PURIFI

1.3" Dome Tweeter

PURE SOUND

Low Distortion Tweeter with Ultra-Wide Dispersion

PTT1.3T04-HAG-01
PREVIEW

- Wide-dispersion Waveguide with cooptimized, integrated Coherer
- Negligible Force Factor Modulation and Surround Radiation Distortion
- Extremely Low Magnetic Hysteresis Distortion
- High Sensitivity, high linear volume displacement (1cm^3)
- Designed and Manufactured in Denmark

KEY SPECIFICATIONS

Driver size	1.3" / 33mm
DC resistance, R_{DC}	3.5 Ω
Resonance freq., f_s	640 Hz
Face Plate Diameter	104mm
Effective piston area	9.4 cm^2
Beam Width (-6dB, 2π)	+/- 65 deg
SPL@2.83V_{rms}/1m	95 dB @3.5 kHz
Linear X_{max}	+/- 1 mm
Main Break-up	27kHz
IEC cl. 18.2 Power, 2.5k	TBD W
Dome material	Hard Anodised Aluminium

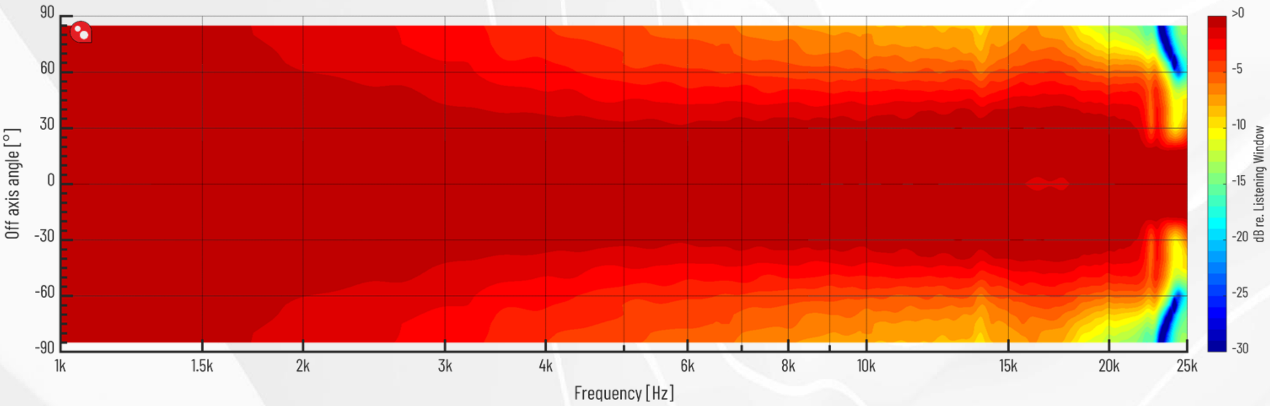

Figure 1 Polar Response normalized to the Listening Window

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1 Specifications

Measurement Conditions & Definitions unless otherwise noted	
Setup:	Infinite baffle/2pi, flush mounted. Polar angles ∠0-85° in 5° steps
Microphone:	G.R.A.S 46AC at 40cm from the baffle, SPL normalised to 1m distance (-20·log10(100/40) = -8.0 dB)
Stimulus:	Exponential sine sweep, 2.83Vrms, 3 sec. /octave , fs = 96 kHz
Gating / Smothing:	Acoustic responses gated at 1.18m distance, complex smoothing to 1/48 octave
Power Averages & D.I	Listening Window: ∠0-30° (cf. CTA-2034A), Power: ∠0-85°, Ratio = Directivity Index (D.I)

Table 1 Measurement Conditions unless otherwise noted

1.1 Electrical & Acoustical Parameter

Parameter		Typ	Unit
Z_n	Nominal impedance	4	Ω
Z_{min}	Minimum impedance above resonance	3.6	Ω
f_{min}	Frequency for minimum impedance	5.7	kHz
Z_o	Maximum impedance	12.4	Ω
R_{DC}	DC resistance	3.5	Ω
L_e	Voice Coil inductance @ 2kHz	0.013	mH
SPL	SPL@2.83V_{rms}/1m, 3.5kHz, ref. 20µPa (infinite baffle / 2pi)	94.9	dB
	SPL@1W(Z_{min})/1m, 3.5kHz, ref. 20µPa (infinite baffle / 2pi)	92.4	dB

Table 2 Electrical & Acoustical Parameters

1.2 T/S & Lumped Parameters

Parameter		Typ	Unit
f_s	Resonance frequency	640	Hz
S_d	Effective piston area	9.5	cm^2
D	Effective piston diameter	34.7	mm
Bl	Force factor	2.8	N/A
M_{ms}	Moving mass	0.45	g

Table 3 T/S & Lumped Parameters

1.3 Mechanical Properties

Parameter		Typ	Unit
Excursion Properties			
X_{max}	Linear excursion, Bl(x) > 97% of Bl_{max}	+/- 1	mm
	Mechanical excursion	+/- 1	mm
Physical Dimensions			
	Faceplate diameter	104	mm
	Cutout diameter	93 / 81	mm
	Mounting hole pattern diameter	98	mm
	Mounting hole diameter	3.5	mm
	Magnet diameter	80	mm
	Outer flange thickness	4.0	mm
	Build-in depth	39	mm
	Weight	0.72	kg
Voice Coil Properties			
	Voice Coil diameter	33	mm
	Voice Coil length	1.8	mm
	Voice Coil layers	2	-
	Airgap height	4	mm
	Winding material	Aluminium	-

