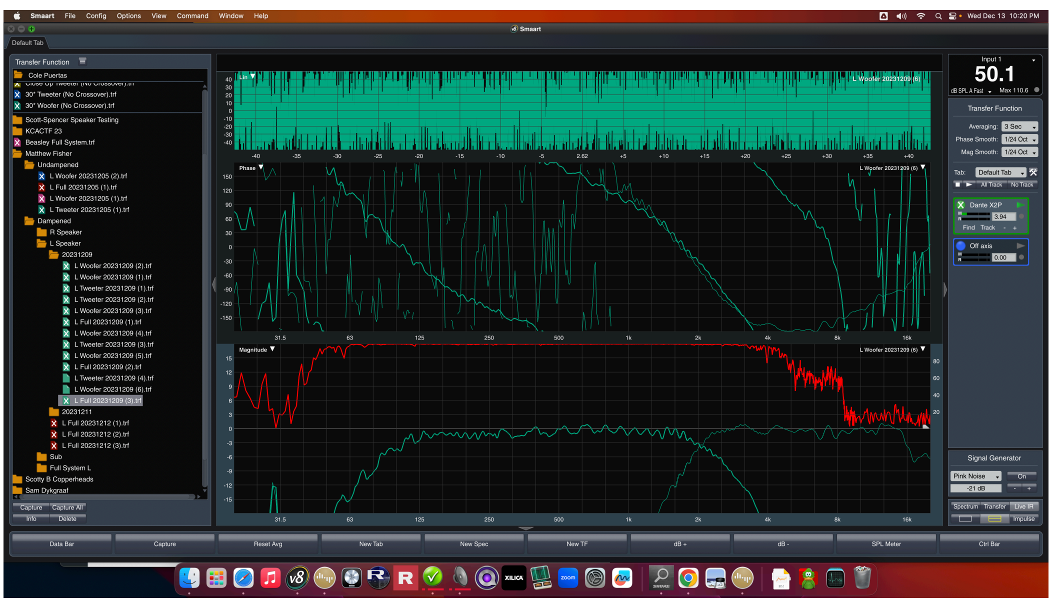
Left Speaker Tweeter Response, 1kHz Crossover, No EQ, Undamped, 83dB @ 1m

Left Speaker Response, Crossover at 2.5kHz, No EQ, Undamped, 83dB @ 1m

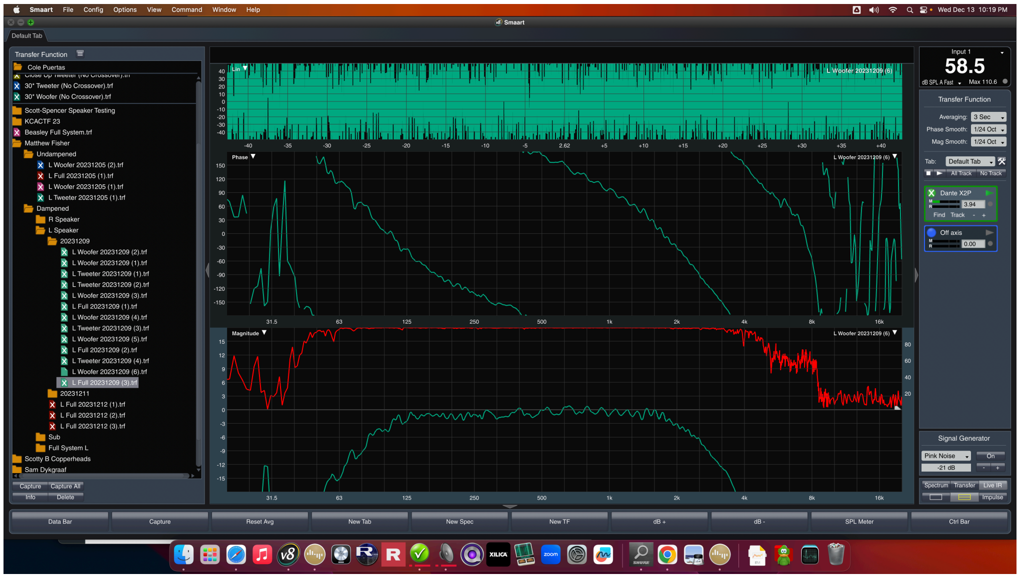
I took measurements without dampening material to test the response in comparison to with dampening material. Below are pictures of the dampening installation. I utilized Rockwool insulation material for internal dampening.

Following the installation of dampening material, I took initial measurements and began tuning the left speaker. I took initial measurements with a rough crossover point, and then I set the delay for the drivers to improve the phase response at the crossover point. I also added EQ points following that in order to flatten out the response.

Left Speaker Response, Crossover at 2.5 kHz, No EQ, 83dB @ 1m



Left Speaker Integrated Response, Crossover at 2.5kHz, 83dB @ 1m, phase aligned (the phase incoherency in the tweeter range is because the woofer measurement is selected)



Left Speaker Woofer Response, Crossover at 2.5kHz, 83dB @1m

Left Tweeter Response, Crossover at 2.5kHz, 83dB @ 1m

On the next tuning session, I decided on my port length. I took port measurements (depicted below) and then measured the full speaker response after the length adjustment. I removed approximately one inch from the length of my port before I got my desired response. Shortening the port moved up the tuning frequency, which smoothed out the roll off on the low end of the C-Notes.

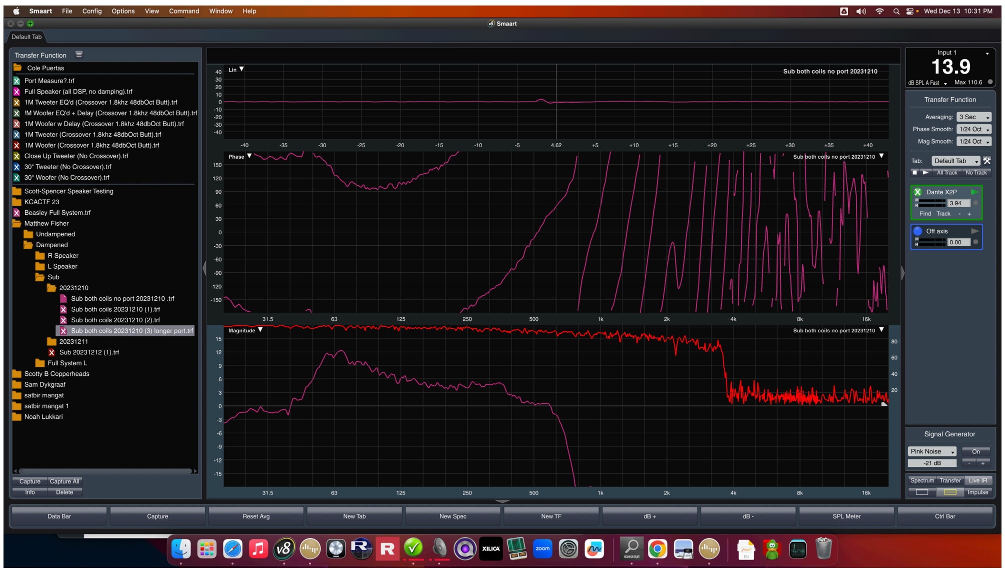
Left Speaker Port Response, 83dB @ 1m, Longer Port Measurement (Green), Shorter Port Measurement (Magenta)

Left Speaker Response, 83dB @ 1m, Final Measurement

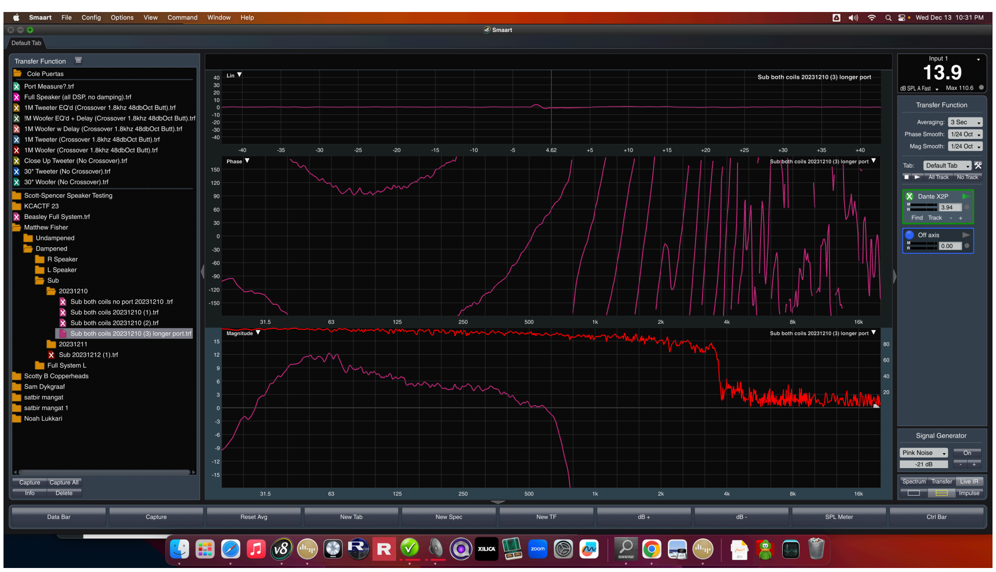
After tuning the port, I made final EQ adjustments to flatten out the response of my speaker. I then repeated this process for the right C-Note speaker and achieved a similar response as shown in the final performance documentation later in this paper.

9.3 Subwoofer Tuning

To begin the subwoofer tuning, I took an initial measurement with both voice coils active and a crossover at 800Hz. From there, I started the process of tuning my port. I took a measurement of the response without a port to compare to the next measurement with the port.



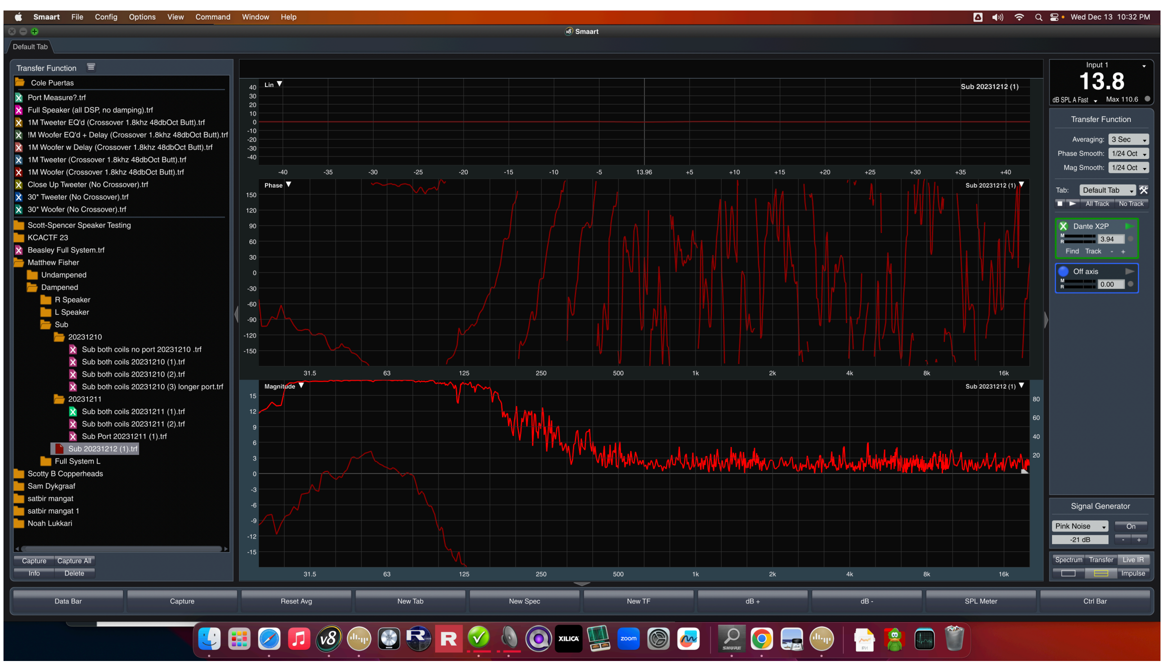
Subwoofer, Crossover at 800Hz, 83dB @ 1m, No Port



Subwoofer, Crossover at 800Hz, 83dB @ 1m, Ported

In the next tuning session, I lengthen my port to the maximum length and took measurements of the subwoofer and port measurements. I also added in a crossover at 80Hz and a shelf EQ to cut the top of the LF bump and increase my F3.

Subwoofer, Crossover at 80Hz, 83dB @ 1m, Port (Purple), Driver (Green)



Subwoofer, Crossover at 80Hz, 83 dB @ 1m, -4dB Shelf EQ to improve F3

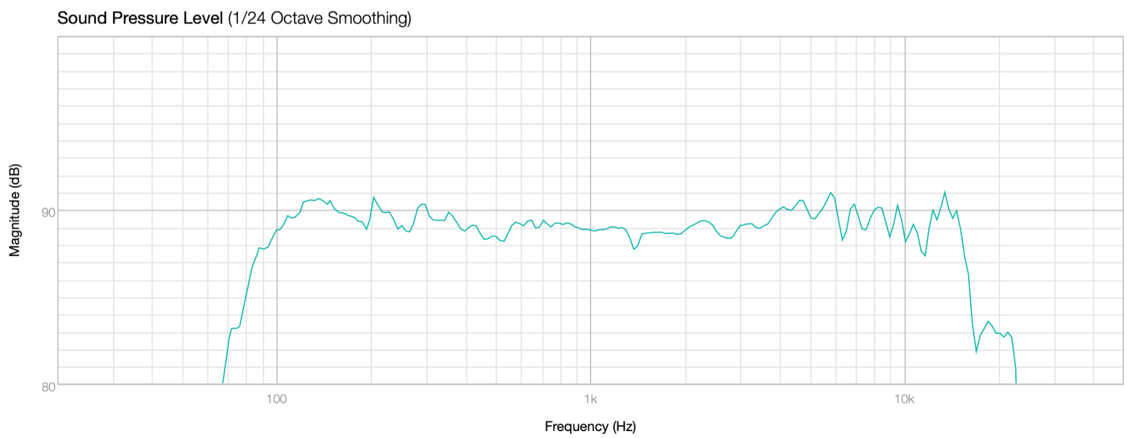
10.0 Final Performance Documentation

10.1 Overview

The following measurements were taken after system tuning was completed. Each speaker was measured at 83dB @ 1m and measured with an Earthworks M50 microphone. The C-Notes were placed on a stand approximately 10 feet tall in a large room to avoid reflections. The subwoofer was placed on acting blocks approximately 2 feet off the floor to remove the boundary effect from it being on the floor. When this system is installed in my room, final EQ measurements and delays will need to be adjusted.

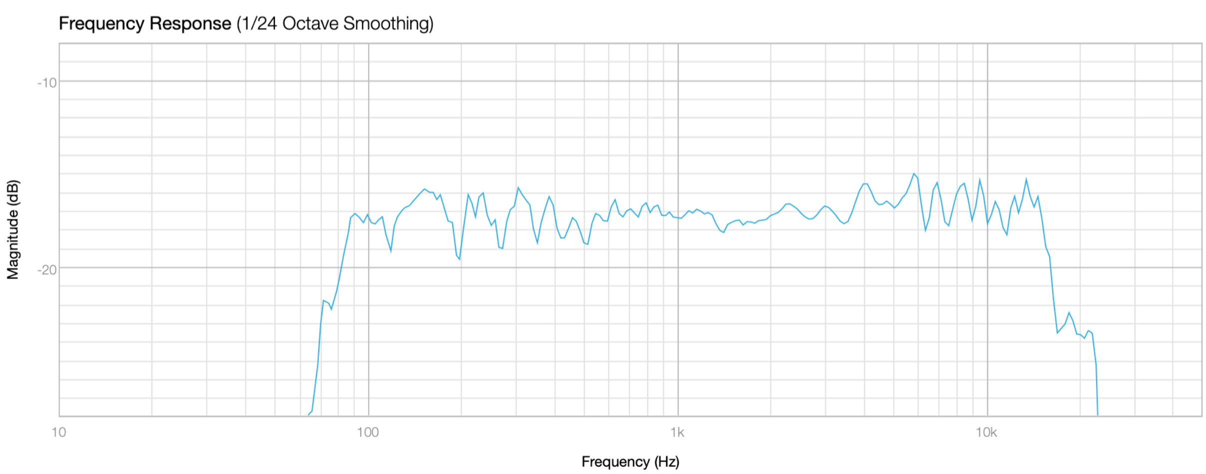
10.2 Left Full Speaker Measurements

SPL and Distance

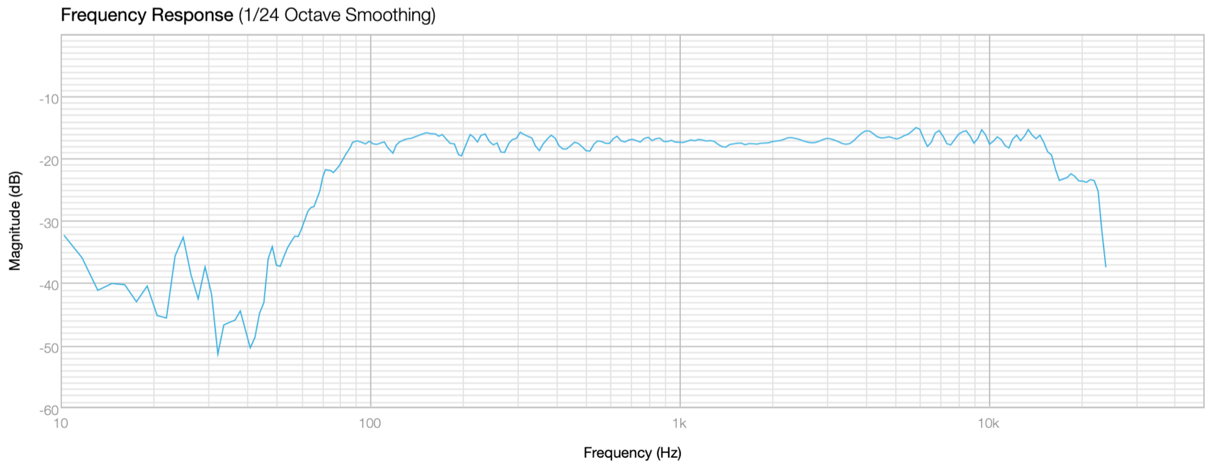


83dB @ 1m, mic at 0.508m (20in), 20dB amplitude range

Frequency Response

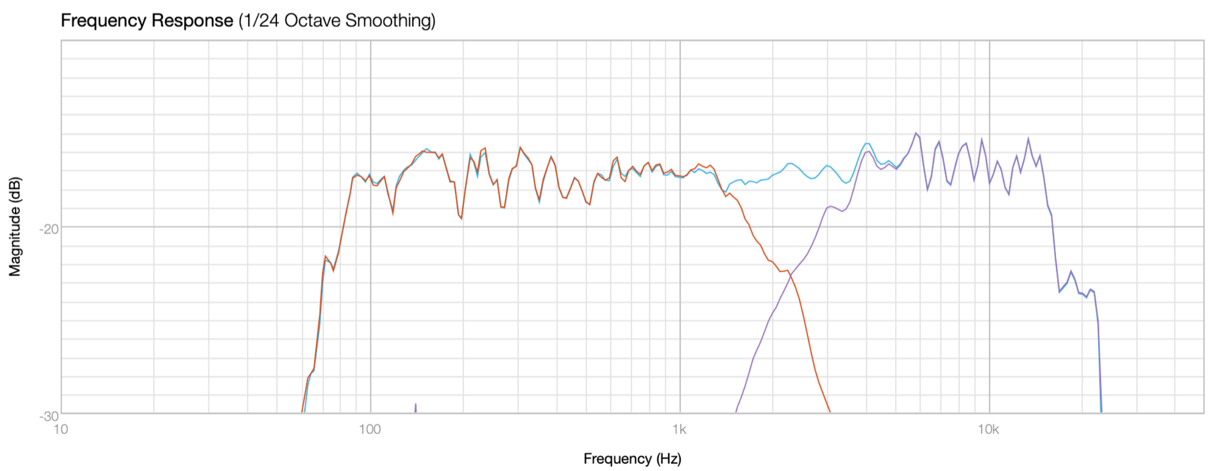


83dB @ 1m, mic at 1m, 20dB amplitude range



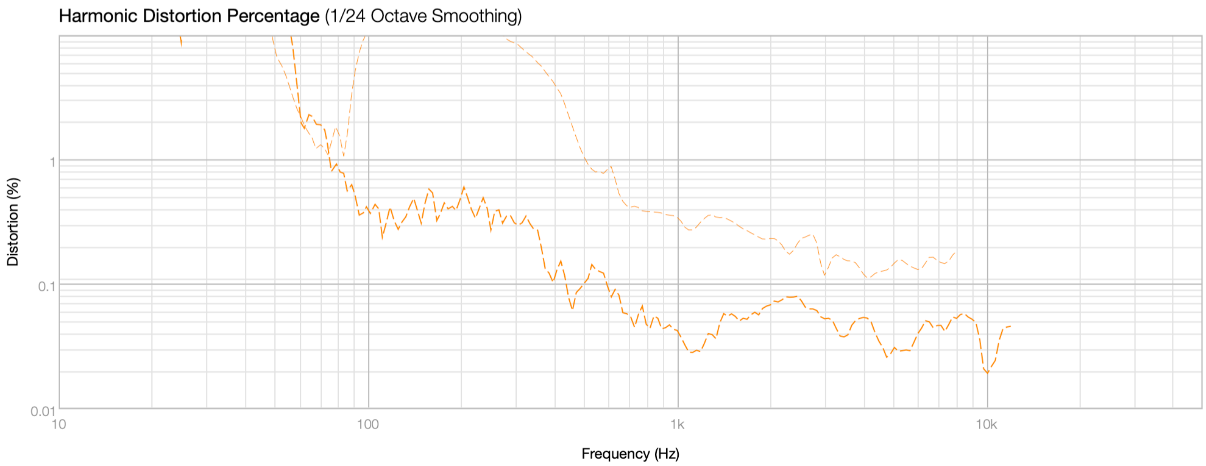
83dB @ 1m, mic at 1m, 60dB amplitude range

Integrated Frequency Response



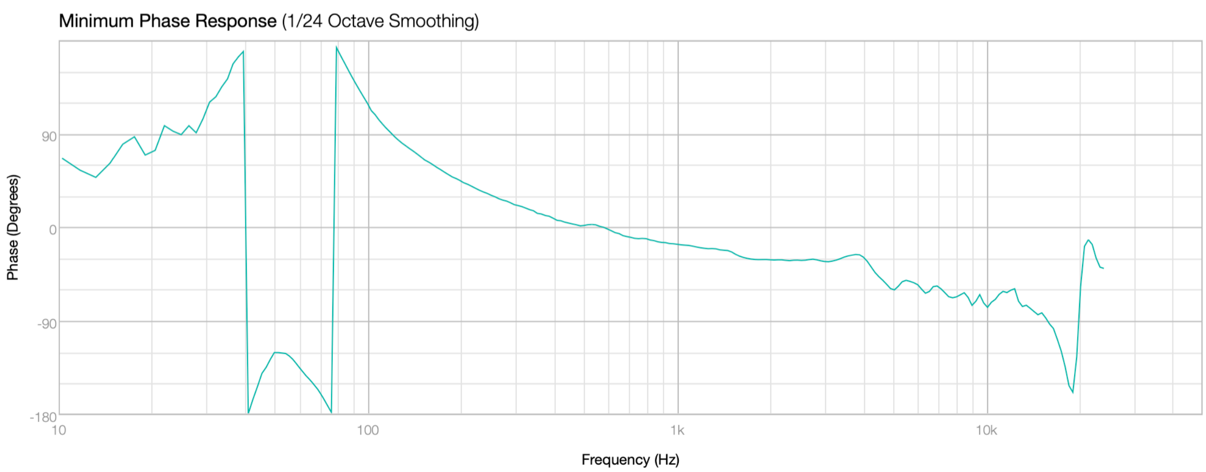
83dB @ 1m, mic at 1m, 20dB amplitude range

Harmonic Distortion



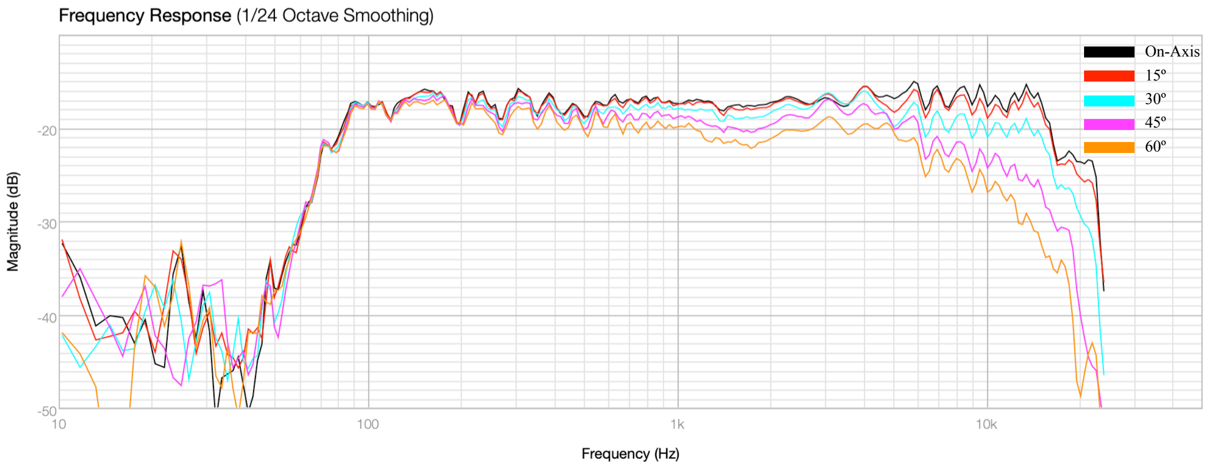
83dB @ 1m, mic at 1in on listening axis

Minimum Phase



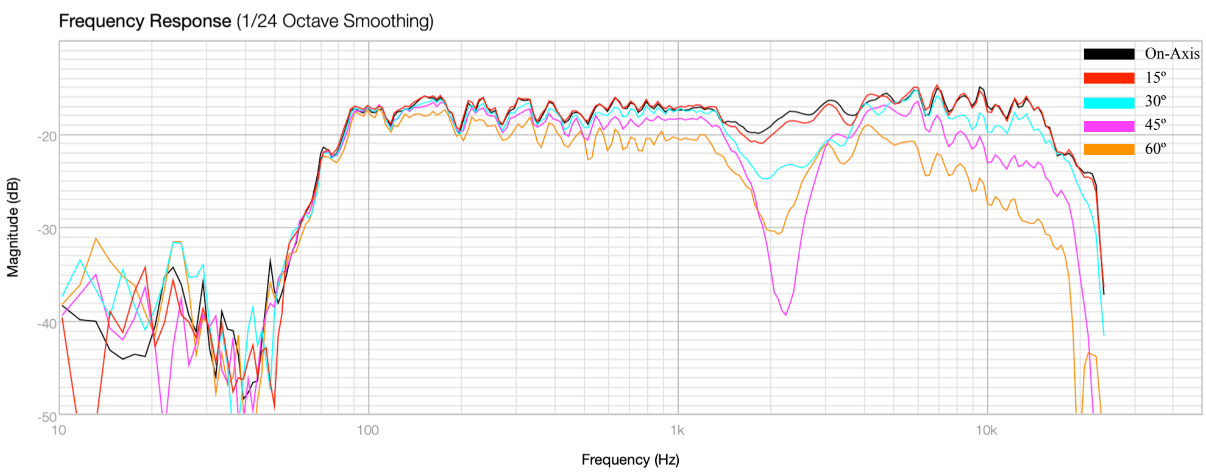
83dB @ 1m

Horizontal Off-Axis Response



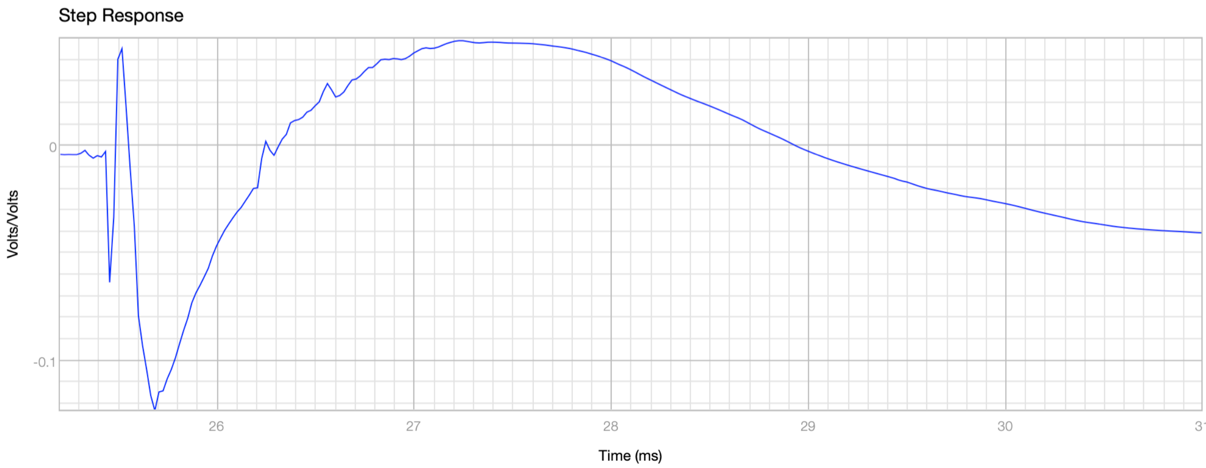
83dB @ 1m, mic at 1m, 40dB amplitude range

Vertical Off-Axis Response



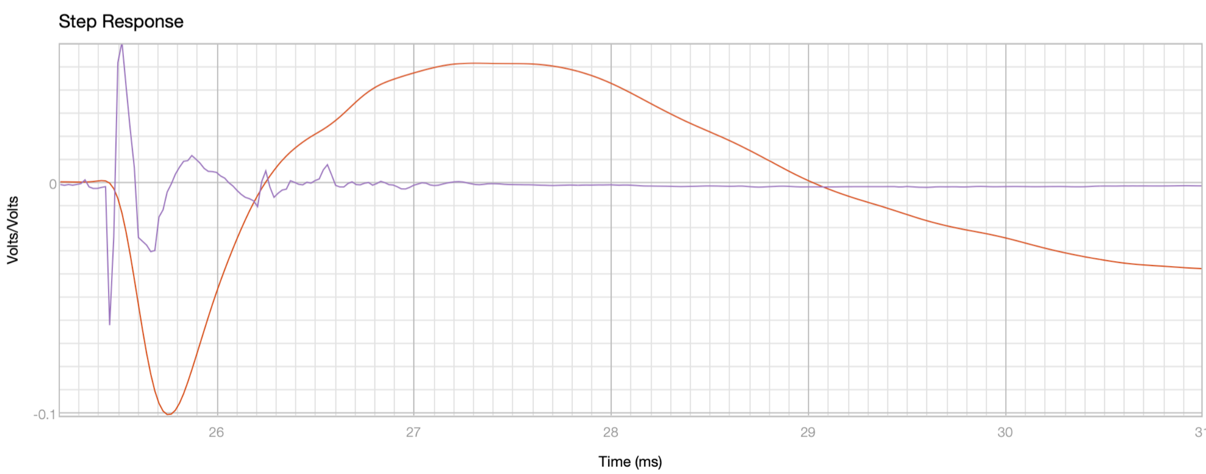
83dB @ 1m, mic at 1m, 40dB amplitude range

Step Response



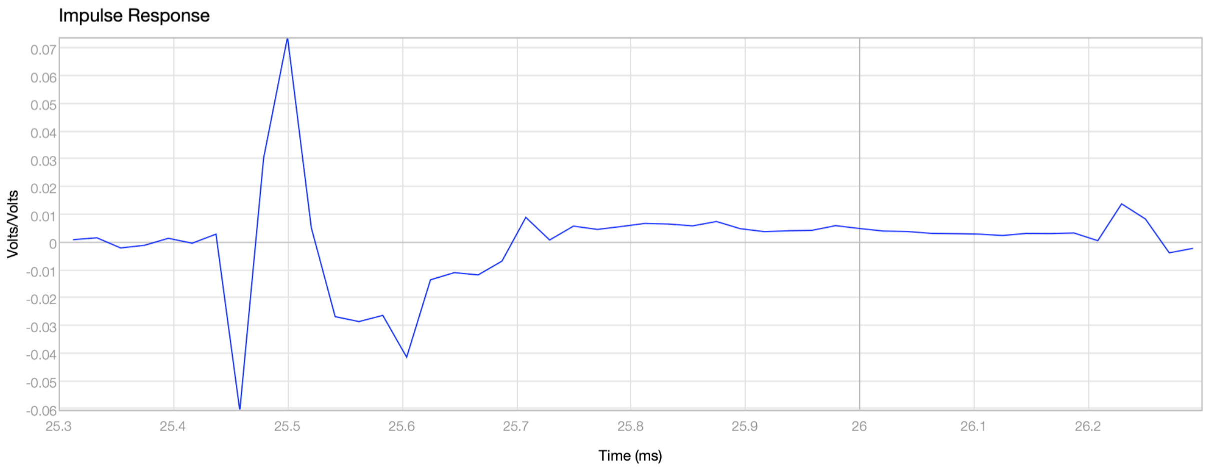
83dB @ 1m, mic at 1m

Integrated Step Response



83dB @ 1m, mic at 1m

Impulse Response

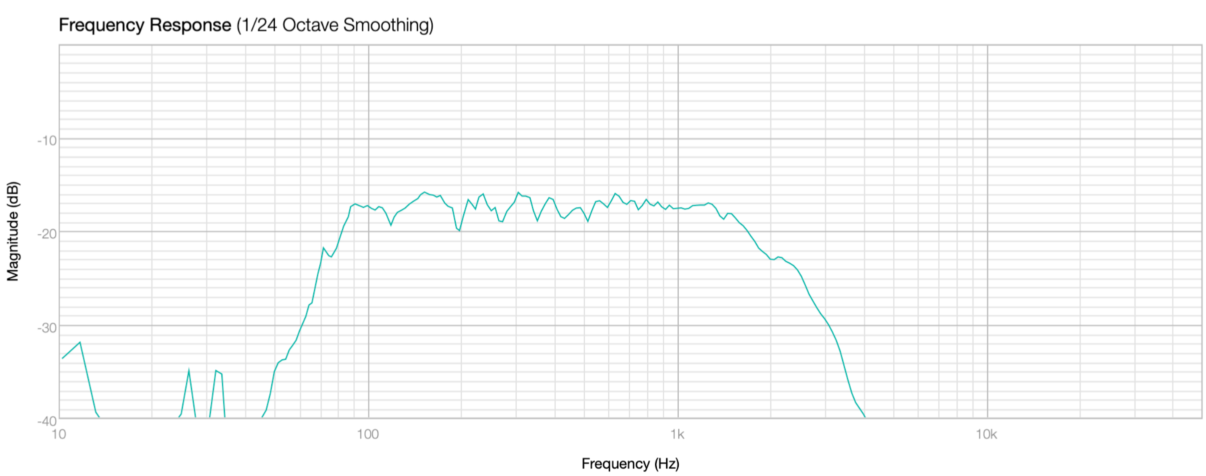


83dB @ 1m, mic at 1m

10.3 Left Speaker Individual Driver Measurements

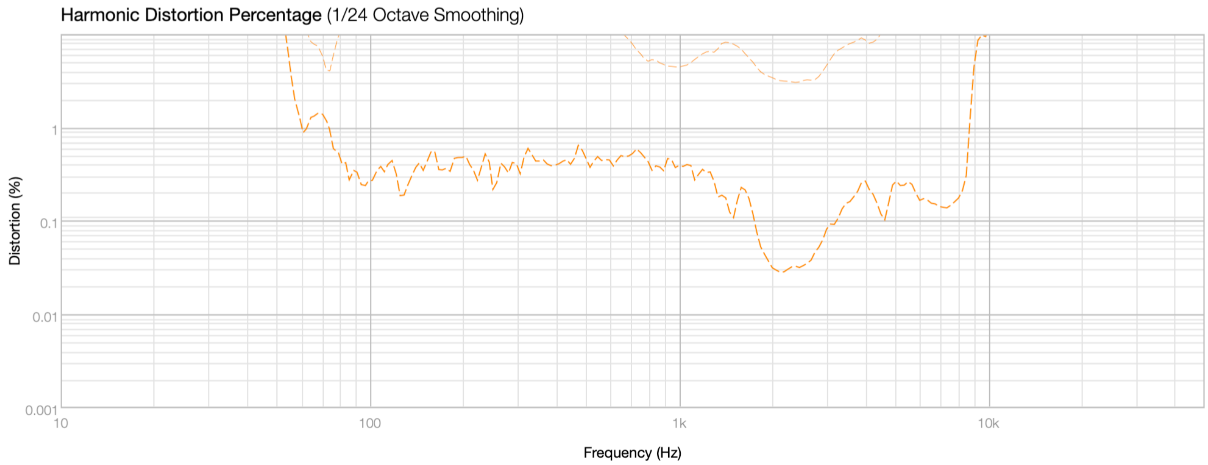
Woofer Measurements

Frequency Response



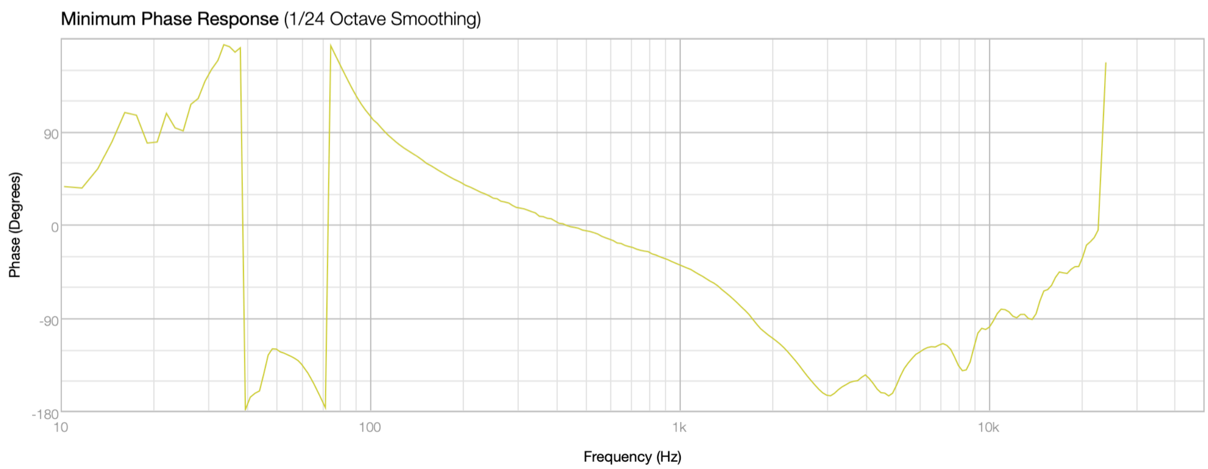
83dB @ 1m, mic at 1m, 40dB amplitude range

Harmonic Distortion



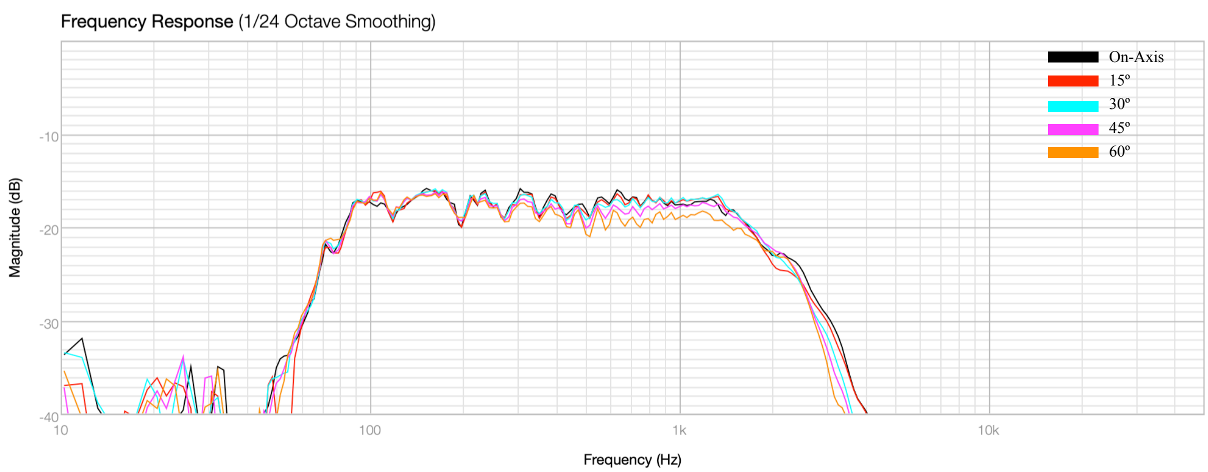
83dB @ 1m, mic at 1in

Minimum Phase



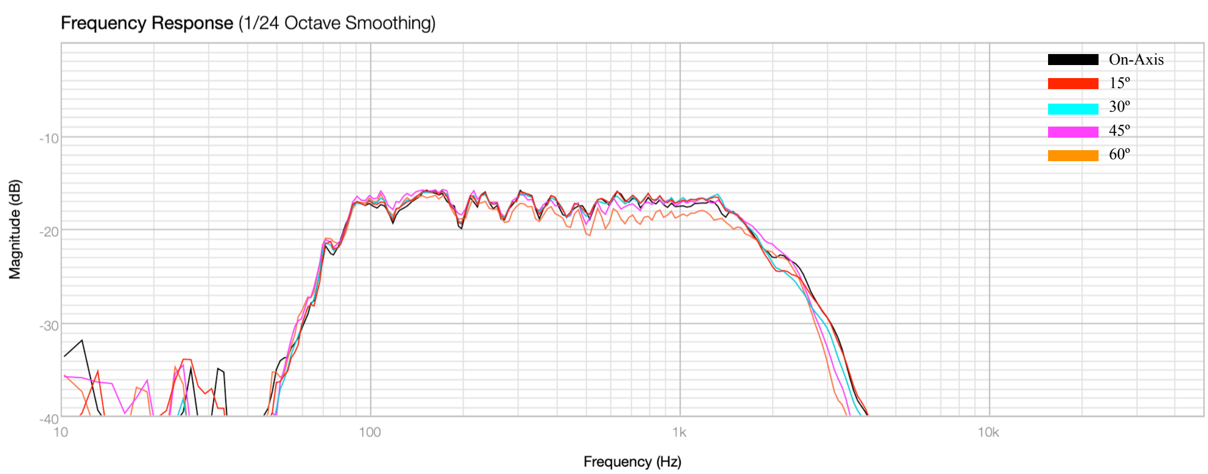
83dB @ 1m

Horizontal Off-Axis Response



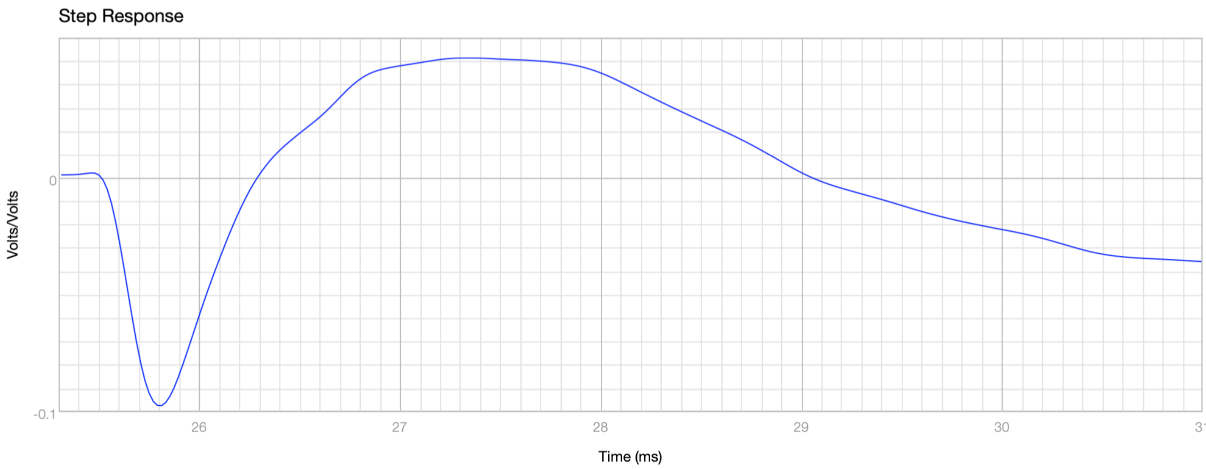
83dB @ 1m, mic at 1m, 40dB amplitude range

Vertical Off-Axis Response



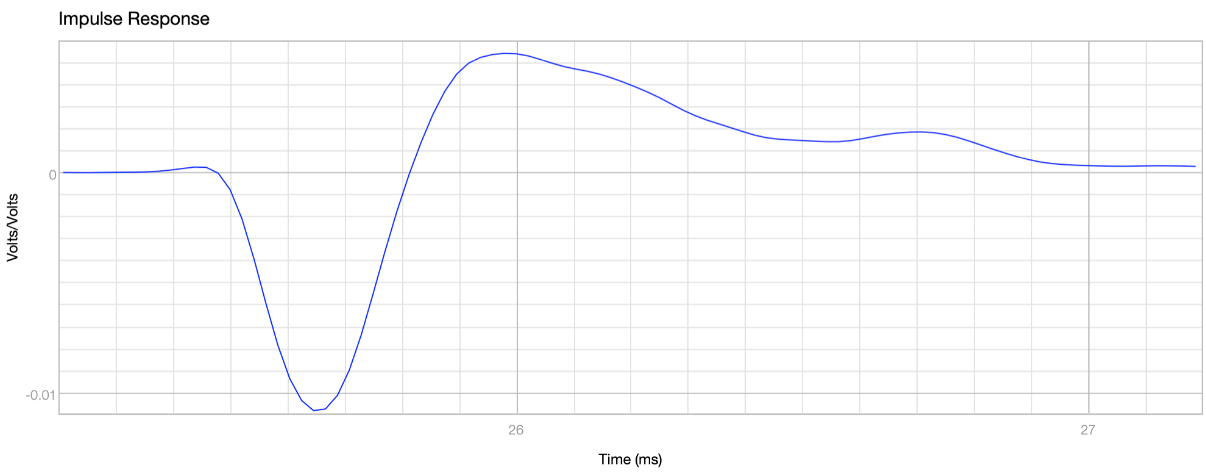
83dB @ 1m, mic at 1m, 40dB amplitude range