Table 4 Mechanical Properties

1.4 Power Handling

Parameter		Typ	Unit
	Long term maximum power (IEC268-5 18.2), 2nd order Butterworth HP @2.5 kHz	150	W
	Rated noise power, 100h (IEC268-5 18.4), 2nd order Butterworth HP @2.5 kHz	TBD	W

Table 5 Power Handling

1.5 Typical Performance, Graphs

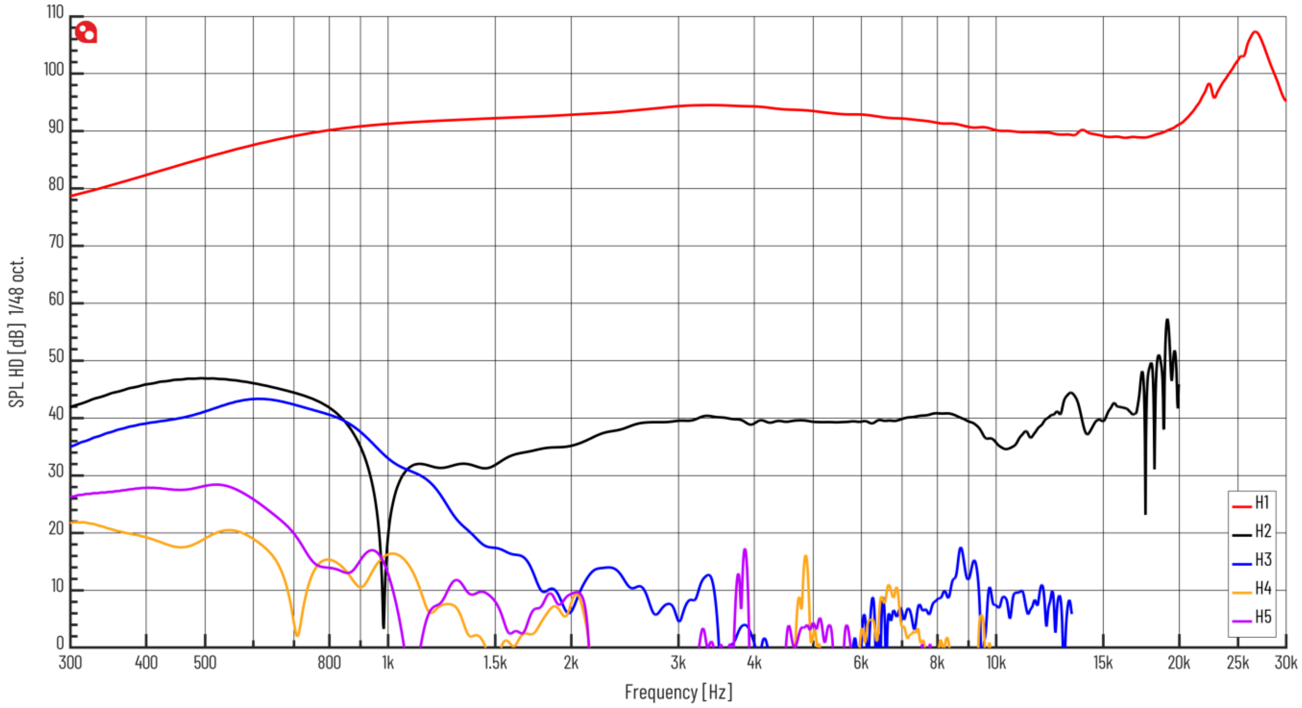


Figure 2 Frequency Response @ 1m, 2.83Vrms

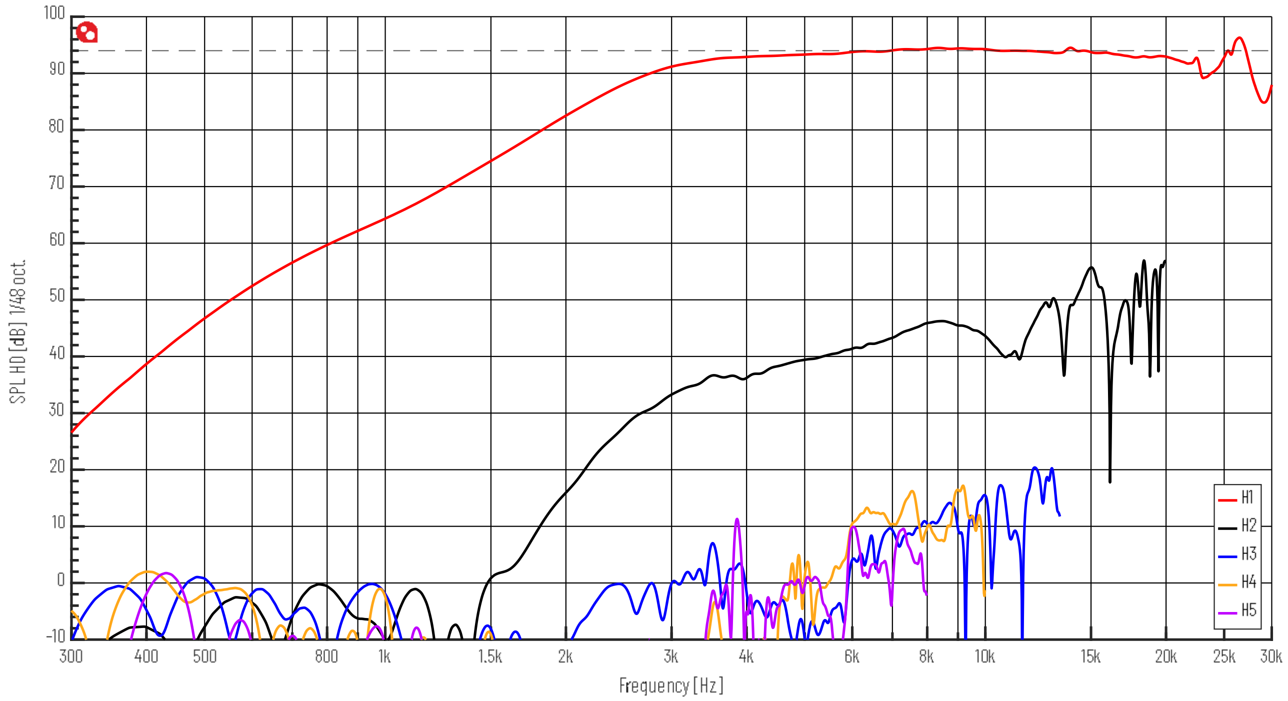


Figure 3 Frequency Response @ 94dB with the passive filter shown in section 2.1,