Step Response



83dB @ 1m, mic at 1m

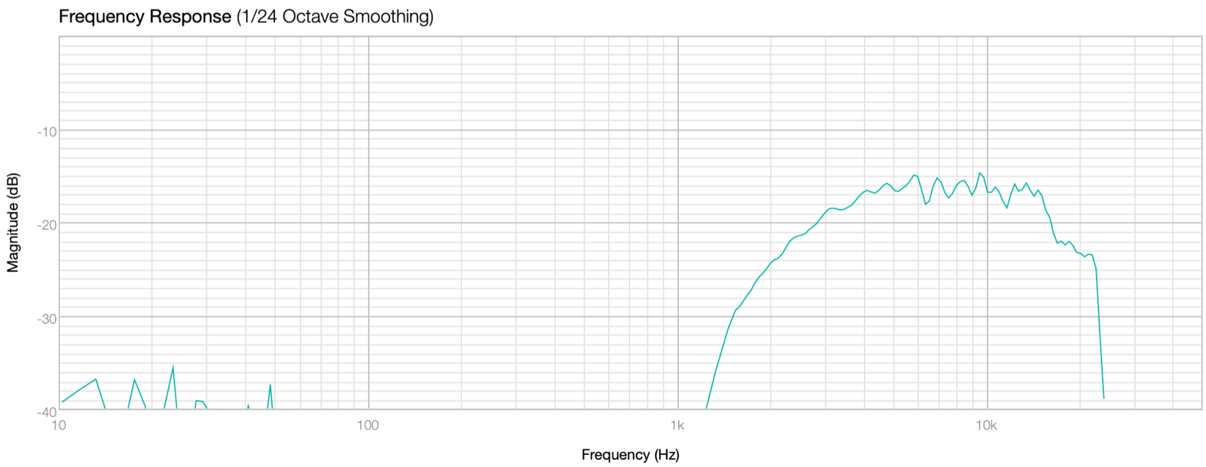
Impulse Response



83dB @ 1m, mic at 1m

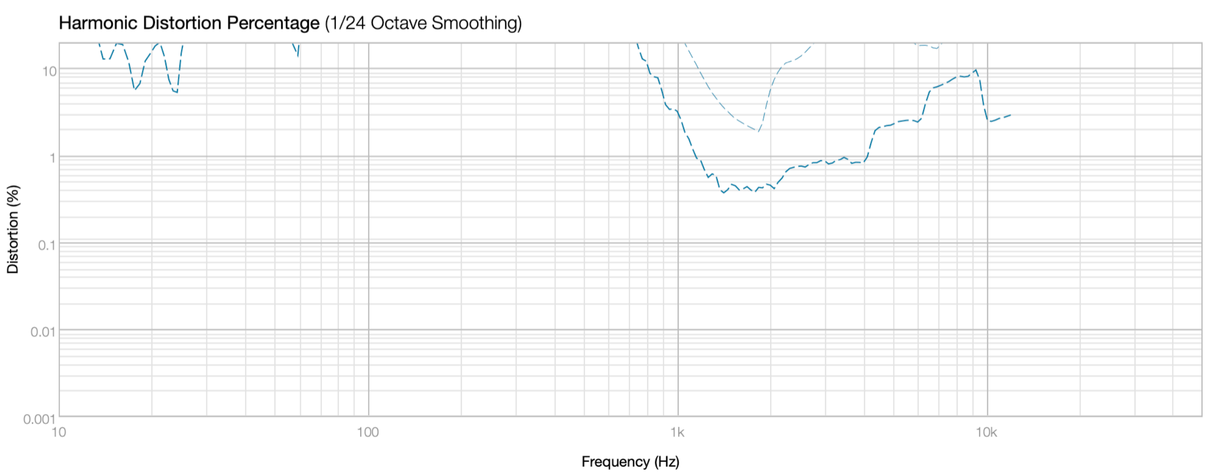
Tweeter Measurements

Frequency Response



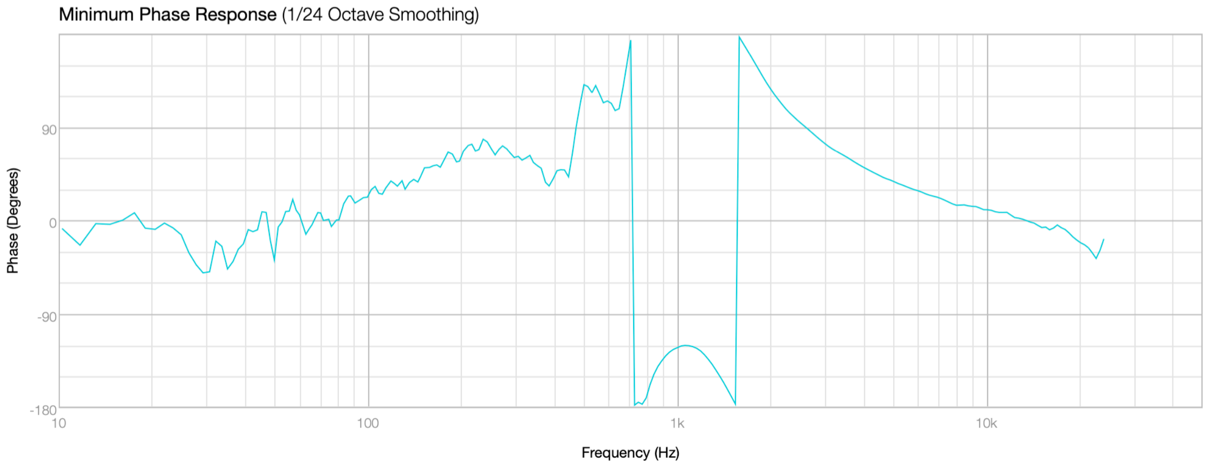
83dB @ 1m, mic at 1m, 40dB amplitude range

Harmonic Distortion



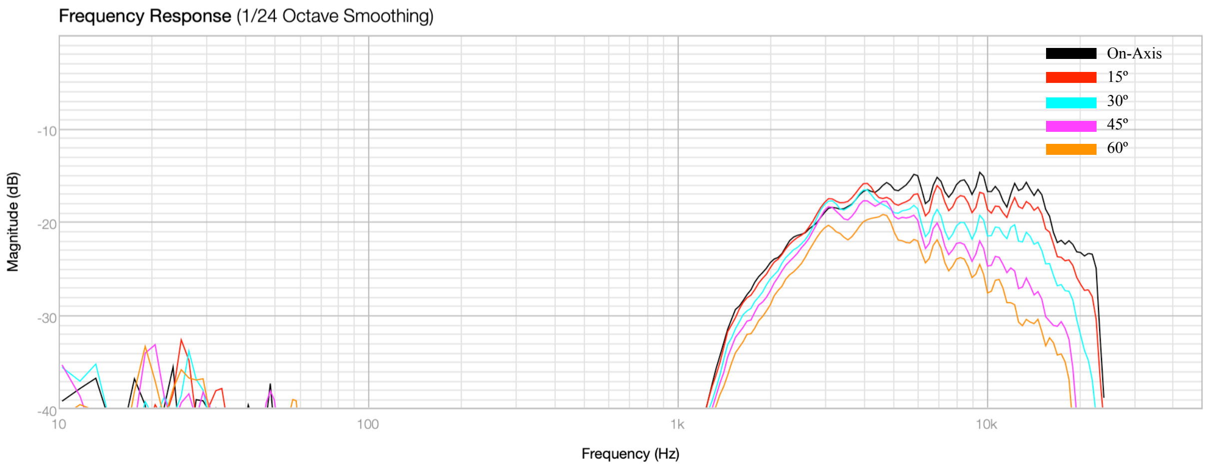
83dB @ 1m, mic at 1in

Minimum Phase



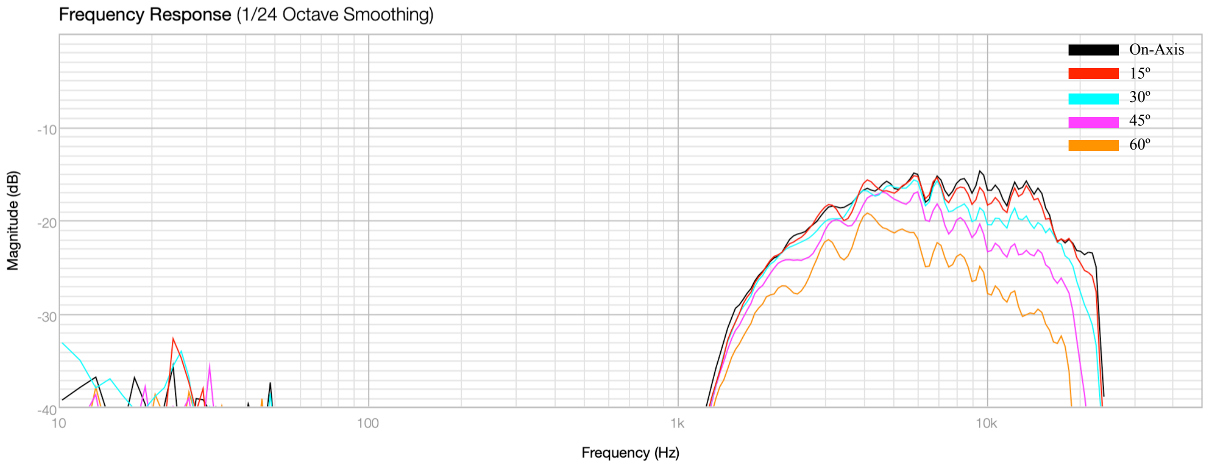
83dB @ 1m

Horizontal Off-Axis Response



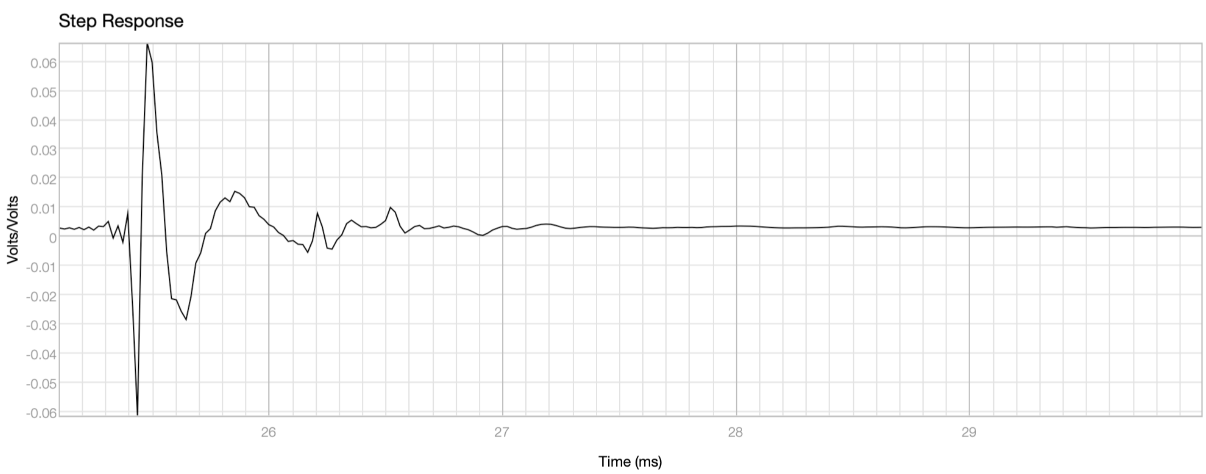
83dB @ 1m, mic at 1m, 40dB amplitude range

Vertical Off-Axis Response



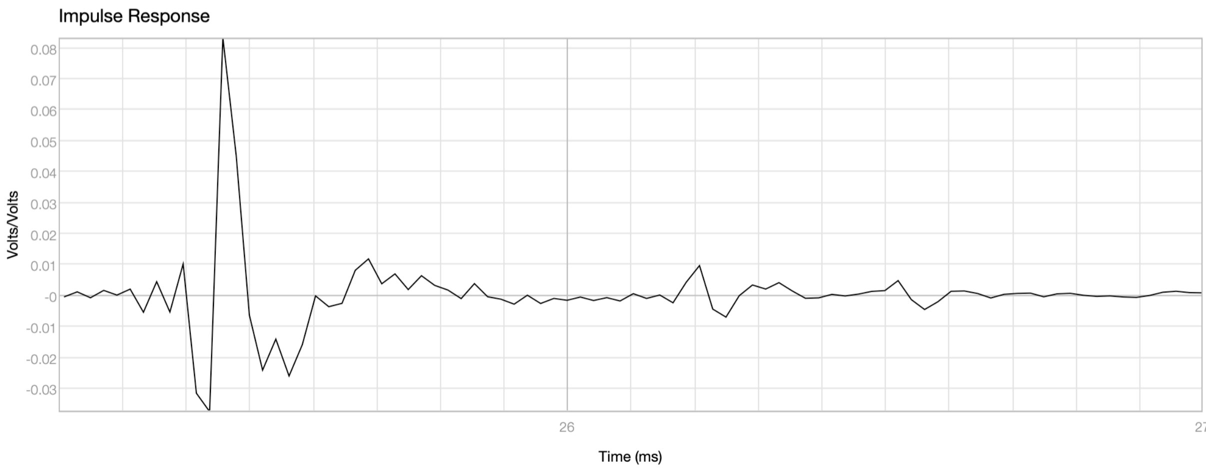
83dB @ 1m, mic at 1m, 40dB amplitude range

Step Response



83dB @ 1m, mic at 1m

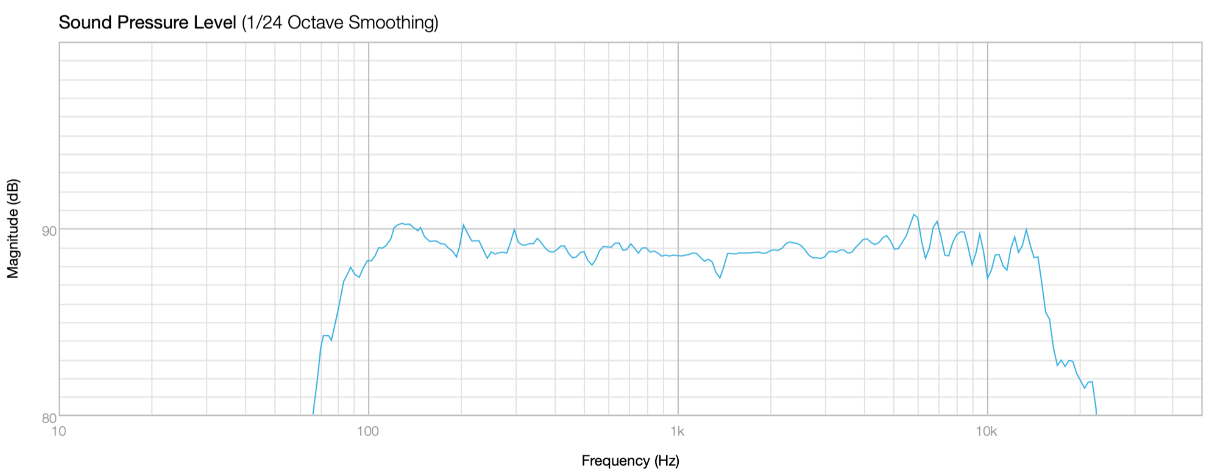
Impulse Response



83dB @ 1m, mic at 1m

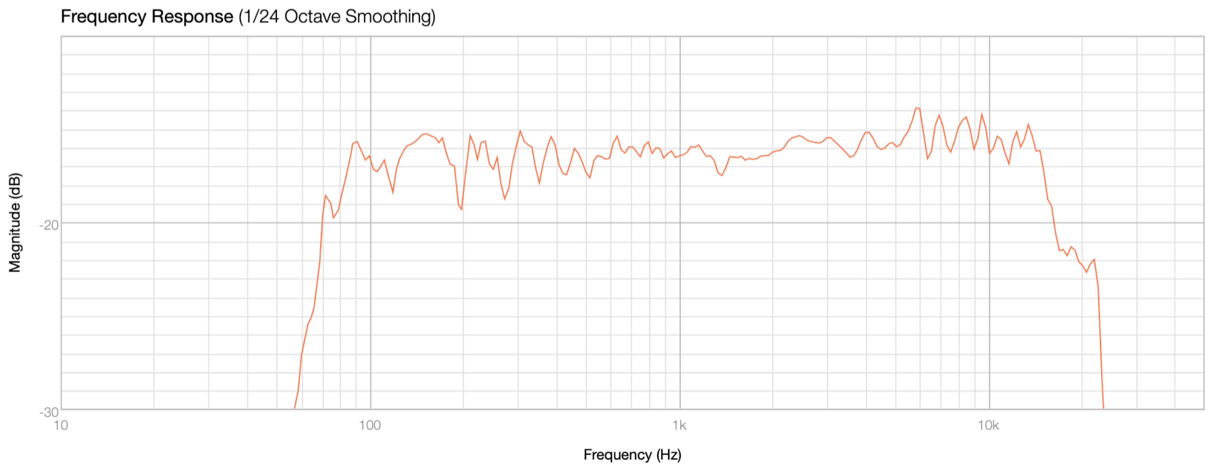
10.4 Right Full Speaker Measurements

SPL and Distance

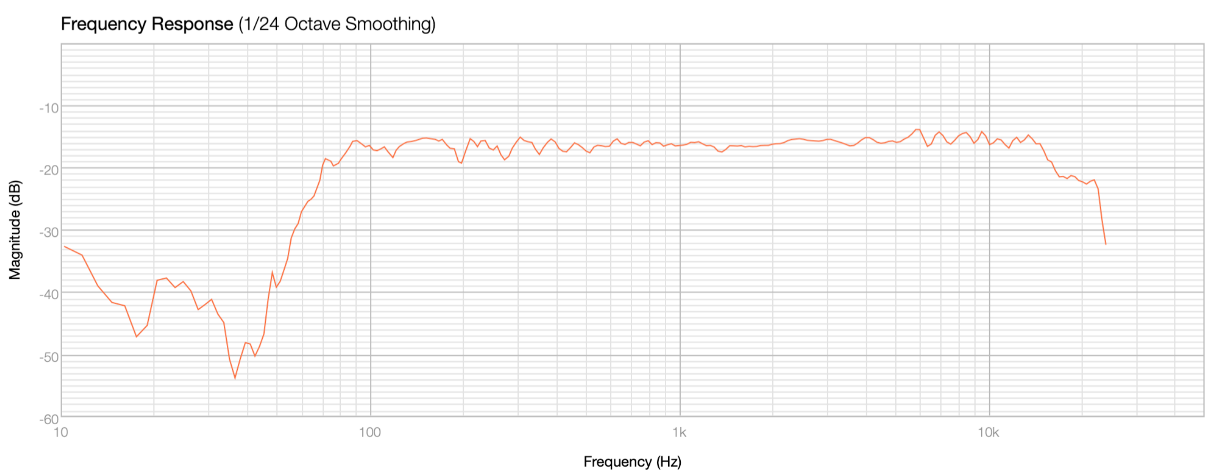


83dB @ 1m, mic at 0.508m (20in), 20dB amplitude range

Frequency Response

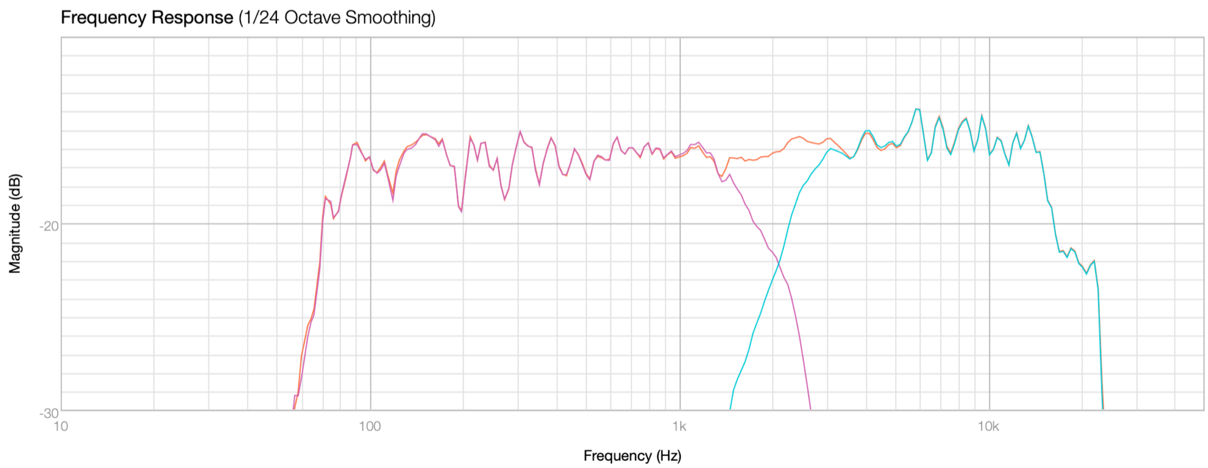


83dB @ 1m, mic at 1m, 20dB amplitude range



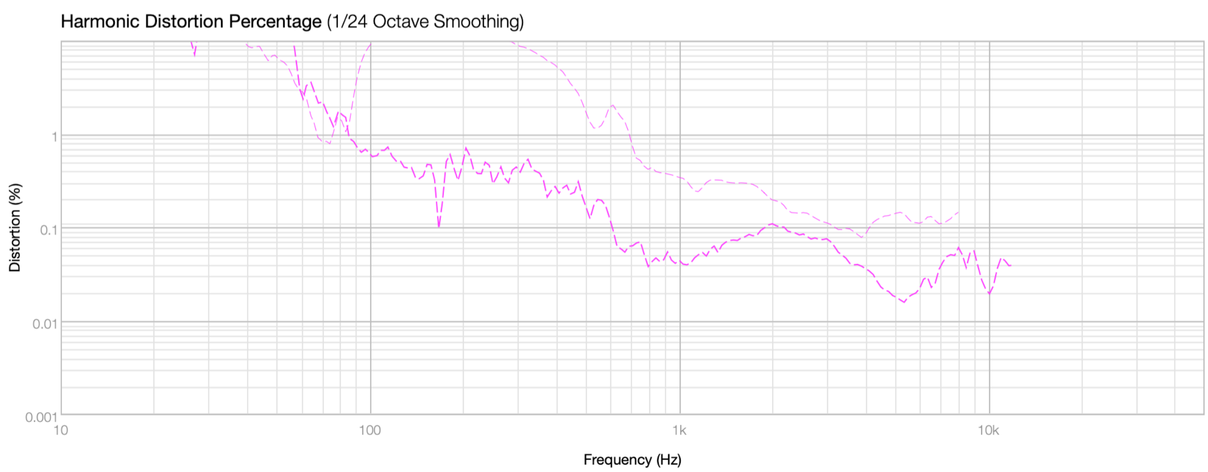
83dB @ 1m, mic at 1m, 60dB amplitude range

Integrated Frequency Response



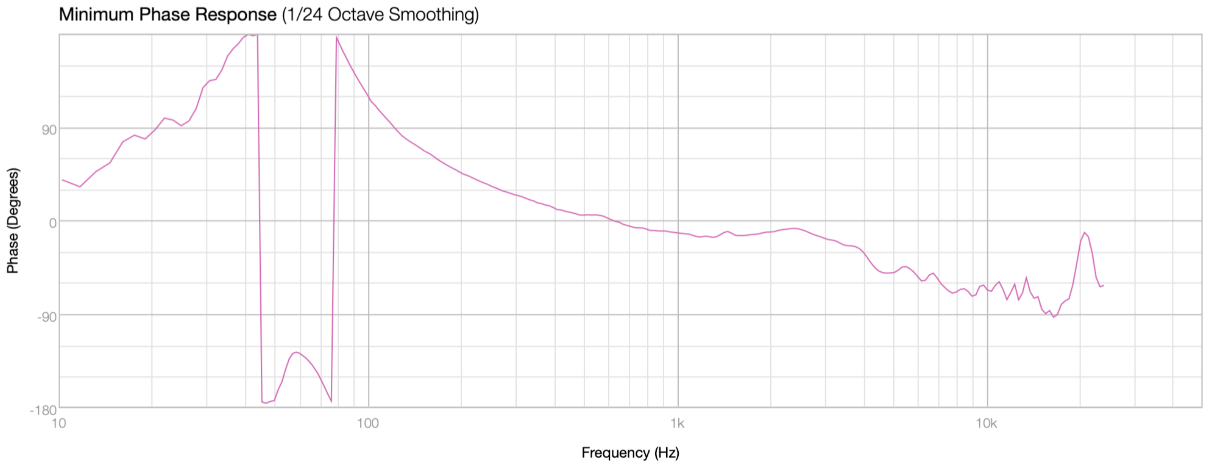
83dB @ 1m, mic at 1m, 20dB amplitude range

Harmonic Distortion



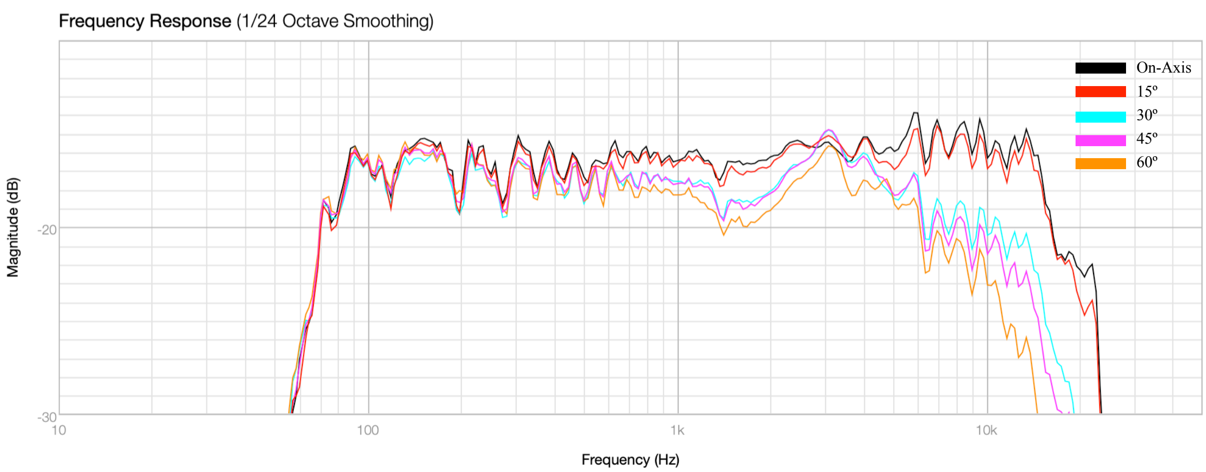
83dB @ 1m, mic at 1in

Minimum Phase



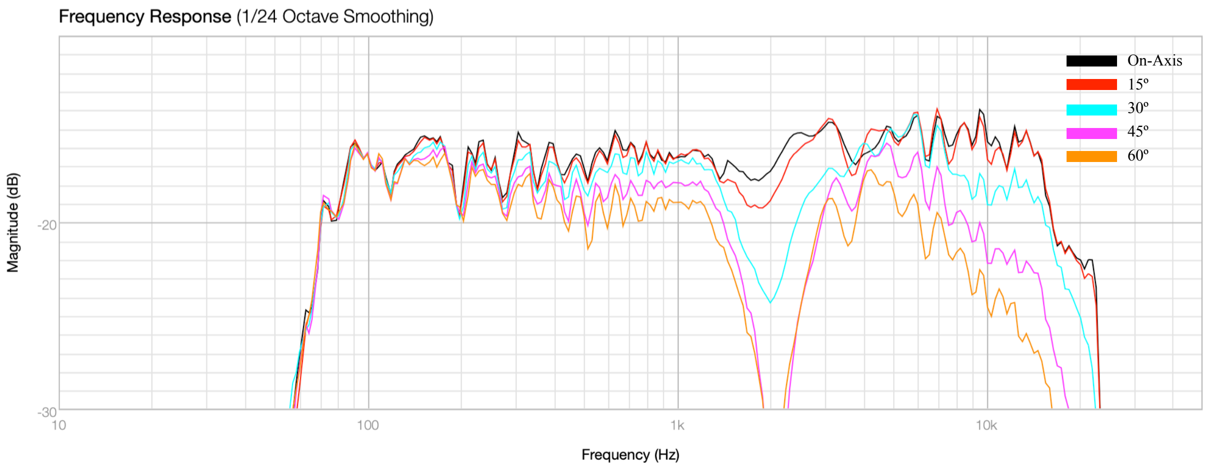
83dB @ 1m

Horizontal Off-Axis Response



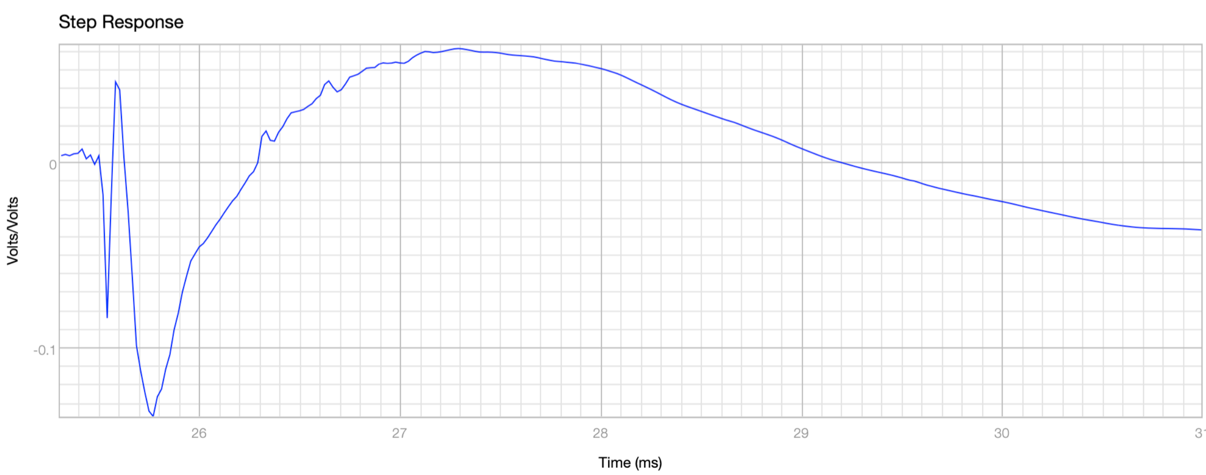
83dB @ 1m, mic at 1m, 20dB amplitude range

Vertical Off-Axis Response



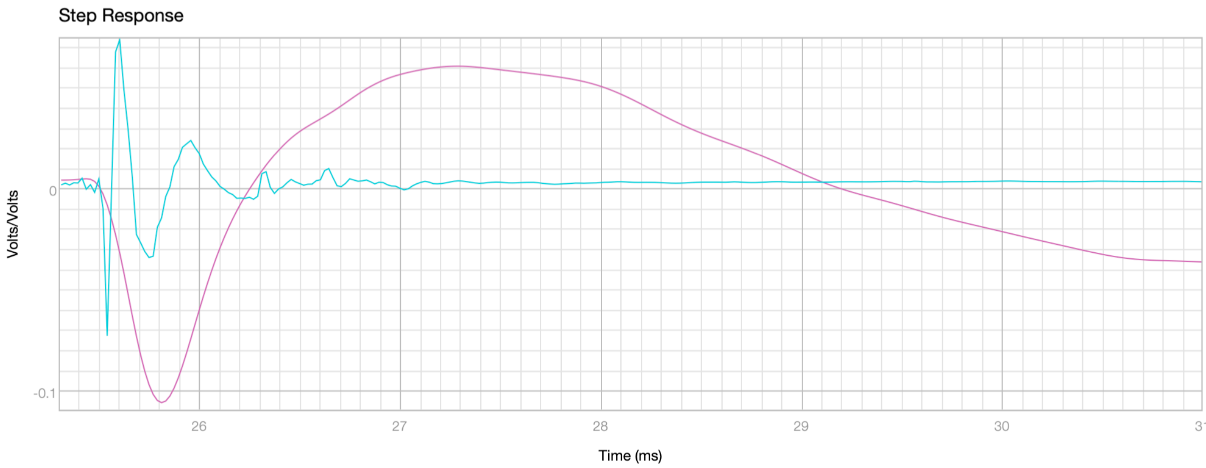
83dB @ 1m, mic at 1m, 20dB amplitude range

Step Response



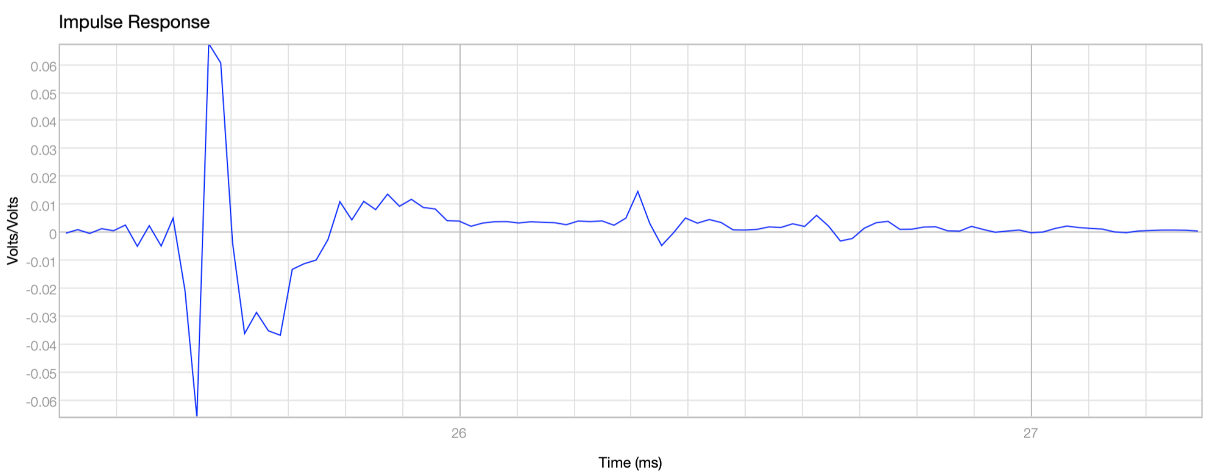
83dB @ 1m, mic at 1m

Integrated Step Response



83dB @ 1m, mic at 1m

Impulse Response

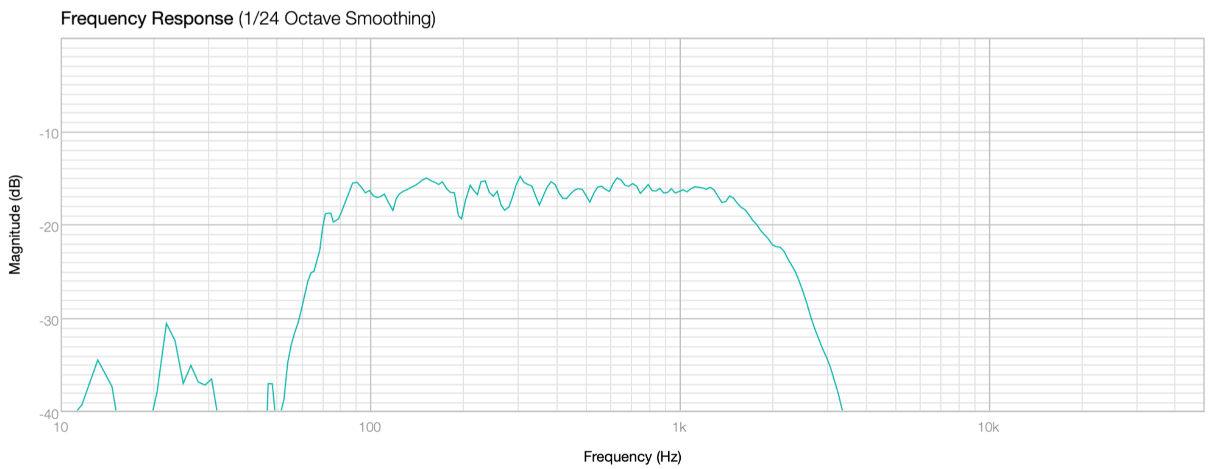


83dB @ 1m, mic at 1m

10.5 Right Speaker Individual Driver Measurements

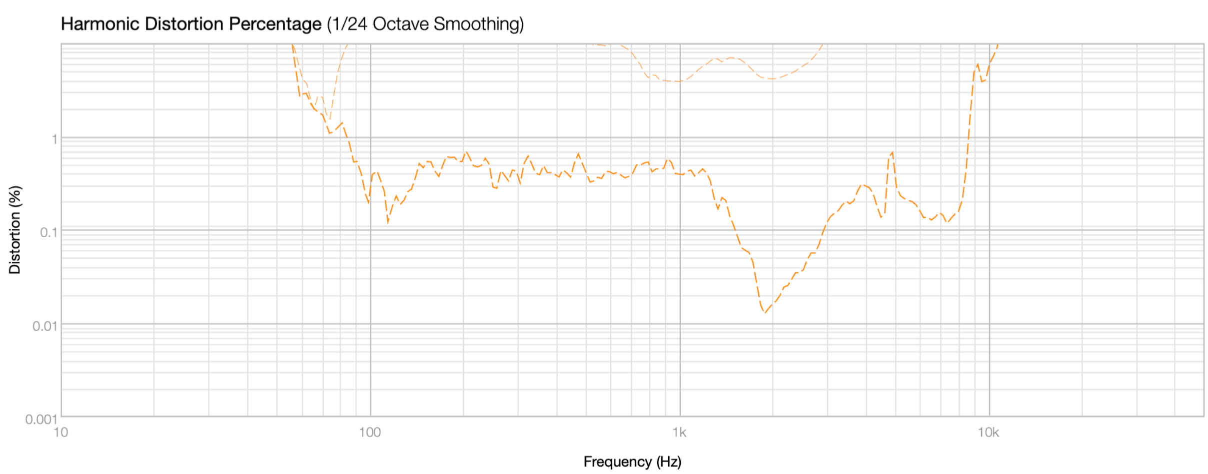
Woofer Measurements

Frequency Response



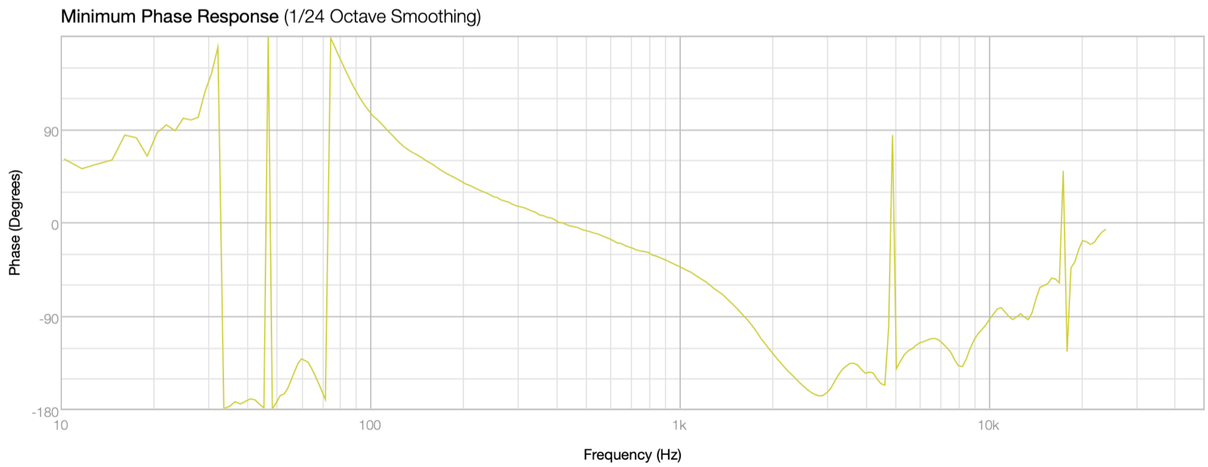
83dB @ 1m, mic at 1m, 40dB amplitude range

Harmonic Distortion



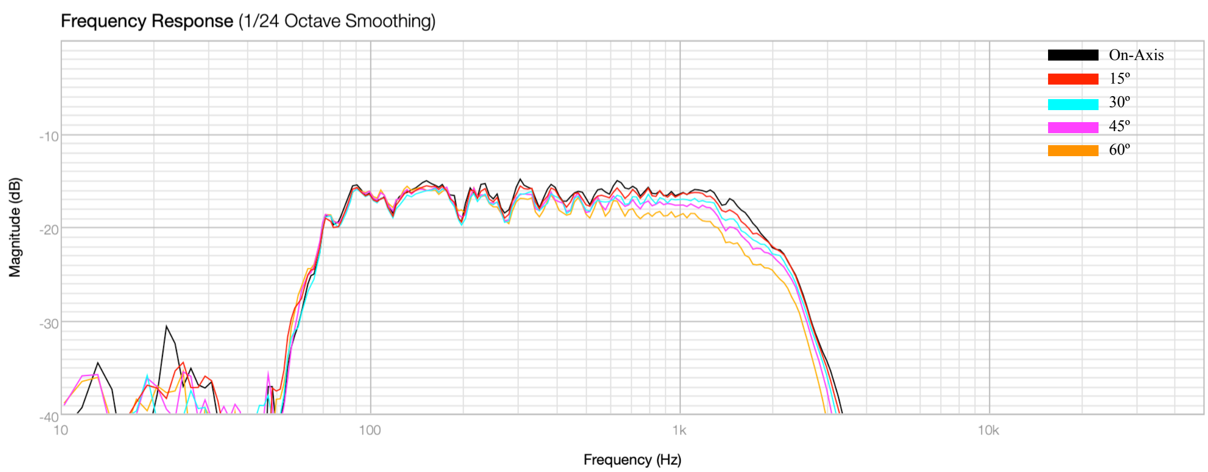
83dB @ 1m, mic at 1in

Minimum Phase



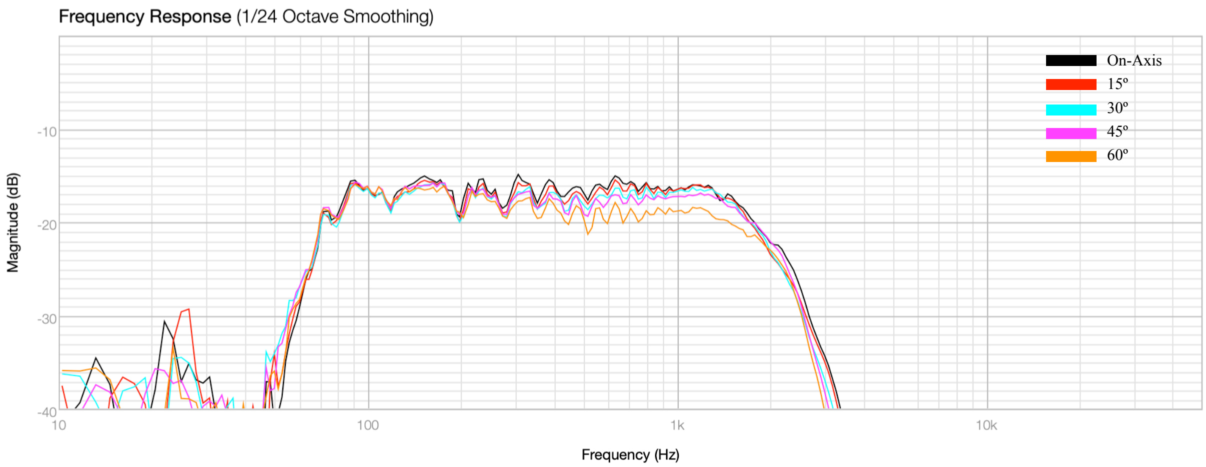
83dB @ 1m

Horizontal Off-Axis Response



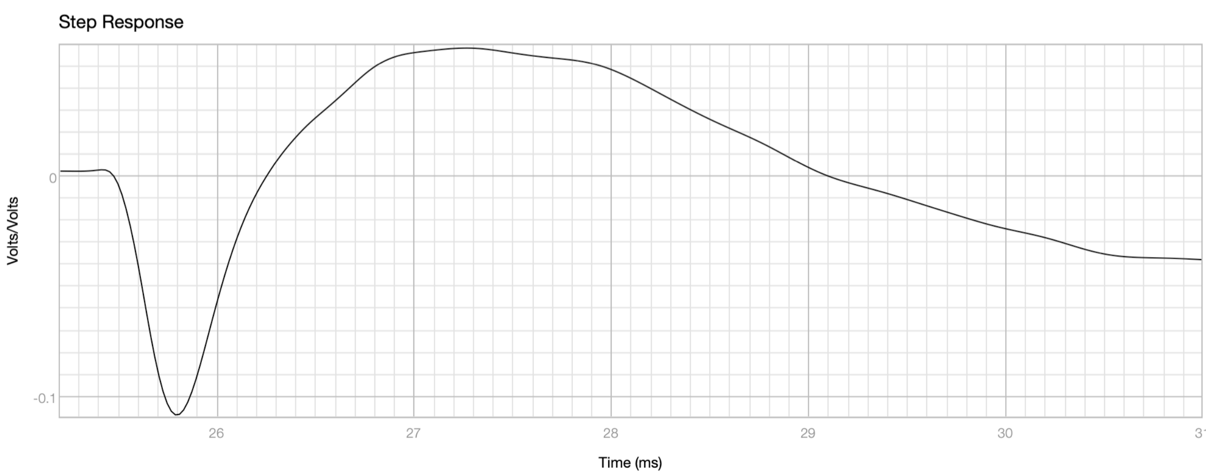
83dB @ 1m, mic at 1m, 40dB amplitude range

Vertical Off-Axis Response



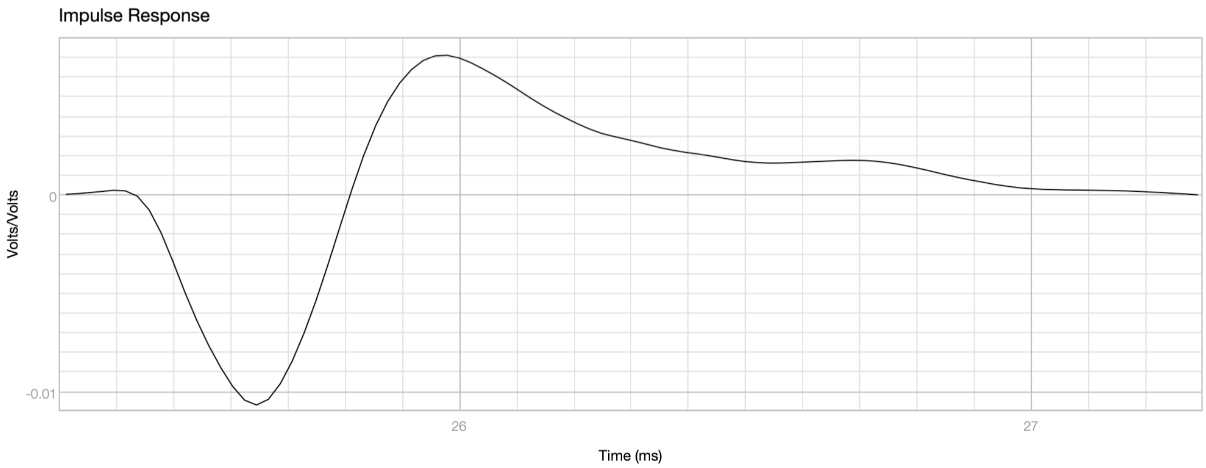
83dB @ 1m, mic at 1m, 40dB amplitude range

Step Response



83dB @ 1m, mic at 1m

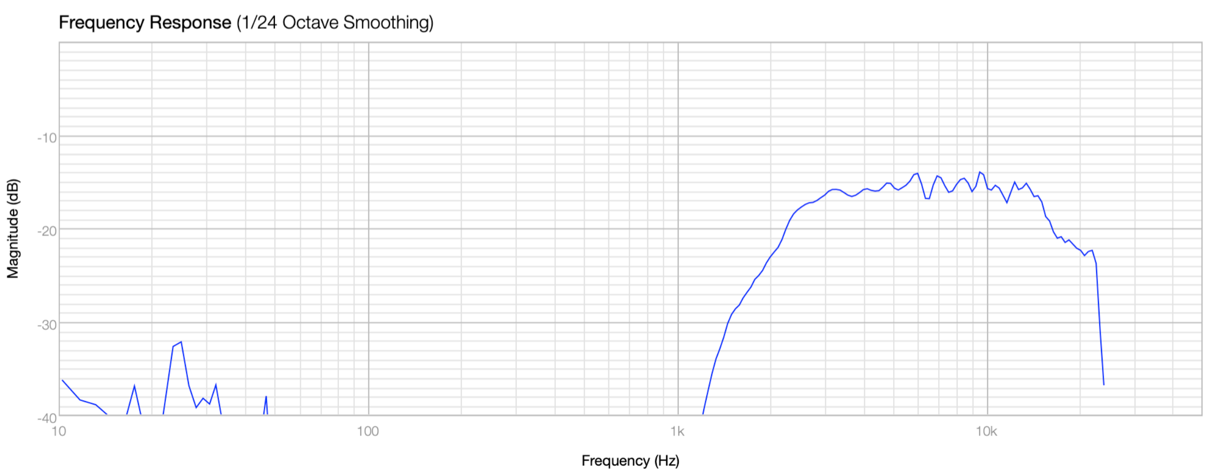
Impulse Response



83dB @ 1m, mic at 1m

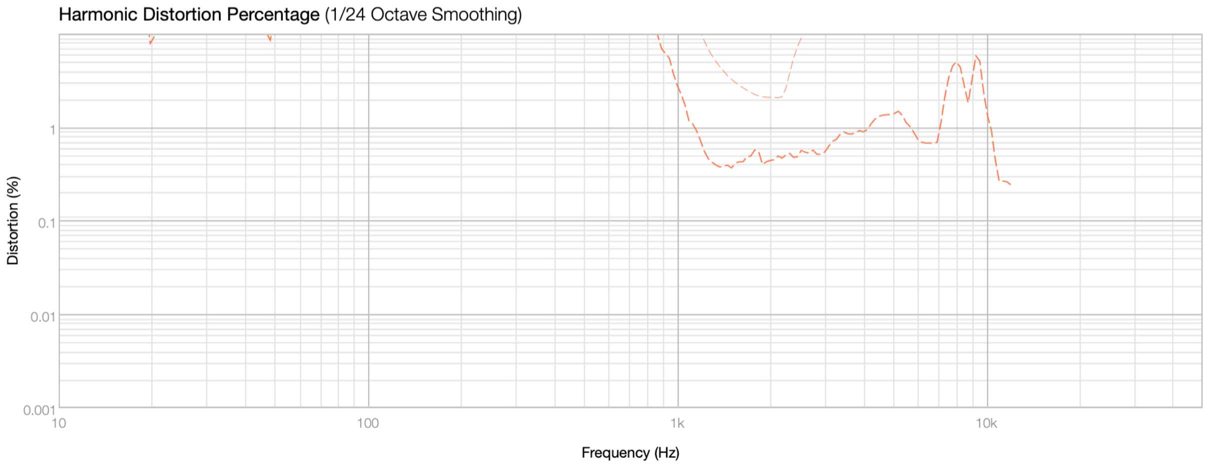
Tweeter Measurements

Frequency Response



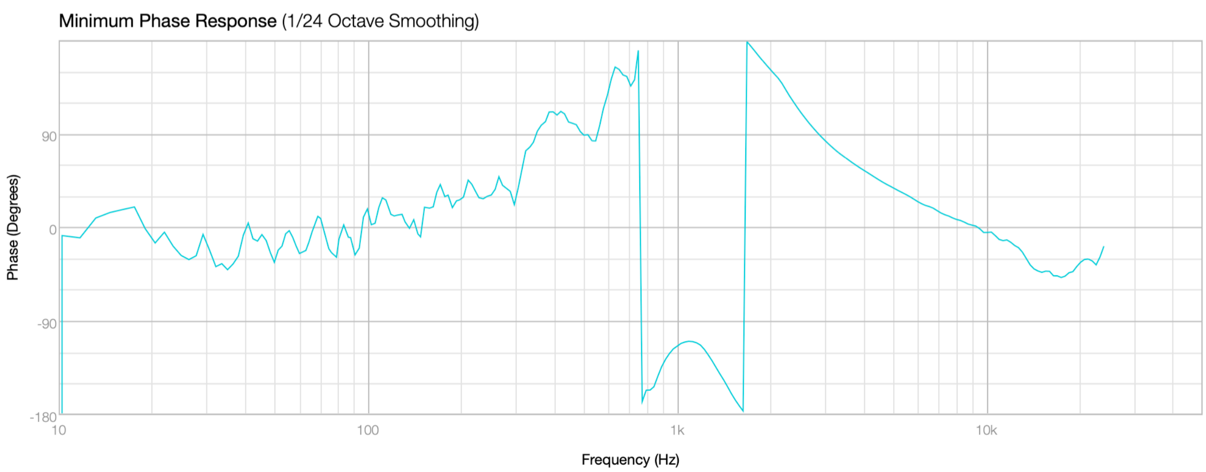
83dB @ 1m, mic at 1m, 40dB amplitude range