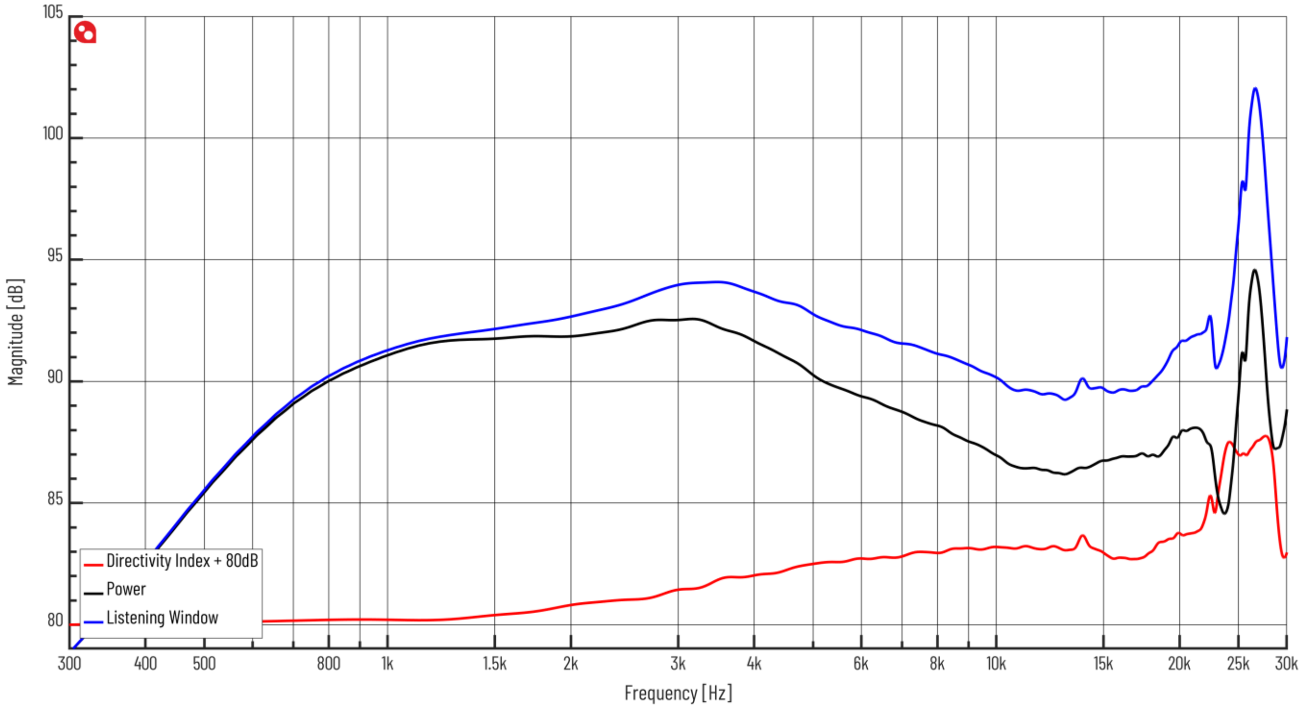


Figure 4 Frequency Response @ 2.83Vrms

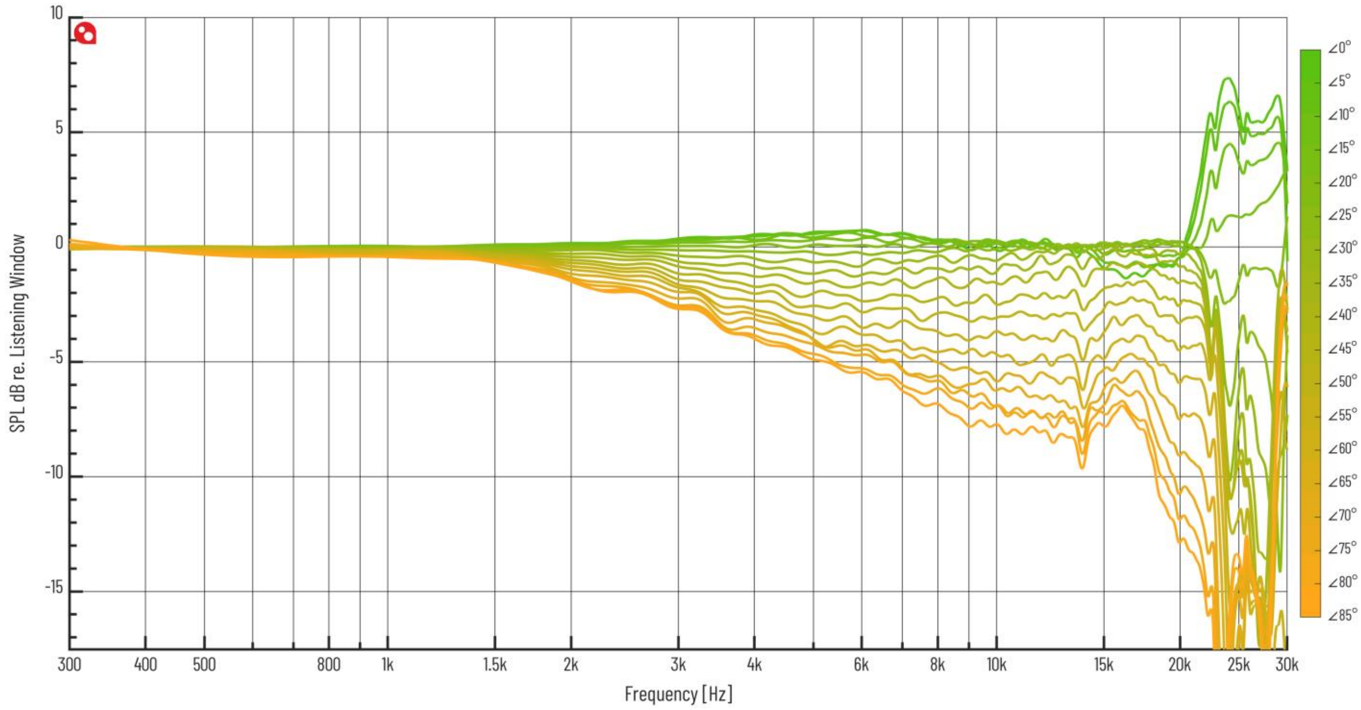


Figure 5 Polar Frequency response relative to the Listening Window

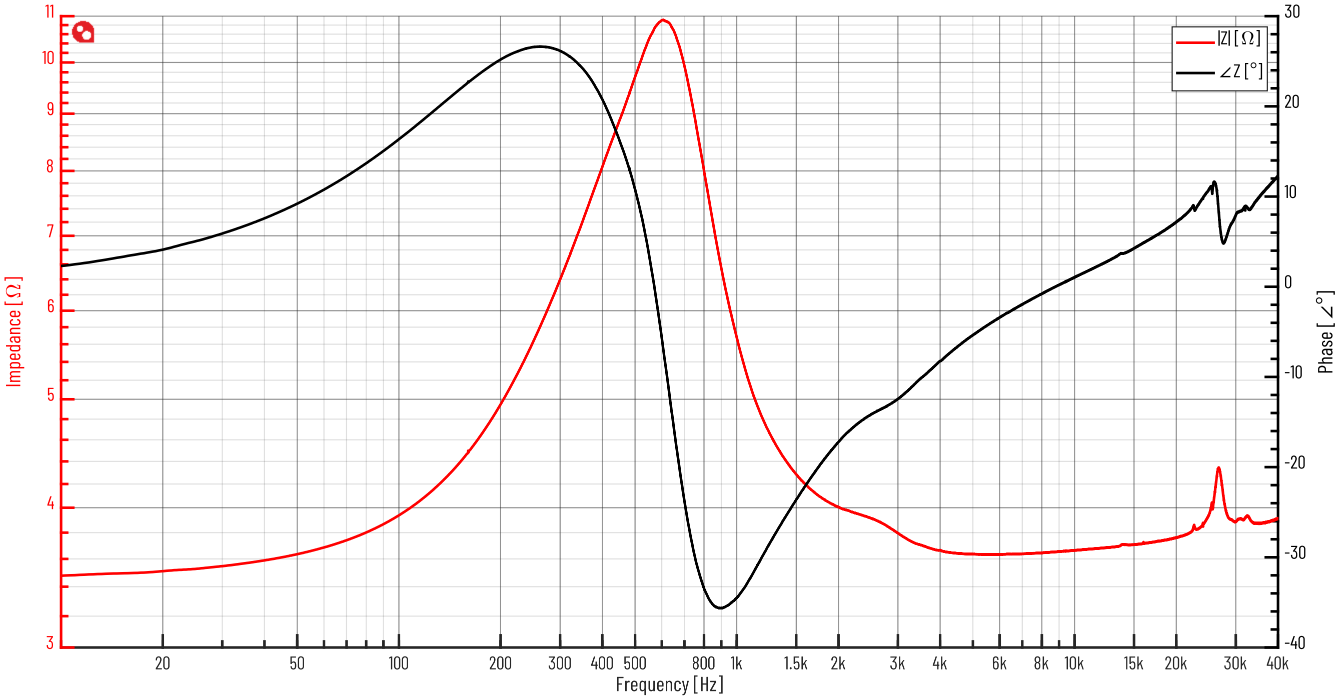


Figure 6 Impedance Response @ 1.41 Vrms, unsmoothed

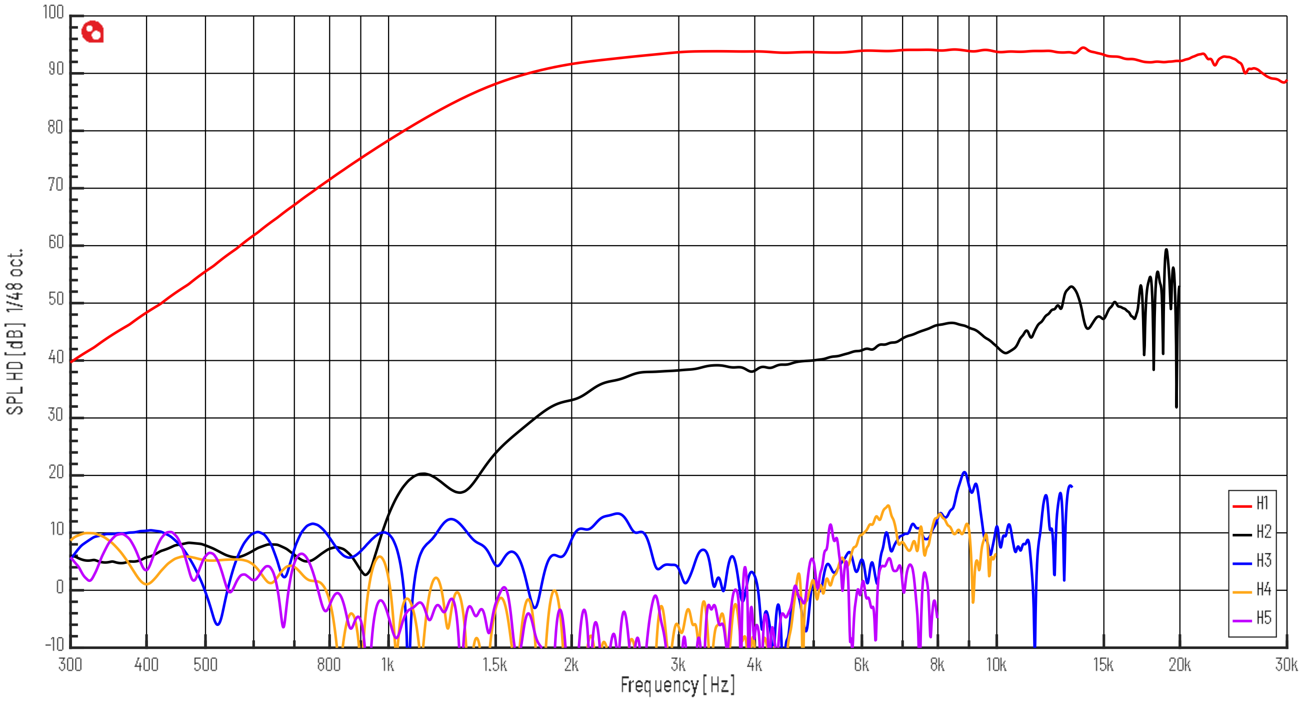


Figure 7 Frequency Response @ 15 deg, 94dB, stimulus EQ'ed for acoustic 1.5 kHz 4th-order Linkwitz Riley High-Pass