Harmonic Distortion



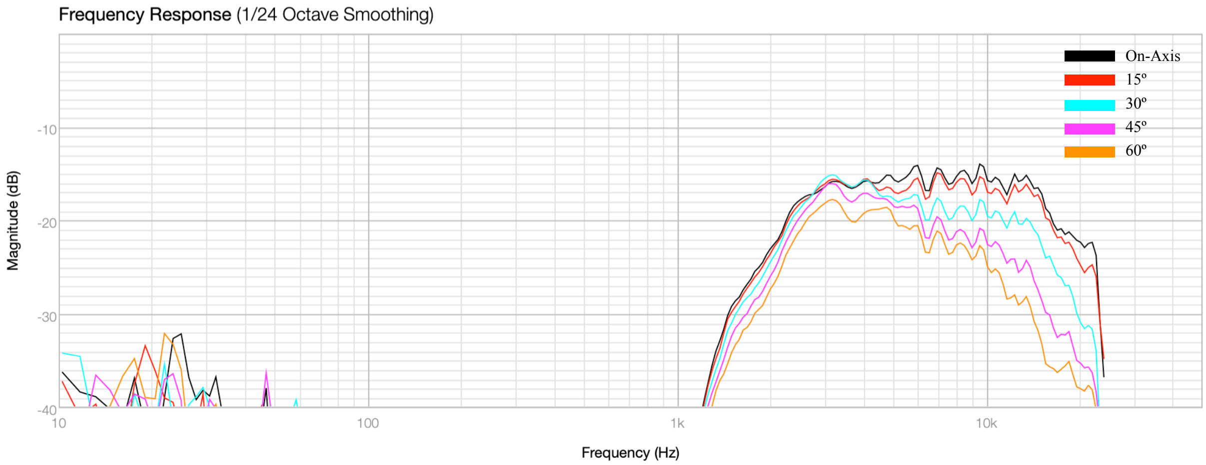
83dB @ 1m, mic at 1in

Minimum Phase



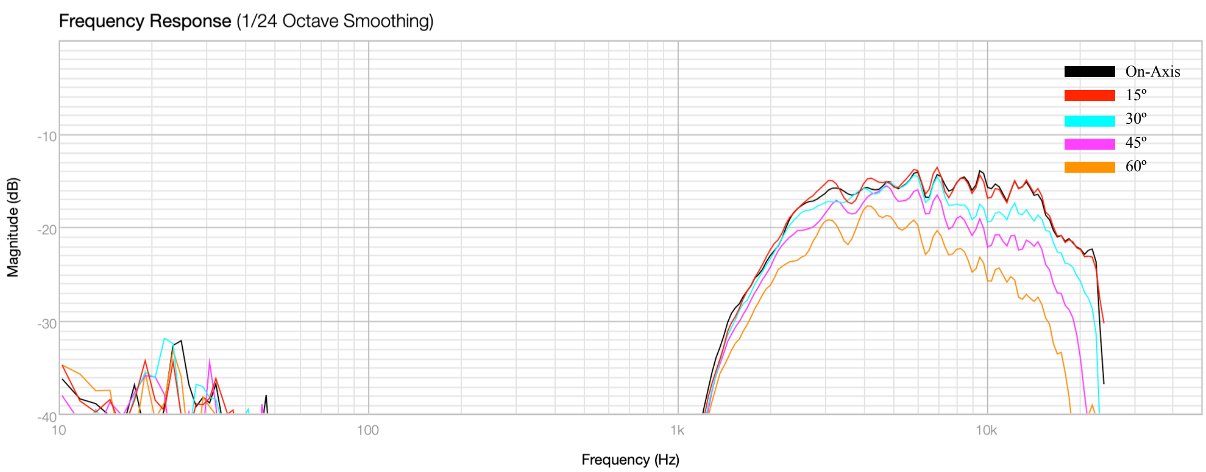
83dB @ 1m

Horizontal Off-Axis Response



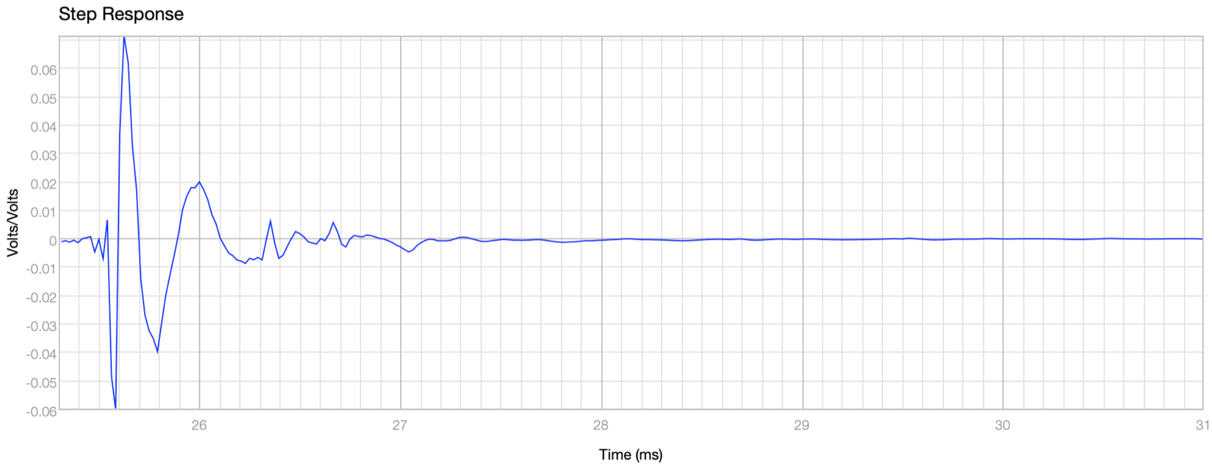
83dB @ 1m, mic at 1m, 40dB amplitude range

Vertical Off-Axis Response



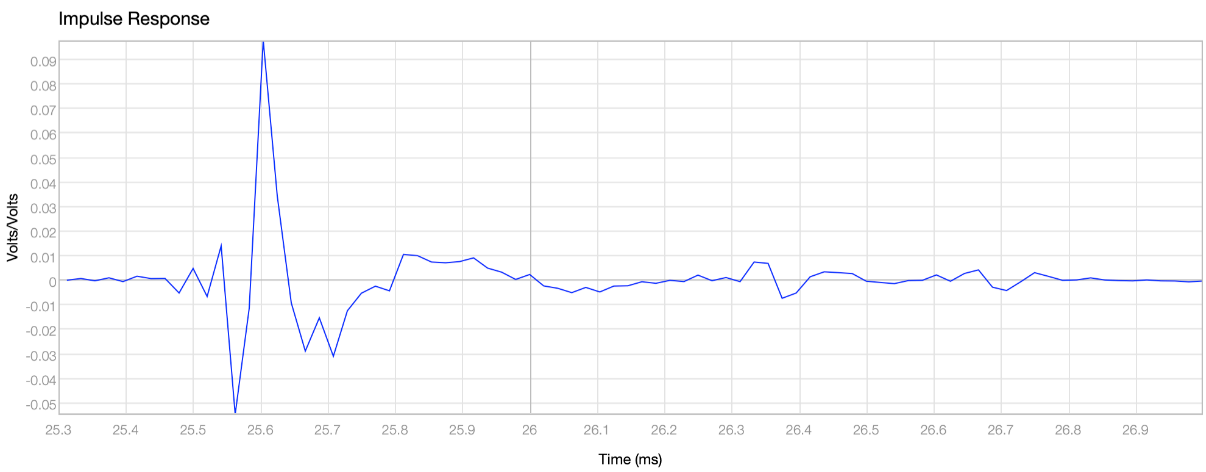
83dB @ 1m, mic at 1m, 40dB amplitude range

Step Response



83dB @ 1m, mic at 1m

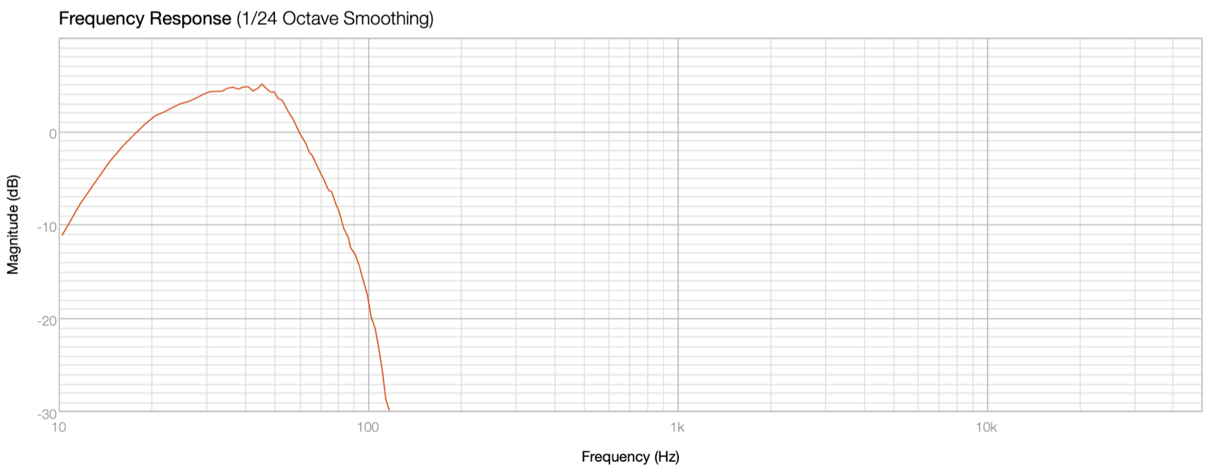
Impulse Response



83dB @ 1m, mic at 1m

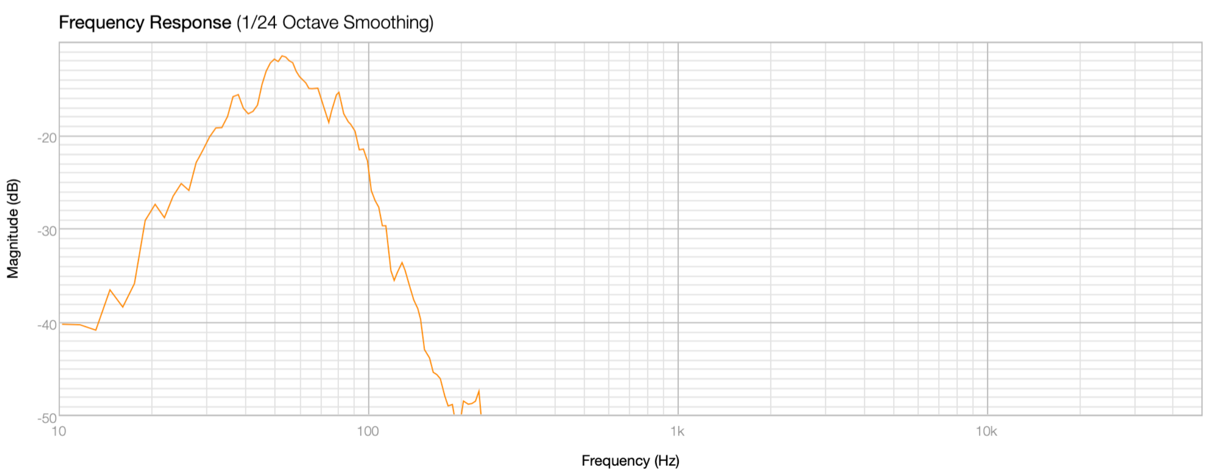
10.6 Subwoofer Measurements

Port Frequency Response



83dB @ 1m, mic at 1m, 40dB amplitude range

Driver Frequency Response

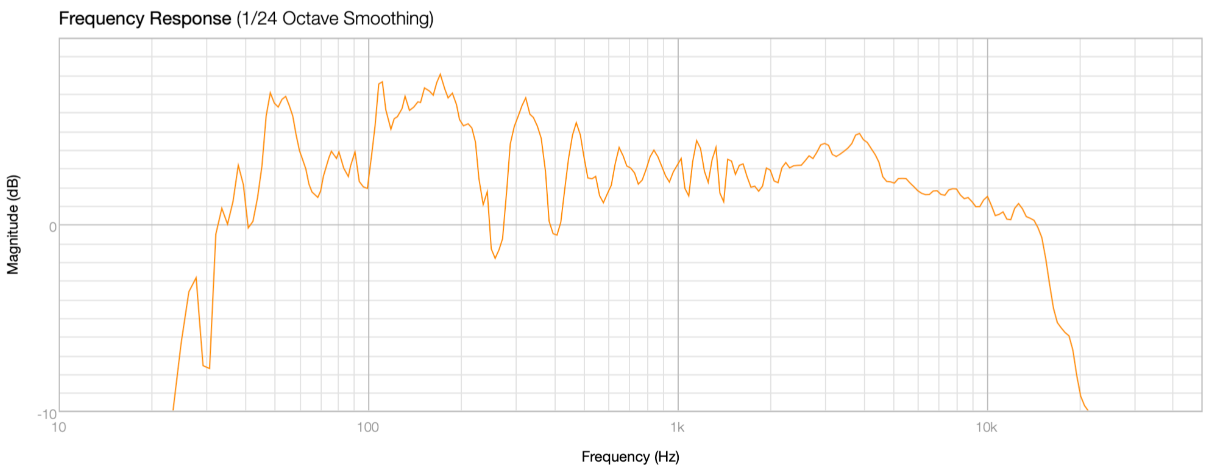


83dB @ 1m, mic at 1m, 40dB amplitude range

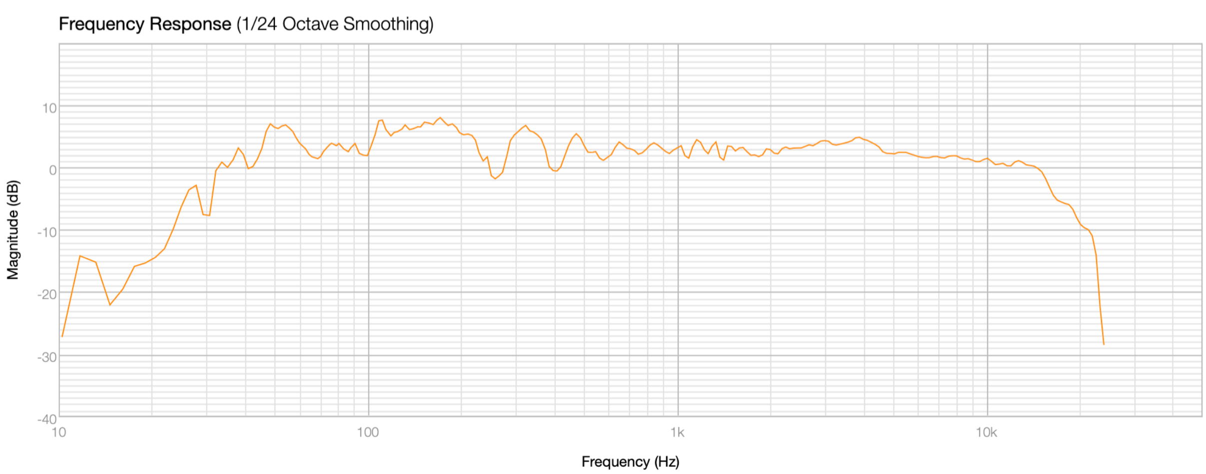
10.7 Full System Integration Measurements

These measurements were taken near the floor at my current listening distance of approximately 1.2 meters, so reflections have colored the response. I placed absorptive material on the stand and floor, which improved the response only slightly. The speakers were approximately five feet off of the floor. The subwoofer was approximately three feet off of the floor, effectively removing the boundary effect from the floor.

Frequency Response

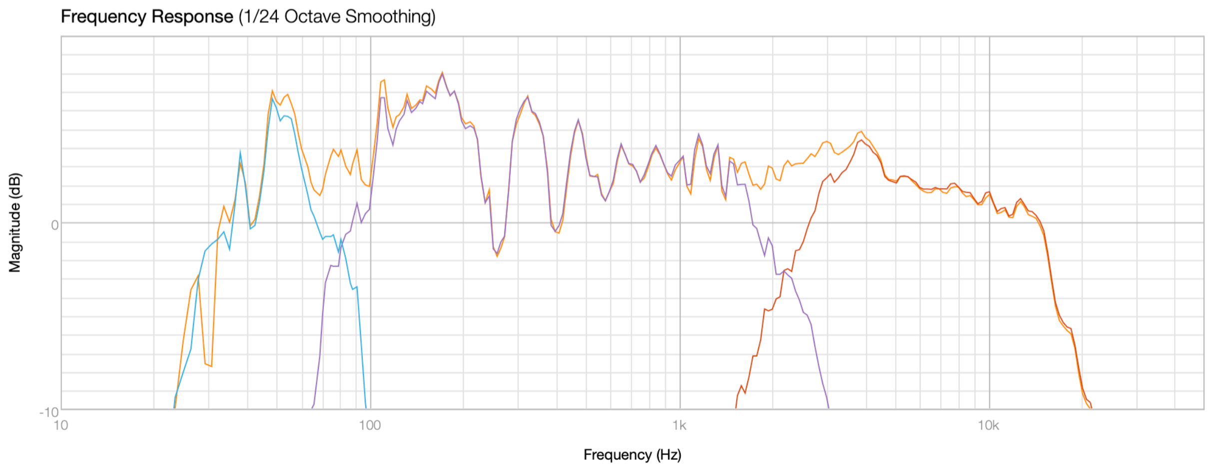


83dB @ 1m, mic at approx. 1.2m, 20dB amplitude range

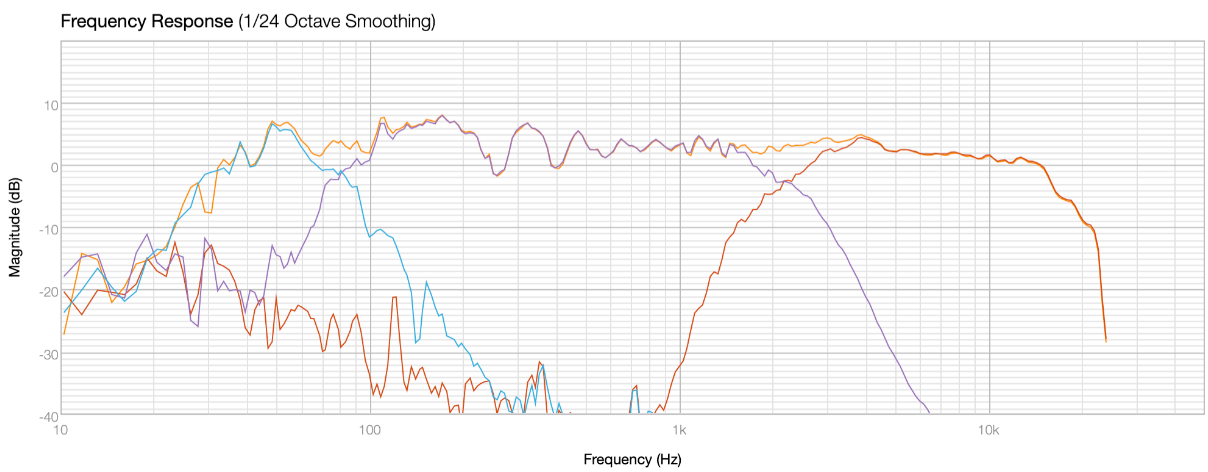


83dB @ 1m, mic at approx. 1.2m, 60dB amplitude range

Integrated Frequency Response

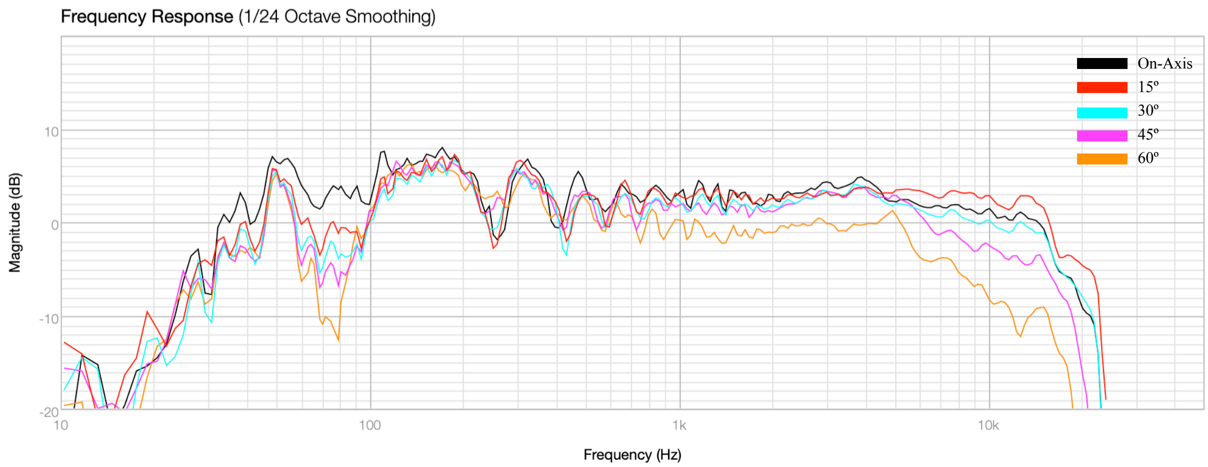


83dB @ 1m, mic at approx. 1.2m, 20dB amplitude range



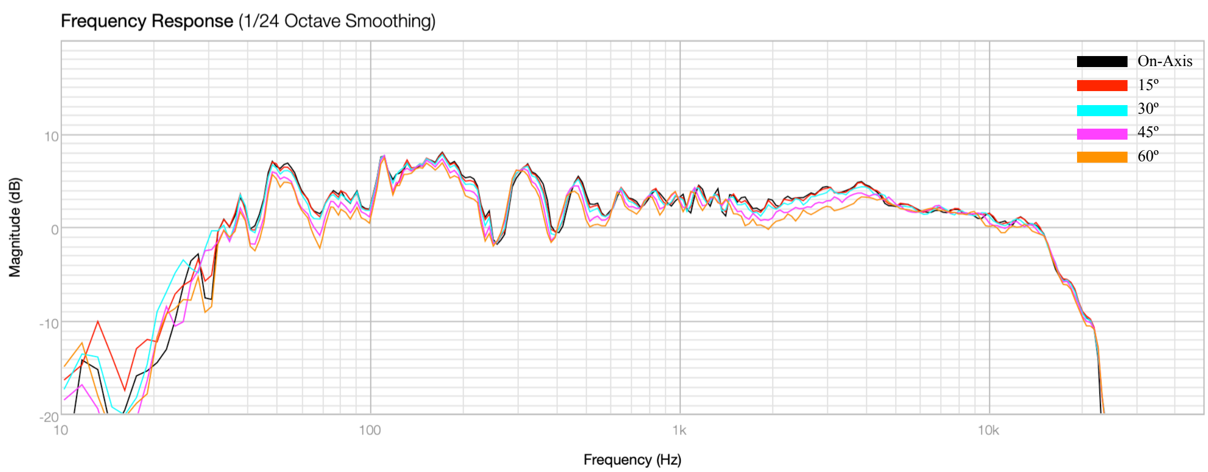
83dB @ 1m, mic at approx. 1.2m, 20dB amplitude range

Horizontal Off-Axis Response



83dB @ 1m, mic at approx. 1.2m, 40dB amplitude range

Vertical Off-Axis Response



83dB @ 1m, mic at approx. 1.2m, 40dB amplitude range

Appendix I - Driver Modeling and Comparison

This section contains my WinSpeakerz calculations for woofer and subwoofer comparisons. I created a list of drivers that meet my desired specifications, analyzed them, and modeled them in WinSpeakerz to determine how they will respond in a given box type. As noted on each calculation, measurements for each driver included:

- 2nd Order Closed Box:
    - Q 0.5
    - Q 0.707
    - Q 1.2
- 4th Order Closed Box:
    - LF Roll-Off
    - LF Boost
    - Low Frequency Extension

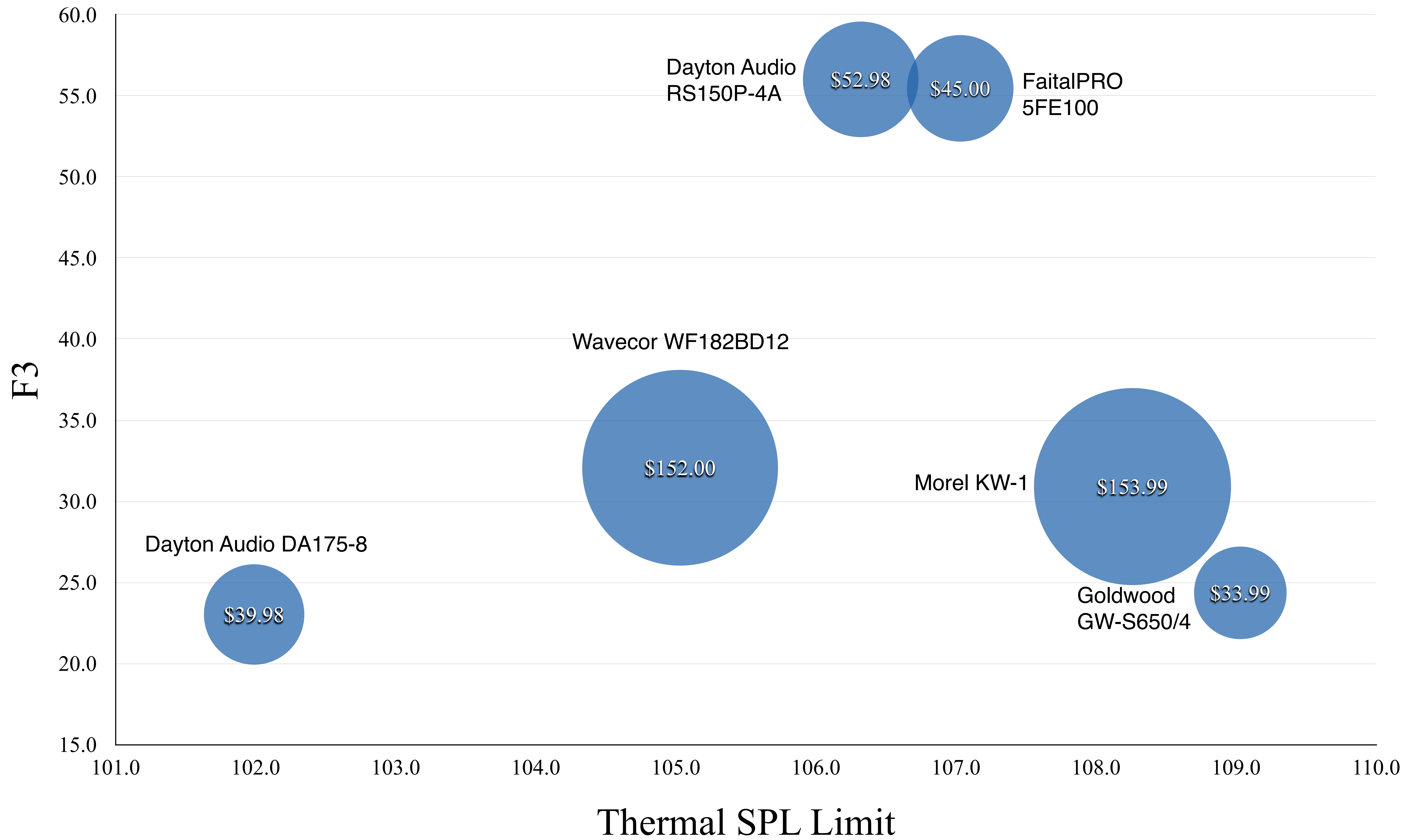
Subwoofers

	Nominal Size	Cone	Price	Sensitivity	Power	Thermal SPL Limit	X-max	Sd cm2	Vas (liters)	Qts	Fs	Vb (liters)	Vb (cu feet)	Vd	F3	X-max SPL	K1	Website	Colloms Wmax	colloms
Peerless SLS 830668	10	Paper	$97.60	88.8	70	107.3	8.3	346.4	72.9	0.55	32.4	202.75	7.16	0.0003	20.7	112.7	0.00000	96.4	0.0	110.65
Dayton Audio DCS305-4	12	Paper/Kevlar	$142.99	90.5	250	114.5	9.3	498.8	92.3	0.4	24.2	89.75	3.17	0.0005	24.5	113.4	0.00000	96.9	0.2	111.37
SB Acoustics SB29NRX75-8	10	Paper	$191.80	88	200	111.0	11	312	85.6	0.37	26	64.35	2.27	0.0003	29.5	113.4	0.00000	96.8	0.3	111.43
Dayton Audio RSS315HO-4	12	Aluminum	$272.99	90.5	700	119.0	12.3	514.7	53.7	0.31	26.2	22.52	0.80	0.0006	38.4	114.3	0.00000	97.4	2.6	112.42
Seas L26RO4Y	10	Aluminum	$498.00	86	250	110.0	14	363	46	0.27	24	12.23	0.43	0.0005	43.0	114.3	0.00000	97.4	2.6	112.42
Scan-Speak 28W/4878T Revelator	11	Paper	$636.20	88	200	111.0	7	363	127	0.3	18	47.79	1.69	0.0003	27.7	113.2	0.00000	96.1	0.1	111.06

Woofers

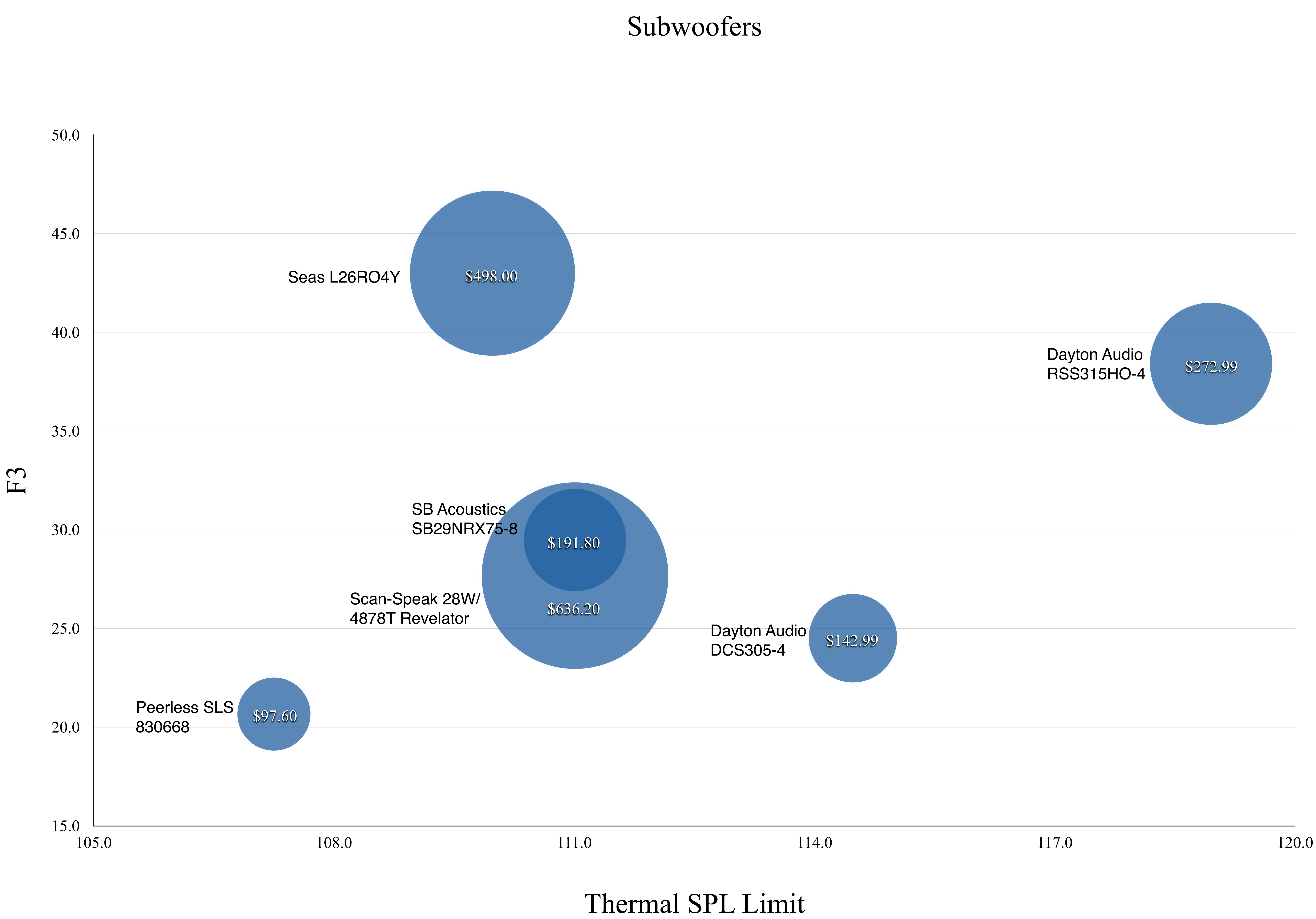
	Nominal Size	Cone	Price	Sensitivity	Power	Thermal SPL Limit	X-max	Sd cm2	Vas (liters)	Qts	Fs	Vb (liters)	Vb (cu feet)	Vd	F3	X-max SPL	K1	Website	Colloms Wmax	colloms
Goldwood GW-S650/4	6.5	Silver Polymer	$33.99	90	80	109.0	2.5	139.66	15.7	0.707	55	100.00	3.53	0.0000	24.4	111.7	0.00000	93.5	0.0	109.11
Dayton Audio DA175-8	7	Aluminum	$39.98	85	50	102.0	4.25	132.7	16.3	0.58	39	54.02	1.91	0.0001	23.0	111.8	0.00000	94.4	0.0	109.43
FaitalPRO 5FE100	5	Paper	$45.00	88	80	107.0	5.25	84	5.7	0.45	65	8.18	0.29	0.0000	55.5	113.0	0.00000	94.4	0.1	110.74
Dayton Audio RS150P-4A	6	Paper	$52.98	90.3	40	106.3	4.4	85	15.7	0.34	43.7	8.93	0.32	0.0000	56.0	113.0	0.00000	94.1	0.0	110.62
Wavecor WF182BD12	7	Paper/Glass Fiber	$152.00	86	80	105.0	5.5	131	24.3	0.42	34	27.76	0.98	0.0001	32.1	112.5	0.00000	94.8	0.0	110.22
Morel KW-1	6	Polymer Composite	$153.99	86.5	150	108.3	4.5	119	10	0.6	55	37.06	1.31	0.0001	30.9	112.2	0.00000	94.4	0.0	109.89

Woofers



F3
60.0
55.0
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
101.0
102.0
103.0
104.0
105.0
106.0
107.0
108.0
109.0
110.0
Thermal SPL Limit
Dayton Audio RS150P-4A
$52.98
$45.00
FaitalPRO 5FE100
Wavecor WF182BD12
$152.00
Morel KW-1
$153.99
Dayton Audio DA175-8
$39.98
Goldwood GW-S650/4
$33.99

2


Subwoofers
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
F3
105.0
108.0
111.0
114.0
117.0
120.0
Thermal SPL Limit
Seas L26RO4Y
$498.00
Dayton Audio
RSS315HO-4
$272.99
SB Acoustics
SB29NRX75-8
$191.80
Scan-Speak 28W/
4878T Revelator
$636.20
Dayton Audio
DCS305-4
$142.99
Peerless SLS
830668
$97.60

3

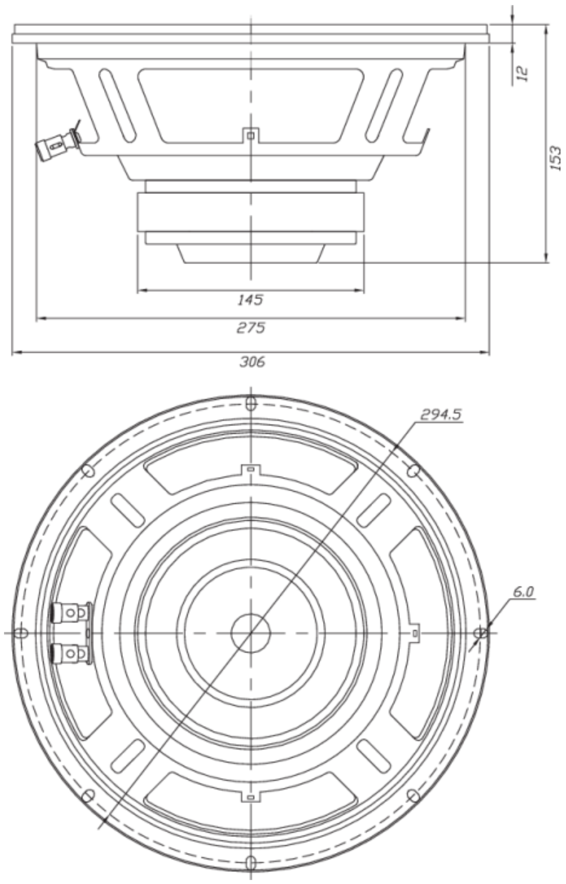
Subwoofer Drivers

Dayton Audio DCS305-4

DAYTONAUDIO

DCS305-4 12" Classic Subwoofer 4 Ohm

DCS305-4



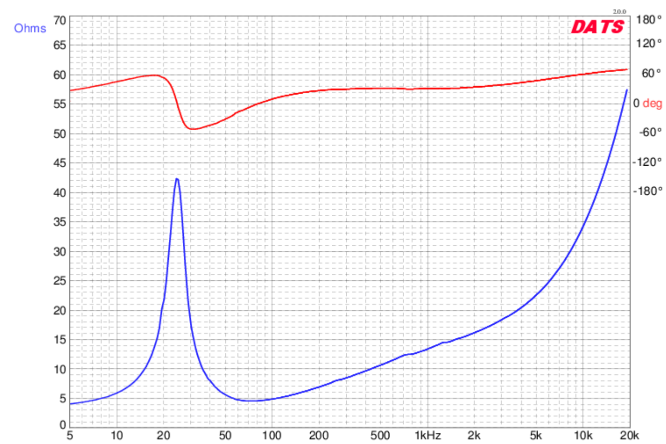
PARAMETERS

Impedance	4 ohms
Re	3.3 ohms
Le	2.06 mH @ 1 kHz
Fs	24.2 Hz
Qms	5.07
Qes	0.43
Qts	0.40
Mms	160g
Cms	0.27 mm/N
Sd	498.8 cm²
Vd	468.8 cm³
BL	13.7 Tm
Vas	92.3 liters
Xmax	9.3 mm
VC Diameter	65.5 mm
SPL	90.5 dB @ 2.83VW/1m
RMS Power Handling	250 watts
Usable Frequency Range (Hz)	23 - 200 Hz

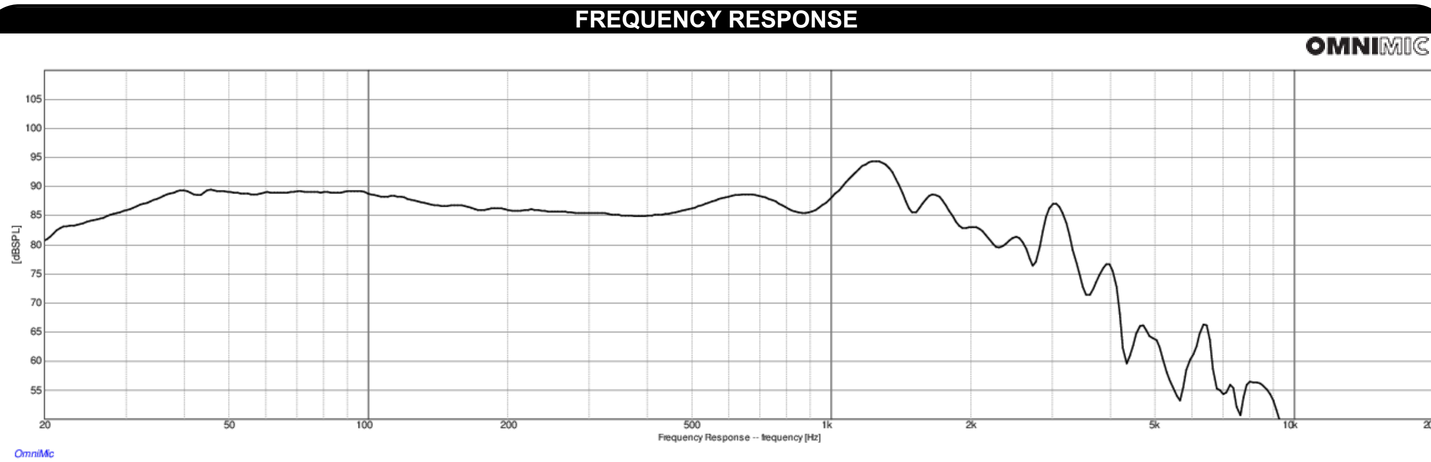
FEATURES

- Sturdy stamped steel frame
- Vented pole piece and bumped back plate
- Inductance-reducing copper pole piece cap
- Treated non-pressed paper/Kevlar cone with rubber surround
- 4-layer VC with polyimide former

IMPEDANCE/PHASE

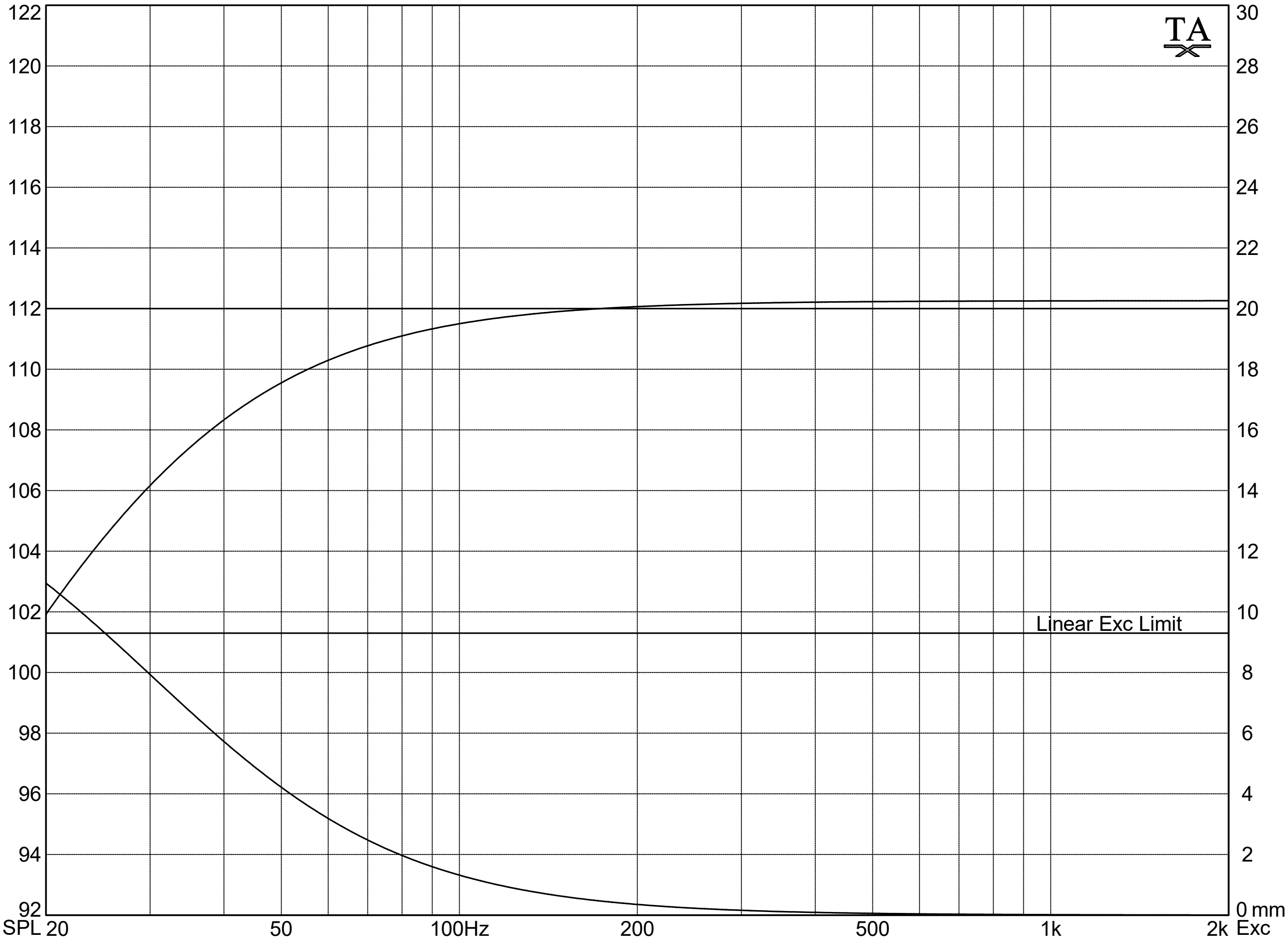


FREQUENCY RESPONSE



Note: 1/12th octave smoothing - nearfield response included in graph below 450 Hz.