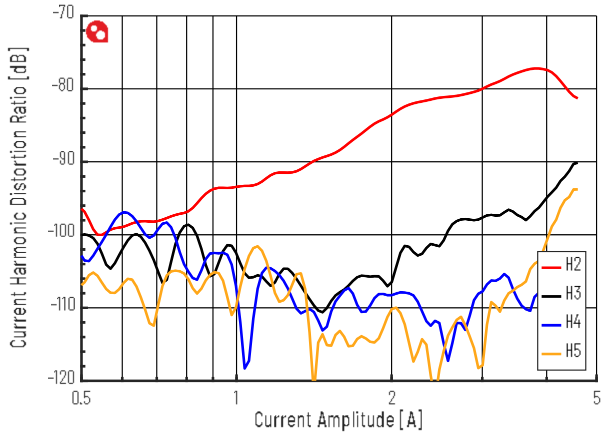


Figure 8 Current Harmonic Distortion @ 4kHz, 0-14.2Vrms

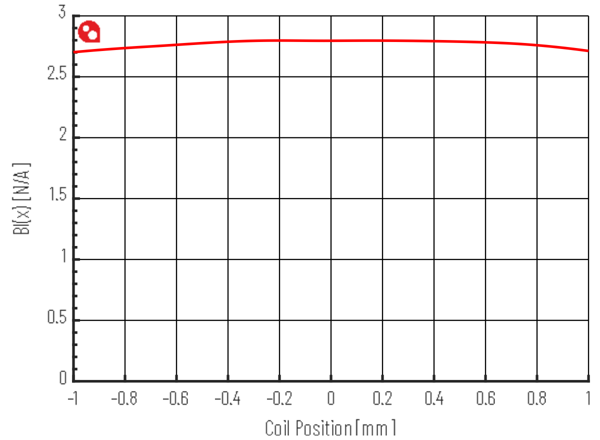


Figure 9 Force Factor Bl vs. Coil Position

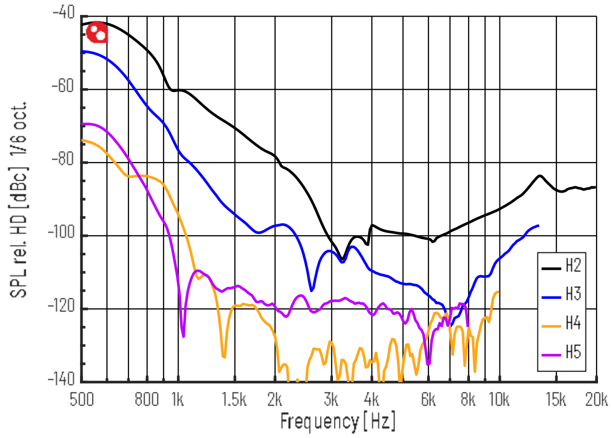


Figure 10 Current Harmonic Distortion vs. Frequency @ 2.83 Vrms

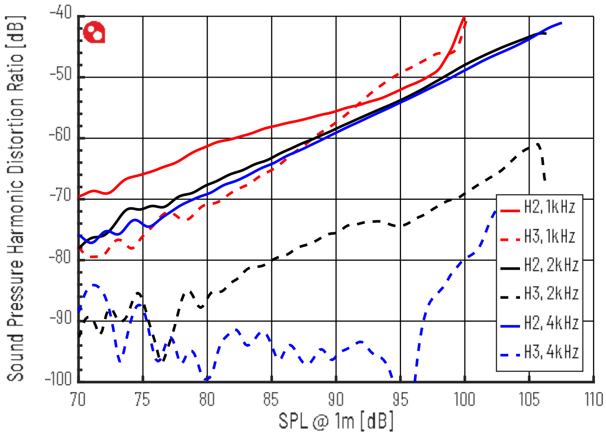


Figure 11 Sound Pressure Harmonic Distortion, 0-14Vrms burst

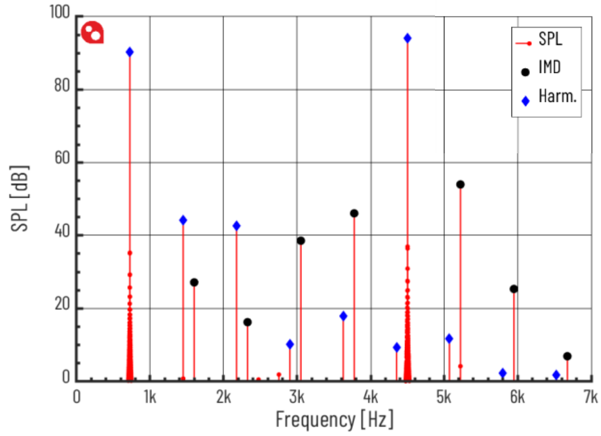


Figure 12 Two-tone Intermodulation Distortion,
725Hz & 4.5kHz, each 4Vp, peak excursion = ± 0.23 mm

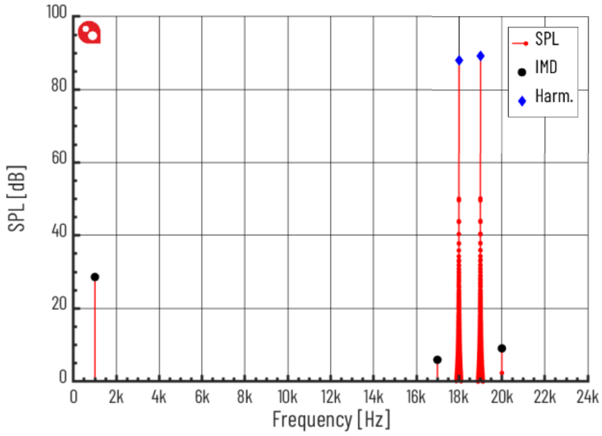


Figure 13 Two-tone Intermodulation Distortion , 18+19kHz , each 4Vp

2 Application Information

2.1 Crossover Filter Example

The tweeter must always be used with a high-pass filter to protect it from low frequency signals. The integral waveguide and coherer makes the on axis response boost around 3.5kHz and droop again towards 20kHz. Such response variation is smooth and can be equalised even with a simple passive filter. As an example, a passive filter was optimised in Vituix Cad to match the Listening Window acoustic response to a 4th order Linkwitz-Riley High-pass filter with a corner frequency of 2.5kHz. For use in a passive speaker, it will often be necessary to reduce the sensitivity of the tweeter to match the woofer. Such reduction in sensitivity is best obtained in a passive system by adding a non-magnetic series resistor directly in series with the tweeter. This increases the drive impedance that the tweeter sees and this help to even further reduce the distortion caused by magnetic hysteresis. An example of such optimised filter with a high-pass LR4 corner of 2.5kHz and pass band sensitivity of 85dB/1m/2.83Vrms is shown in Fig. 14. Note that this filter is optimised for the infinite baffle response and is only shown as an example. For use in a box, the filter optimisation should further compensate for the baffle/box diffraction. When used in a box, the woofer needs up to 6dB baffle step compensation. This means that the tweeter sensitivity of 85dB/m will match a woofer with a nominal infinite baffle sensitivity of around 91dB/m.