Black = 0°



Driver Parameters

Driver: **Dayton Audio DCS305-4**

Nominal Diameter	D =	12	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.5	dB SPL
Free Air Resonance	f(s) =	24.2	Hz
Total Q	Q(ts) =	0.4	
Electrical Q	Q(es) =	0.43	
Mechanical Q	Q(ms) =	5.07	
Equivalent Volume	V(as) =	3.25	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.3	Ohms
Max Thermal Power	P(t) =	500	Watts
Max Linear Excursion	X(max) =	9.3	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	5.778	cu ft
Closed Box Q	Q(tc) =	0.5	
System Resonance	F(sc) =	30.25	Hz
Compliance Ratio	alpha =	0.5625	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	150	Watts
SPL Distance	D =	1	m

Dayton Audio DCS305-4 12" Subwoofer

System Name:

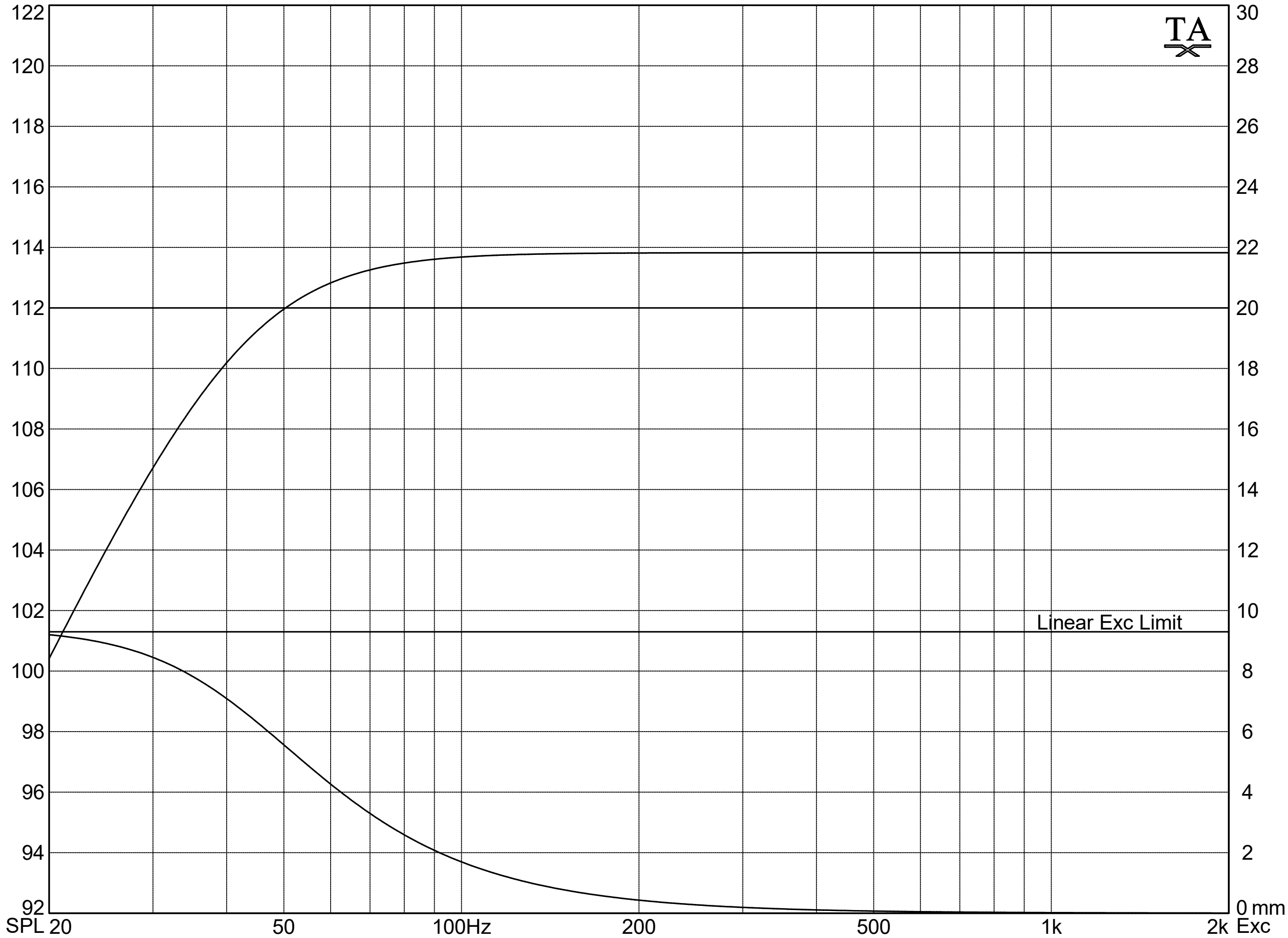
2nd Order Closed Box

Designer: Matthew Fisher

Title: Q 0.5

Rev Date: 10/3/23

Rev: 1



Driver Parameters

Driver: **Dayton Audio DCS305-4**

Nominal Diameter	D =	12	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.5	dB SPL
Free Air Resonance	f(s) =	24.2	Hz
Total Q	Q(ts) =	0.4	
Electrical Q	Q(es) =	0.43	
Mechanical Q	Q(ms) =	5.07	
Equivalent Volume	V(as) =	3.25	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.3	Ohms
Max Thermal Power	P(t) =	500	Watts
Max Linear Excursion	X(max) =	9.3	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	1.53	cu ft
Closed Box Q	Q(tc) =	0.707	
System Resonance	F(sc) =	42.77	Hz
Compliance Ratio	alpha =	2.124	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	215	Watts
SPL Distance	D =	1	m

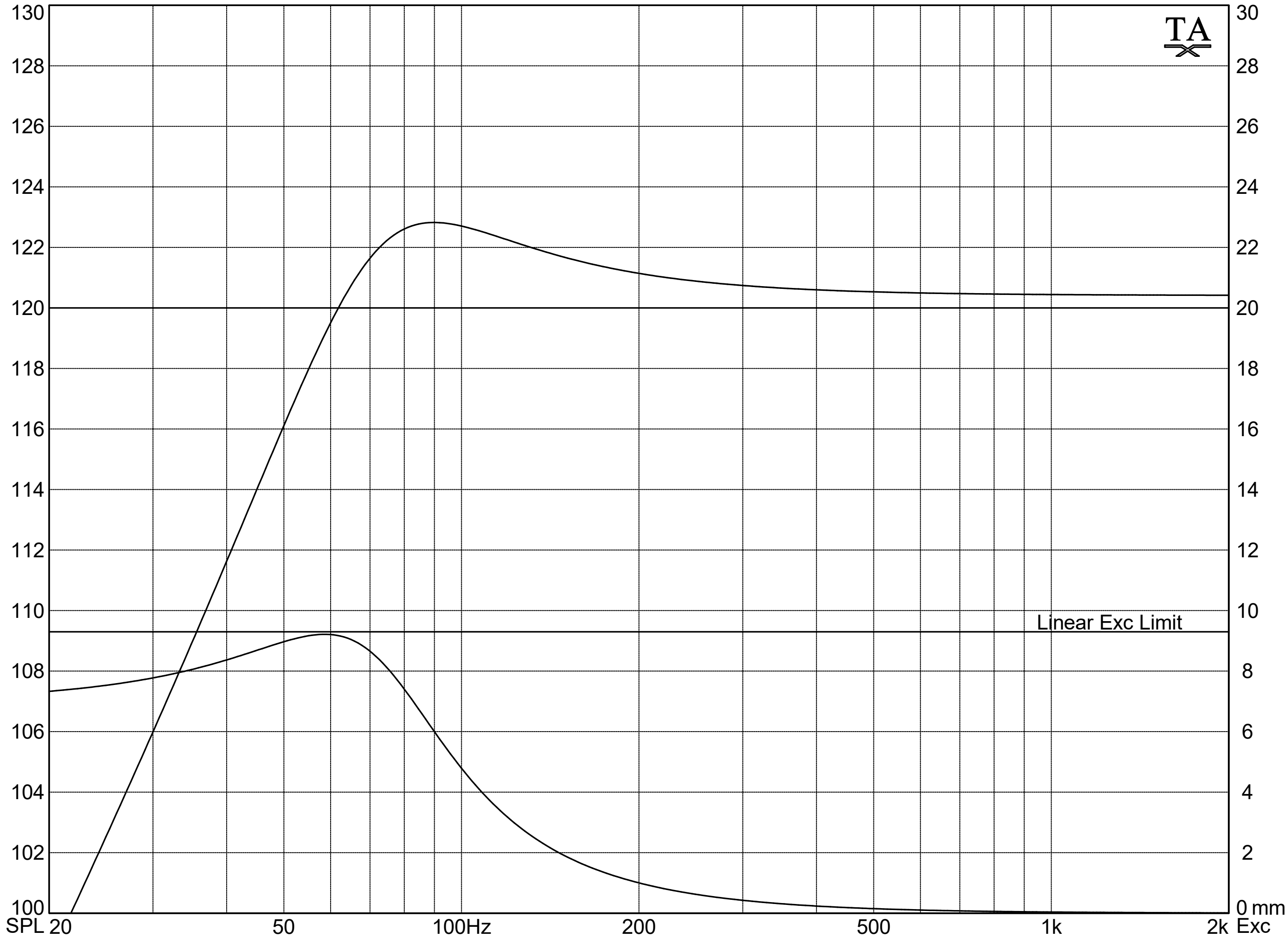
Dayton Audio DCS305-4 12" Subwoofer

System Name:

2nd Order Closed Box

Designer: Matthew Fisher
Title: 0.707

Rev Date: 10/3/23
Rev: 1



Driver Parameters

Driver: **Dayton Audio DCS305-4**

Nominal Diameter	D =	12	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.5	dB SPL
Free Air Resonance	f(s) =	24.2	Hz
Total Q	Q(ts) =	0.4	
Electrical Q	Q(es) =	0.43	
Mechanical Q	Q(ms) =	5.07	
Equivalent Volume	V(as) =	3.25	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.3	Ohms
Max Thermal Power	P(t) =	500	Watts
Max Linear Excursion	X(max) =	9.3	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	0.4063	cu ft
Closed Box Q	Q(tc) =	1.2	
System Resonance	F(sc) =	72.61	Hz
Compliance Ratio	alpha =	8.003	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	980	Watts
SPL Distance	D =	1	m

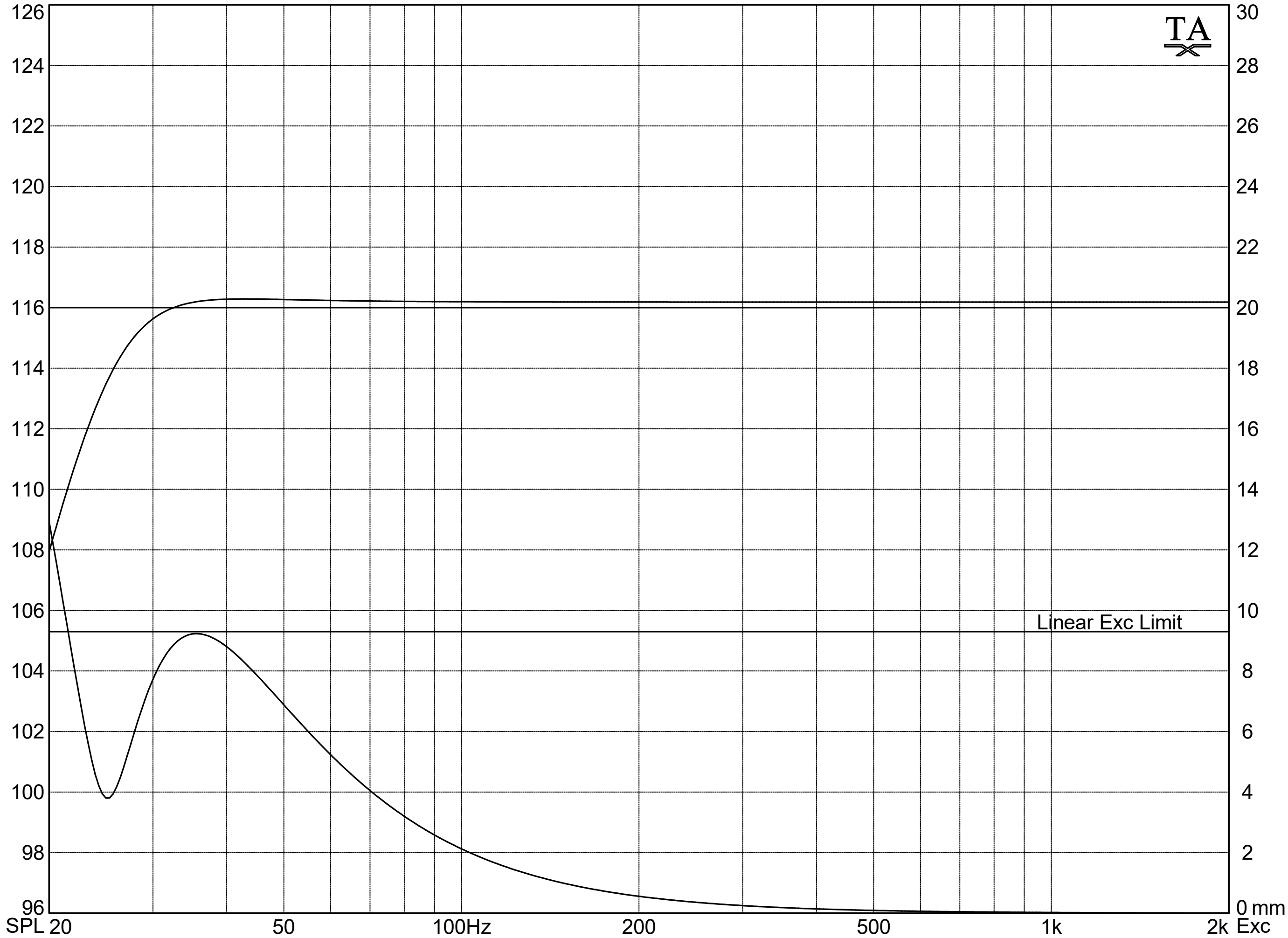
Dayton Audio DCS305-4 12" Subwoofer

System Name:

2nd Order Closed Box

Designer: Matthew Fisher
Title: Q 1.2

Rev Date: 10/3/23
Rev: 1



Driver Parameters

Driver: **Dayton Audio DCS305-4**

Nominal Diameter	D =	12	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.5	dB SPL
Free Air Resonance	f(s) =	24.2	Hz
Total Q	Q(ts) =	0.4	
Electrical Q	Q(es) =	0.43	
Mechanical Q	Q(ms) =	5.07	
Equivalent Volume	V(as) =	3.25	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.3	Ohms
Max Thermal Power	P(t) =	500	Watts
Max Linear Excursion	X(max) =	9.3	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	3	cu ft
Closed Box Q	Q(tc) =	0.5773	
Box Frequency	F(B) =	25	Hz
Min Rec Vent Area	S(vMin) =	14.4	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	1.083	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	370	Watts
SPL Distance	D =	1	m

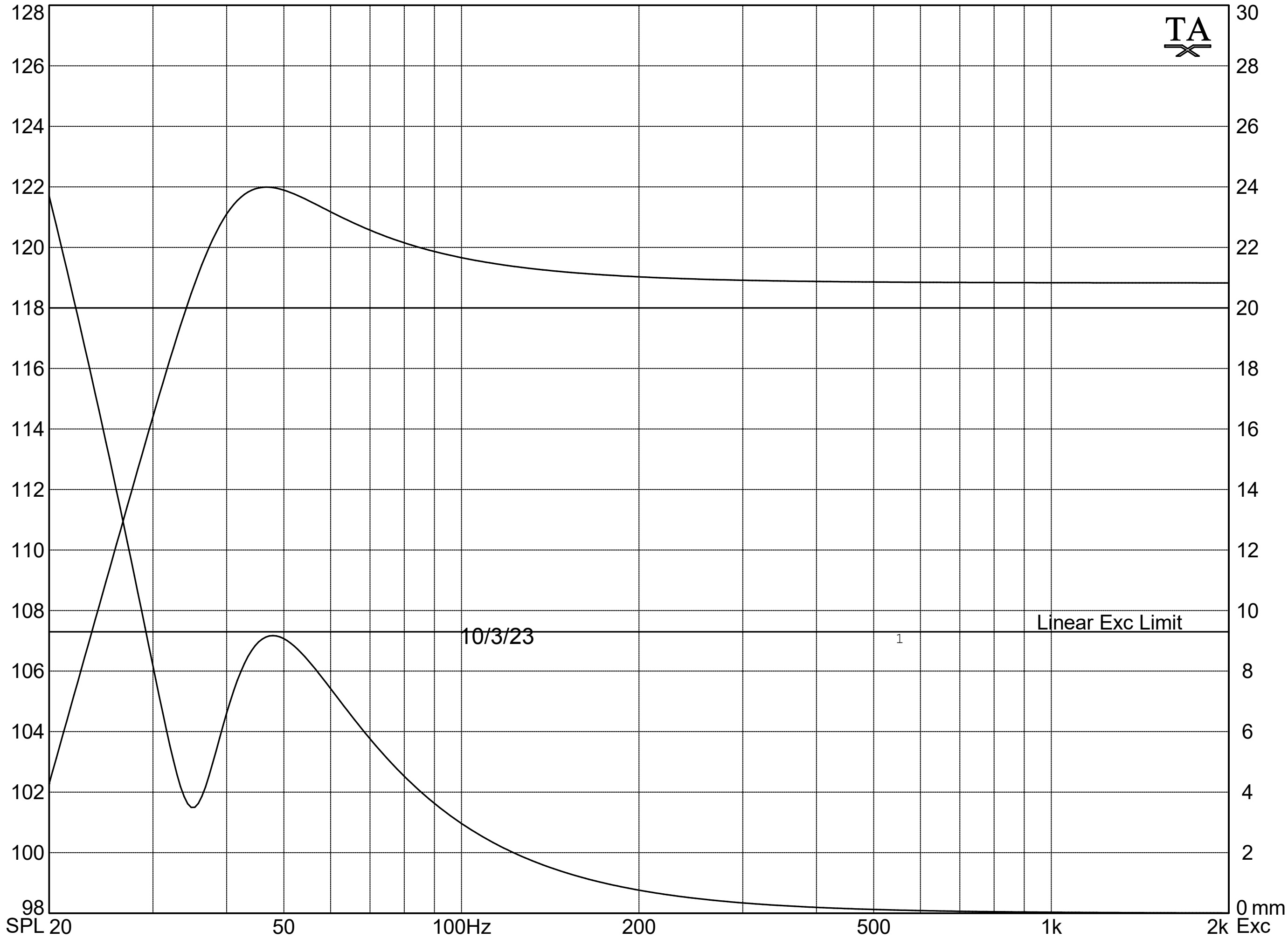
Dayton Audio DCS305-4 12" Subwoofer

System Name:

4th Order Vented Box

Designer: Matthew Fisher
Title: Roll-off

Rev Date: 10/3/23
Rev: 1



Driver Parameters

Driver: **Dayton Audio DCS305-4**

Nominal Diameter	D =	12	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.5	dB SPL
Free Air Resonance	f(s) =	24.2	Hz
Total Q	Q(ts) =	0.4	
Electrical Q	Q(es) =	0.43	
Mechanical Q	Q(ms) =	5.07	
Equivalent Volume	V(as) =	3.25	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.3	Ohms
Max Thermal Power	P(t) =	500	Watts
Max Linear Excursion	X(max) =	9.3	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	2	cu ft
Closed Box Q	Q(tc) =	0.6481	
Box Frequency	F(B) =	35	Hz
Min Rec Vent Area	S(vMin) =	20.1	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	1.625	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	680	Watts
SPL Distance	D =	1	m

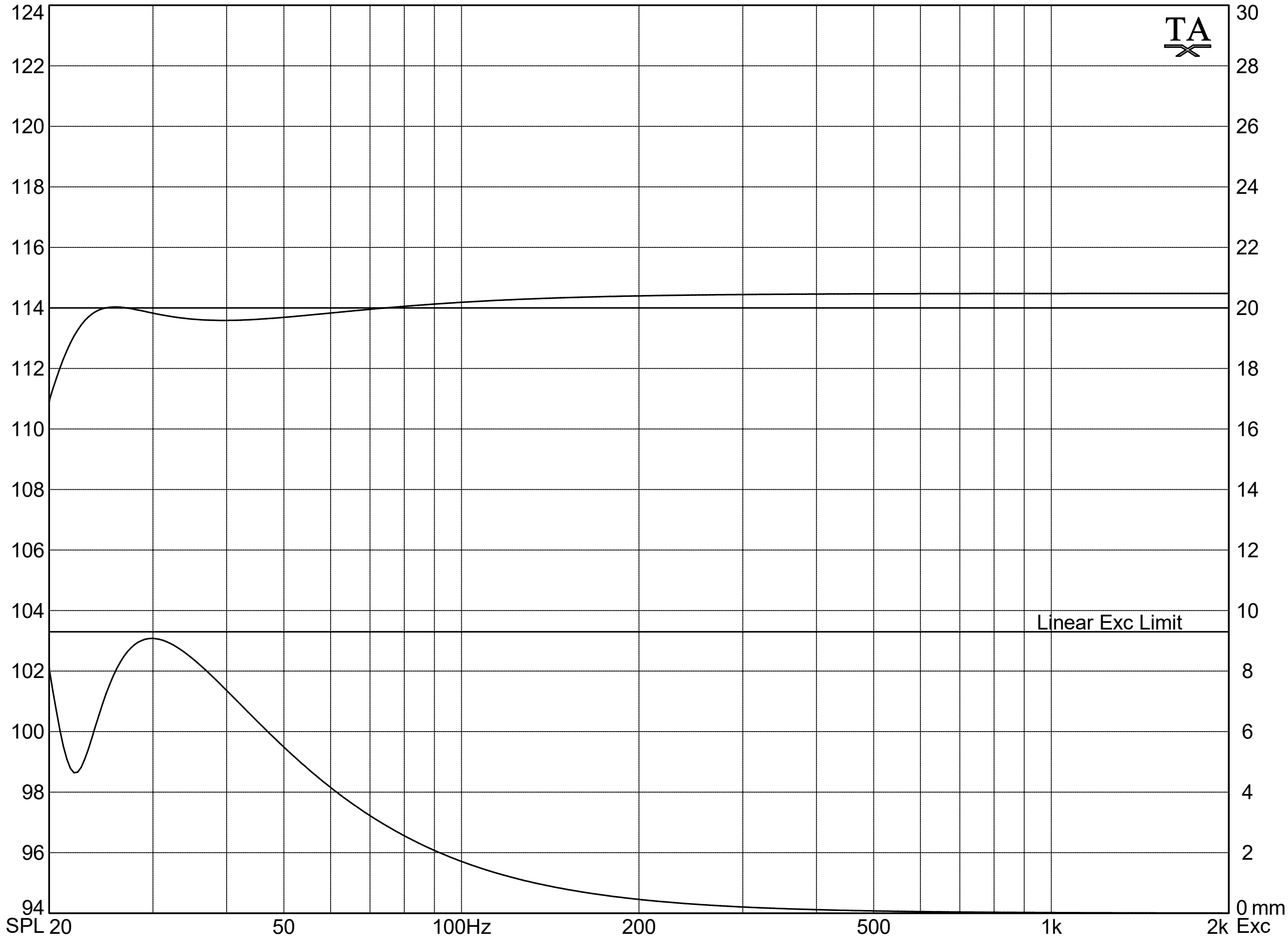
Dayton Audio DCS305-4 12" Subwoofer

System Name:

4th Order Vented Box

Designer: Matthew Fisher
Title: Bass Boost

Rev Date: 10/3/23
Rev: 1



Driver Parameters

Driver: **Dayton Audio DCS305-4**

Nominal Diameter	D =	12	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.5	dB SPL
Free Air Resonance	f(s) =	24.2	Hz
Total Q	Q(ts) =	0.4	
Electrical Q	Q(es) =	0.43	
Mechanical Q	Q(ms) =	5.07	
Equivalent Volume	V(as) =	3.25	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.3	Ohms
Max Thermal Power	P(t) =	500	Watts
Max Linear Excursion	X(max) =	9.3	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	5	cu ft
Closed Box Q	Q(tc) =	0.5138	
Box Frequency	F(B) =	22	Hz
Min Rec Vent Area	S(vMin) =	12.7	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	0.65	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	250	Watts
SPL Distance	D =	1	m

Dayton Audio DCS305-4 12" Subwoofer

System Name:

4th Order Vented Box

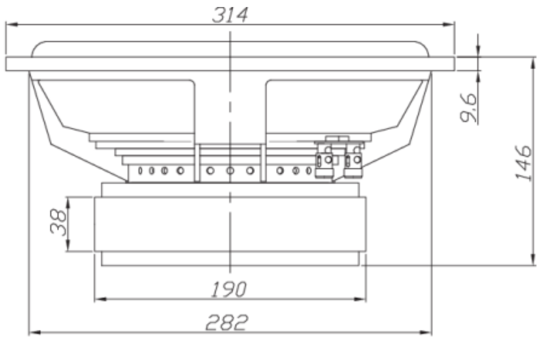
Designer: Matthew Fisher
Title: Low Frequency Extension
Rev Date: 10/3/23
Rev: 1

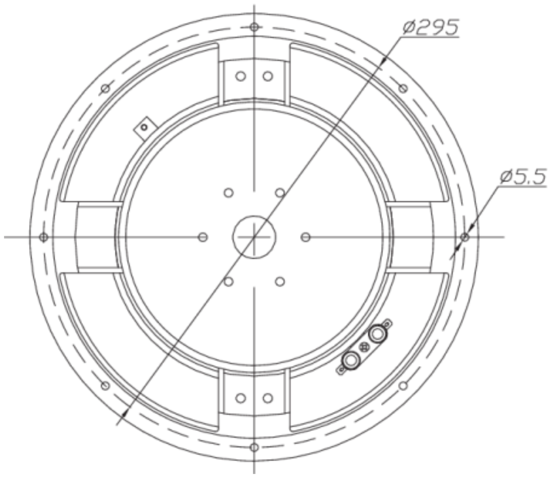
Dayton Audio RSS315H0-4

RSS315HO-4 12" Reference HO Subwoofer 4 Ohm

DAYTONAUDIO

RSS315HO-4





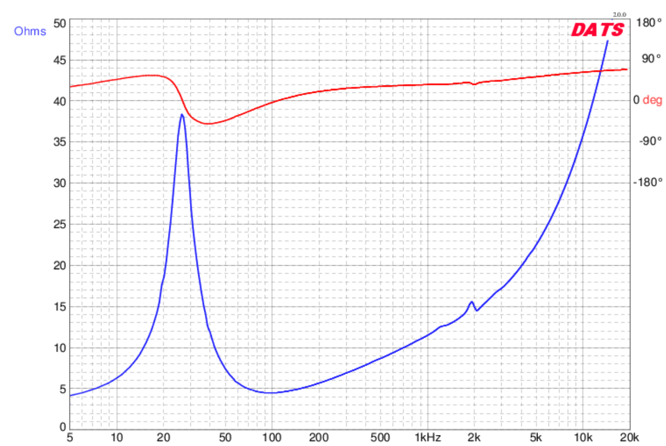
PARAMETERS

Impedance	4 ohms
Re	3.2 ohms
Le	1.75 mH
Fs	26.2 Hz
Qms	3.63
Qes	0.33
Qts	0.31
Mms	251g
Cms	0.15 mm/N
Sd	514.7 cm²
Vd	633.1 cm³
BL	20 Tm
Vas	53.7 liters
Xmax	12.3 mm
VC Diameter	64 mm
SPL	90.5 dB @ 2.83V/1m
RMS Power Handling	700 watts
Usable Frequency Range (Hz)	26 - 600 Hz

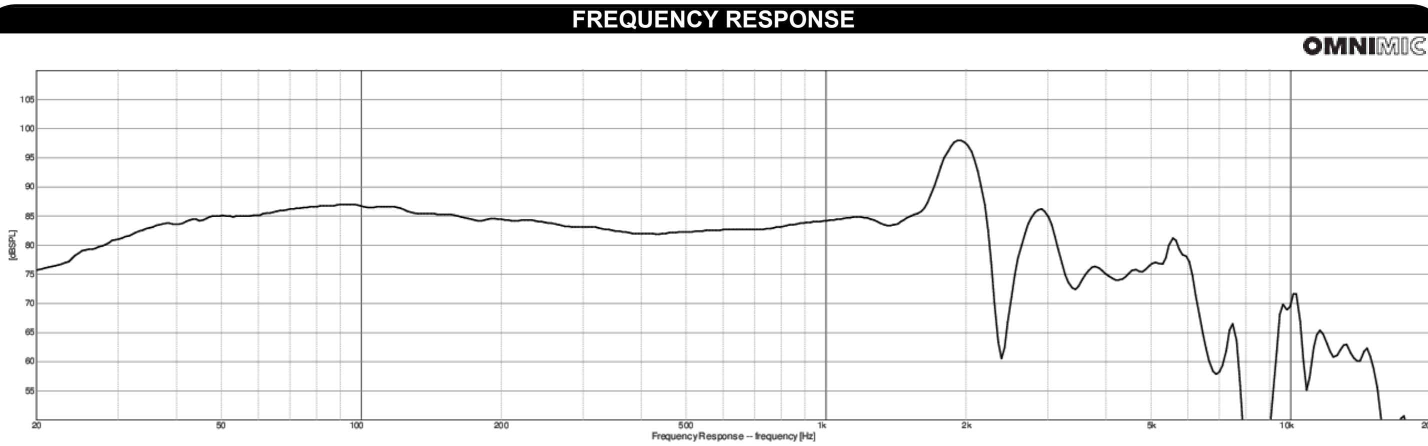
FEATURES

- Extensively vented motor eliminates compression and allows quiet excursion
- Extra-thick black anodized aluminum cone for maximum rigidity
- Triple shorting ring motor for ultra-low distortion
- 4-layer coil for high power handling
- Optimized parameters for small enclosures

IMPEDANCE/PHASE

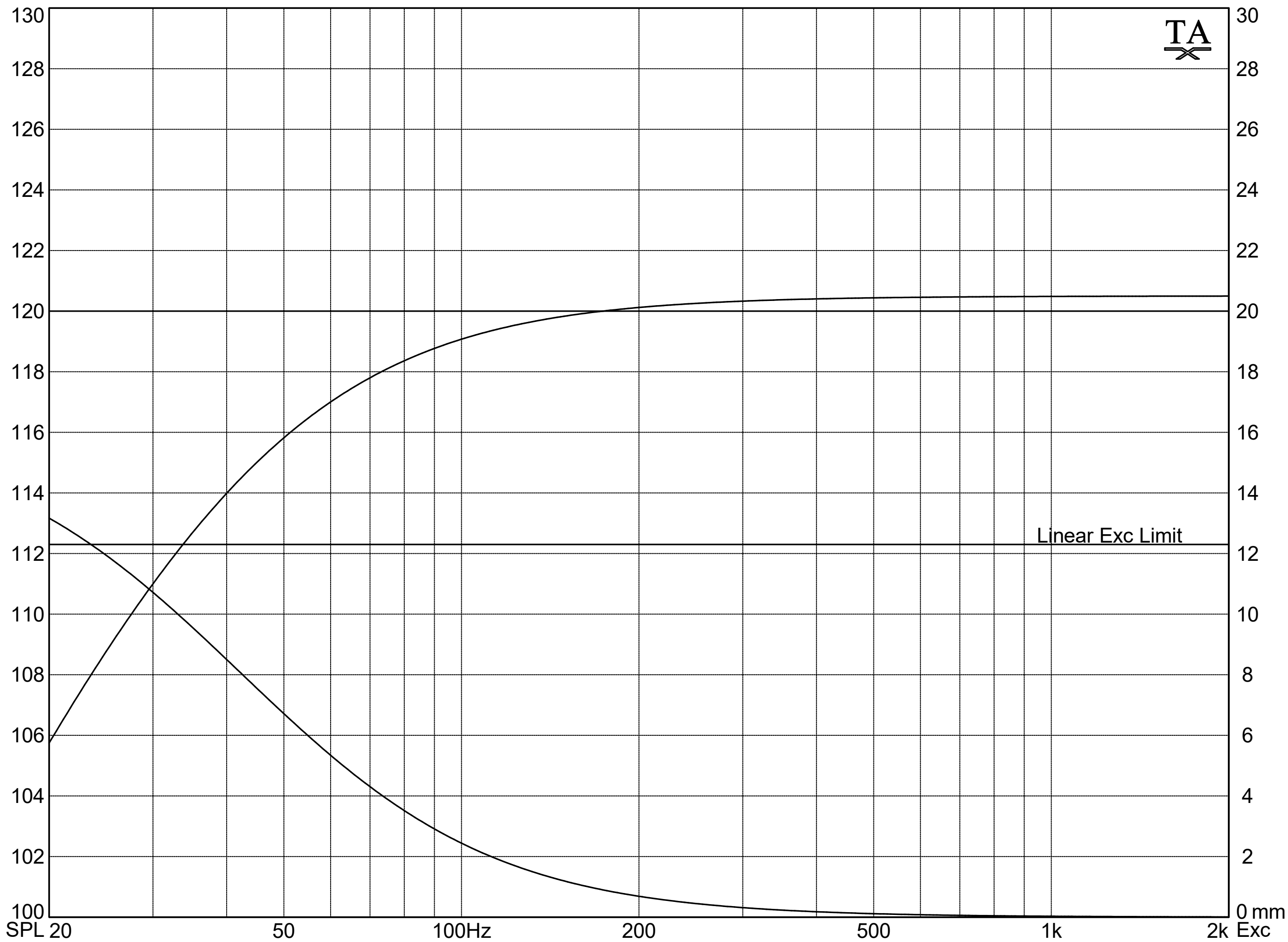


FREQUENCY RESPONSE



Black = 0°

Note: 1/24th octave smoothing - nearfield response included in graph below 450 Hz.



Driver Parameters

Driver: **Dayton Audio RSS315HO-4**

Nominal Diameter	D =	12	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.5	dB SPL
Free Air Resonance	f(s) =	26.2	Hz
Total Q	Q(ts) =	0.31	
Electrical Q	Q(es) =	0.33	
Mechanical Q	Q(ms) =	3.63	
Equivalent Volume	V(as) =	1.896	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.2	Ohms
Max Thermal Power	P(t) =	700	Watts
Max Linear Excursion	X(max) =	12.3	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	1.184	cu ft
Closed Box Q	Q(tc) =	0.5	
System Resonance	F(sc) =	42.26	Hz
Compliance Ratio	alpha =	1.602	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	1000	Watts
SPL Distance	D =	1	m

Dayton Audio RSS315H0-4

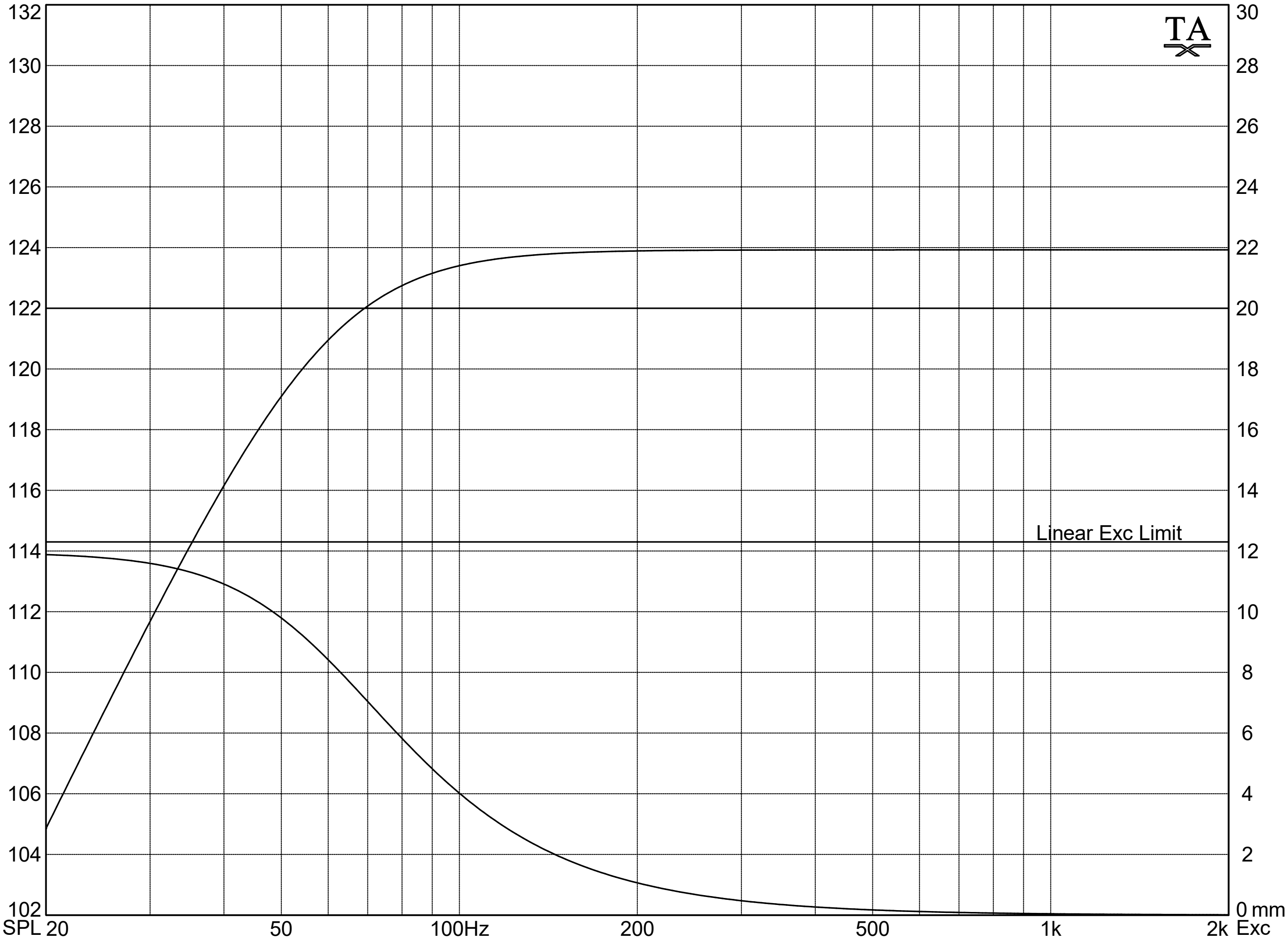
System Name:

2nd Order Closed Box

Designer: Matthew Fisher
Title: Q 0.5

Rev Date: 10/3/23
Rev: 1

Friday, December 15, 2023



Driver Parameters

Driver: **Dayton Audio RSS315HO-4**

Nominal Diameter	D =	12	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.5	dB SPL
Free Air Resonance	f(s) =	26.2	Hz
Total Q	Q(ts) =	0.31	
Electrical Q	Q(es) =	0.33	
Mechanical Q	Q(ms) =	3.63	
Equivalent Volume	V(as) =	1.896	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.2	Ohms
Max Thermal Power	P(t) =	700	Watts
Max Linear Excursion	X(max) =	12.3	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	0.4514	cu ft
Closed Box Q	Q(tc) =	0.707	
System Resonance	F(sc) =	59.76	Hz
Compliance Ratio	alpha =	4.202	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	2200	Watts
SPL Distance	D =	1	m

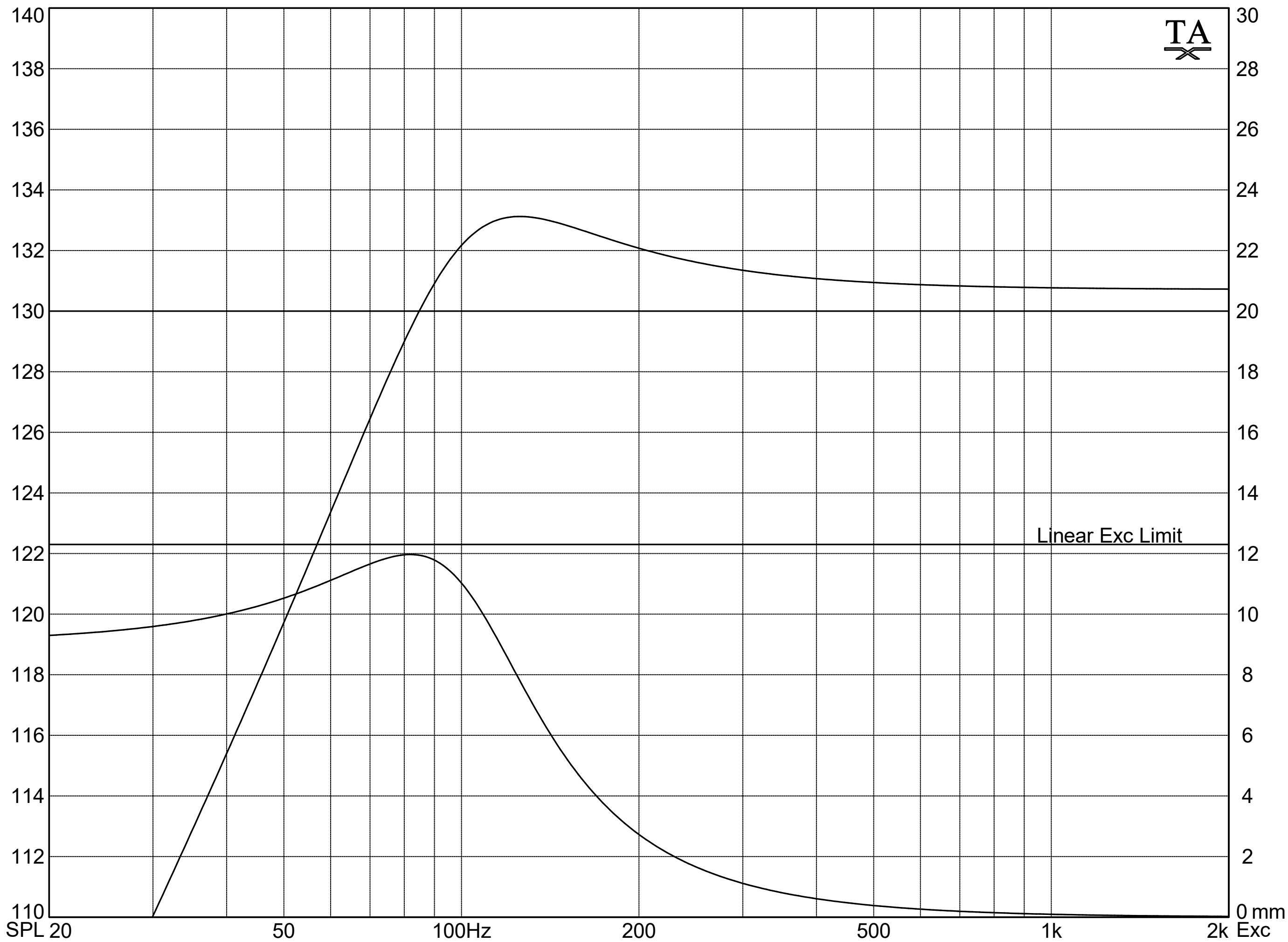
Dayton Audio RSS315H0-4

System Name:

2nd Order Closed Box

Designer: Matthew Fisher
Title: Q 0.707

Rev Date: 10/3/23 Rev: 1



Driver Parameters

Driver: **Dayton Audio RSS315HO-4**

Nominal Diameter	D =	12	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.5	dB SPL
Free Air Resonance	f(s) =	26.2	Hz
Total Q	Q(ts) =	0.31	
Electrical Q	Q(es) =	0.33	
Mechanical Q	Q(ms) =	3.63	
Equivalent Volume	V(as) =	1.896	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.2	Ohms
Max Thermal Power	P(t) =	700	Watts
Max Linear Excursion	X(max) =	12.3	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	0.1356	cu ft
Closed Box Q	Q(tc) =	1.2	
System Resonance	F(sc) =	101.4	Hz
Compliance Ratio	alpha =	13.98	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	1.05E+004	Watts
SPL Distance	D =	1	m

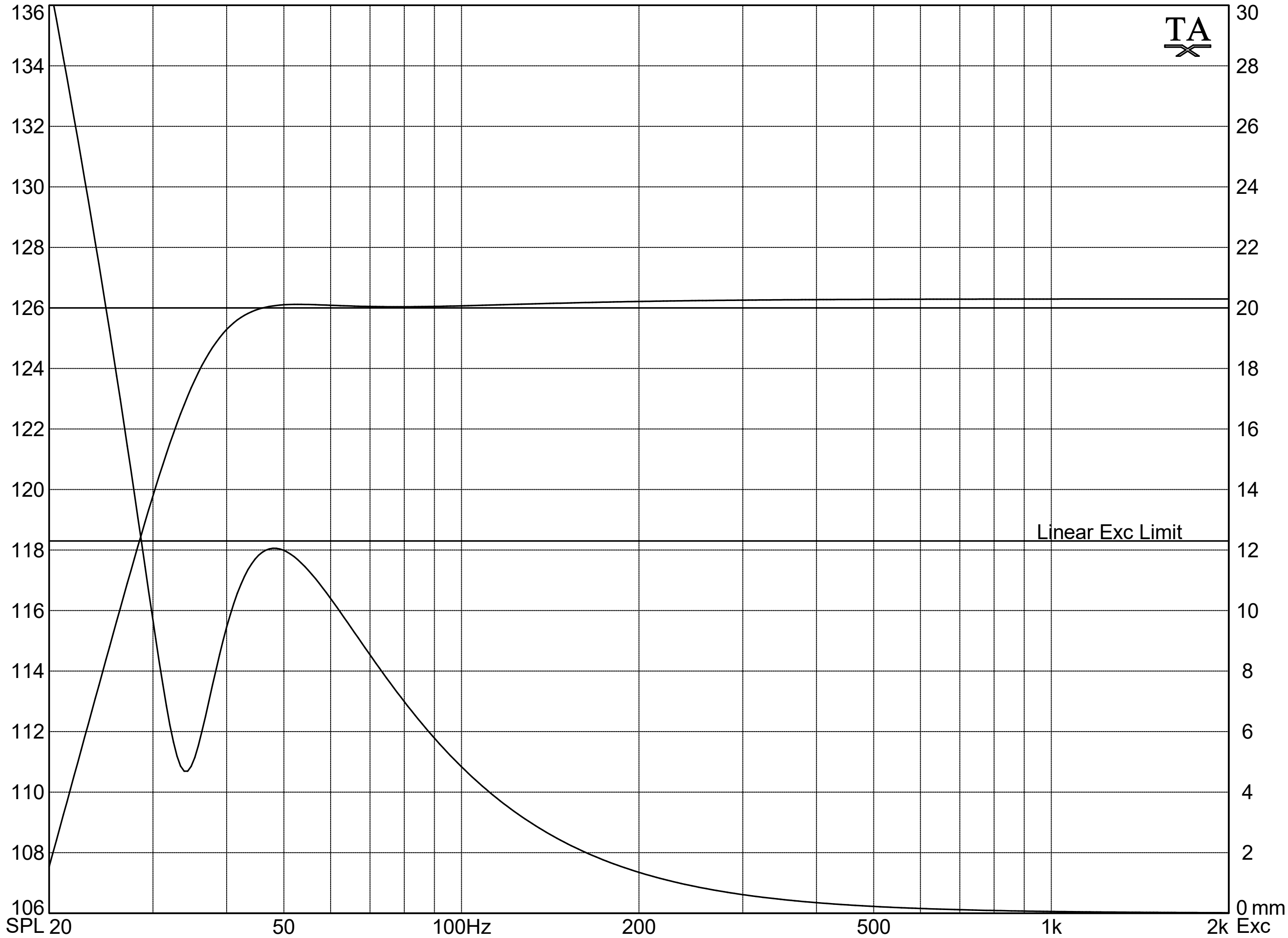
Dayton Audio RSS315H0-4

System Name:

2nd Order Closed Box

Designer: Matthew Fisher
Title: Q 1.2

Rev Date: 10/3/23
Rev: 1



Driver Parameters

Driver: **Dayton Audio RSS315HO-4**

Nominal Diameter	D =	12	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.5	dB SPL
Free Air Resonance	f(s) =	26.2	Hz
Total Q	Q(ts) =	0.31	
Electrical Q	Q(es) =	0.33	
Mechanical Q	Q(ms) =	3.63	
Equivalent Volume	V(as) =	1.896	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.2	Ohms
Max Thermal Power	P(t) =	700	Watts
Max Linear Excursion	X(max) =	12.3	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	1	cu ft
Closed Box Q	Q(tc) =	0.5276	
Box Frequency	F(B) =	34	Hz
Min Rec Vent Area	S(vMin) =	32.8	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	1.896	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	3800	Watts
SPL Distance	D =	1	m