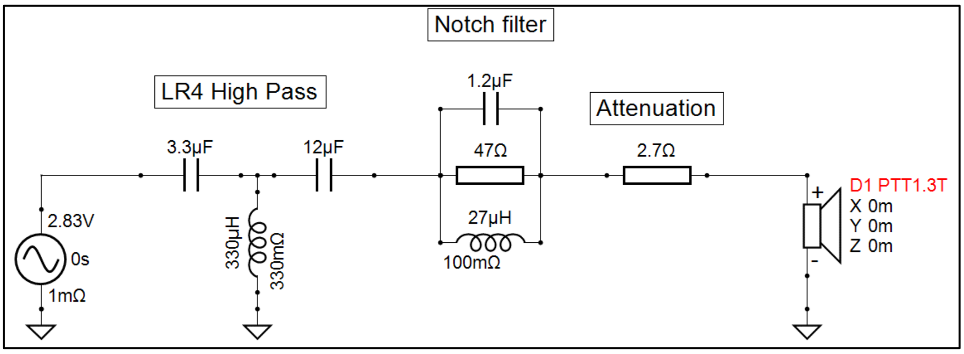


Figure 14 Passive filter for Acoustic 2.5kHz 4th Order Linkwitz-Riley Response

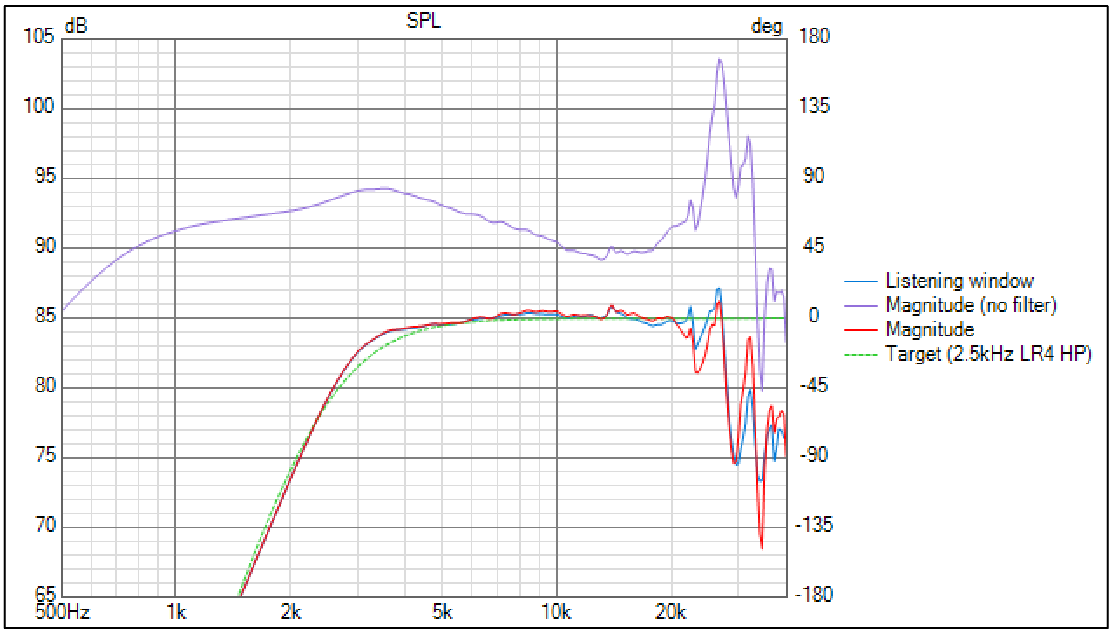


Figure 15 Response Graph from Vituix CAD

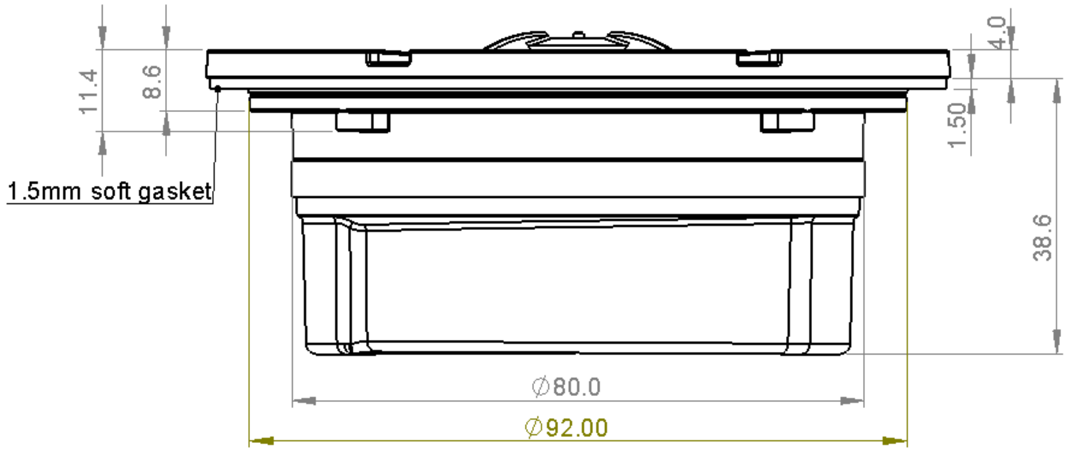
2.2 Dome Cavity Pressure Equalisation

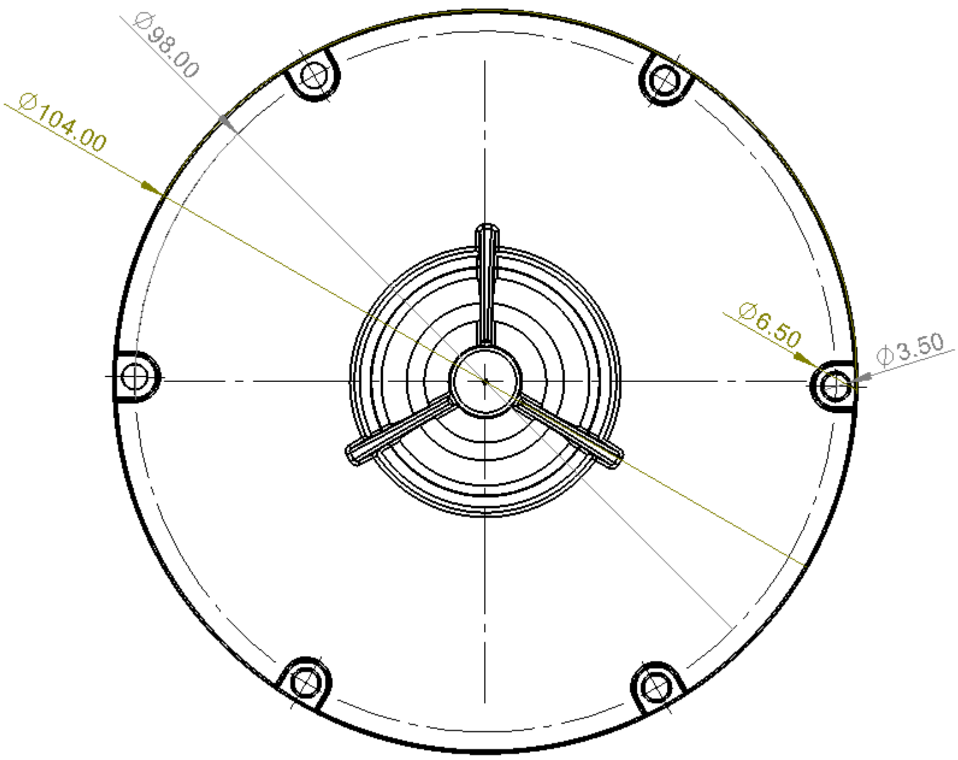
The rear chamber is equipped with a long narrow channel for pressure equalisation between the dome front- and backside pressure. This reduces the risk of damage during, e.g., air shipment. The pressure equalisation equalises slow pressure variations whilst blocking frequencies above approx. 20Hz from reaching the dome. However, the box pressure caused by the woofer in a multiway speaker may cause a detectable displacement of the dome. In order to completely avoid such displacement and associated risk of intermodulation distortion, a chamber behind the tweeter can be installed to block the pressure from a woofer. However, this additional chamber should pressure equalise to the front side of the tweeter to allow air shipment.

2.3 Mounting the Tweeter in a Baffle

This tweeter has significantly wider dispersion compared to most other tweeters. This makes the mounting into a baffle or front panel more critical. The integral waveguide and coherer is designed to give the intended wide and smooth dispersion and frequency response when the baffle is completely flush with the outer edge of the tweeter waveguide. Even a small height step or trench/gap at the outer edge causes a measurable response aberration due to diffraction.

3 Drawings,all dimensions in mm





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