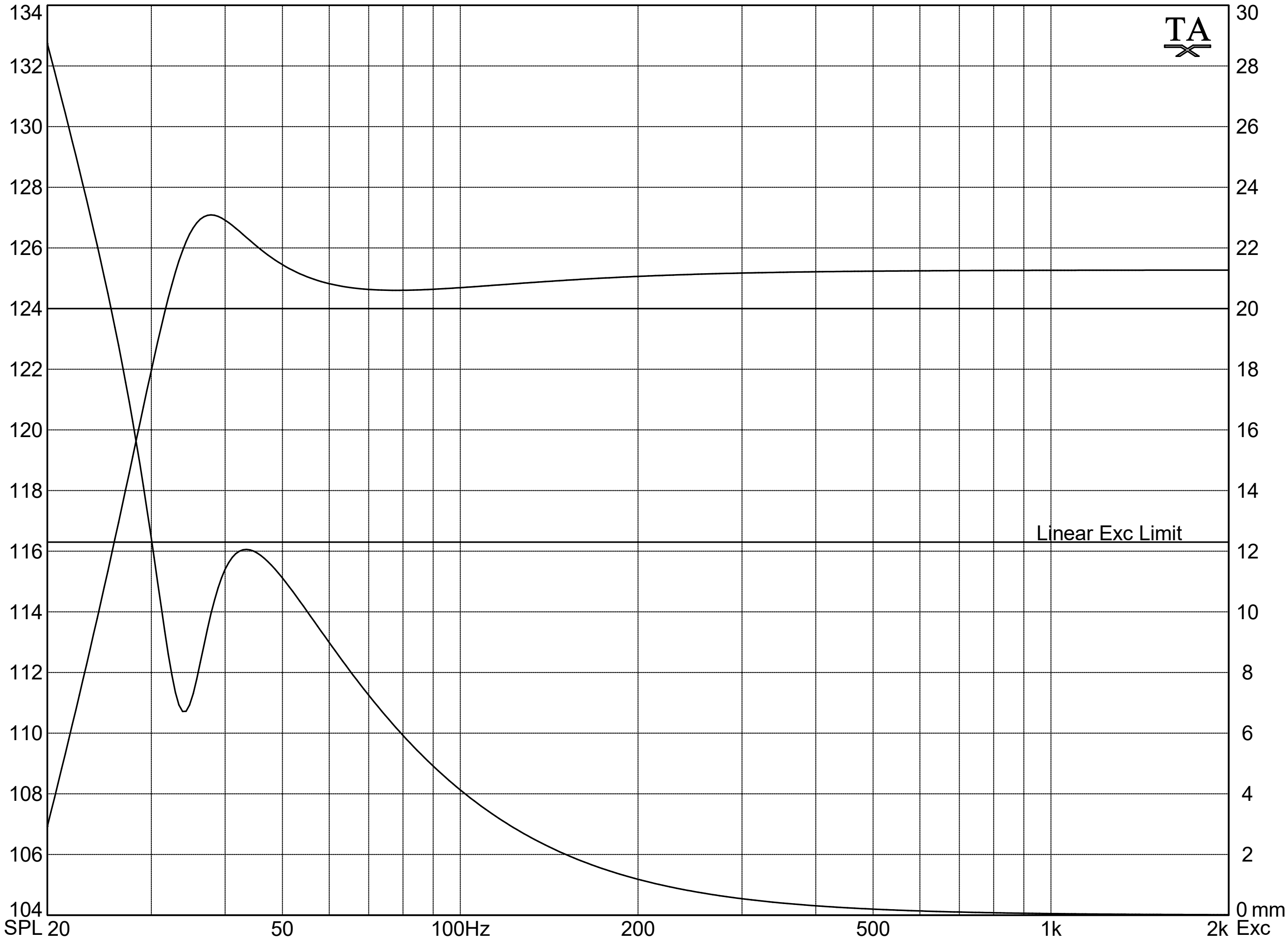
Dayton Audio RSS315H0-4

System Name:

4th Order Vented Box

Designer: Matthew Fisher
Title: Roll-off

Rev Date: 10/3/23 Rev: 1



Driver Parameters

Driver: **Dayton Audio RSS315HO-4**

Nominal Diameter	D =	12	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.5	dB SPL
Free Air Resonance	f(s) =	26.2	Hz
Total Q	Q(ts) =	0.31	
Electrical Q	Q(es) =	0.33	
Mechanical Q	Q(ms) =	3.63	
Equivalent Volume	V(as) =	1.896	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.2	Ohms
Max Thermal Power	P(t) =	700	Watts
Max Linear Excursion	X(max) =	12.3	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	2	cu ft
Closed Box Q	Q(tc) =	0.4327	
Box Frequency	F(B) =	34	Hz
Min Rec Vent Area	S(vMin) =	32.8	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	0.9482	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	3000	Watts
SPL Distance	D =	1	m

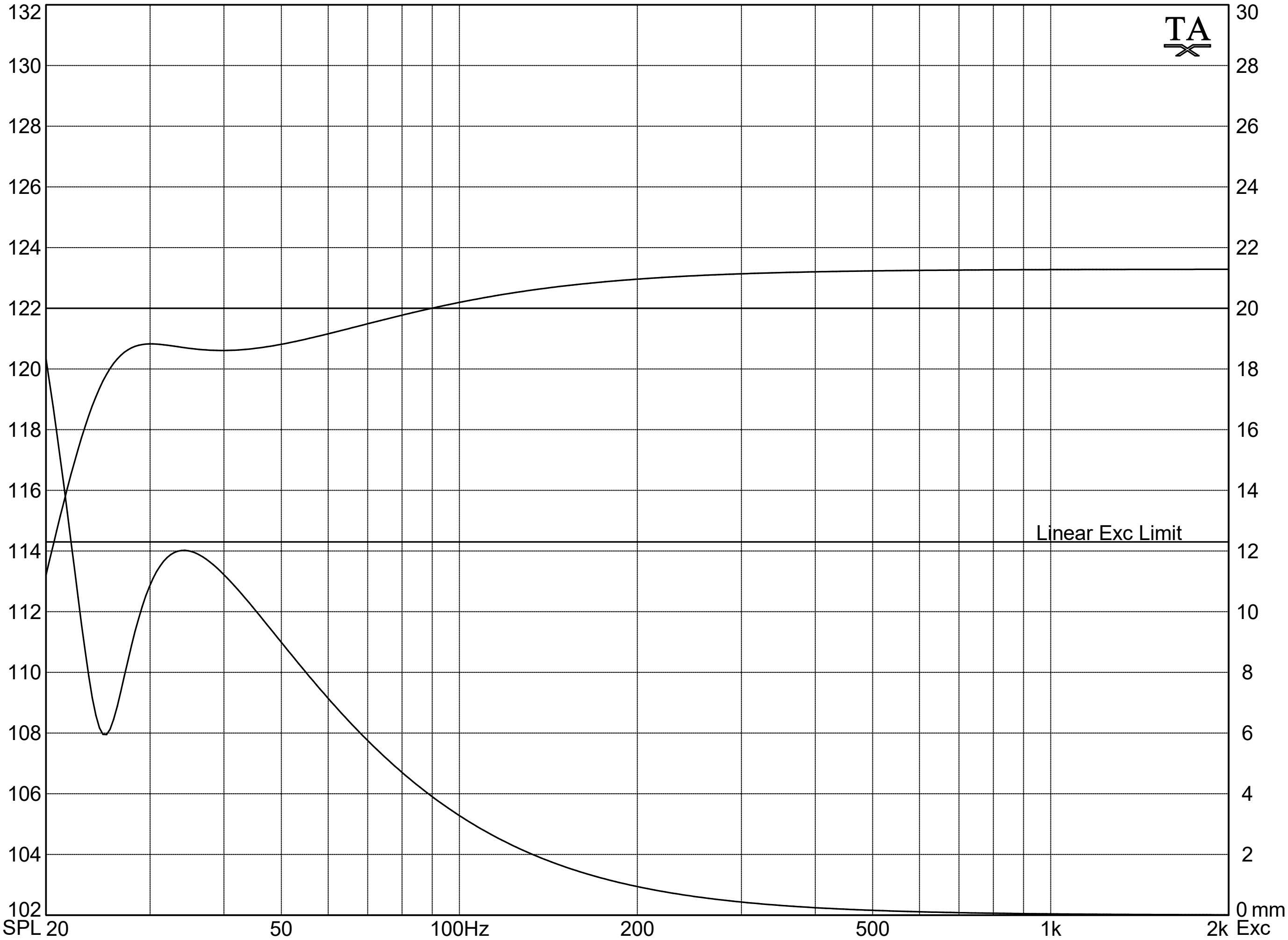
Dayton Audio RSS315H0-4

System Name:

4th Order Vented Box

Designer: Matthew Fisher
Title: Bass Boost

Rev Date: 10/3/23
Rev: 1



Driver Parameters

Driver: **Dayton Audio RSS315HO-4**

Nominal Diameter	D =	12	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.5	dB SPL
Free Air Resonance	f(s) =	26.2	Hz
Total Q	Q(ts) =	0.31	
Electrical Q	Q(es) =	0.33	
Mechanical Q	Q(ms) =	3.63	
Equivalent Volume	V(as) =	1.896	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.2	Ohms
Max Thermal Power	P(t) =	700	Watts
Max Linear Excursion	X(max) =	12.3	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	2	cu ft
Closed Box Q	Q(tc) =	0.4327	
Box Frequency	F(B) =	25	Hz
Min Rec Vent Area	S(vMin) =	24.1	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	0.9482	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	1900	Watts
SPL Distance	D =	1	m

Dayton Audio RSS315H0-4

System Name:

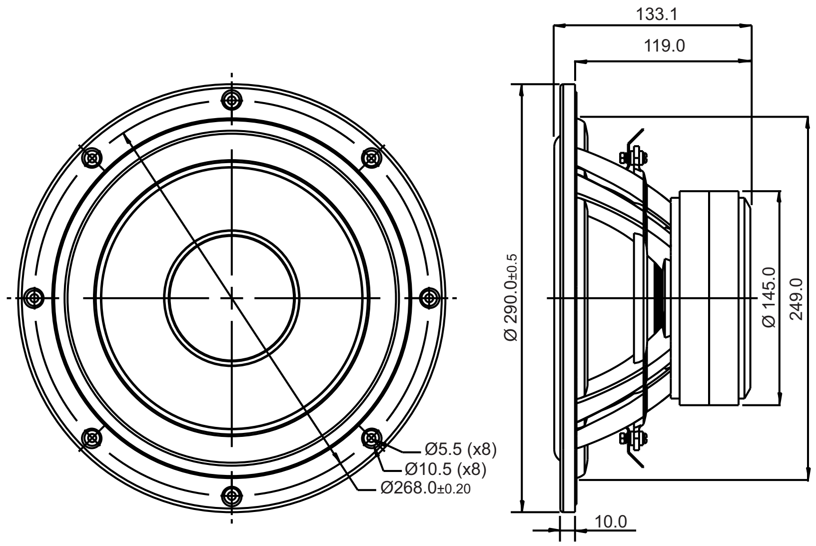
4th Order Vented Box

Designer: Matthew Fisher
Title: Low Frequency Extension
Rev Date: 10/3/23
Rev: 1

SB Acoustics 29NRX75-8

SB ACOUSTICS

10″ SB29NRX75-8



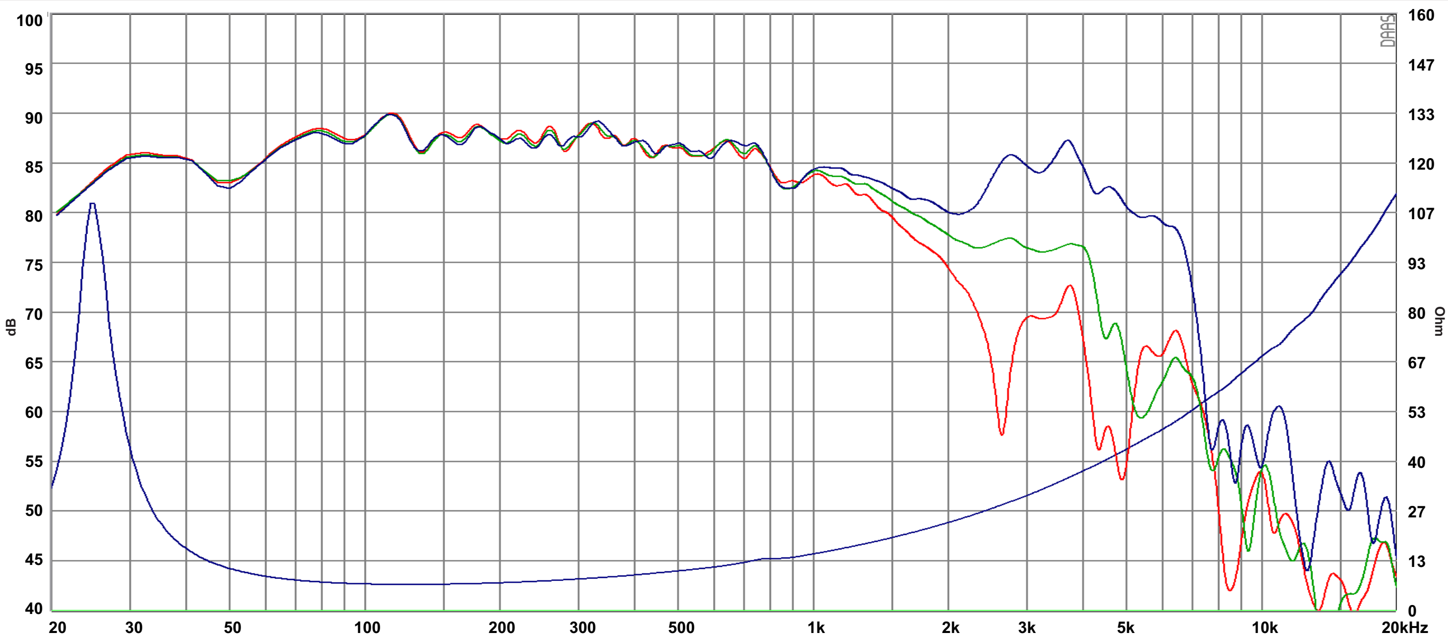
FEATURES

- Hard paper cone for improved piston operation (made in-house)
- Vented pole piece for minimum compression
- Vented cast aluminum chassis for optimum strength and low compression
- 3″ copper voice coil for improved power handling
- Long life silver lead wires
- Low damping rubber surround for improved dynamic linearity
- Non-conducting fiber glass voice coil former for minimum damping

Specs :

Nominal Impedance	8 Ω	Free air resonance, Fs	26 Hz
DC resistance, Re	6.2 Ω	Sensitivity (2.83 V / 1 m)	88 dB
Voice coil inductance, Le	2.3 mH	Mechanical Q-factor, Qms	7.06
Effective piston area, Sd	312 cm^2	Electrical Q-factor, Qes	0.39
Voice coil diameter	75.6 mm	Total Q-factor, Qts	0.37
Voice coil height	28 mm	Moving mass incl.air, Mms	58.9 g
Air gap height	6 mm	Force factor, Bl	12.4 Tm
Linear coil travel (p-p)	22 mm	Equivalent volume, Vas	85.6 liters
Magnetic flux density	0.9 T	Compliance, Cms	0.63 mm/N
Magnet weight	2.1 kg	Mechanical loss, Rms	1.4 kg/s
Net weight	5.40 kg	Rated power handling*	200 W

* IEC 268-5, T/S parameters measured on drive units that are broken in.

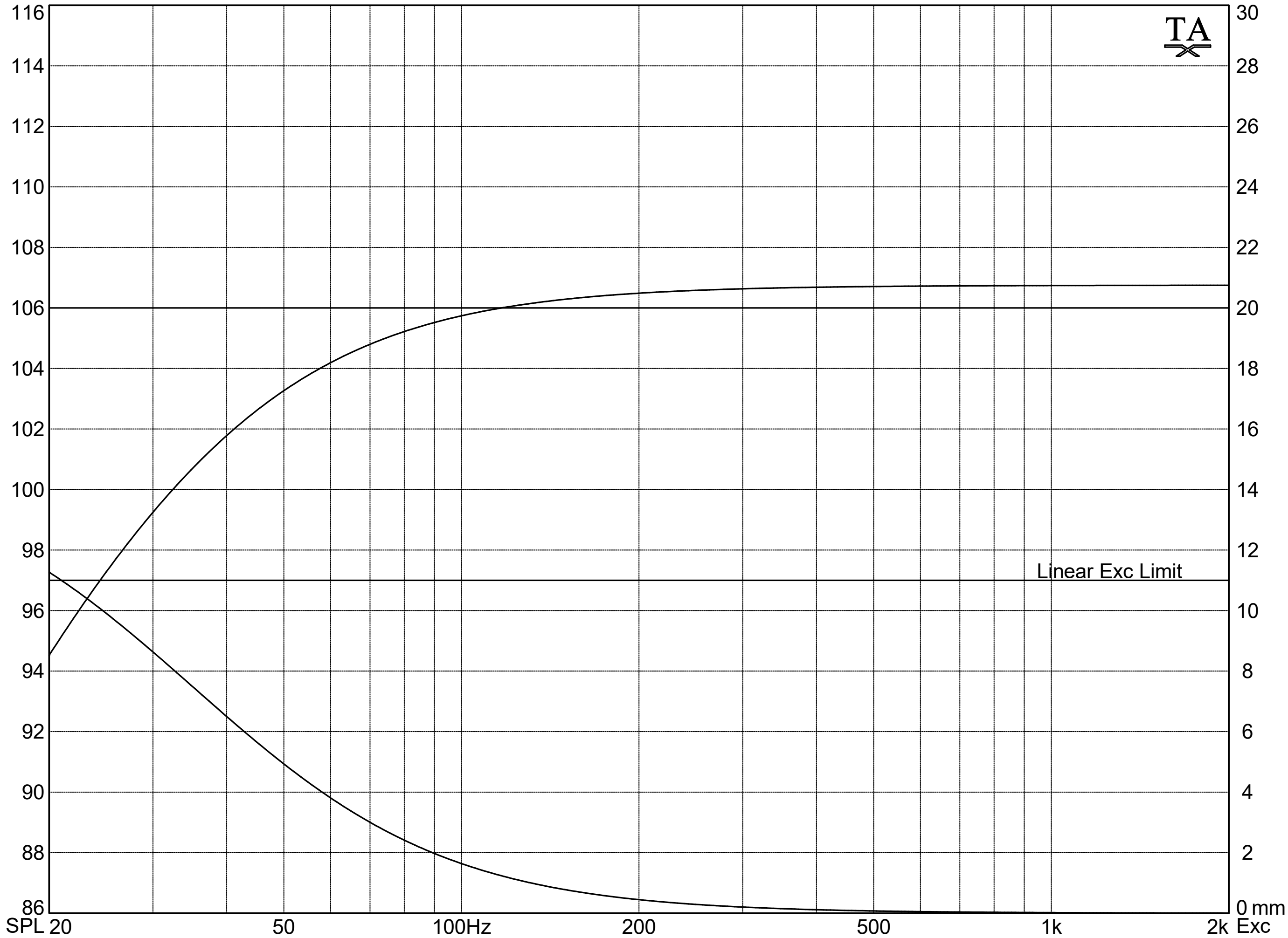


(IEC baffle, mic. distance 31.6 cm, SPL shown for 2.83 V / 1 m)

REV.3 (12.01.2022)

Response Curve :

------ (Blue) : on axis
------ (Green) : 30° off-axis
------ (Red) : 60° off-axis



Driver Parameters

Driver: **SB Acoustics SB29NRX75-8**

Nominal Diameter	D =	10	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	88	dB SPL
Free Air Resonance	f(s) =	26	Hz
Total Q	Q(ts) =	0.37	
Electrical Q	Q(es) =	0.39	
Mechanical Q	Q(ms) =	7.06	
Equivalent Volume	V(as) =	3.023	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	6.2	Ohms
Max Thermal Power	P(t) =	200	Watts
Max Linear Excursion	X(max) =	11	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	3.659	cu ft
Closed Box Q	Q(tc) =	0.5	
System Resonance	F(sc) =	35.14	Hz
Compliance Ratio	alpha =	0.8263	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	75	Watts
SPL Distance	D =	1	m

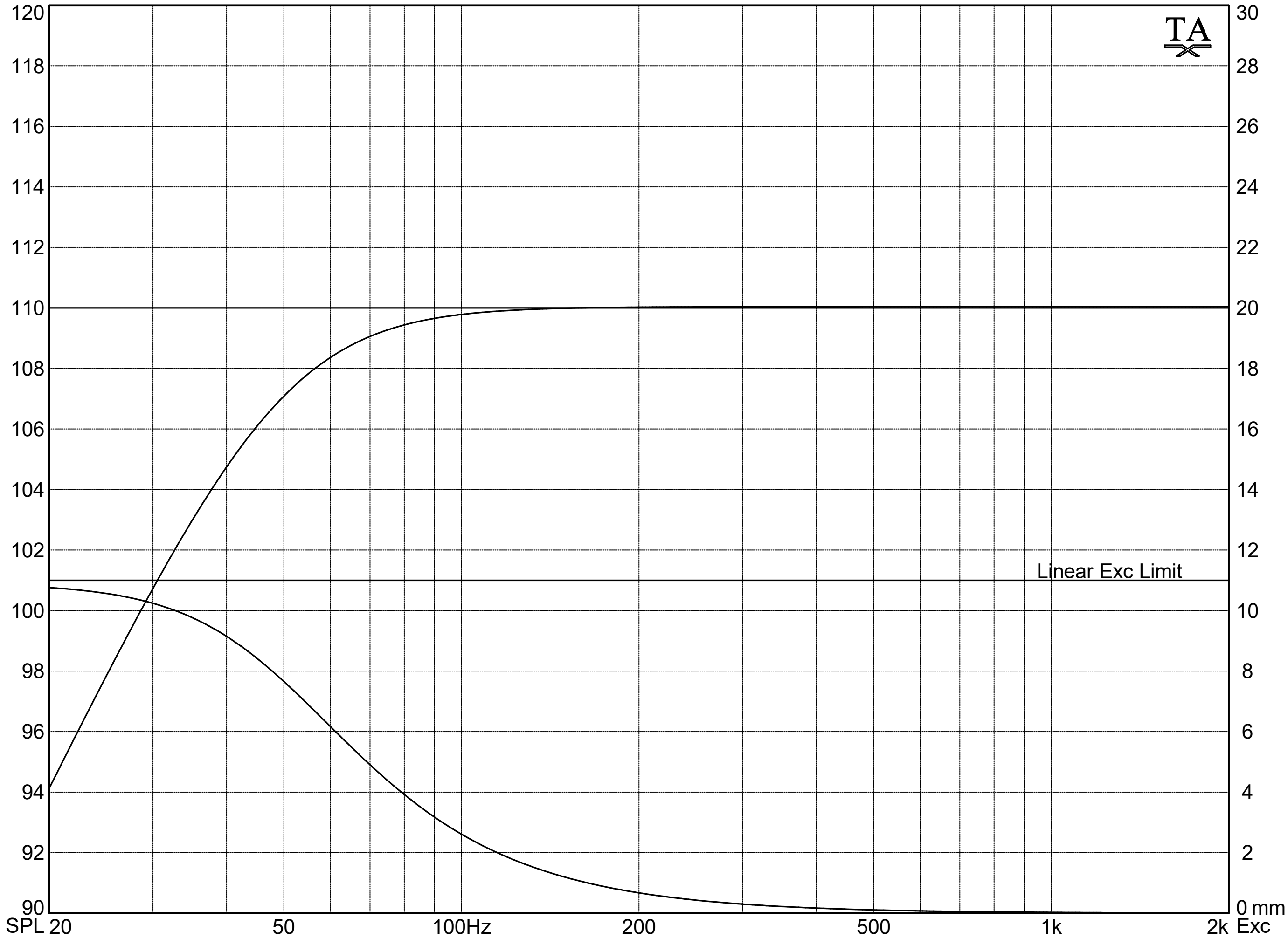
SB Acoustics 29NRX75-8

System Name:

2nd Order Closed Box

Designer: Matthew Fisher
Title: Q 0.5

Rev Date: 10/3/23
Rev: 1



Driver Parameters

Driver: **SB Acoustics SB29NRX75-8**

Nominal Diameter	D =	10	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	88	dB SPL
Free Air Resonance	f(s) =	26	Hz
Total Q	Q(ts) =	0.37	
Electrical Q	Q(es) =	0.39	
Mechanical Q	Q(ms) =	7.06	
Equivalent Volume	V(as) =	3.023	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	6.2	Ohms
Max Thermal Power	P(t) =	200	Watts
Max Linear Excursion	X(max) =	11	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	1.14	cu ft
Closed Box Q	Q(tc) =	0.707	
System Resonance	F(sc) =	49.68	Hz
Compliance Ratio	alpha =	2.651	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	160	Watts
SPL Distance	D =	1	m

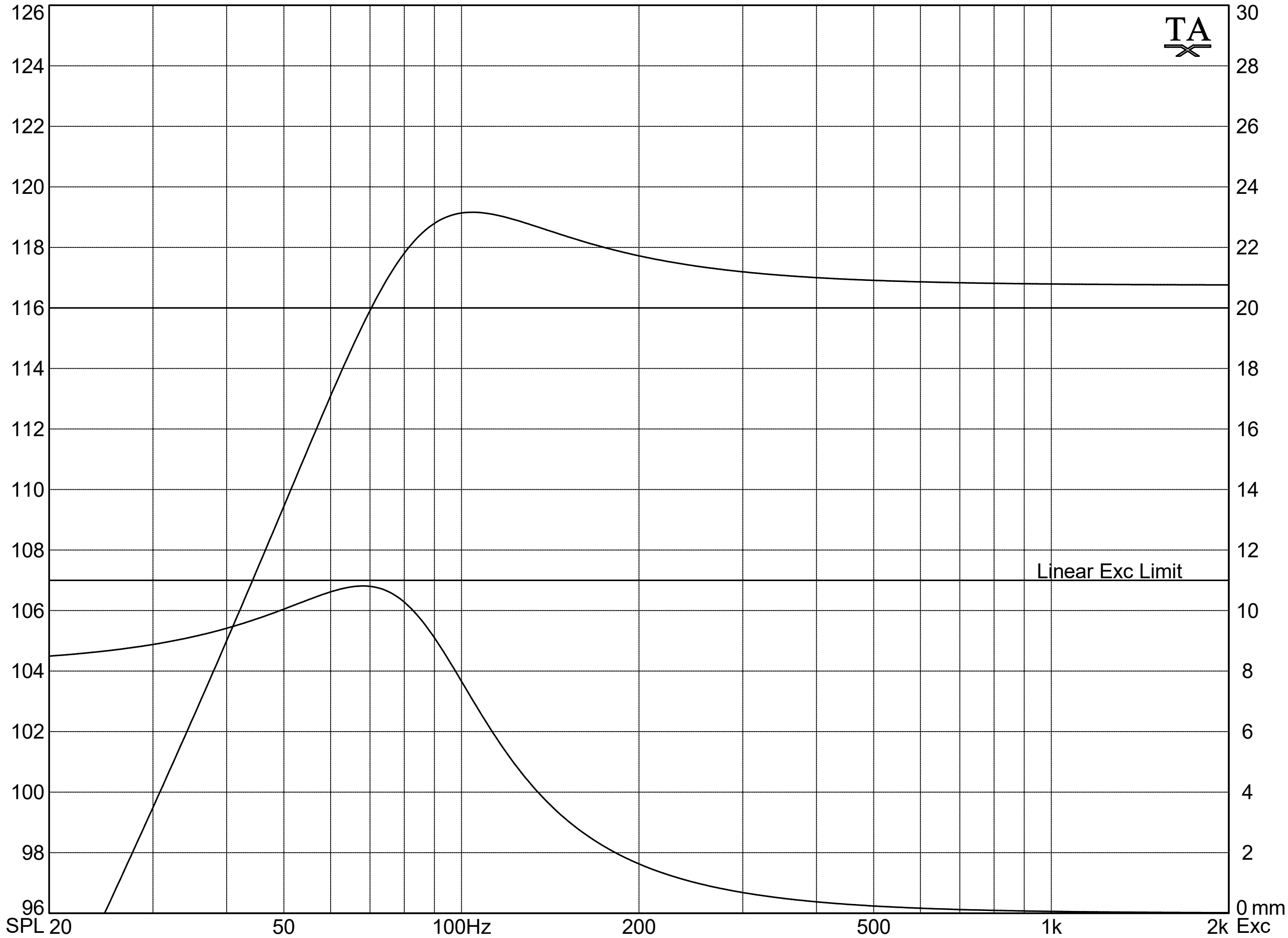
SB Acoustics 29NRX75-8

System Name:

2nd Order Closed Box

Designer: Matthew Fisher
Title: Q 0.707

Rev Date: 10/3/23
Rev: 1



Driver Parameters

Driver: **SB Acoustics SB29NRX75-8**

Nominal Diameter	D =	10	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	88	dB SPL
Free Air Resonance	f(s) =	26	Hz
Total Q	Q(ts) =	0.37	
Electrical Q	Q(es) =	0.39	
Mechanical Q	Q(ms) =	7.06	
Equivalent Volume	V(as) =	3.023	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	6.2	Ohms
Max Thermal Power	P(t) =	200	Watts
Max Linear Excursion	X(max) =	11	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	0.3176	cu ft
Closed Box Q	Q(tc) =	1.2	
System Resonance	F(sc) =	84.32	Hz
Compliance Ratio	alpha =	9.519	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	750	Watts
SPL Distance	D =	1	m

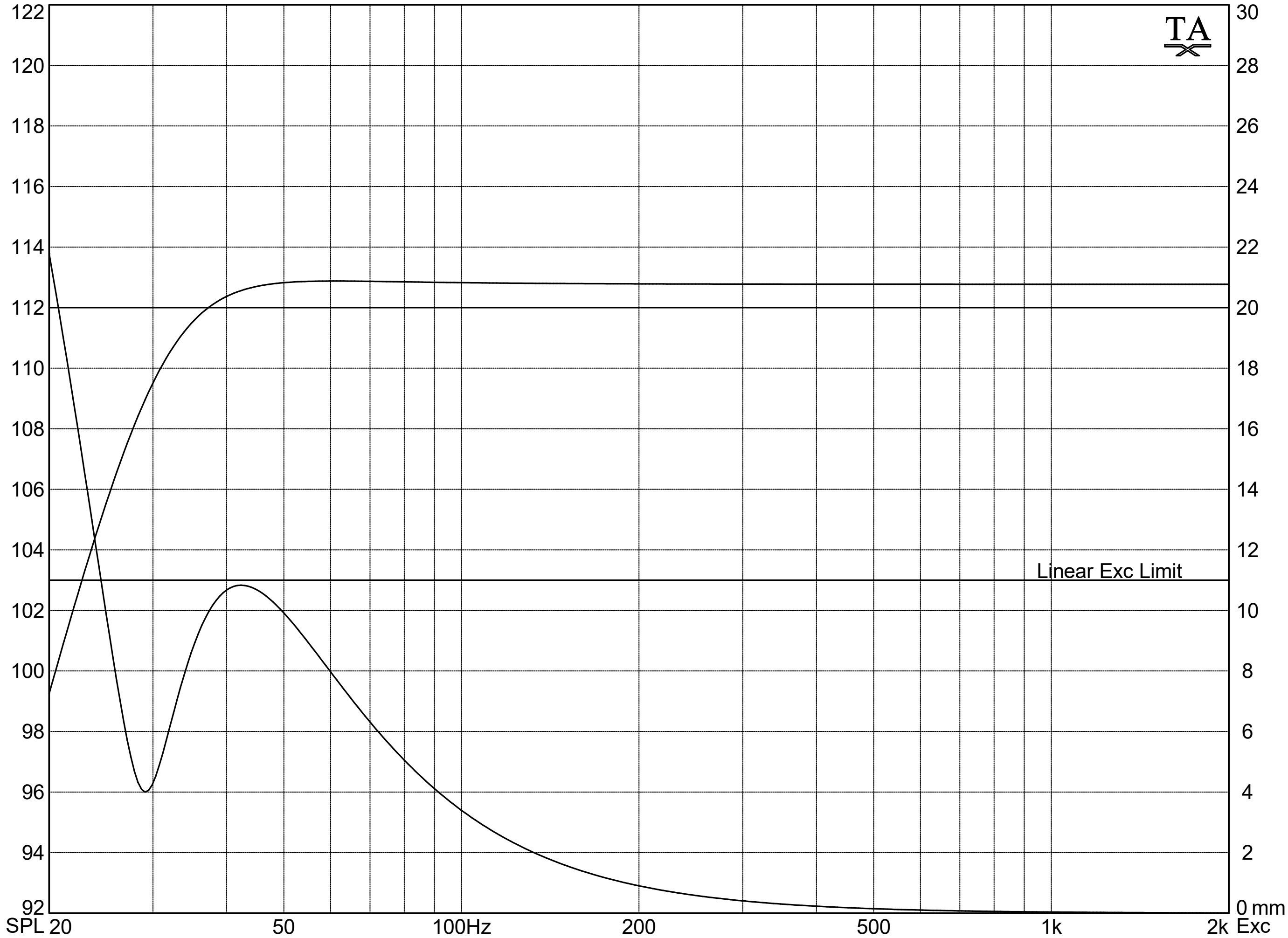
SB Acoustics 29NRX75-8

System Name:

2nd Order Closed Box

Designer: My Name
Title: My Title

Rev Date: 10/3/23
Rev: 1



Driver Parameters

Driver: **SB Acoustics SB29NRX75-8**

Nominal Diameter	D =	10	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	88	dB SPL
Free Air Resonance	f(s) =	26	Hz
Total Q	Q(ts) =	0.37	
Electrical Q	Q(es) =	0.39	
Mechanical Q	Q(ms) =	7.06	
Equivalent Volume	V(as) =	3.023	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	6.2	Ohms
Max Thermal Power	P(t) =	200	Watts
Max Linear Excursion	X(max) =	11	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	2	cu ft
Closed Box Q	Q(tc) =	0.5864	
Box Frequency	F(B) =	29	Hz
Min Rec Vent Area	S(vMin) =	12.3	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	1.511	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	300	Watts
SPL Distance	D =	1	m

SB Acoustics 29NRX75-8

System Name:

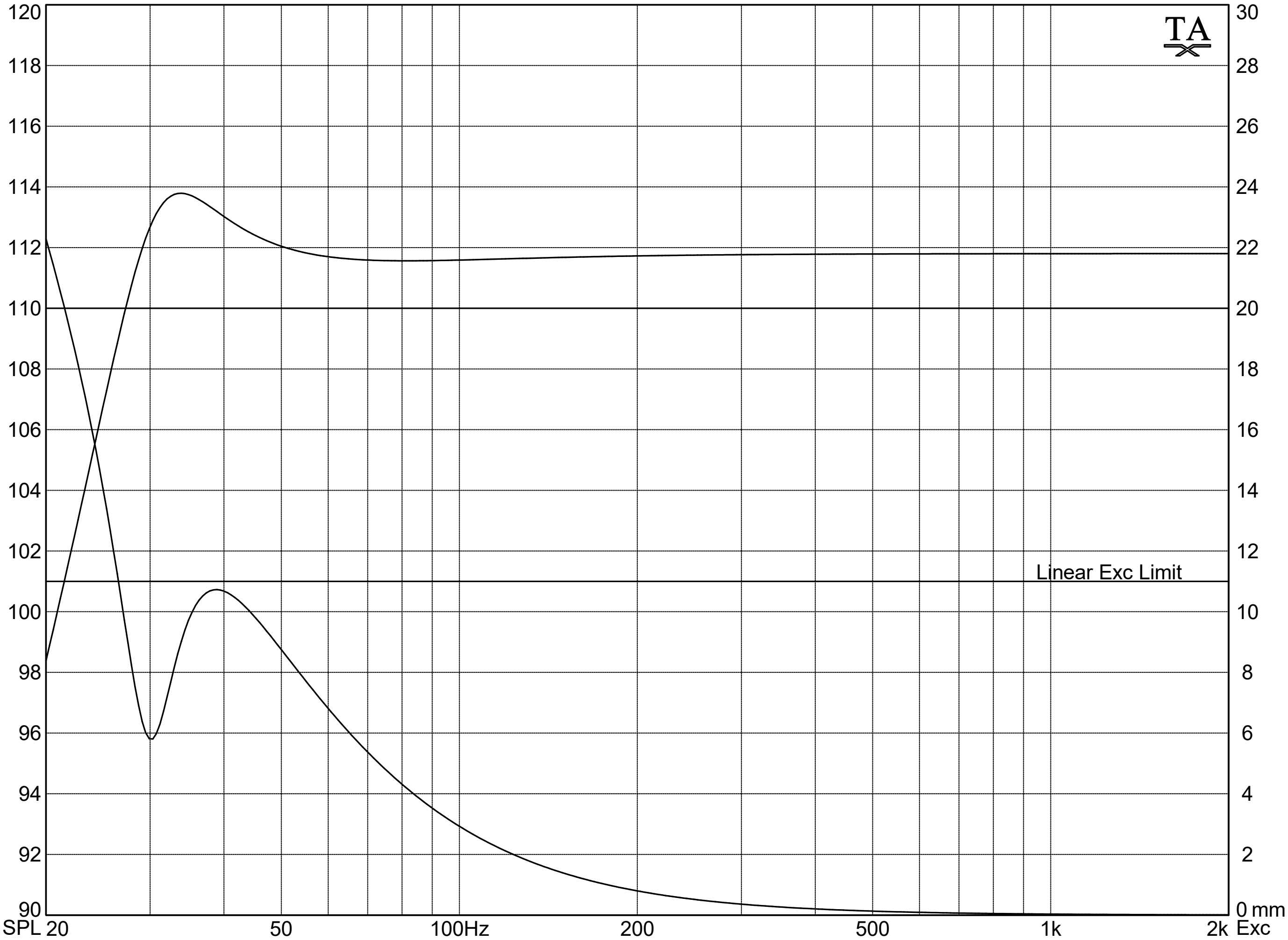
4th Order Vented Box

Designer: Matthew Fisher

Title: Roll-off

Rev Date: 10/3/23

Rev: 1



Driver Parameters

Driver: **SB Acoustics SB29NRX75-8**

Nominal Diameter	D =	10	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	88	dB SPL
Free Air Resonance	f(s) =	26	Hz
Total Q	Q(ts) =	0.37	
Electrical Q	Q(es) =	0.39	
Mechanical Q	Q(ms) =	7.06	
Equivalent Volume	V(as) =	3.023	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	6.2	Ohms
Max Thermal Power	P(t) =	200	Watts
Max Linear Excursion	X(max) =	11	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	4	cu ft
Closed Box Q	Q(tc) =	0.4903	
Box Frequency	F(B) =	30	Hz
Min Rec Vent Area	S(vMin) =	12.7	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	0.7557	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	240	Watts
SPL Distance	D =	1	m

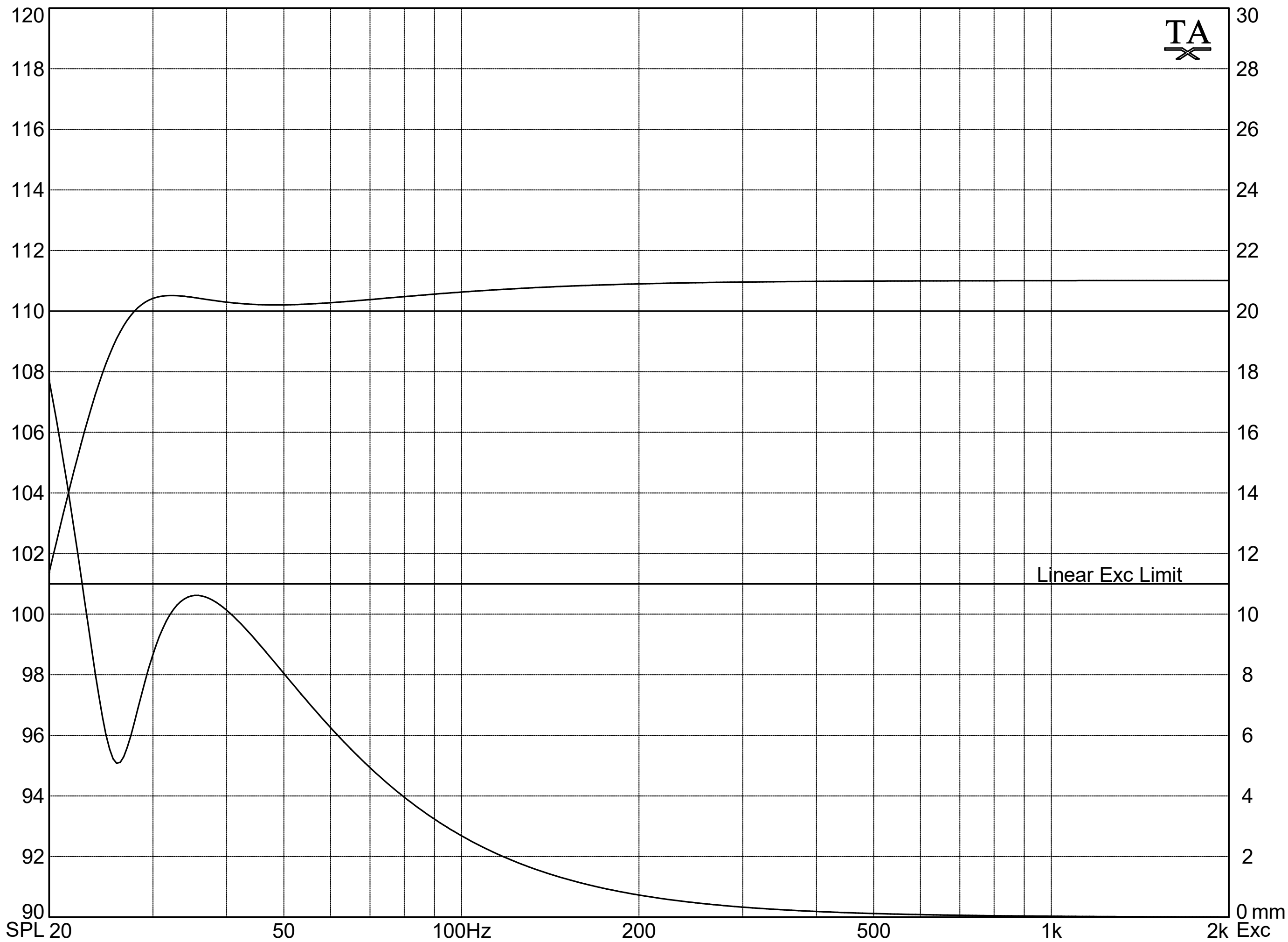
SB Acoustics 29NRX75-8

System Name:

4th Order Vented Box

Designer: Matthew Fisher
Title: Bass Boost

Rev Date: 10/3/23
Rev: 1



Driver Parameters

Driver: SB Acoustics SB29NRX75-8

Nominal Diameter	D =	10	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	88	dB SPL
Free Air Resonance	f(s) =	26	Hz
Total Q	Q(ts) =	0.37	
Electrical Q	Q(es) =	0.39	
Mechanical Q	Q(ms) =	7.06	
Equivalent Volume	V(as) =	3.023	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	6.2	Ohms
Max Thermal Power	P(t) =	200	Watts
Max Linear Excursion	X(max) =	11	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.
NOTE: Reference Efficiency was calculated based on the

System Notes:

Box Parameters

System Type: 4th Order Vented Box

Box Volume	V(B) =	3.5	cu ft
Closed Box Q	Q(tc) =	0.5051	
Box Frequency	F(B) =	26	Hz
Min Rec Vent Area	S(vMin) =	11	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	0.8637	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	200	Watts
SPL Distance	D =	1	m

SB Acoustics 29NRX75-8

System Name:

4th Order Vented Box

Designer: Matthew Fisher
Title: Low Frequency Extension
Rev Date: 10/3/23
Rev: 1

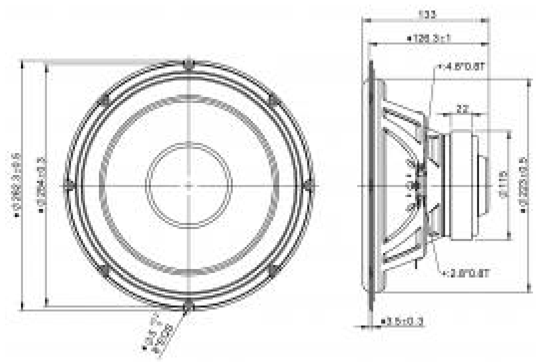
Peerless SLS 830668

Model No::	SLS-P830668	Rev:	1
Product Line:	Peerless	Last Update:	2017-04-25 14:32:09

Product Description

The SLS line combines high quality performance with an affordable design. This 10 inch 8 ohm member of the SLS family features a rigid steel basket, a coated paper cone, and a ferrite magnet motor with aluminium shorting ring for improved distortion performance.

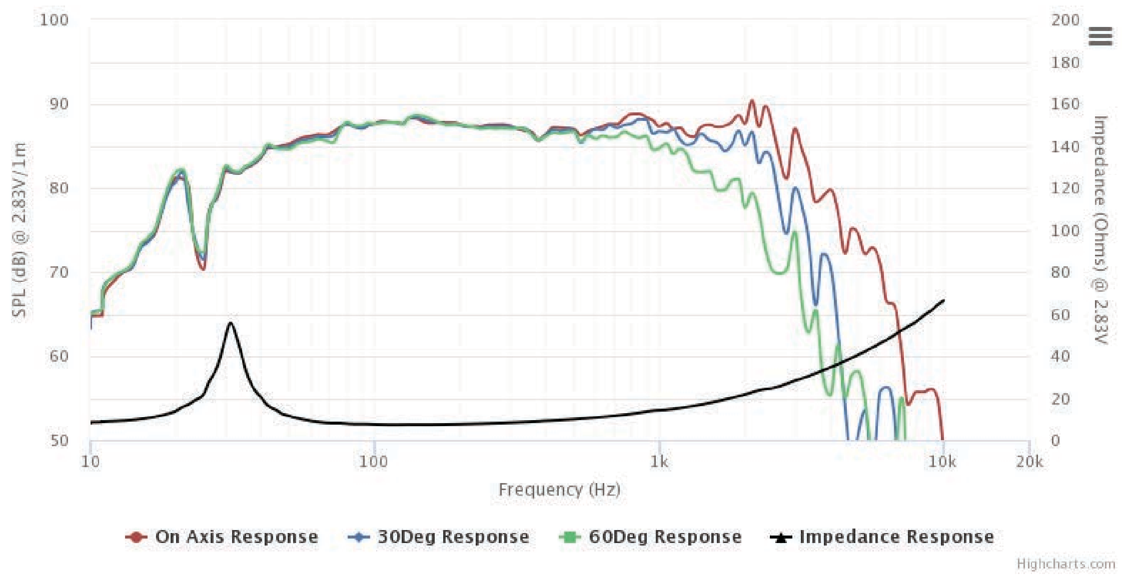
Mechanical Drawing



Specifications

DC Resistance	Revc	Ohms	5.61	5.0%	Energy Bandwidth Product	EBP	(1/Qes)*fs	
Minimum Impedance	Zmin	Ohms	7.31	7.5%	Moving Mass	Mms	g	56.3
Voice Coil Inductance	Le	mH	1.37		Suspension Compliance	Cms	um/N	429
Resonant Frequency	Fs	Hz	32.4	15%	Effective Cone diameter	D	cm	21
Mechanical Q Factor	Qms		7.15		Effective Piston Area	Sd	cm^2	346.4
Electrical Q Factor	Qes	0.59			Effective Volume	Vas	L	72.9
Total Q Factor	Qts		0.55		Motor Force Factor	BL	Tm	10.42
Ratio Fs/Qts	F	Fs/Qts	59.23		Motor Efficiency Factor	ß	(T*M^2)/Ohms	19.3
Half Space Sensitivity @2.83V	db@2.83V/1M	dB	87.9	+/- 1.0db	Voice coil former Material	VCfm		GSV
Half Space Sensitivity @1W/1M	db@1W/1M	dB	87.5	+/- 1.0db	Voice coil inner diameter	VCd	mm	38.43
Gap Height	Gh	mm	8		Rated Noise Power	P	W	70
Maximum Linear Excursion	Xmax	mm	8.3		Test Spectrum Bandwidth	30Hz-2KHz		
Ferrofluid Type	FF				Driver Size	Inch	10 in	
Driver Mass	Kg	2.7						

Frequency and Impedance Response



Tymphany HK LTD
Address : Room 1307-8 Dominion Centre, 43-59 Queens Rd East, Wanchai, Hong Kong
E-mail: sales@tymphany.com

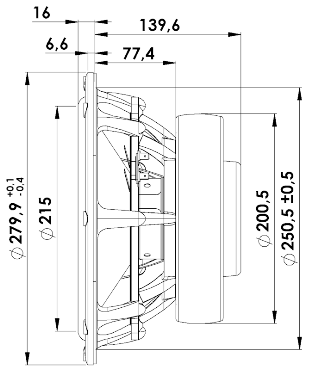
ScanSpeak
28W/4878T00
Revelator

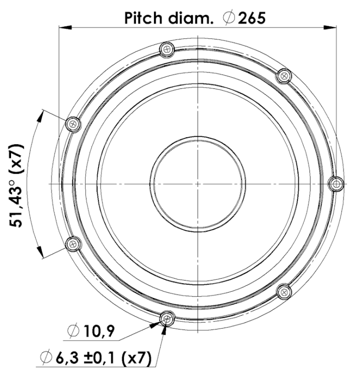
SCANSPEAK

Revelator

28 cm Subwoofer

28W/4878T00





T-S Parameters:	
Resonance frequency [fs]	18 Hz
Mechanical Q factor [Qms]	5.6
Electrical Q factor [Qes]	0.32
Total Q factor [Qts]	0.3
Force factor [Bl]	11.2 Tm
Mechanical resistance [Rms]	2.3 kg/s
Moving mass [Mms]	114.5 g
Compliance [Cms]	0.68 mm/N
Effective diaph. diameter [D]	215 mm
Effective piston area [Sd]	363 cm²
Equivalent volume [Vas]	127 l
Sensitivity (2,83V/1m)	88 dB

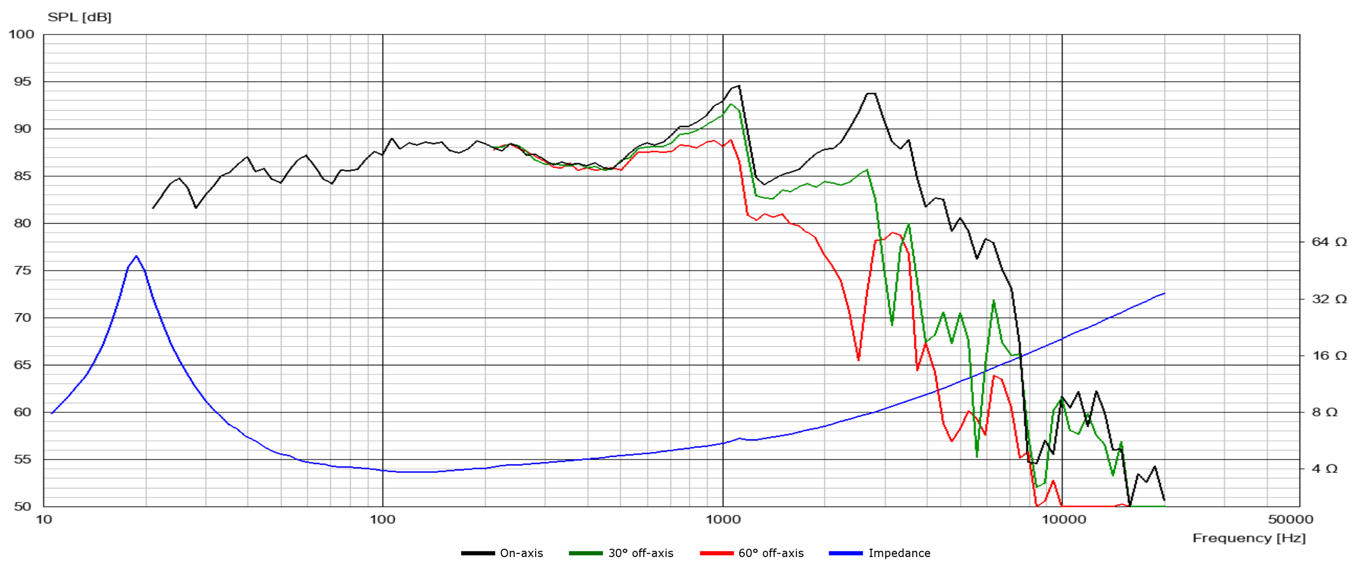
Mechanical Data:	
Voice coil diameter	75 mm
Voice coil height	36 mm
Voice coil layers	2
Gap height	8 mm
Linear excursion	± 14 mm
Max mech. excursion	± 26 mm
Unit weight	7.5 kg
Cabinet Displacement Volume	2.23 l

Key Features:
Paper sandwich cone
Patented Symmetrical Drive motor
Spider with balanced tinsel leads
Extreme linear excursion (+/-14 mm)
3" Voice coil, Titanium former and paper reinforced
Stiff and strong die cast aluminium chassis

Electrical Data:	
Nominal impedance [Zn]	4 Ω
Minimum impedance [Zmin]	3.8 Ω
Maximum impedance [Zo]	53 Ω
DC resistance [Re]	3.1 Ω
Voice coil inductance [Le]	0.5 mH

Recommendations (please see Tech Note):	
Operating frequency range:	fs-1000 Hz
Cabinet volume - closed box:	Vbox=35 ltr, f(-3dB)=39 Hz
Cabinet volume - vented box:	Vbox=65 ltr, fb=23 Hz, f(-3dB)=24 Hz

Power Handling:	
100h RMS noise test (IEC 18.4)	200 W
Long-term max power (IEC 18.2)	500 W
X-over: 2. order LP Butterworth, 200 Hz	



Seas L26R04Y

DESIGN by seas

L26RO4Y D1004

Extremely stiff and rigid aluminium cone gives tremendous bass precision. The cone and the long throw low loss rubber surround show no sign of the familiar cone edge resonance and distortion associated with soft cones.

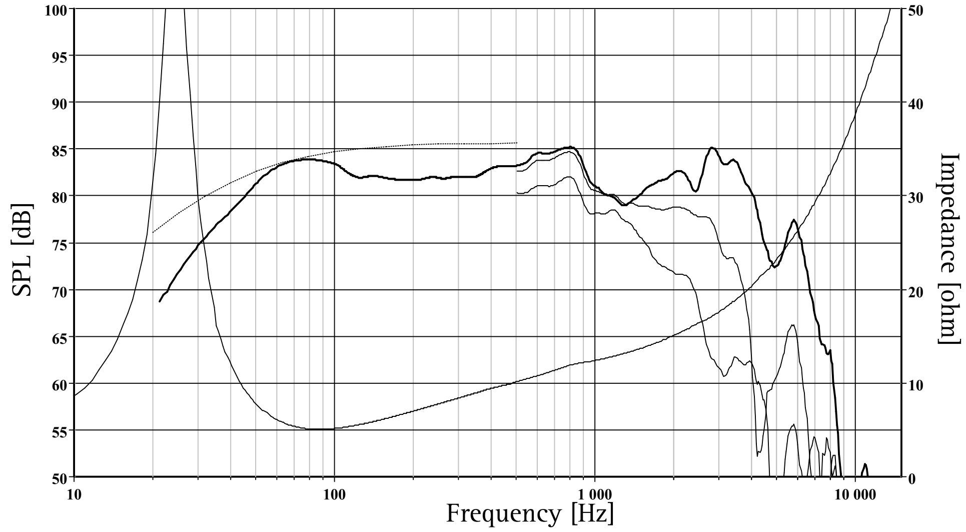
Lead-out wires symetrically stitched to the spider to avoid resonances. Total suspension designed to assure stability for extreme excursions.

4-layer, extremely long, high temperature voice coil wound on an glassfiber voice coil former gives a high power handling capacity.

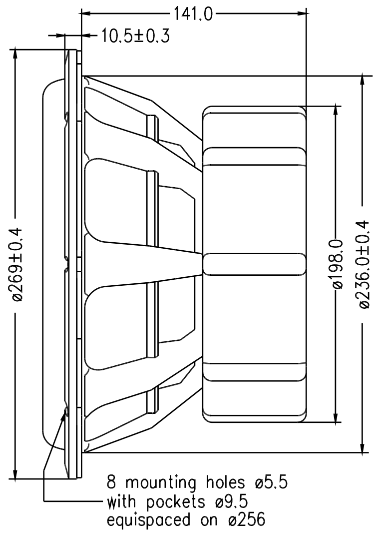
Cu-cap around the pole pieces reduce non linear and modulation distortion and increase overload margin.

Extra large magnet system provides high efficiency and low Q.

Extremely stiff and stable injection moulded metal basket keeps the critical components in perfect alignment. Large windows in the basket both above and below the spider reduce sound reflection, air flow noise and cavity resonance to a minimum.



The frequency responses above show measured free field sound pressure in 0, 30, and 60 degrees angle using a 28L closed box. Input 2.83 VRMS, microphone distance 0.5m, normalized to SPL 1m.The dotted line is a calculated response in infinite baffle based on the parameters given for this specific driver. The impedance is measured in free air without baffle using a 2V sine signal.



Nominal Impedance	4 Ohms	Voice Coil Resistance	3.3 Ohms
Recommended Frequency Range	20 - 1000 Hz	Voice Coil Inductance	3.85 mH
Short Term Power Handling *	500 W	Force Factor	18 N/A
Long Term Power Handling *	250 W	Free Air Resonance	24 Hz
Characteristic Sensitivity (2,83V, 1m)	85.5 dB	Moving Mass	173 g
Voice Coil Diameter	56 mm	Air Load Mass In IEC Baffle	4.0 g
Voice Coil Height	38 mm	Suspension Compliance	0.26 mm/N
Air Gap Height	10 mm	Suspension Mechanical Resistance	5.4 Ns/m
Linear Coil Travel (p-p)	28 mm	Effective Piston Area	363 cm²
Maximum Coil Travel (p-p)	56 mm	VAS	46 Litres
Magnetic Gap Flux Density	1.1 T	QMS	4.90
Magnet Weight	2.34 kg	QES	0.28
Total Weight	10 kg	QTS	0.27

Jun 2011-1

*IEC 268-5

SEAS reserves the right to change technical data

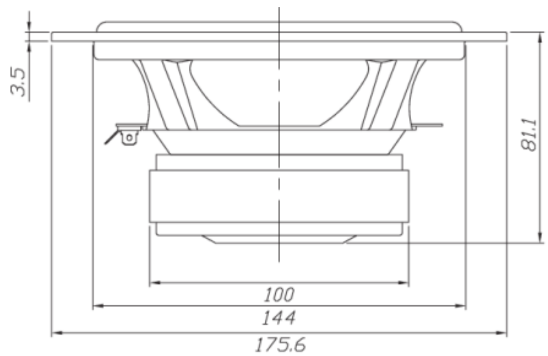
RoHS compliant product

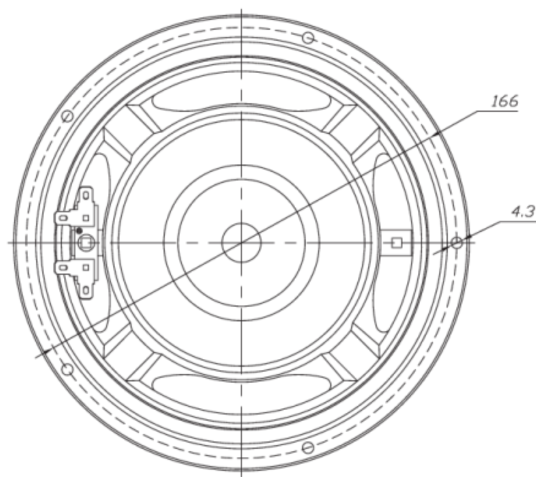
Woofer Drivers

Dayton Audio DA175-8

DA175-8 7" Aluminum Cone Woofer

DA175-8





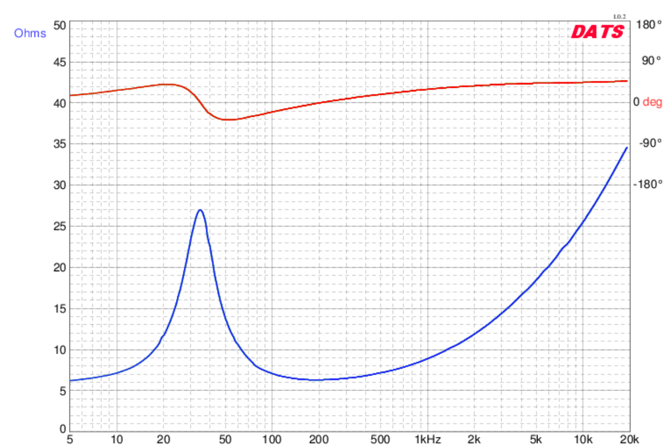
PARAMETERS

Impedance	8 ohms
Re	5.9 ohms
Le	1.14 mH
Fs	39.0 Hz
Qms	3.31
Qes	0.70
Qts	0.58
Mms	25.17g
Cms	0.66 mm/N
Sd	132.7 cm²
Vd	56.4 cm³
BL	7.17 Tm
Vas	16.3 liters
Xmax	4.25 mm
VC Diameter	35 mm
SPL	85 dB @ 1W/1m
RMS Power Handling	50 watts
Usable Frequency Range (Hz)	35 - 10,000 Hz

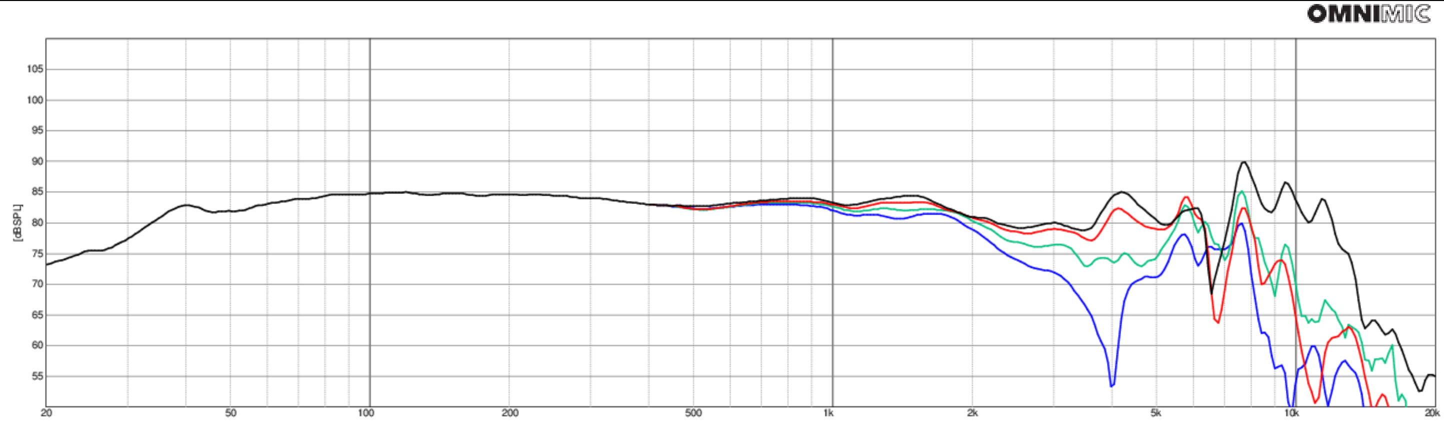
FEATURES

- Special composite dustcap
- Stamped steel frame provides a very high-class and professional look
- Aluminum cone offers a flat frequency response in the passband region with very low distortion

IMPEDANCE/PHASE

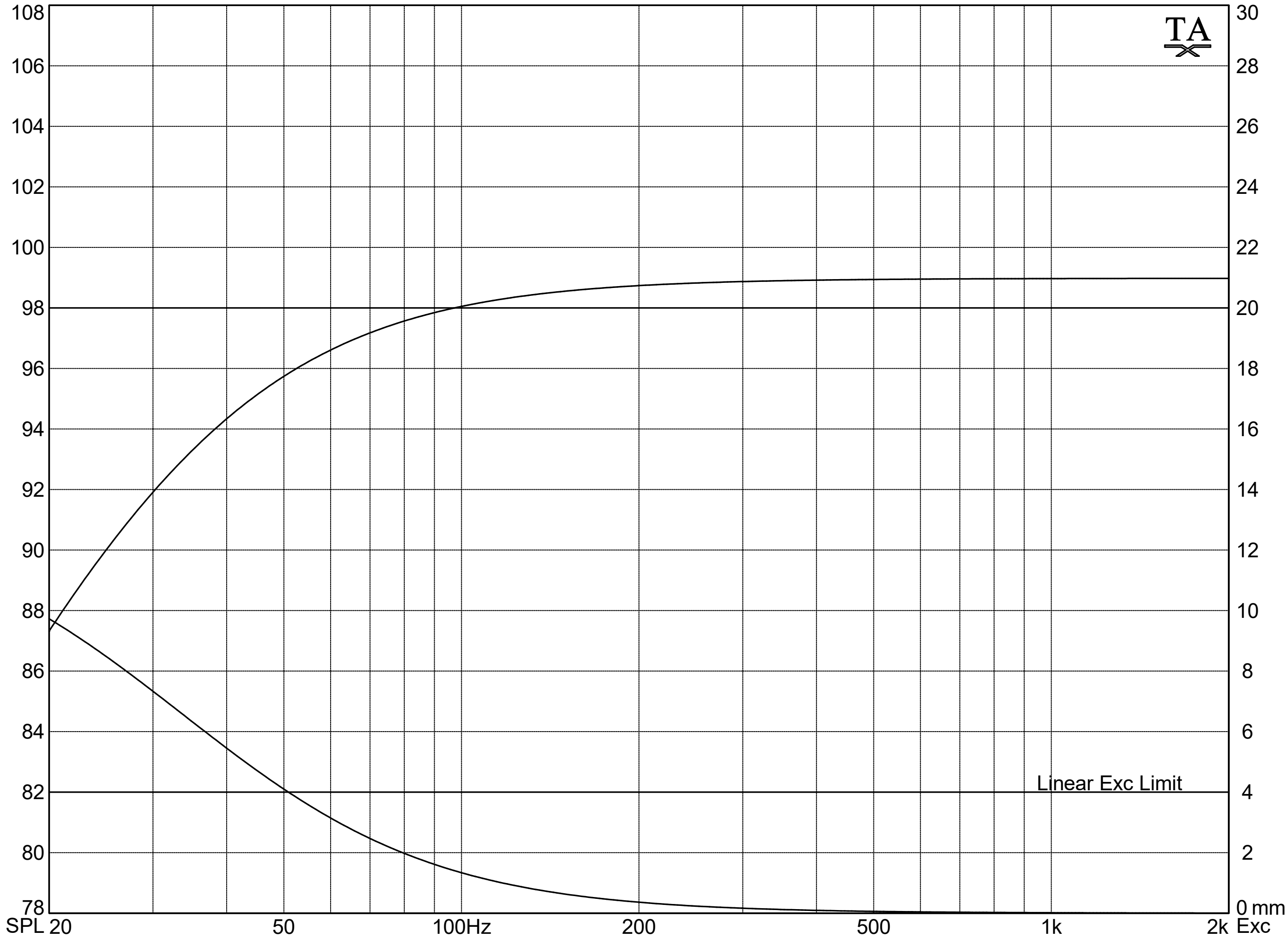


FREQUENCY RESPONSE



Note: 1/12th octave smoothing - nearfield response included in graph below 450 Hz.

Black = 0°
Red = 15°
Green = 30°
Blue = 45°



Driver Parameters

Driver: **Dayton Audio DA175-8**

Nominal Diameter	D =	7	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	85	dB SPL
Free Air Resonance	f(s) =	39	Hz
Total Q	Q(ts) =	0.58	
Electrical Q	Q(es) =	0.7	
Mechanical Q	Q(ms) =	3.31	
Equivalent Volume	V(as) =	0.576	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	5.9	Ohms
Max Thermal Power	P(t) =	100	Watts
Max Linear Excursion	X(max) =	4	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	-2.243	cu ft
Closed Box Q	Q(tc) =	0.5	
System Resonance	F(sc) =	33.62	Hz
Compliance Ratio	alpha =	-0.2568	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	25	Watts
SPL Distance	D =	1	m

Dayton Audio DA175-8

System Name:

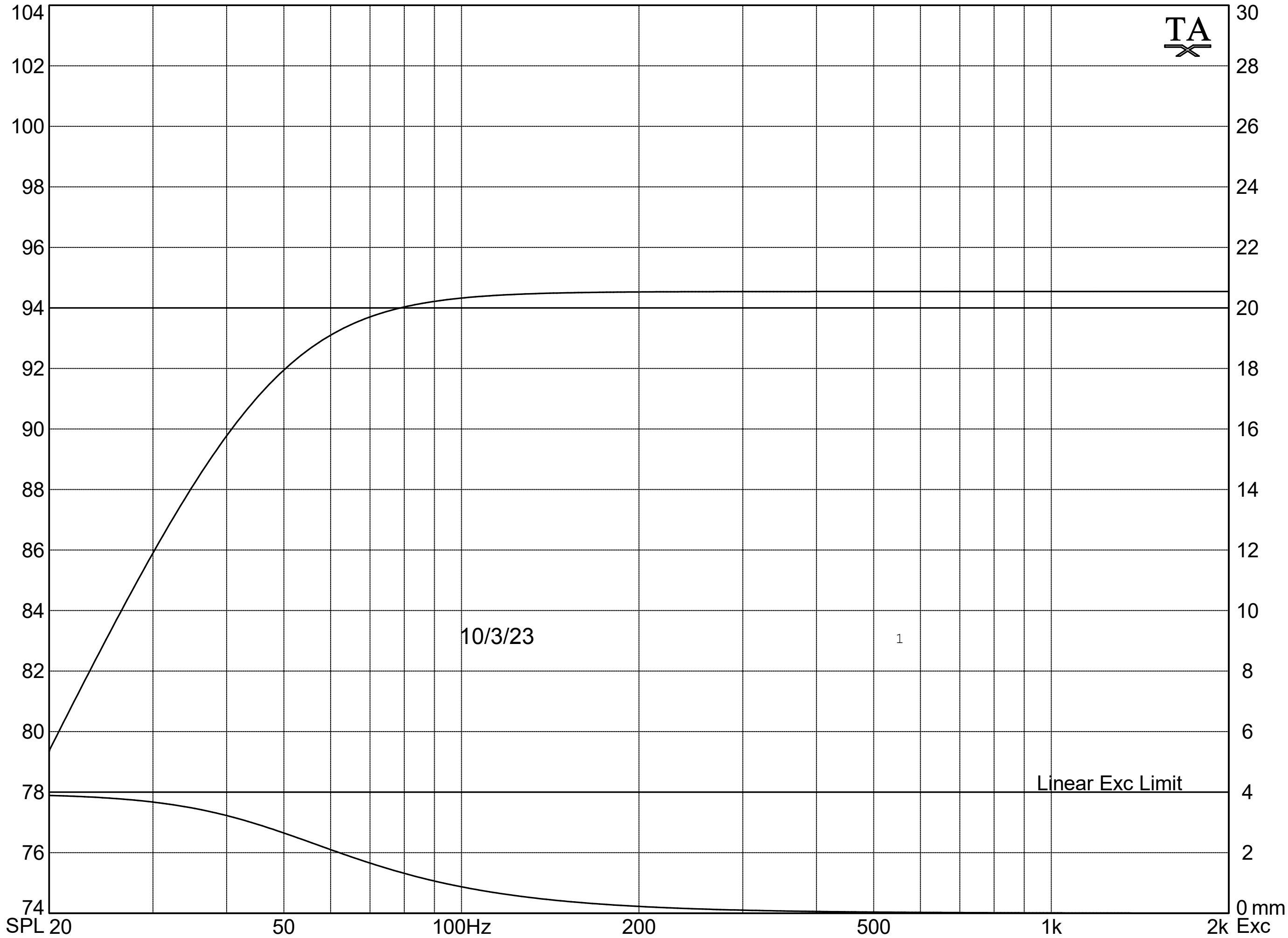
2nd Order Closed Box

Designer: Matthew Fisher

Title: Q 0.5

Rev Date: 10/3/23

Rev: 1



Driver Parameters

Driver: **Dayton Audio DA175-8**

Nominal Diameter	D =	7	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	85	dB SPL
Free Air Resonance	f(s) =	39	Hz
Total Q	Q(ts) =	0.58	
Electrical Q	Q(es) =	0.7	
Mechanical Q	Q(ms) =	3.31	
Equivalent Volume	V(as) =	0.576	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	5.9	Ohms
Max Thermal Power	P(t) =	100	Watts
Max Linear Excursion	X(max) =	4	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	1.186	cu ft
Closed Box Q	Q(tc) =	0.707	
System Resonance	F(sc) =	47.54	Hz
Compliance Ratio	alpha =	0.4859	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	9	Watts
SPL Distance	D =	1	m

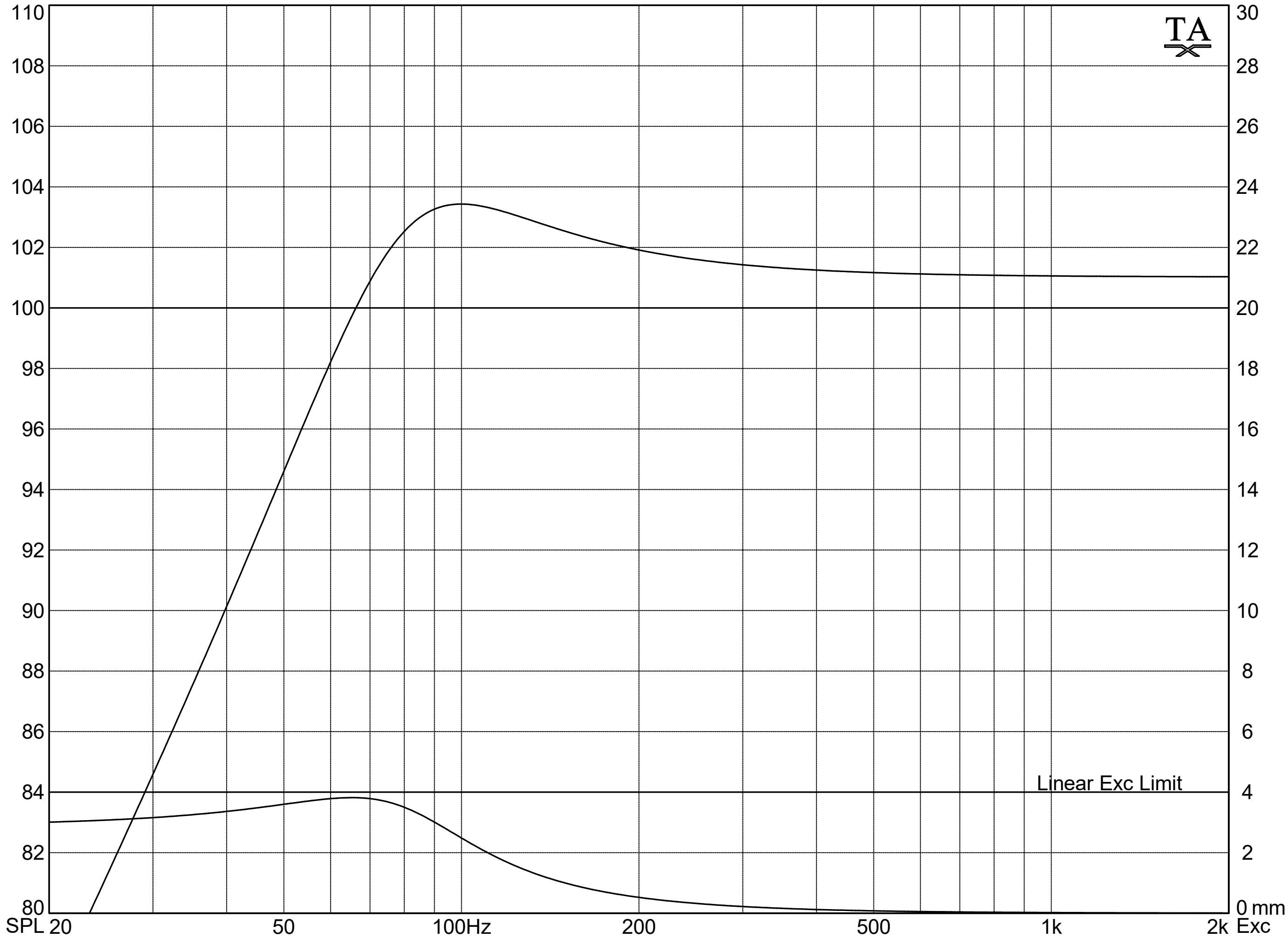
Dayton Audio DA175-8

System Name:

2nd Order Closed Box

Designer: Matthew Fisher
Title: Q 0.707

Rev Date: 10/3/23
Rev: 1



Driver Parameters

Driver: Dayton Audio DA175-8

Nominal Diameter	D =	7	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	85	dB SPL
Free Air Resonance	f(s) =	39	Hz
Total Q	Q(ts) =	0.58	
Electrical Q	Q(es) =	0.7	
Mechanical Q	Q(ms) =	3.31	
Equivalent Volume	V(as) =	0.576	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	5.9	Ohms
Max Thermal Power	P(t) =	100	Watts
Max Linear Excursion	X(max) =	4	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: 2nd Order Closed Box

Box Volume	V(B) =	0.1756	cu ft
Closed Box Q	Q(tc) =	1.2	
System Resonance	F(sc) =	80.69	Hz
Compliance Ratio	alpha =	3.281	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	40	Watts
SPL Distance	D =	1	m

Dayton Audio DA175-8

System Name:

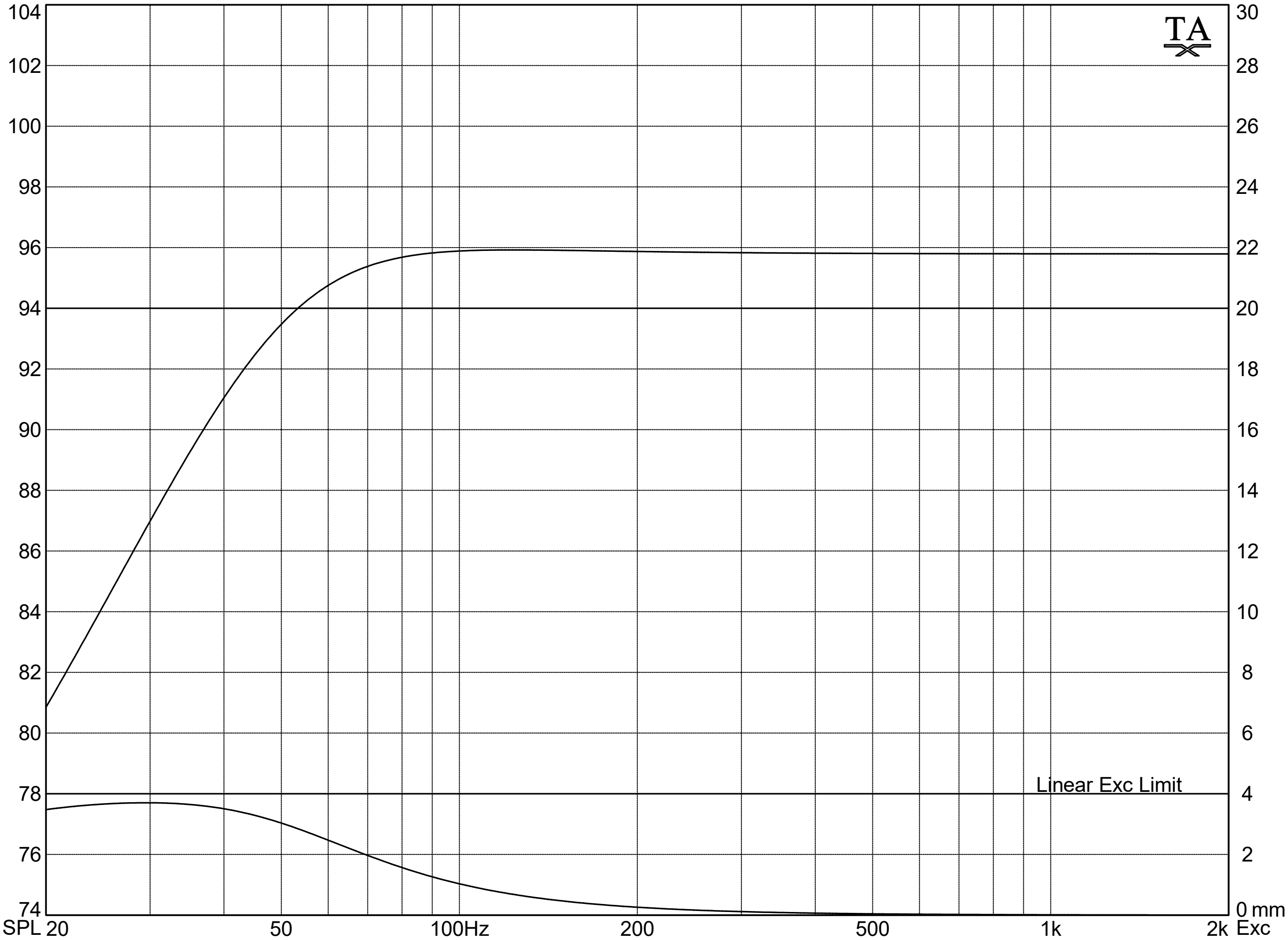
2nd Order Closed Box

Designer: Matthew Fisher

Title: Q 1.2

Rev Date: 10/3/23

Rev: 1



Driver Parameters

Driver: **Dayton Audio DA175-8**

Nominal Diameter	D =	7	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	85	dB SPL
Free Air Resonance	f(s) =	39	Hz
Total Q	Q(ts) =	0.58	
Electrical Q	Q(es) =	0.7	
Mechanical Q	Q(ms) =	3.31	
Equivalent Volume	V(as) =	0.576	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	5.9	Ohms
Max Thermal Power	P(t) =	100	Watts
Max Linear Excursion	X(max) =	4	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	0.8	cu ft
Closed Box Q	Q(tc) =	0.7607	
Box Frequency	F(B) =	10	Hz
Min Rec Vent Area	S(vMin) =	0.699	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	0.72	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	12	Watts
SPL Distance	D =	1	m

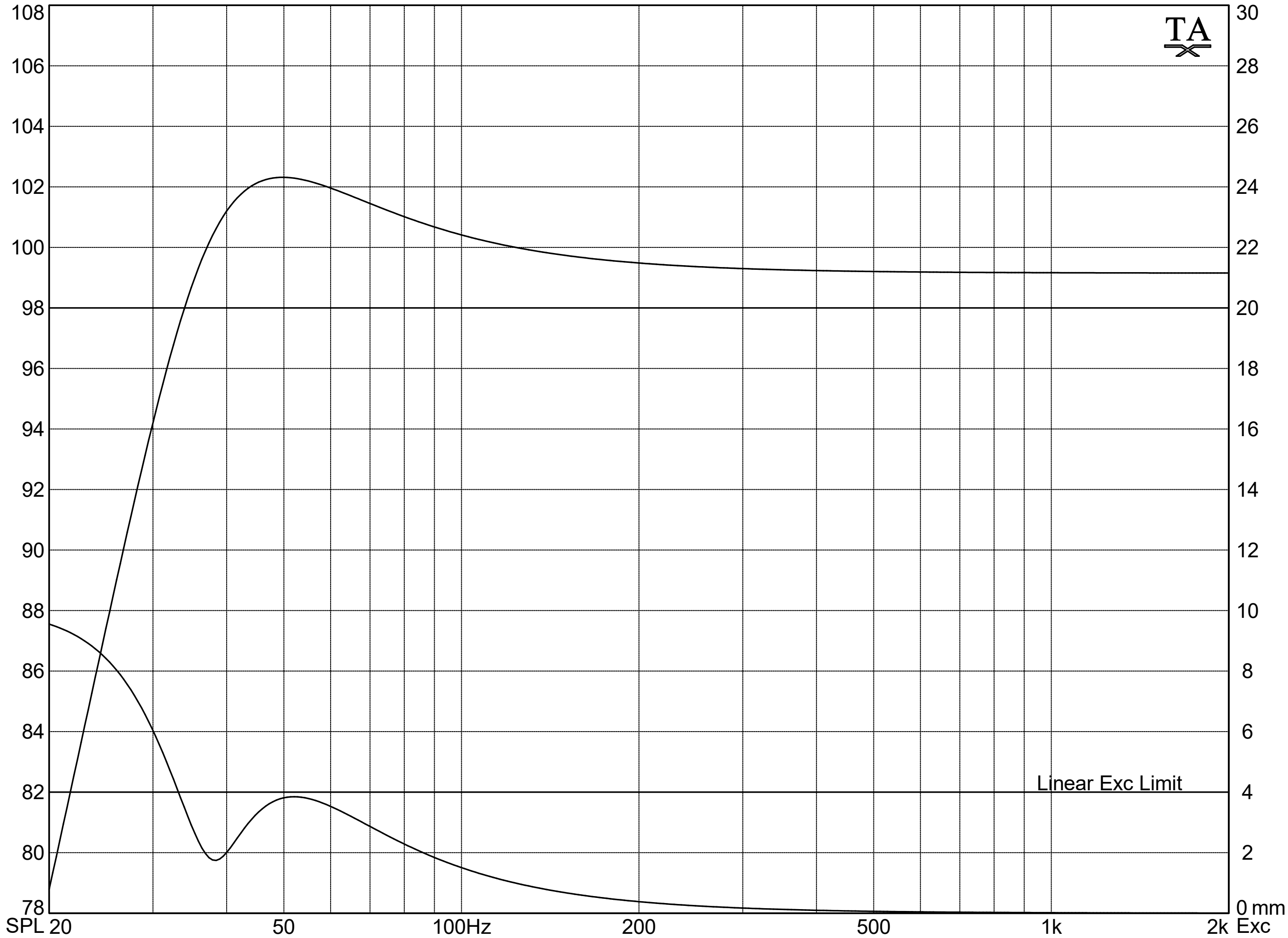
Dayton Audio DA175-8

System Name:

4th Order Vented Box

Designer: Matthew Fisher
Title: Roll-off

Rev Date: 10/3/23 Rev: 1



Driver Parameters

Driver: **Dayton Audio DA175-8**

Nominal Diameter	D =	7	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	85	dB SPL
Free Air Resonance	f(s) =	39	Hz
Total Q	Q(ts) =	0.58	
Electrical Q	Q(es) =	0.7	
Mechanical Q	Q(ms) =	3.31	
Equivalent Volume	V(as) =	0.576	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	5.9	Ohms
Max Thermal Power	P(t) =	100	Watts
Max Linear Excursion	X(max) =	4	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	1	cu ft
Closed Box Q	Q(tc) =	0.7281	
Box Frequency	F(B) =	38	Hz
Min Rec Vent Area	S(vMin) =	2.66	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	0.576	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	26	Watts
SPL Distance	D =	1	m

Dayton Audio DA175-8

System Name:

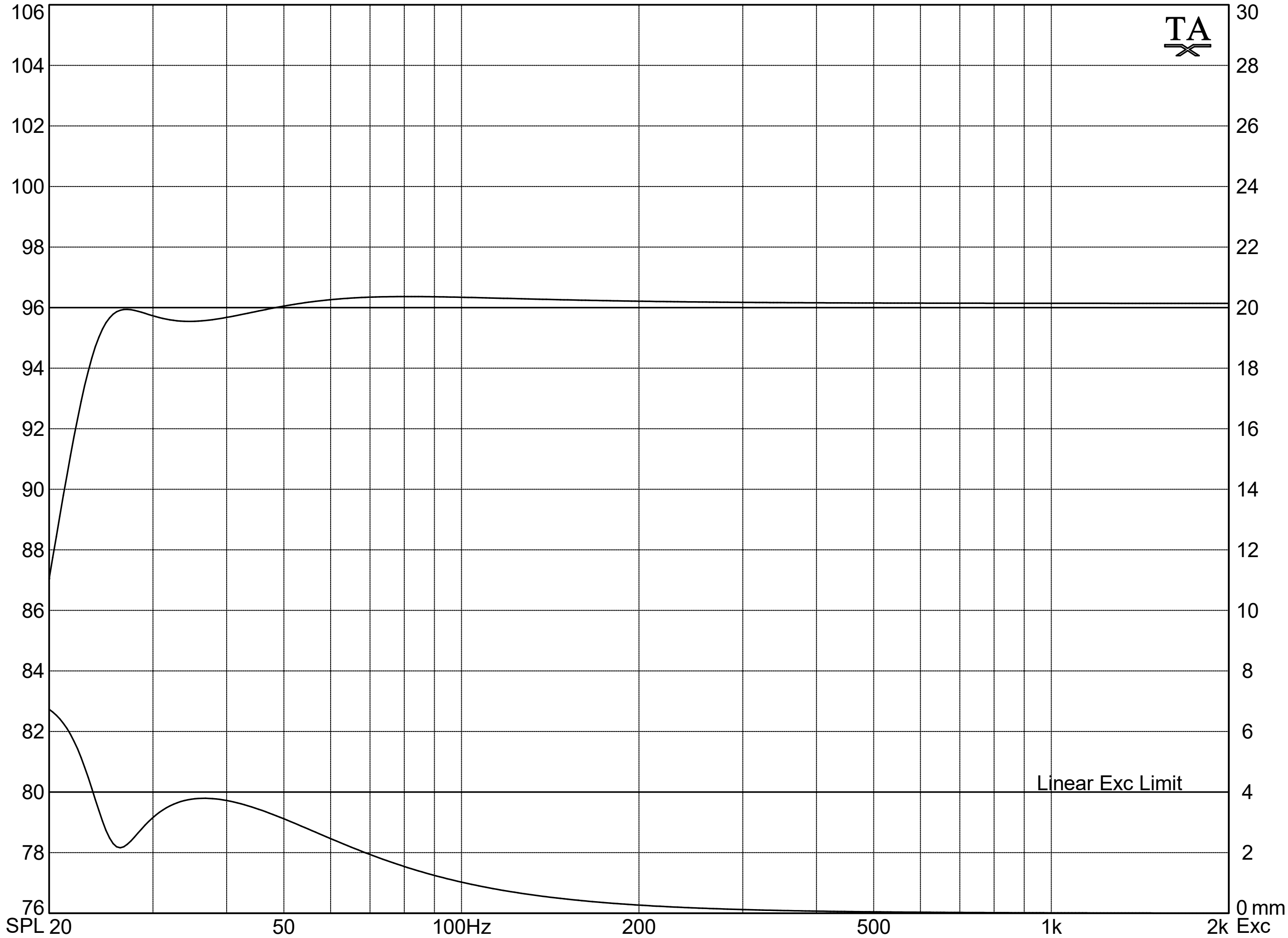
4th Order Vented Box

Designer: Matthew Fisher

Title: Bass Boost

Rev Date: 10/3/23

Rev: 1



Driver Parameters

Driver: **Dayton Audio DA175-8**

Nominal Diameter	D =	7	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	85	dB SPL
Free Air Resonance	f(s) =	39	Hz
Total Q	Q(ts) =	0.58	
Electrical Q	Q(es) =	0.7	
Mechanical Q	Q(ms) =	3.31	
Equivalent Volume	V(as) =	0.576	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	5.9	Ohms
Max Thermal Power	P(t) =	100	Watts
Max Linear Excursion	X(max) =	4	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	2	cu ft
Closed Box Q	Q(tc) =	0.6582	
Box Frequency	F(B) =	26	Hz
Min Rec Vent Area	S(vMin) =	1.82	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	0.288	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	13	Watts
SPL Distance	D =	1	m

Dayton Audio DA175-8

System Name:

4th Order Vented Box

Designer: Matthew Fisher

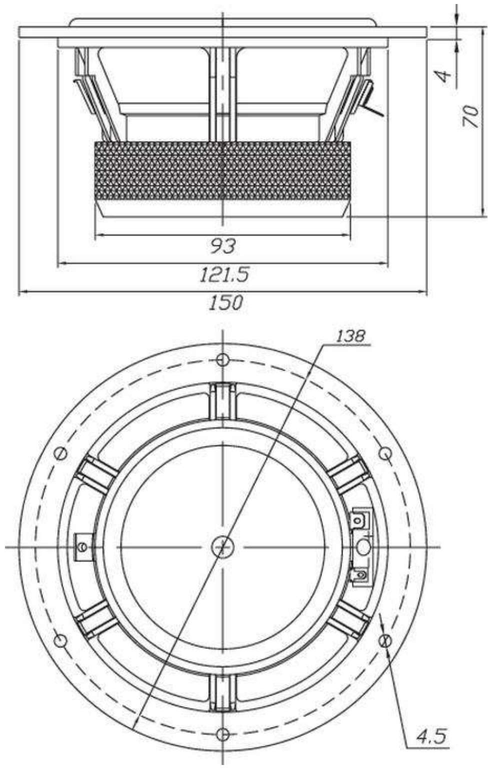
Title: Low Frequency Extension

Rev Date: 10/3/23

Rev: 1

Dayton Audio RS150P-4A

RS150P-4A 6" Reference Paper Woofer 4 Ohm



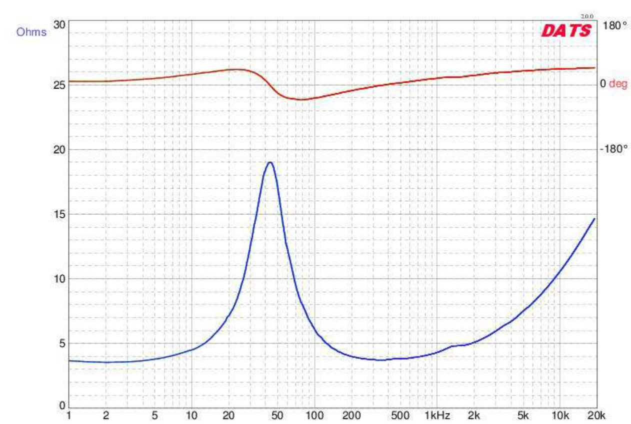
PARAMETERS

Impedance	4 ohms
Re	3.5 ohms
Le	0.39 mH @ 1 kHz
Fs	43.7 Hz
Qms	1.85
Qes	0.42
Qts	0.34
Mms	8.6g
Cms	1.54 mm/N
Sd	85.0 cm²
Vd	37.4 cm³
BL	4.4 Tm
Vas	15.7 liters
Xmax	4.4 mm
VC Diamet r	25 mm
SPL	90.3 dB @ 2.83V/1m
RMS Power Handling	40 watts
Usable Frequency ange (Hz)	45 - 10,000 Hz

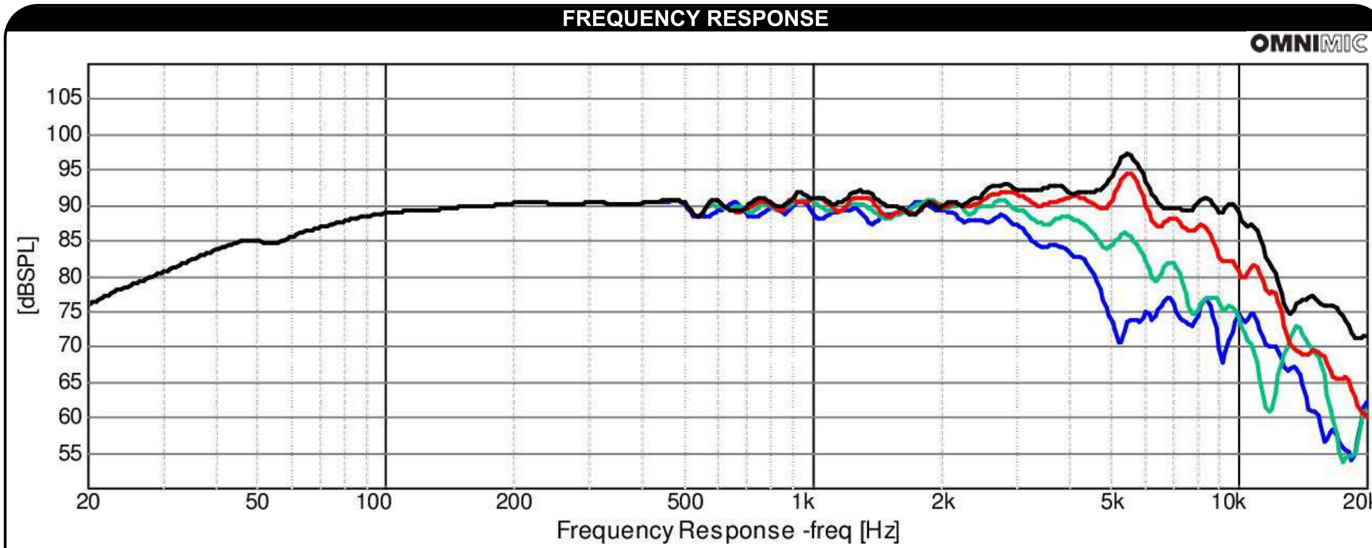
FEATURES

- Now with improv d fr qu ncy r spons for easier crossover integration
- Three-part paper composi diaphragm featuring pap r, Kevlar, and glass fibers
- Low-distortion motor, 6-hol cas frame, rubber surround, and solid aluminum phase plug
- Perfect for use as a woof r, midwoof r, or dedicated midrange driv r
- 90.3 dB sensitivity and 4.4 mm of xcursion

IMPEDANCE/PHASE



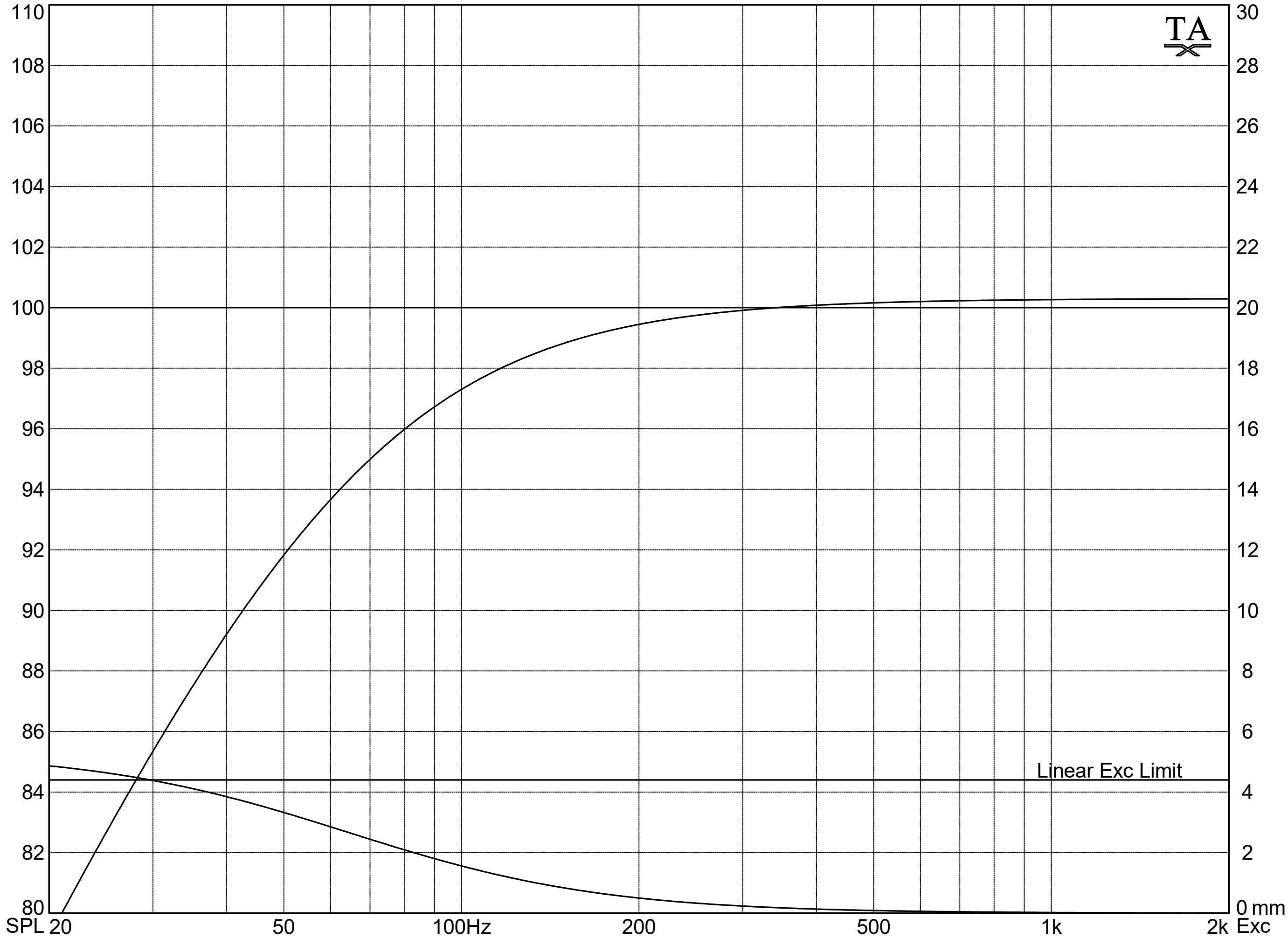
FREQUENCY RESPONSE



OmniMic

Note: 1/24th octave smoothing - nearfield response included in graph below 450 Hz.

lack = 0°
Red = 15°
Green = 30°
Blue = 45°



Driver Parameters

Driver: **Dayton Audio** **RS150P-4A**

Nominal Diameter	D =	6	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.3	dB SPL
Free Air Resonance	f(s) =	43.7	Hz
Total Q	Q(ts) =	0.34	
Electrical Q	Q(es) =	0.42	
Mechanical Q	Q(ms) =	1.85	
Equivalent Volume	V(as) =	0.55	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.5	Ohms
Max Thermal Power	P(t) =	65	Watts
Max Linear Excursion	X(max) =	4.4	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	0.4731	cu ft
Closed Box Q	Q(tc) =	0.5	
System Resonance	F(sc) =	64.26	Hz
Compliance Ratio	alpha =	1.162	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	10	Watts
SPL Distance	D =	1	m

Dayton Audio RS150P-4A

System Name:

2nd Order Closed Box

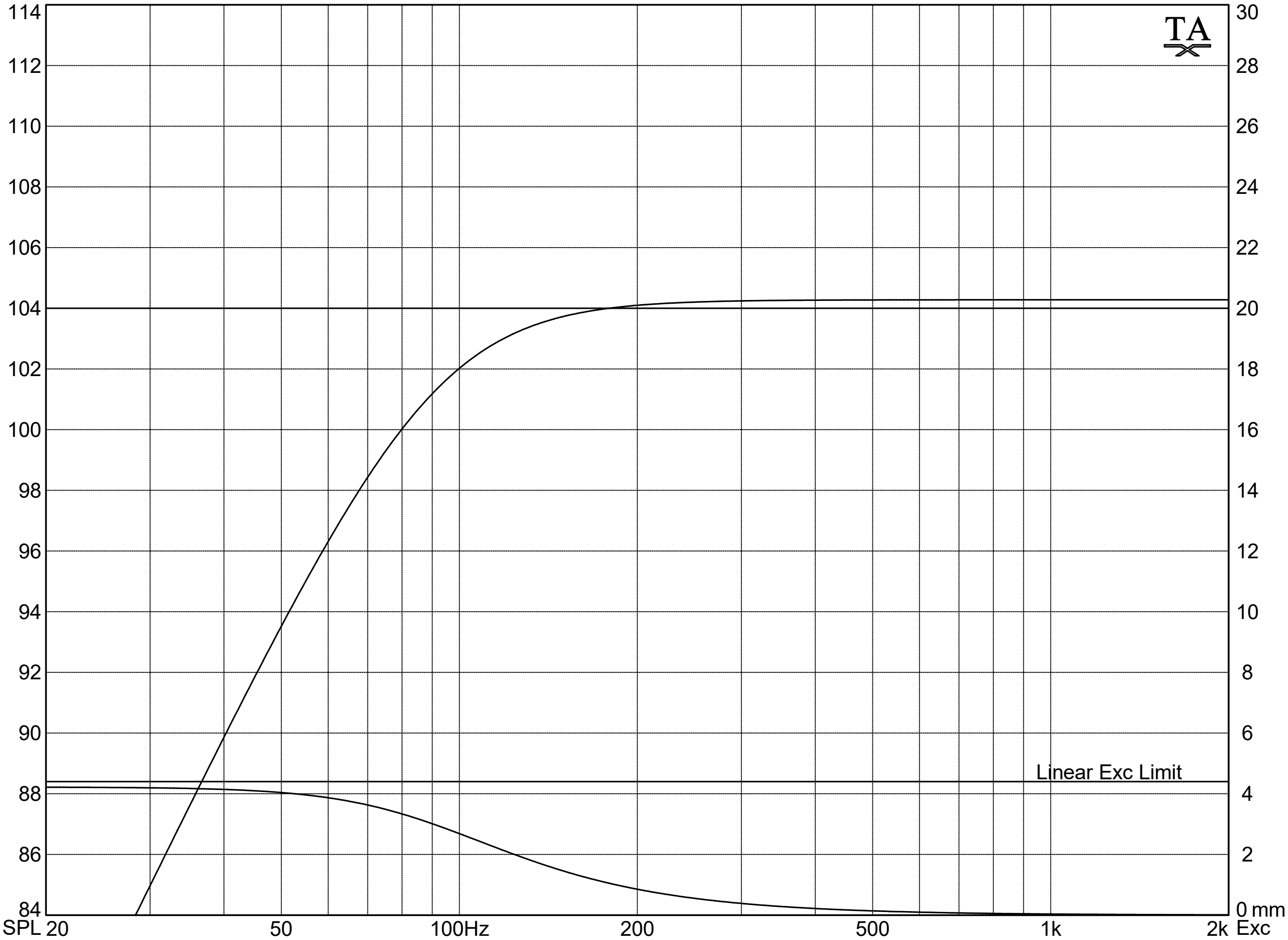
Designer: Matthew Fisher

Title: Q 0.5

Rev Date: 10/3/23

Rev: 1

Friday, December 15, 2023



Driver Parameters

Driver: **Dayton Audio RS150P-4A**

Nominal Diameter	D =	6	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.3	dB SPL
Free Air Resonance	f(s) =	43.7	Hz
Total Q	Q(ts) =	0.34	
Electrical Q	Q(es) =	0.42	
Mechanical Q	Q(ms) =	1.85	
Equivalent Volume	V(as) =	0.55	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.5	Ohms
Max Thermal Power	P(t) =	65	Watts
Max Linear Excursion	X(max) =	4.4	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	0.1655	cu ft
Closed Box Q	Q(tc) =	0.707	
System Resonance	F(sc) =	90.87	Hz
Compliance Ratio	alpha =	3.324	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	25	Watts
SPL Distance	D =	1	m

Dayton Audio RS150P-4A

System Name:

2nd Order Closed Box

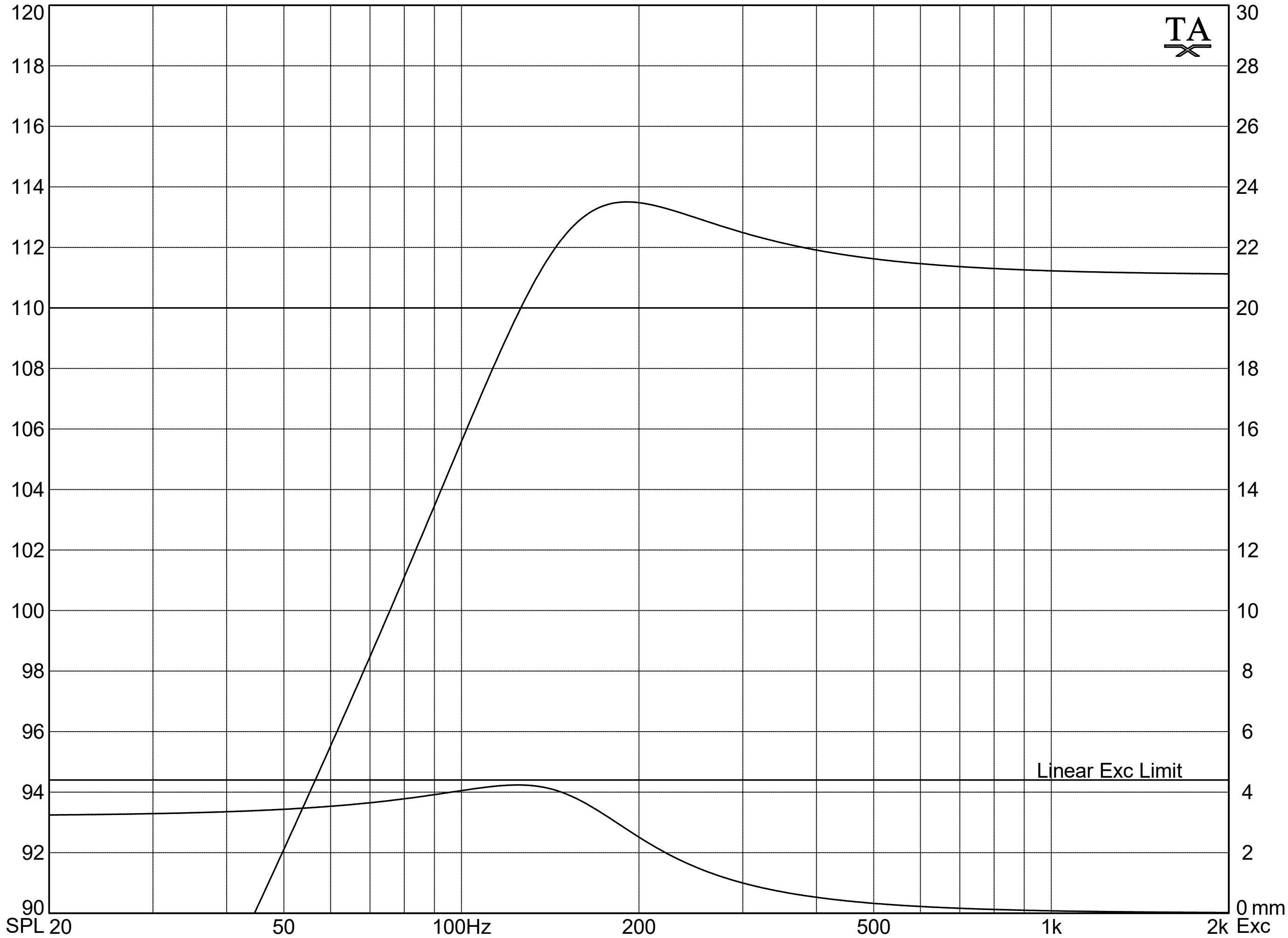
Designer: Matthew Fisher

Title: Q 0.707

Rev Date: 10/3/23

Rev: 1

Friday, December 15, 2023



Driver Parameters

Driver: **Dayton Audio RS150P-4A**

Nominal Diameter	D =	6	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.3	dB SPL
Free Air Resonance	f(s) =	43.7	Hz
Total Q	Q(ts) =	0.34	
Electrical Q	Q(es) =	0.42	
Mechanical Q	Q(ms) =	1.85	
Equivalent Volume	V(as) =	0.55	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.5	Ohms
Max Thermal Power	P(t) =	65	Watts
Max Linear Excursion	X(max) =	4.4	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	0.04801	cu ft
Closed Box Q	Q(tc) =	1.2	
System Resonance	F(sc) =	154.3	Hz
Compliance Ratio	alpha =	11.46	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	120	Watts
SPL Distance	D =	1	m

Dayton Audio RS150P-4A

System Name:

2nd Order Closed Box

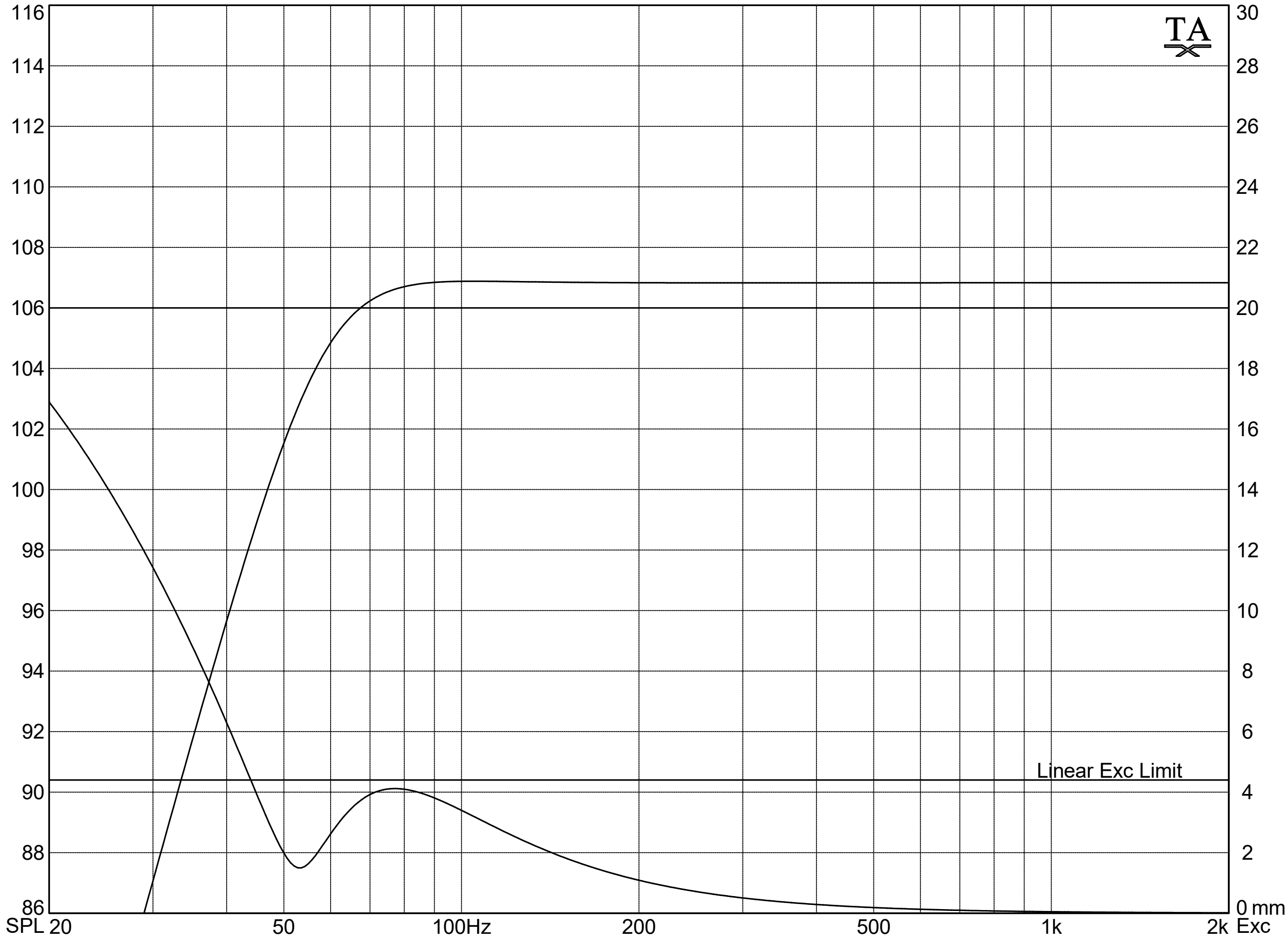
Designer: Matthew Fisher

Title: Q 1.2

Rev Date: 10/3/23

Rev: 1

Friday, December 15, 2023



Driver Parameters

Driver: **Dayton Audio RS150P-4A**

Nominal Diameter	D =	6	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.3	dB SPL
Free Air Resonance	f(s) =	43.7	Hz
Total Q	Q(ts) =	0.34	
Electrical Q	Q(es) =	0.42	
Mechanical Q	Q(ms) =	1.85	
Equivalent Volume	V(as) =	0.55	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.5	Ohms
Max Thermal Power	P(t) =	65	Watts
Max Linear Excursion	X(max) =	4.4	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	0.3	cu ft
Closed Box Q	Q(tc) =	0.5723	
Box Frequency	F(B) =	53	Hz
Min Rec Vent Area	S(vMin) =	2.46	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	1.833	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	45	Watts
SPL Distance	D =	1	m

Dayton Audio RS150P-4A

System Name:

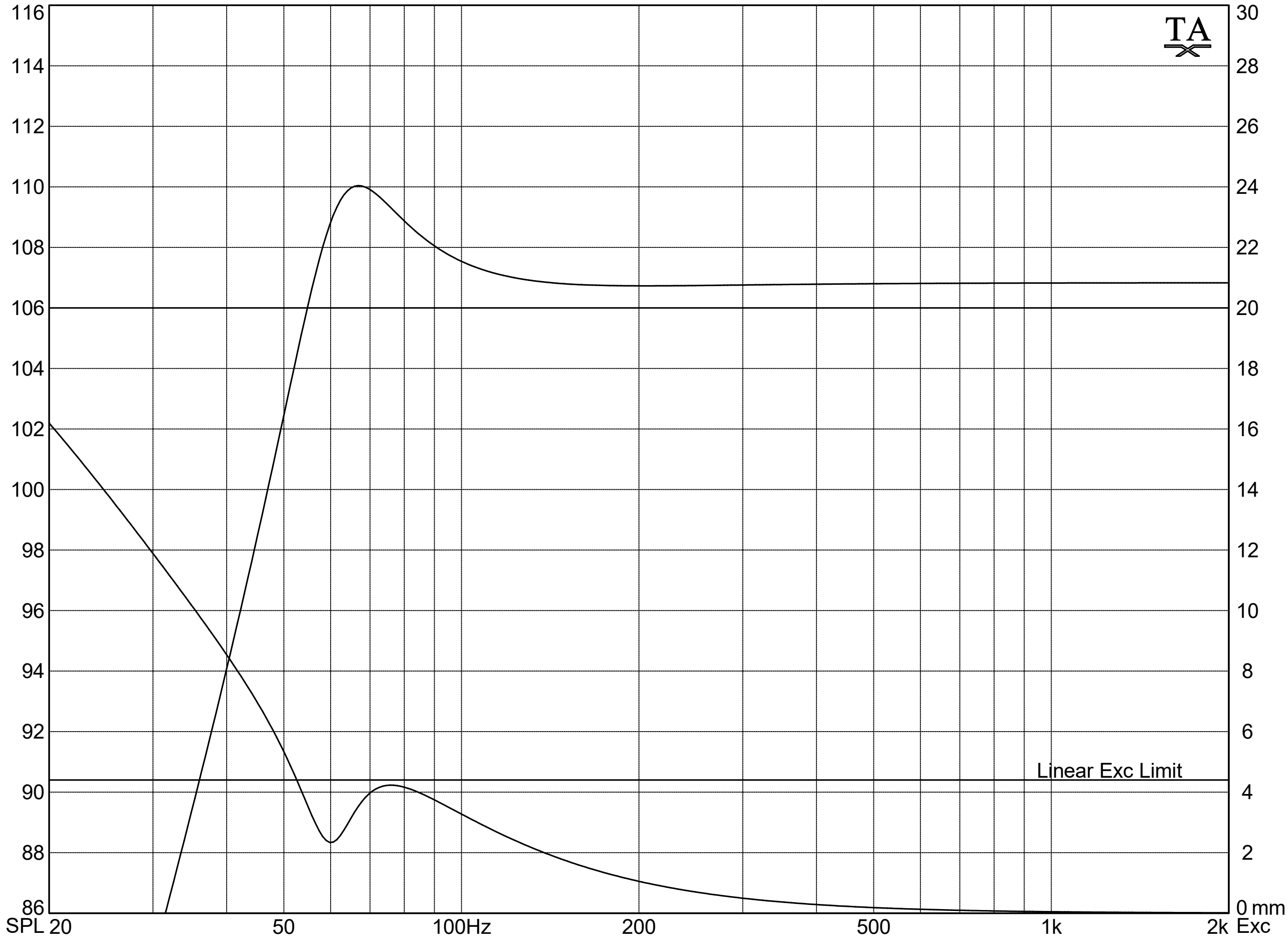
4th Order Vented Box

Designer: Matthew Fisher

Title: Roll-off

Rev Date: 10/3/23

Rev: 1



Driver Parameters

Driver: **Dayton Audio RS150P-4A**

Nominal Diameter	D =	6	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.3	dB SPL
Free Air Resonance	f(s) =	43.7	Hz
Total Q	Q(ts) =	0.34	
Electrical Q	Q(es) =	0.42	
Mechanical Q	Q(ms) =	1.85	
Equivalent Volume	V(as) =	0.55	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.5	Ohms
Max Thermal Power	P(t) =	65	Watts
Max Linear Excursion	X(max) =	4.4	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	0.6	cu ft
Closed Box Q	Q(tc) =	0.4707	
Box Frequency	F(B) =	60	Hz
Min Rec Vent Area	S(vMin) =	2.78	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	0.9167	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	45	Watts
SPL Distance	D =	1	m

Dayton Audio RS150P-4A

System Name:

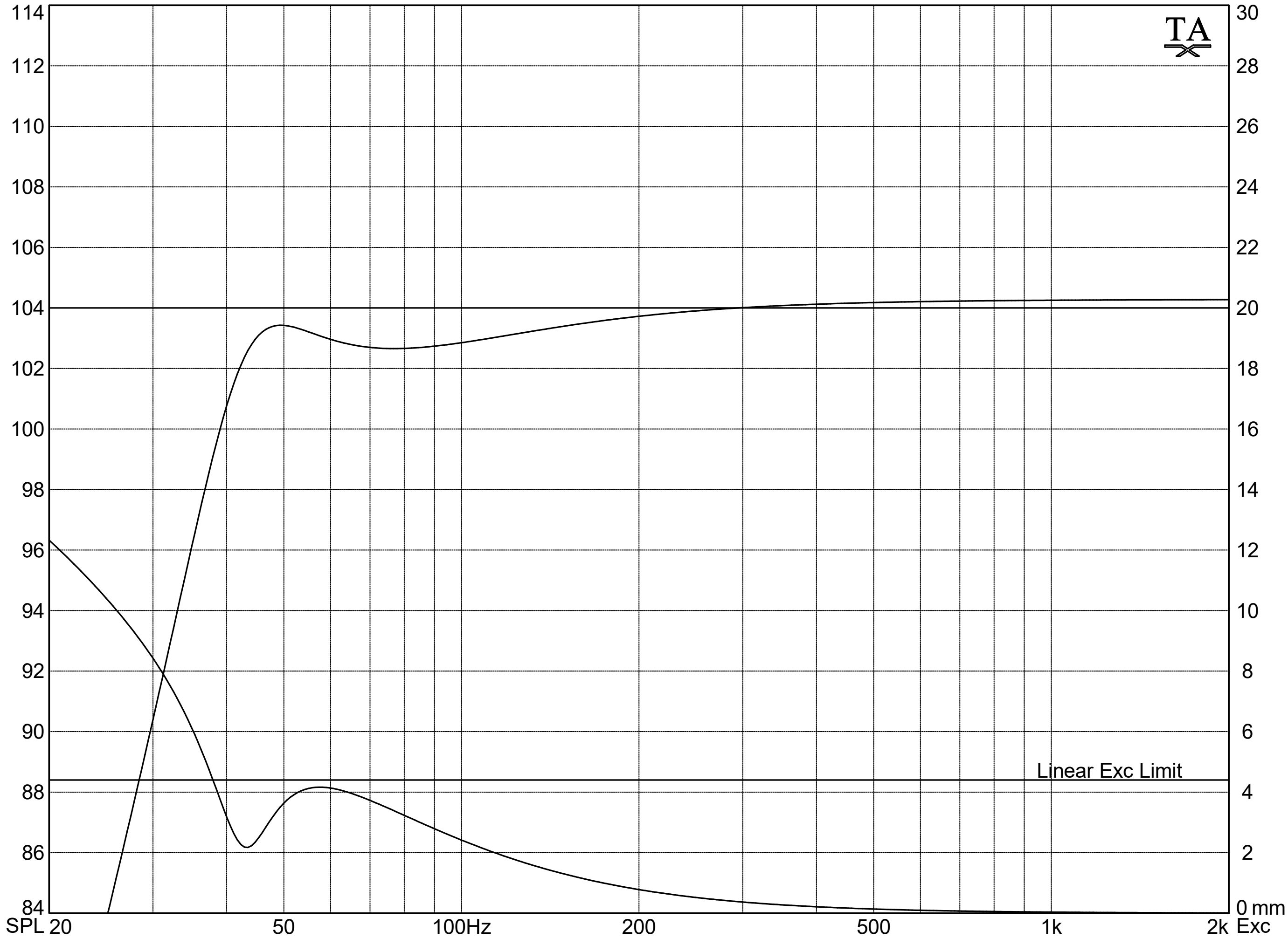
4th Order Vented Box

Designer: Matthew Fisher

Title: Bass Boost

Rev Date: 10/3/23

Rev: 1



Driver Parameters

Driver: **Dayton Audio RS150P-4A**

Nominal Diameter	D =	6	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90.3	dB SPL
Free Air Resonance	f(s) =	43.7	Hz
Total Q	Q(ts) =	0.34	
Electrical Q	Q(es) =	0.42	
Mechanical Q	Q(ms) =	1.85	
Equivalent Volume	V(as) =	0.55	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.5	Ohms
Max Thermal Power	P(t) =	65	Watts
Max Linear Excursion	X(max) =	4.4	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	0.7	cu ft
Closed Box Q	Q(tc) =	0.4543	
Box Frequency	F(B) =	43	Hz
Min Rec Vent Area	S(vMin) =	1.99	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	0.7857	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	25	Watts
SPL Distance	D =	1	m

Dayton Audio RS150P-4A

System Name:

4th Order Vented Box

Designer: Matthew Fisher
Title: Low Frequency Extension

Rev Date: 10/3/23 Rev: 1

Goldwood GW-S650/4

GW-S650/4

Parameter	Value	Unit / Notes
Effective Piston Area (Sd)	139.66	cm^2
Free Air Resonance (Fs)	55.0	Hz
DC Resistance (Re)	3.7	Ω
Mechanical Q Factor (Qms)	3.793	
Electrical Q Factor (Qes)	0.869	
Total Q Factor (Qts)	0.707	
Voice Coil Inductance (Le)	0.3	mH/milli-Henrys
Equivalent Air Volume (Vas)	15.7	Liters
Moving Mass (Mms)	14.6	Grams/Mmd + air load mass
Suspension Compliance (Cms)	574.497	µM/N/micro-Meters per Newton
Force Factor (Bl)	4.613	Tm / Tesla-Meters
Sensitivity (SPLref)	90.0	dB/Reference 8Ω/2.83Vrms

GW-S650/4

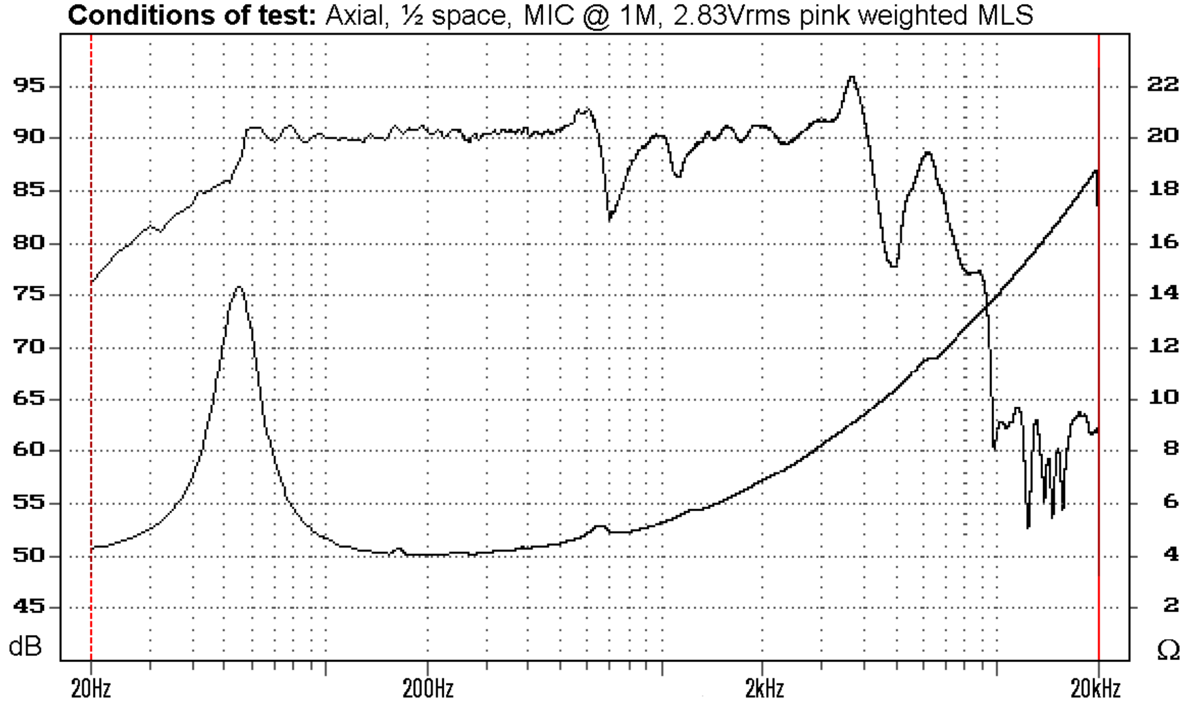
Transducer Evaluation

3/14/03

Device Under Test: GW-S650/4

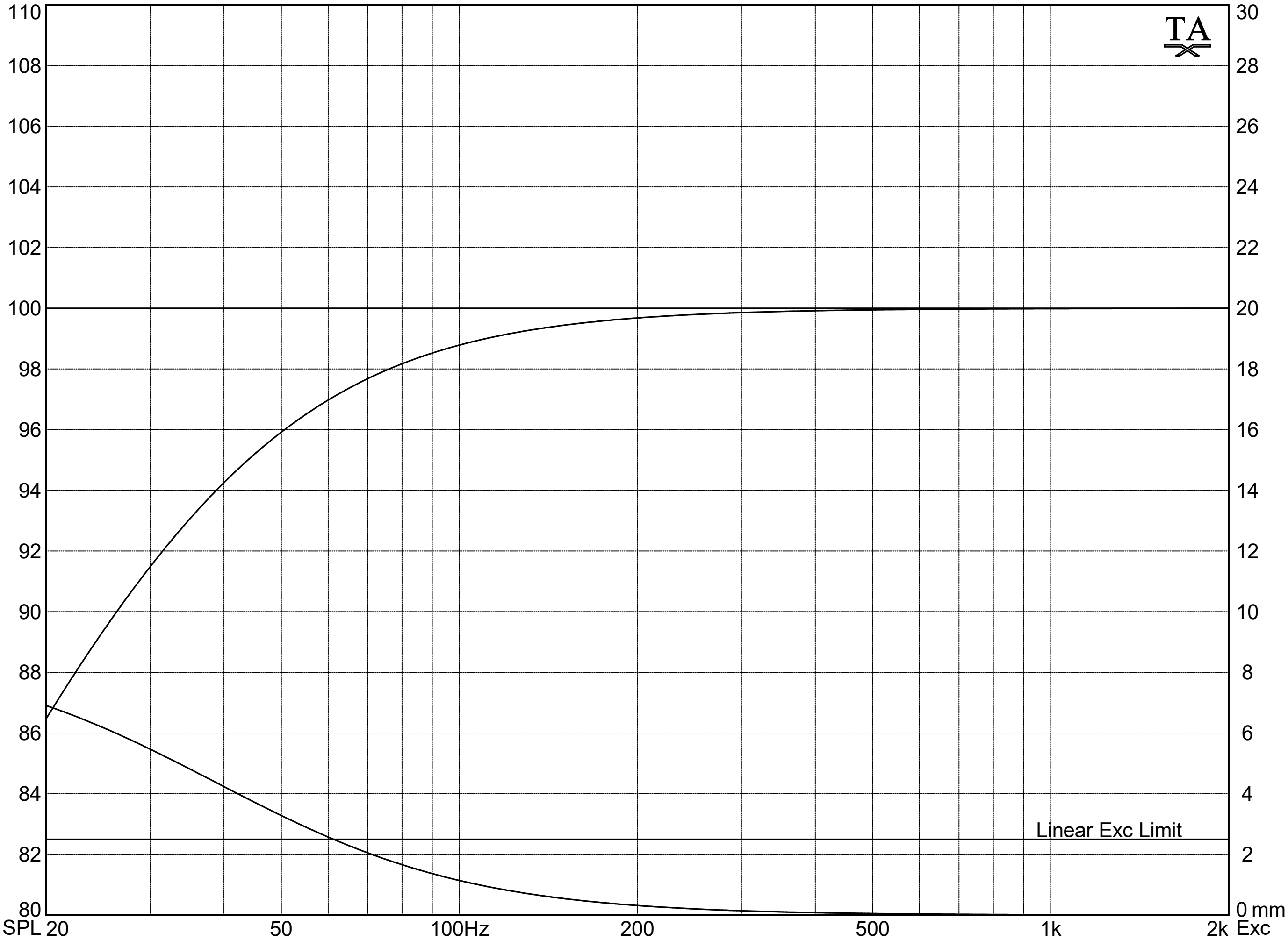
Object of Test: Response, sensitivity and impedance

Conditions of test: Axial, ½ space, MIC @ 1M, 2.83Vrms pink weighted MLS



Free Air Resonance (Fs): 54Hz **Minimum Impedance: 4.1Ω @ 275Hz**

Response resolution: 2Hz, smoothing: 0.05 octave
Impedance resolution: 1Hz, smoothing: 0.01 octave
Enclosure volume: 283L



Driver Parameters

Driver: **Goldwood GW-S650/4**

Nominal Diameter	D =	6.5	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90	dB SPL
Free Air Resonance	f(s) =	55	Hz
Total Q	Q(ts) =	0.71	
Electrical Q	Q(es) =	0.87	
Mechanical Q	Q(ms) =	3.79	
Equivalent Volume	V(as) =	0.55	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.7	Ohms
Max Thermal Power	P(t) =	170	Watts
Max Linear Excursion	X(max) =	2.5	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	-1.091	cu ft
Closed Box Q	Q(tc) =	0.5	
System Resonance	F(sc) =	38.73	Hz
Compliance Ratio	alpha =	-0.5041	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	10	Watts
SPL Distance	D =	1	m

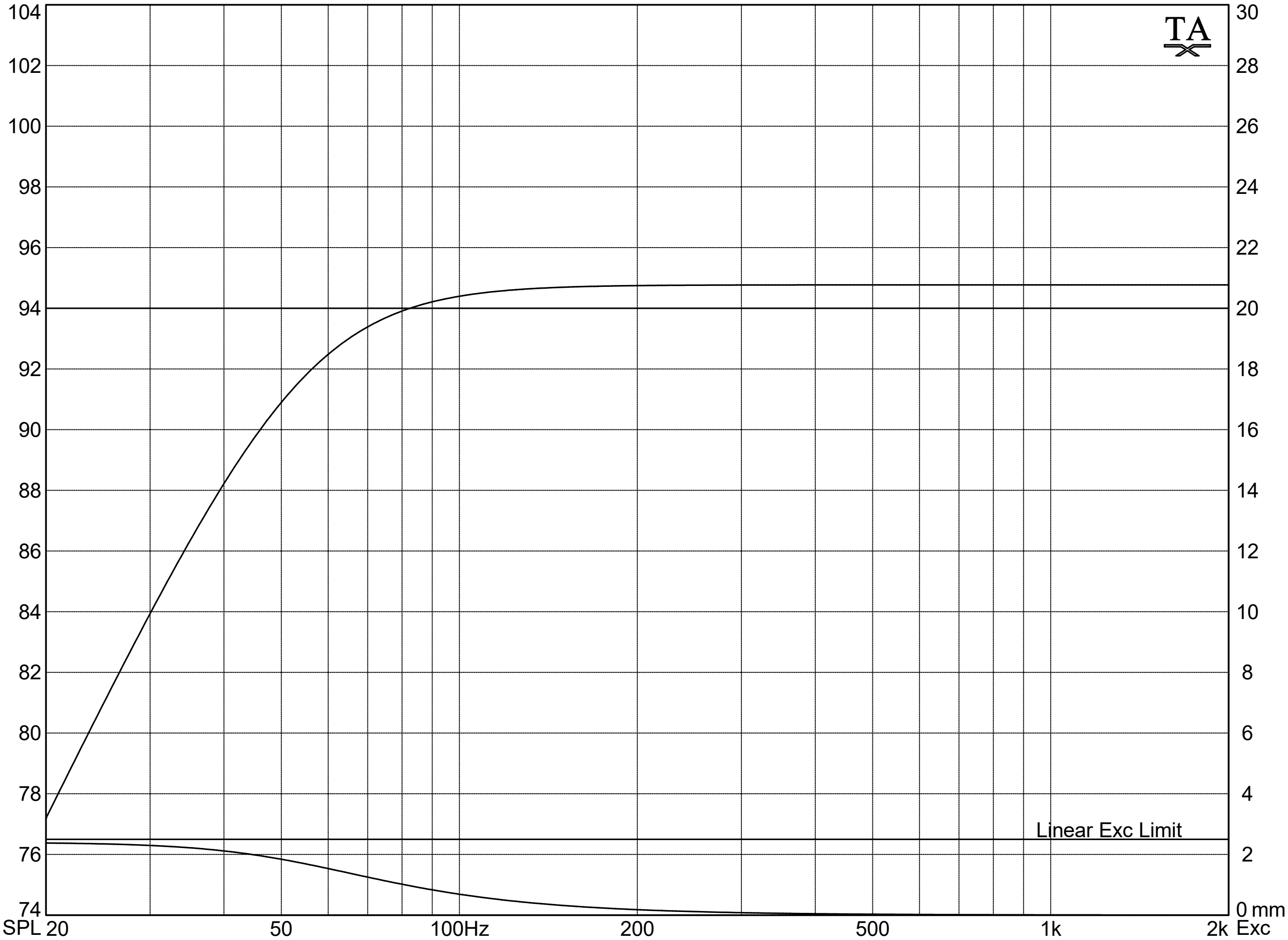
Goldwood GW-S650/4

System Name:

2nd Order Closed Box

Designer: Matthew Fisher
Title: Q 0.5

Rev Date: 10/3/23
Rev: 1



Driver Parameters

Driver: **Goldwood GW-S650/4**

Nominal Diameter	D =	6.5	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90	dB SPL
Free Air Resonance	f(s) =	55	Hz
Total Q	Q(ts) =	0.71	
Electrical Q	Q(es) =	0.87	
Mechanical Q	Q(ms) =	3.79	
Equivalent Volume	V(as) =	0.55	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.7	Ohms
Max Thermal Power	P(t) =	170	Watts
Max Linear Excursion	X(max) =	2.5	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	-65.22	cu ft
Closed Box Q	Q(tc) =	0.707	
System Resonance	F(sc) =	54.77	Hz
Compliance Ratio	alpha =	-0.008432	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	3	Watts
SPL Distance	D =	1	m

Goldwood GW-S650/4

System Name:

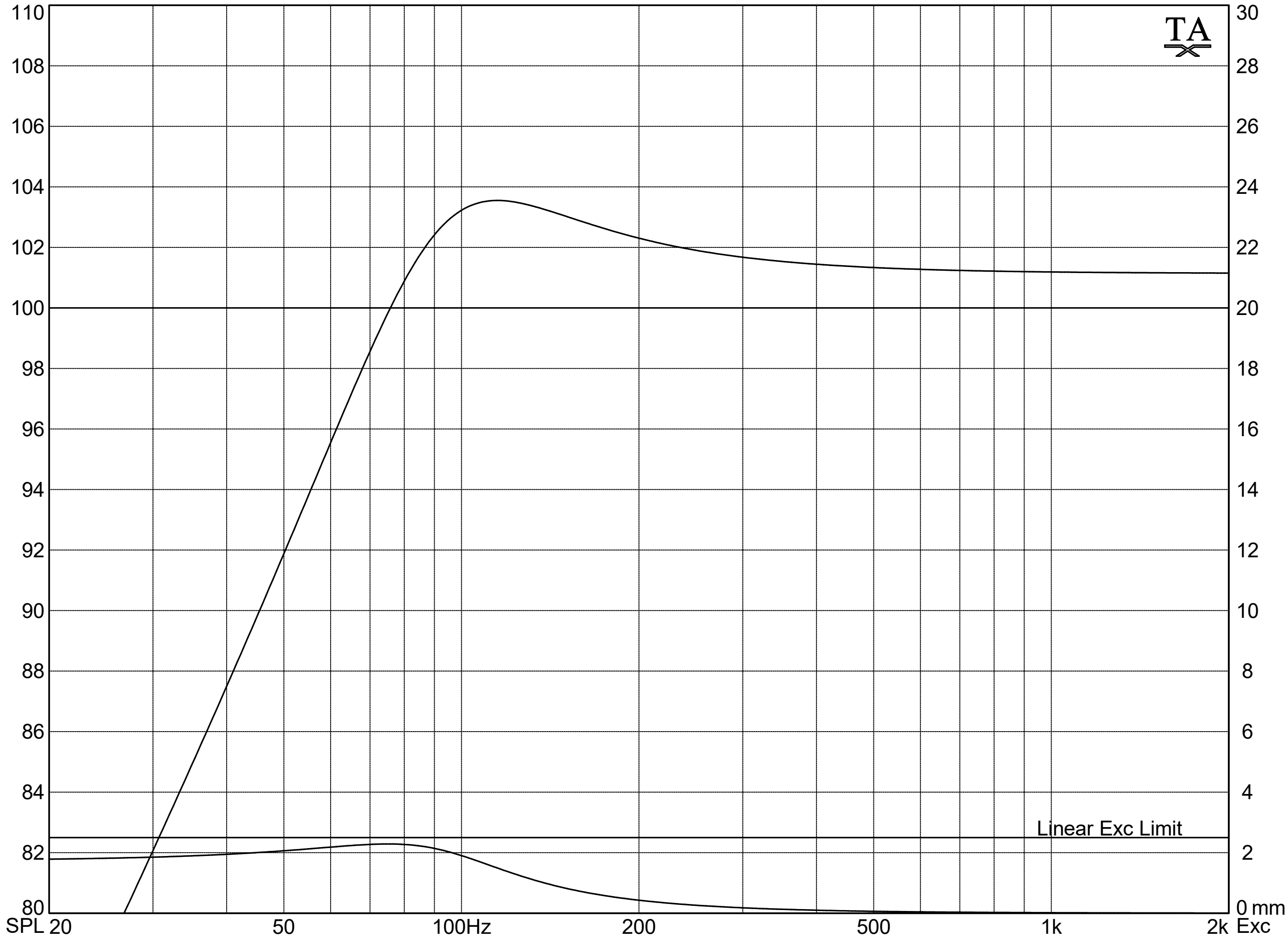
2nd Order Closed Box

Designer: Matthew Fisher

Title: Q 0.707

Rev Date: 10/3/23

Rev: 1



Driver Parameters

Driver: **Goldwood GW-S650/4**

Nominal Diameter	D =	6.5	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90	dB SPL
Free Air Resonance	f(s) =	55	Hz
Total Q	Q(ts) =	0.71	
Electrical Q	Q(es) =	0.87	
Mechanical Q	Q(ms) =	3.79	
Equivalent Volume	V(as) =	0.55	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.7	Ohms
Max Thermal Power	P(t) =	170	Watts
Max Linear Excursion	X(max) =	2.5	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **2nd Order Closed Box**

Box Volume	V(B) =	0.2962	cu ft
Closed Box Q	Q(tc) =	1.2	
System Resonance	F(sc) =	92.96	Hz
Compliance Ratio	alpha =	1.856	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	13	Watts
SPL Distance	D =	1	m

Goldwood GW-S650/4

System Name:

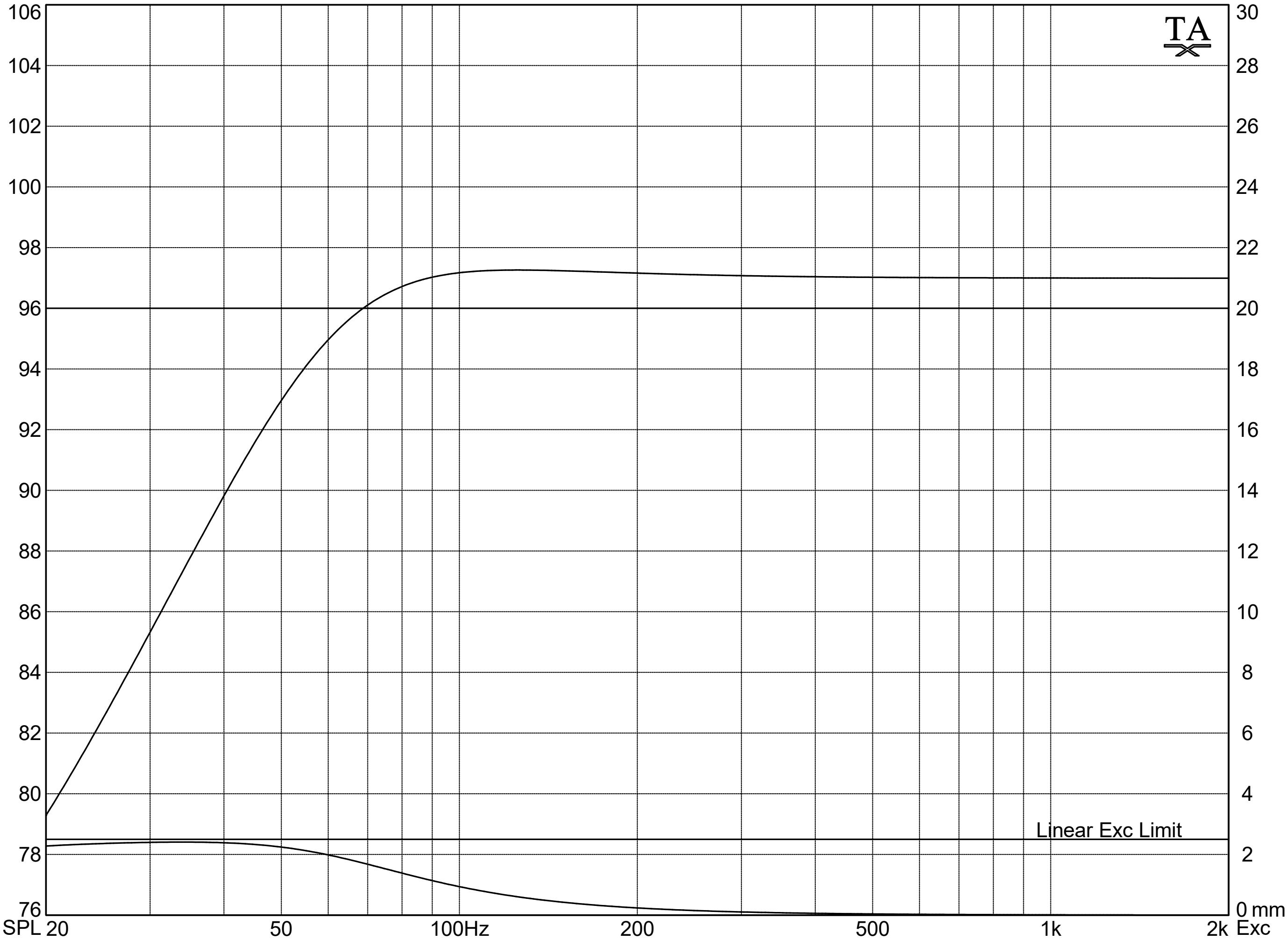
2nd Order Closed Box

Designer: Matthew Fisher

Title: Q 1.2

Rev Date: 10/3/23

Rev: 1



Driver Parameters

Driver: **Goldwood GW-S650/4**

Nominal Diameter	D =	6.5	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90	dB SPL
Free Air Resonance	f(s) =	55	Hz
Total Q	Q(ts) =	0.71	
Electrical Q	Q(es) =	0.87	
Mechanical Q	Q(ms) =	3.79	
Equivalent Volume	V(as) =	0.55	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.7	Ohms
Max Thermal Power	P(t) =	170	Watts
Max Linear Excursion	X(max) =	2.5	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	2	cu ft
Closed Box Q	Q(tc) =	0.8017	
Box Frequency	F(B) =	10	Hz
Min Rec Vent Area	S(vMin) =	0.434	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	0.275	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	5	Watts
SPL Distance	D =	1	m

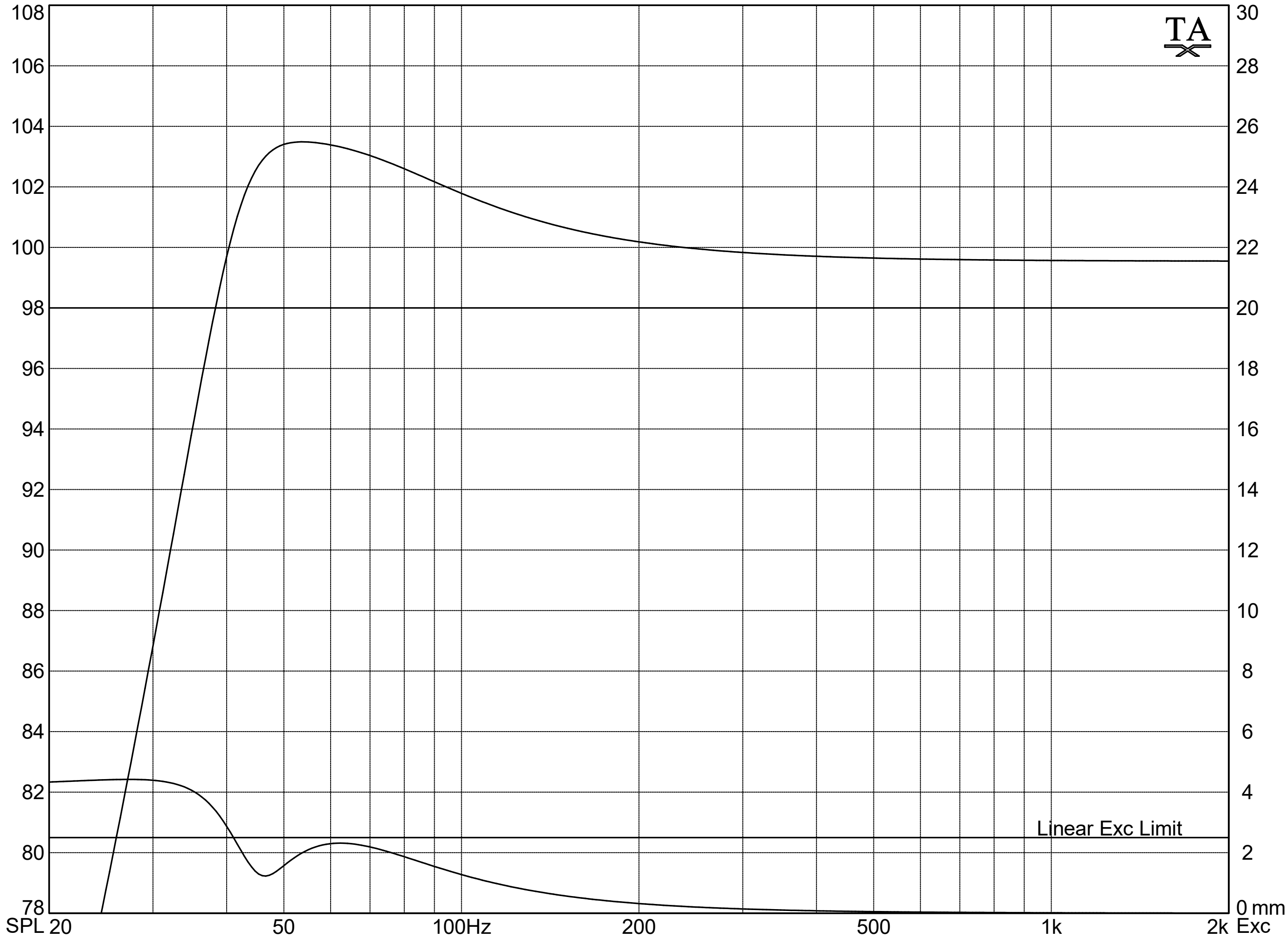
Goldwood GW-S650/4

System Name:

4th Order Vented Box

Designer: Matthew Fisher
Title: Roll-off

Rev Date: 10/3/23
Rev: 1



Driver Parameters

Driver: **Goldwood GW-S650/4**

Nominal Diameter	D =	6.5	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90	dB SPL
Free Air Resonance	f(s) =	55	Hz
Total Q	Q(ts) =	0.71	
Electrical Q	Q(es) =	0.87	
Mechanical Q	Q(ms) =	3.79	
Equivalent Volume	V(as) =	0.55	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.7	Ohms
Max Thermal Power	P(t) =	170	Watts
Max Linear Excursion	X(max) =	2.5	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	1.8	cu ft
Closed Box Q	Q(tc) =	0.8113	
Box Frequency	F(B) =	46	Hz
Min Rec Vent Area	S(vMin) =	2	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	0.3056	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	9	Watts
SPL Distance	D =	1	m

Goldwood GW-S650/4

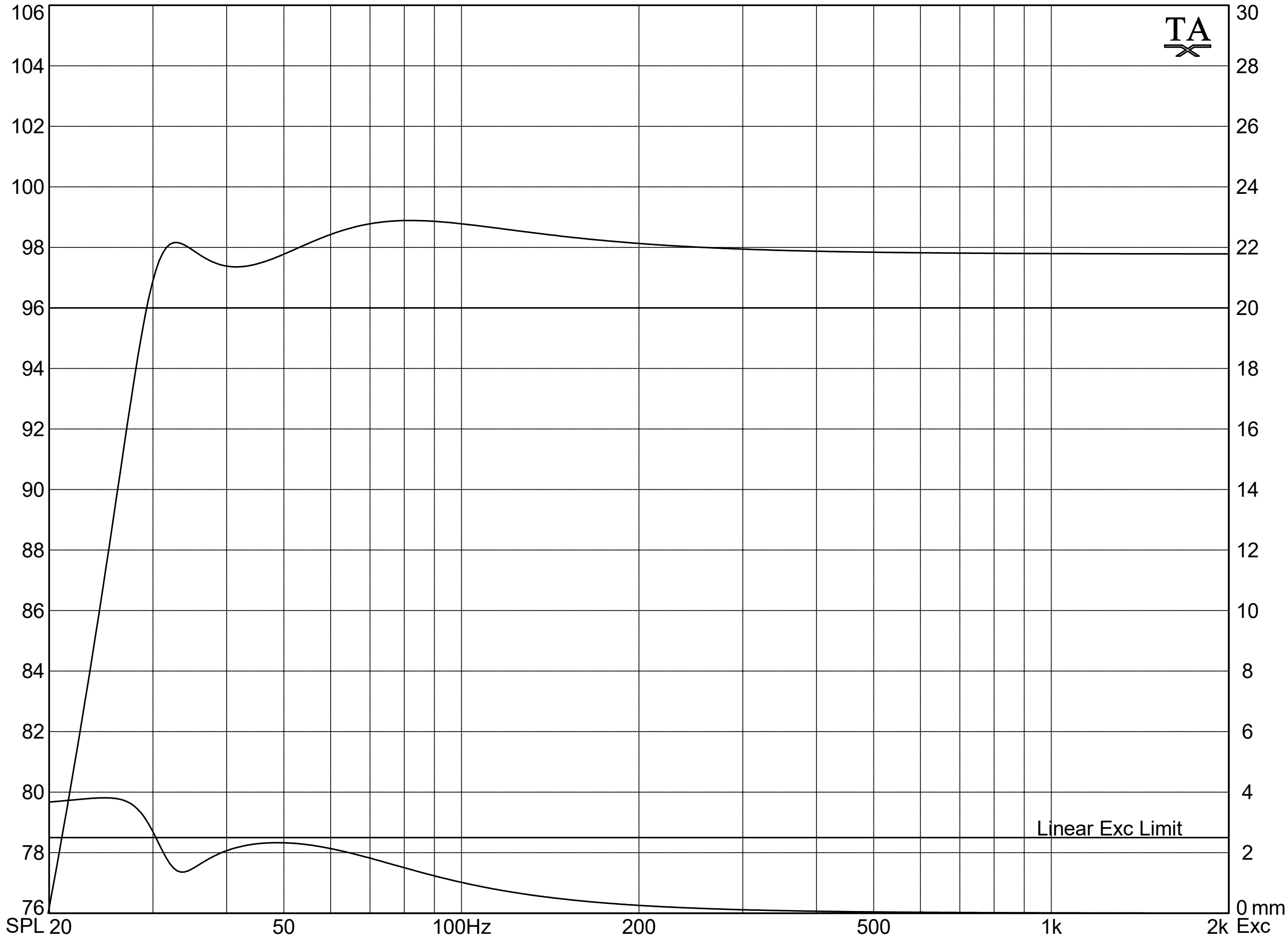
System Name:

4th Order Vented Box

Designer: Matthew Fisher

Title: Bass Boost

Rev Date: 10/3/23 Rev: 1



Driver Parameters

Driver: **Goldwood GW-S650/4**

Nominal Diameter	D =	6.5	in
Nominal Power	P =	0	Watts
Sensitivity (1W/1m)	SPL =	90	dB SPL
Free Air Resonance	f(s) =	55	Hz
Total Q	Q(ts) =	0.71	
Electrical Q	Q(es) =	0.87	
Mechanical Q	Q(ms) =	3.79	
Equivalent Volume	V(as) =	0.55	cu ft
Nominal Impedance	Z =	0	Ohms
DC Resistance	R(e) =	3.7	Ohms
Max Thermal Power	P(t) =	170	Watts
Max Linear Excursion	X(max) =	2.5	mm
Max Excursion	X(lim) =	0	mm
Voice Coil Diam.	D(vc) =	0	mm

Driver Notes:

NOTE: Reference Efficiency was calculated based on the 1W/1m sensitivity.

System Notes:

Box Parameters

System Type: **4th Order Vented Box**

Box Volume	V(B) =	2.6	cu ft
Closed Box Q	Q(tc) =	0.7815	
Box Frequency	F(B) =	33	Hz
Min Rec Vent Area	S(vMin) =	1.43	sq in
Vent Surface Area	S(v) =	0	sq in
Vent Length	L(v) =	0	in
Compliance Ratio	alpha =	0.2115	
Box Loss Q	Q(B) =	7	

System Parameters

No. of Drivers	N =	1	
Isobaric Factor	I =	1	(1=normal, 2=iso)
Input Power	P(in) =	6	Watts
SPL Distance	D =	1	m

Goldwood GW-S650/4

System Name:

4th Order Vented Box

Designer: Matthew Fisher
Title: Low Frequency Extension
Rev Date: 10/3/23
Rev: 1

Faital Pro
5FE100

PROFESSIONAL LOUDSPEAKERS

5FE100

5" - 80 W - 88 dB - 8 Ohm

NOMINAL SPECIFICATIONS

Nominal Diameter	130 mm (5 in)
Overall Diameter	144.8/124.5 mm (5.7/4.9 in)
Bolt Circle Diameter	133 mm (5.24 in)
Baffle Cutout Diameter	114 mm (4.49 in)
Depth	71.5 mm (2.81 in)
Flange and Gasket Thickness	6.5 mm (0.25 in)
Net Weight	**1.12 kg (2.5 lb)**
Shipping Box (Single Carton Box - 8 units)	302 x 275 x 186 mm (11.9 x 10.8 x 7.3 in)
Shipping Weight (8 units)	10.1 kg (22.3 lb)

PART NUMBER

Faston Terminals - 8 Ohm Version	01303917

NOTES:

Packaged and sold in multiples of 8 units

(1) 2 Hours Test According to AES 2-1984 Rev. 2003

(2) Maximum power is defined as 3dB greater than nominal power.

(3) NBR (Rubber)

(4) Xmax= [(winding depth - magnetic gap depth)/2] + (magnetic gap depth/3)

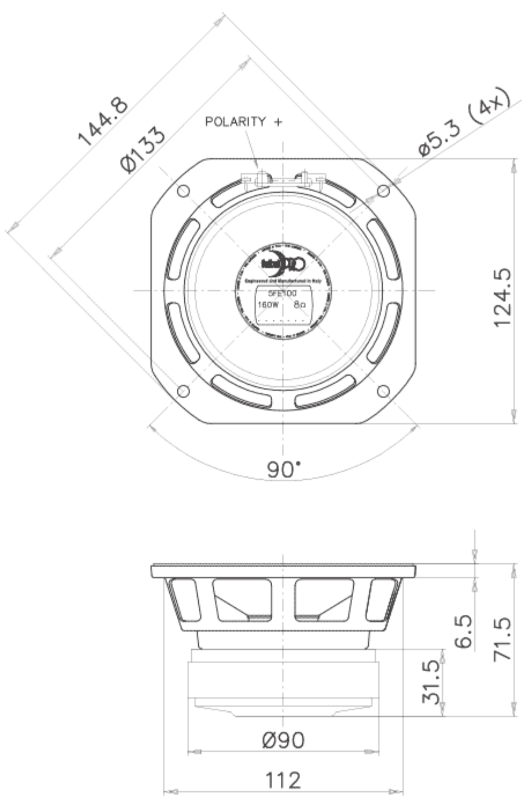
(5) Maximum excursion before permanent damage

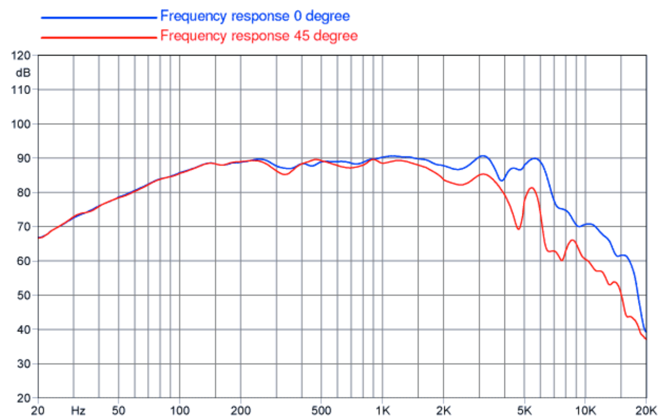
TECHNICAL PARAMETERS

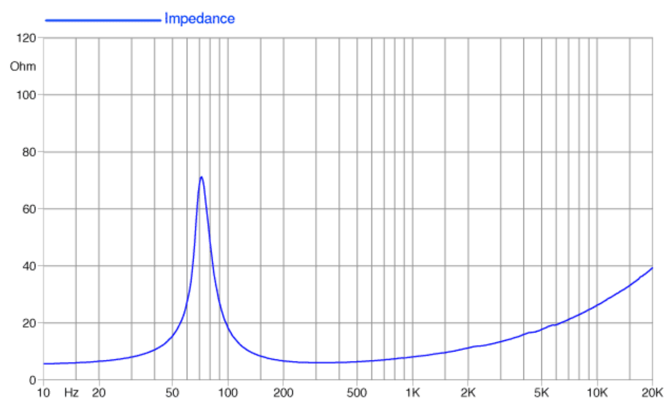
Nominal Impedance	8 Ohm
Minimum Impedance	6.3 Ohm
AES Power Handling **(1)**	80 W
Maximum Power Handling (2)	**160 W**
Sensitivity (1W/1m)	**88 dB**
Frequency Range	63÷6300 Hz
Voice Coil Diameter	**32 mm (1.26 in)**
Winding Material	Cu
Former Material	Kapton
Winding Depth	12.5 mm (0.49 in)
Magnetic Gap Depth	**6 mm (0.24 in)**
Flux Density	1 T
Magnet	Ferrite Ring
Basket Material	Steel
Demodulation	No
Cone Surround **(3)**	Half Roll
NET Air Volume filled by Loudspeaker	0.3 dm^3 (0.011 ft^3)
Spider Profile	1x constant height waves

THIELE & SMALL PARAMETERS

Fs	65 Hz
Re	5.4 Ohm
Qes	0.48
Qms	8.2
Qts	0.45
Vas	5.7 dm^3 (0.20 ft^3)
Sd	84 cm^2 (13.07 in^2)
Xmax **(4)**	5.25 mm
Xdamage **(5)**	9.5 mm
Mms	10.5 g
Bl	6.9 N/A
Le	0.53 mH
Mmd	9.6 g
Cms	0.57 mm/N
Rms	0.52 kg/s
Eta Zero	0.31 %
EBP	135 Hz







Morel KW-1

Morel KW-1

Designed for Morel Kit 1

Ø 6", Ø 3" voicecoil, 4Ω

SPECIFICATIONS

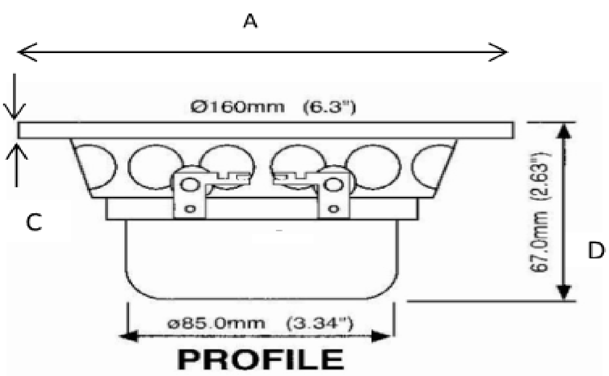
General Data		
Overall Dimensions	DxH	160mm(6.3")x67mm(2.63")
Nominal Power Handling (DIN)	P	150W
Transient Power 10ms		1000W
Sensitivity 2.83V/1M		86.5 dB SPL
Frequency Response		See graph
Cone Material		Damped Polymer Composite
Net Weight	Kg	1.1
Electrical Data		
Nominal Impedance	Z	4Ω
DC Resistance	Re	3.65Ω
Voice Coil Inductance @ 1KHz	LBM	0.51mH
Voice Coil and Magnet Parameters		
Voice Coil Diameter	DIA	75mm
Voice Coil Height		14mm
HE Magnetic Gap Height	HE	5mm
Max. Linear Excursion	X	± 4.5mm
Voice Coil Former		Aluminum
Voice Coil Wire		Hexatech™ Aluminum
Number Of Layers		2
Magnet System Type		High flux double ferrite vented
B Flux Density	B	0.66 T
BL Product	BXL	5.2 N.A

T-S Parameters		Small Signal	1 V
Suspension Compliance	Cms	0.51 mm/N	
Mechanical Q Factor	Qms	2.75	
Electrical Q Factor	Qes	0.77	
Total Q Factor	Qts	0.6	
Mechanical Resistance	Rms	2.07 Kg/s	
Moving Mass	Mms	16.5 g	
Eq. Cas Air Load (liters)	VAS	10.0 Lt	
Resonant Frequency	Fs	55 Hz	
Effective Piston Area	SD	119 cm ²	

FEATURES

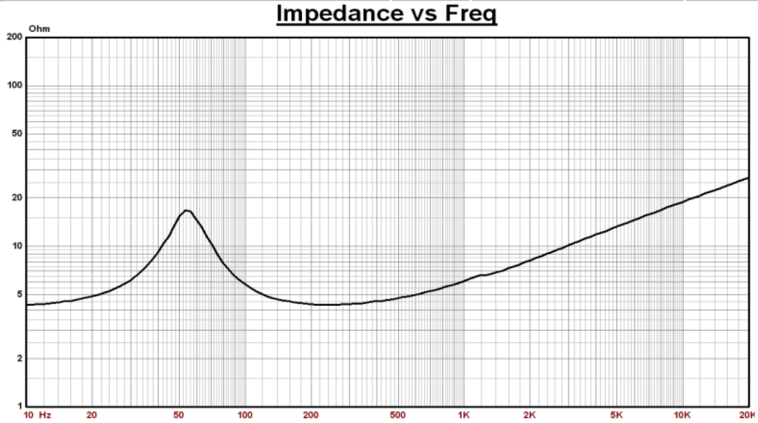
* High flux ferrite double magnet system
* 3" Large Hexatech™ Aluminum voice coil
* High power handling
* Shallow profile D.P.C cone
* Improved parameteres

Unit Dimensions

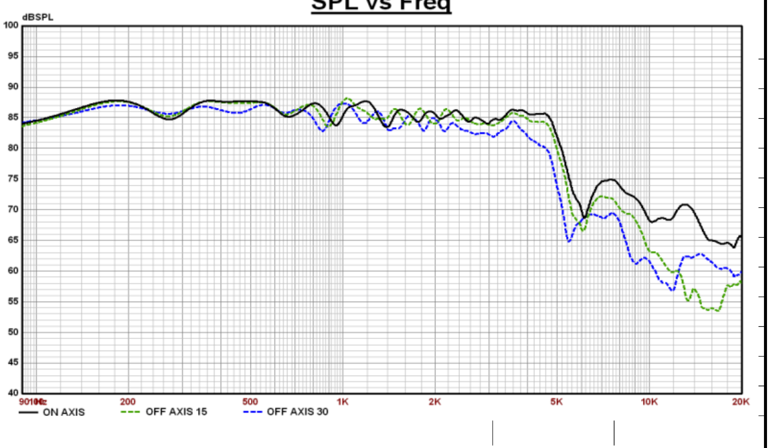


A - Overall diameter	Ø 160mm
B - Magnet diameter	Ø 85mm
C - Flange thickness	5mm
D - Overall height	67mm
E - Not Relevant	
F - Mounting holes location radius	76.4 mm
G -4 Mounting holes, at 90º interval, inner hole diameter	Ø 4.2mm

Impedance vs Freq



SPL vs Freq



Measured on IEC baffle using Bruel & Kjaer 3144 model microphone.

Morel operate policy of continuous product design improvement, consequently specifications are subject to alteration without prior notice.

Wavecor
WF182BD12

SPECIFICATIONS

WF182BD09/10/11/12   7” die cast, paper/glass fiber cone mid/woofers, 4/8 ohm

The 7” transducers WF182BD09 and WF182BD11 (both 4 ohm) and WF182BD10 and WF182BD12 (both 8 ohm) were designed as high performance bass and midrange units for monitors and high-end hi-fi speakers. They offer outstanding deep bass performance and dynamic and detailed midrange.

WF182BD09 and
WF182BD10,
round frames

FEATURES

- Balanced Drive motor structure for optimal drive force symmetry resulting in largely reduced even order harmonic distortion
- Copper cap on center pole to reduce voice coil inductance and to minimize variations in voice coil inductance as a function of voice coil position
- Cone made of a new paper/glass fiber mix with improved consistency and stability
- Rigid die cast alu chassis with extensive venting for lower air flow speed reducing audible distortion
- Vented voice coil former for reduced distortion and compression
- Vented center pole with dual flares for reduced noise level at large cone excursions
- Heavy-duty black fiber glass voice coil former to reduce mechanical losses resulting in better dynamic performance and low-level details
- Large motor with 1½” voice coil diameter for better control and power handling
- Built-in alu field-stabilizing ring for reduced distortion at high levels
- Low-loss suspension (high Qm) for better reproduction of details and dynamics
- Black motor parts for better heat transfer to the surrounding air
- Conex spider for better durability under extreme conditions
- Gold plated terminals to ensure long-term trouble free connection

Photo showing round versions WF182BD09 and WF182BD10 versus truncated versions WF182BD11 and WF182BD12.

NOMINAL SPECIFICATIONS

Notes	Parameter	WF182BD09/11		WF182BD10/12		Unit
		Before burn-in	After burn-in	Before burn-in	After burn-in	
	Nominal size	7		7		[inch.]
	Nominal impedance	4		8		[ohm]
	Recommended max. upper frequency limit	2.5		2.5		[kHz]
1, 4	Sensitivity, 2.83V/1m (average SPL in range 200 - 1,000 Hz)	88.5		86		[dB]
2, 4	Power handling, short term, IEC 268-5, no additional filtering	400		400		[W]
2, 4	Power handling, long term, IEC 268-5, no additional filtering	250		250		[W]
2, 4	Power handling, continuous, IEC 268-5, no additional filtering	80		80		[W]
	Effective radiating area, S_d	131		131		[cm²]
3, 4, 6	Resonance frequency (free air, no baffle), F_s	33	28.5	34	29.5	[Hz]
	Moving mass, incl. air (free air, no baffle), M_{ms}	23.4		21.9		[g]
3, 4	Force factor, Bxl	6.5		8.2		[N/A]
3, 4, 6	Suspension compliance, C_{ms}	1.0	1.33	1.0	1.33	[mm/N]
3, 4, 6	Equivalent air volume, V_{as}	24.3	32.4	24.3	32.4	[lit.]
3, 4, 6	Mechanical resistance, R_{ms}	0.44	0.46	0.44	0.46	[Ns/m]
3, 4, 6	Mechanical Q, Q_{ms}	10.9	9.1	10.5	8.8	[-]
3, 4, 6	Electrical Q, Q_{es}	0.37	0.32	0.44	0.38	[-]
3, 4, 6	Total Q, Q_{ts}	0.35	0.31	0.42	0.37	[-]
4	Voice coil resistance, R_{DC}	3.2		6.4		[ohm]
5	Voice coil inductance, L_e (measured at 10 kHz)	0.10		0.17		[mH]
	Voice coil inside diameter	39		39		[mm]
	Voice coil winding height	16		16		[mm]
	Air gap height	5		5		[mm]
	Theoretical linear motor stroke, Xmax	±5.5		±5.5		[mm]
	Magnet weight	725		725		[g]
	Total unit net weight excl. packaging	1.95		1.95		[kg]
3, 4, 5	K_{rm}	131		117		[mohm]
3, 4, 5	E_{rm}	0.30		0.34		[-]
3, 4, 5	K_{xm}	17.5		37		[mH]
3, 4, 5	E_{xm}	0.47		0.43		[-]

Note 1   *Measured in infinite baffle.*

Note 2   *Tested in free air (no cabinet).*

Note 3   *Measured using a semi-constant current source, nominal level 2 mA.*

Note 4   *Measured at 25 deg. C*

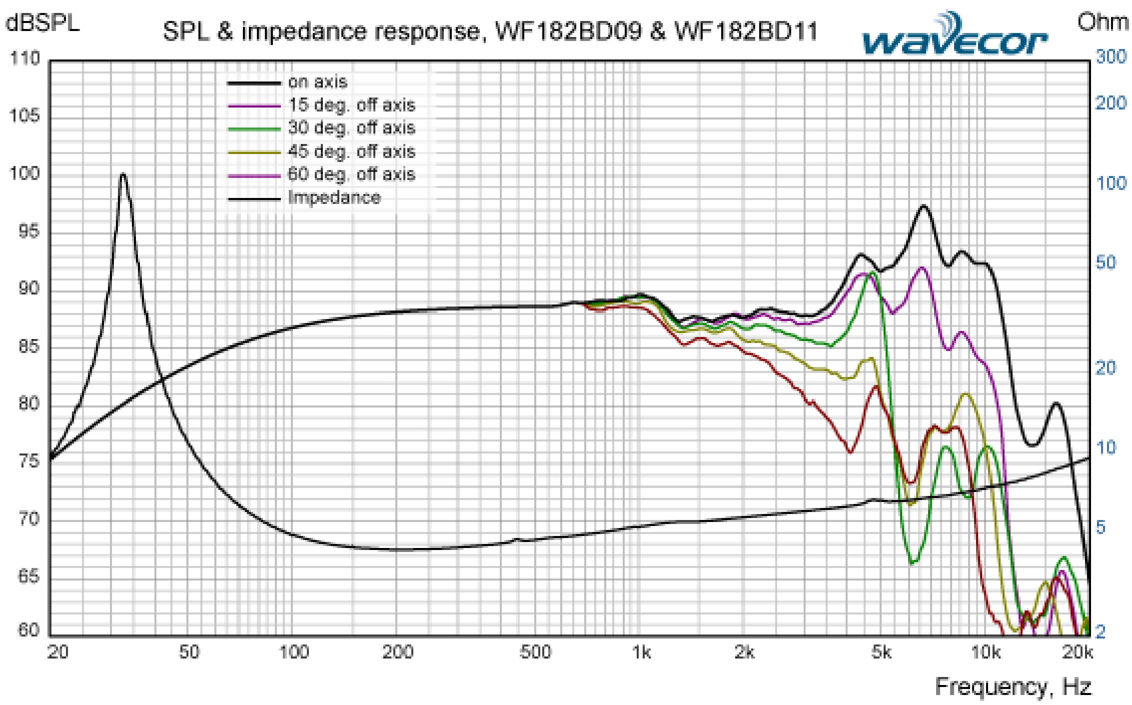
Note 5   *It is generally a rough simplification to assume that loudspeaker transducer voice coils exhibit the characteristics of an inductor. Instead it is a far more accurate approach to use the more advanced model often referred to as the “Wright empirical model”, also used in LEAP-4 as the TSL model (www.linearx.com), involving parameters K_{rm}, E_{rm}, K_{xm}, and E_{xm}.* This more accurate transducer model is described in a technical paper **here at our web site.**

Note 6   After burn-in specifications are measured 12 hours after exiting the transducer by a 20 Hz sine wave for 2 hours at level 10/14.1 V_{RMS} (4/8 ohm version). The unit is not burned in before shipping.

 For more information please visit **www.Wavecor.com**

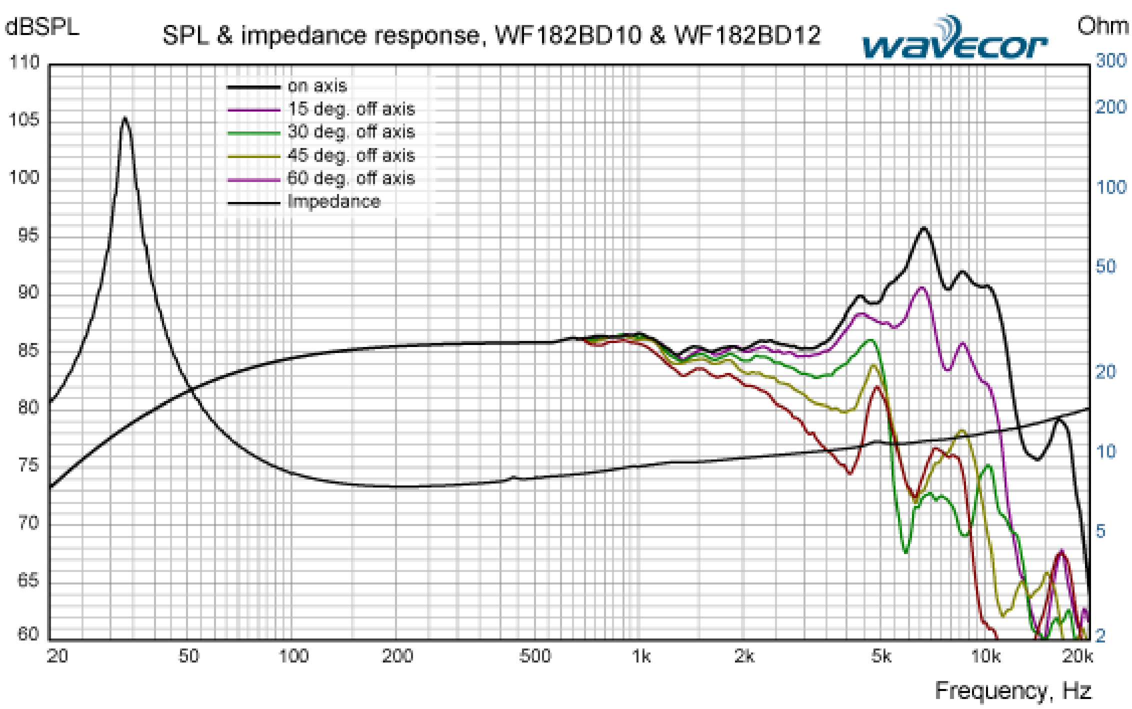
SPECIFICATIONS

WF182BD09/10/11/12 7" die cast, paper/glass fiber cone mid/woofers, 4/8 ohm



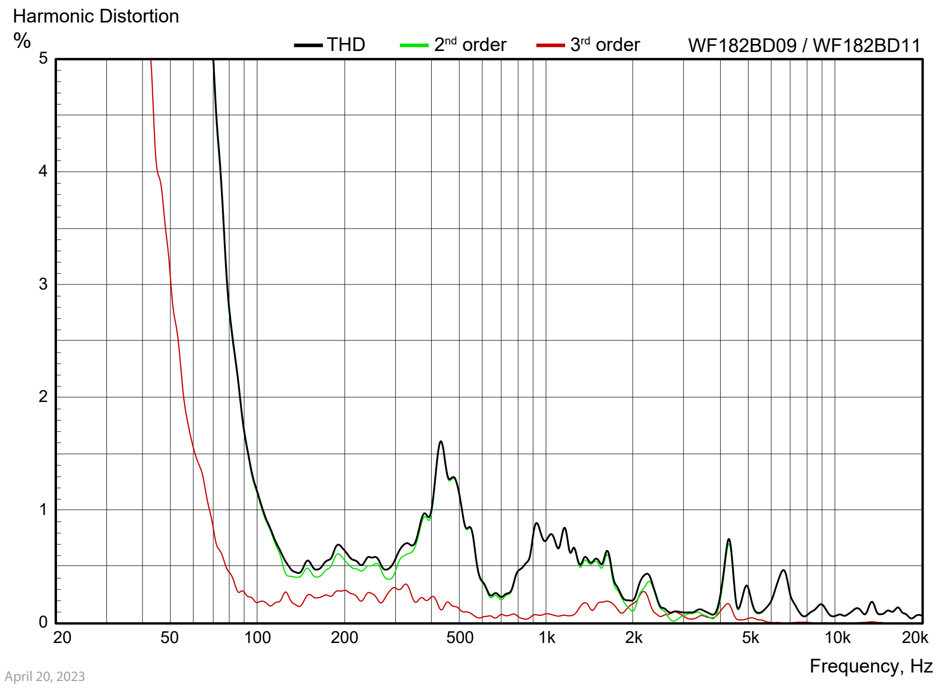
Measuring conditions, SPL
Driver mounting: Flush in infinite baffle, back side open (no cabinet)
Microphone distance: 1.0 m
Input level: 2.83 V_{RMS}
Smoothing: 1/6 oct.

Measuring conditions, impedance
Driver mounting: Free air, no baffle, back side open (no cabinet)
Input signal: Semi-current-drive, nominal current 2 mA
Smoothing: None

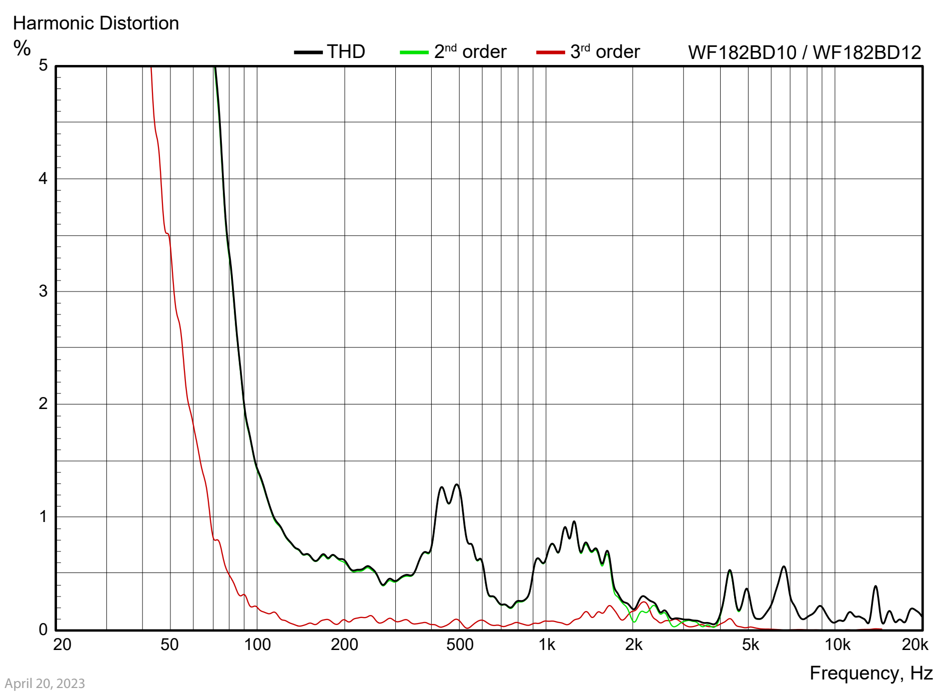


wavecor

WF182BD09/10/11/12 7” die cast, paper/glass fiber cone mid/woofers, 4/8 ohm



<u>Measuring conditions, distortion</u>
Driver mounting: 5 lit. sealed cabinet
Input voltage: 5.65 V_{RMS}
Smoothing: 1/12 oct.



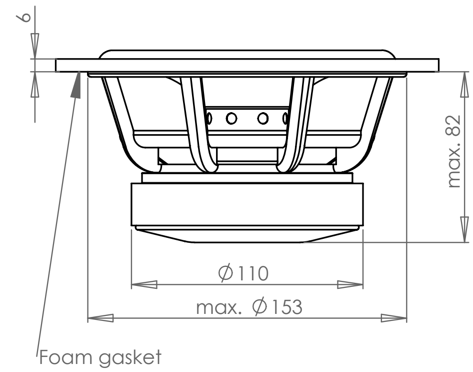
<u>Measuring conditions, distortion</u>
Driver mounting: 5 lit. sealed cabinet
Input voltage: 7.75V_{RMS}
Smoothing: 1/12 oct.

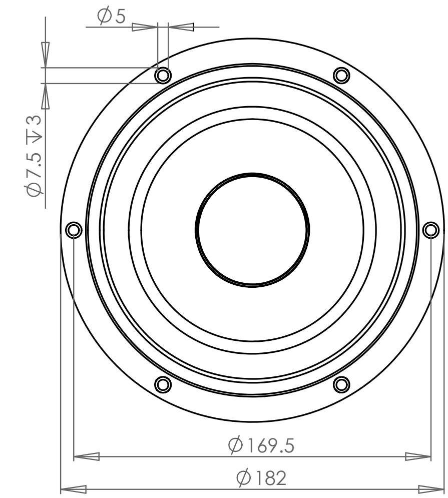
 For more information please visit **www.Wavecor.com**

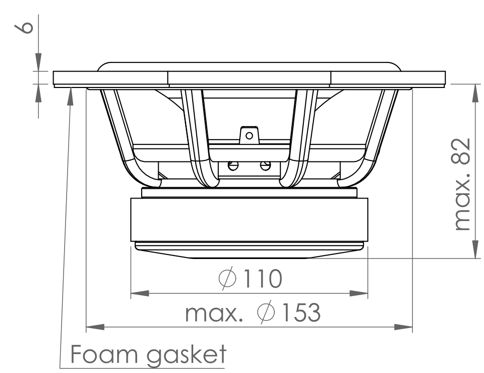
SPECIFICATIONS

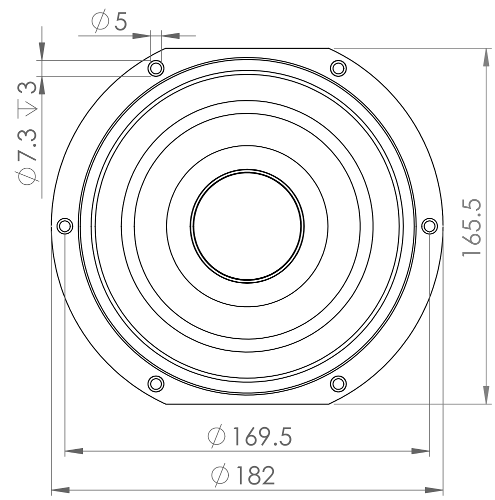
WF182BD09/10/11/12 7” die cast, paper/glass fiber cone mid/woofers, 4/8 ohm

OUTLINE DRAWING
(nominal dimensions, mm)

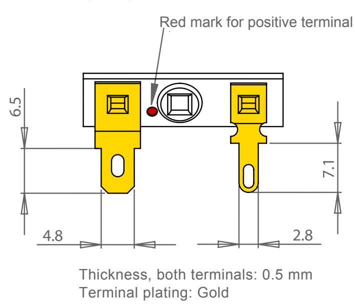








CONNECTIONS



PACKAGING AND ORDERING INFORMATION

Part no. WF182BD09-01	4 ohm version, round frame, individual packaging (one piece per box)
Part no. WF182BD09-02	4 ohm version, round frame, bulk packaging
Part no. WF182BD10-01	8 ohm version, round frame, individual packaging (one piece per box)
Part no. WF182BD10-02	8 ohm version, round frame, bulk packaging
Part no. WF182BD11-01	4 ohm version, truncated frame, individual packaging (one piece per box)
Part no. WF182BD11-02	4 ohm version, truncated frame, bulk packaging
Part no. WF182BD12-01	8 ohm version, truncated frame, individual packaging (one piece per box)
Part no. WF182BD12-02	8 ohm version, truncated frame, bulk packaging

Latest update: April 26, 2023

Bibliography

Alto Professional. Accessed October 2, 2023. https://www.altoprofessional.com/.

Dayton Audio. Accessed October 4, 2023. https://www.daytonaudio.com/.

"Designer Series." Dayton Audio. Accessed November 11, 2023. https://www.daytonaudio.com/category/170/designer-series

Falcon Acoustics. Accessed October 4, 2023. https://www.falconacoustics.co.uk.

Focal USA. Accessed October 2, 2023. https://www.focal.com/us.

G.H. "Klipsch R-120SW Active Subwoofer Review." Perfect Acoustic. Accessed October 3, 2023. https://perfectacoustic.co.uk/klipsch-r-120sw/.

Goldwood. Accessed October 4, 2023. https://www.goldwood.com/.

"JBL 305P MkII." JBL. Accessed September 30, 2023. https://www.jbl.com/studio-monitors/305PMKII.html.

"JBL 305P MkII - Powered Two-Way Studio Monitor Review." Audio Science Review. Accessed September 30, 2023. https://www.audiosciencereview.com/forum/index.php?threads/jbl-305p-mkii-review-erin.22999/.

Katz, Bob. "Levels Practices (Part 2)." Digital Domain. Accessed September 30, 2023. https://www.digido.com/portfolio-item/level-practices-part-2/.

Kirchberger M, Russo FA. Dynamic Range Across Music Genres and the Perception of Dynamic Compression in Hearing-Impaired Listeners. Trends in Hearing, 2016. Accessed September 30, 2023. doi:10.1177/2331216516630549.

Klipsch. Accessed October 2, 2023. https://www.klipsch.com/.

Laurence, Michael. "Road Test: The New QSC KS118 Subwoofer." ProSoundWeb. October 3, 2019. Accessed October 2, 2023. https://www.prosoundweb.com/road-test-the-new-qsc-ks118-subwoofer/.

Madisound Speaker Store. Accessed October 4, 2023. https://www.madisoundspeakerstore.com/welcome.

Moulton, David. *Total Recording*. KIQ Productions, 2000. Accessed August 28, 2023.

Murphy, John. *Introduction to Loudspeaker Design*. True Audio, 2014. Accessed Sept. 9, 2023.

Neuman.Berlin. Accessed September 30, 2023. https://www.neumann.com/en-en/monitors/

"Neumann KH 150 manual." Manual.Is. Accessed September 30, 2023. https://www.manua.ls/neumann/kh-150/manual.

"Neumann KH 150 Monitor Review." Audio Science Review. Accessed September 30, 2023. https://www.audiosciencereview.com/forum/index.php?threads/neumann-kh-150-monitor-review.39922/

Newell, Philip, and Keith Holland. *Loudspeakers for Music Recording and Reproduction*. Second Edition. Routledge. Accessed August 28, 2023.

Nikolic, Julijan. "Loudness Standards – Full Comparison Table (music, film, podcast)." Youlean, 2019. Accessed September 30, 2023. https://youlean.co/loudness-standards-full-comparison-table/.

Polk. Accessed September 30, 2023. https://www.polkaudio.com/en-us/.

"Polk Reserve R200: Spinorama and measurements (a really nice surprise!)." Audio Science Review. Accessed September 30, 2023. https://www.audiosciencereview.com/forum/index.php?threads/polk-reserve-r200-spinorama-and-measurements-a-really-nice-surprise.23502/.

Price, Simon. "Totem KIN Play Powered Bookshelf Speakers." 13th Note HiFi Reviews. Accessed September 30, 2023. https://www.13thnote.net/2020/04/09/totem-kin-play-review-powered-speakers/.

QSC. Accessed October 2, 2023. https://www.qsc.com/.

"Revel M55XC Outdoor Speaker Review." Audio Science Review. Accessed September 30, 2023. https://www.audiosciencereview.com/forum/index.php?threads/revel-m55xc-outdoor-speaker-review.14881/

Revel Speakers. Accessed September 30, 2023. https://www.revelspeakers.com/

SB Acoustics. Accessed October 4, 2023. https://sbacoustics.com/.

Sweetwater. Accessed September 30, 2023. https://www.sweetwater.com/.

Tech Speakers. Accessed August 31, 2023. https://areteaudio.wordpress.com/page/2/.

Toole, Floyd. *Sound Reproduction*. Third Edition. Routledge. Accessed September 9, 2023.

Totem. Accessed September 30, 2023. https://totemacoustic.com/.

Vnuk, Paul. "FOCAL SUB6, SUB ONE AND SUB12." Recording Magazine. Accessed October 3, 2023. https://recordingmag.com/focal-sub6-sub-one-and-sub12/.

"What is the Reference Level?" THX, 2016. Accessed September 30, 2023. https://www.thx.com/questions/what-is-the-reference-level/