PURIFI

1.3" Dome Tweeter

PURE SOUND

Low Distortion Tweeter
Ultra-Wide Dispersion
147 mm Waveguide

PTT1.3T04-HAG-10
DATA SHEET

- 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
- Designed and Manufactured in Denmark

KEY SPECIFICATIONS

Driver size	1.3" / 33 mm
DC resistance, R_{DC}	3.5 Ω
Resonance freq., f_s	680 Hz
Face plate diameter	147 mm
Effective piston area	9.5 cm^2
Beam width (-6dB, 4pi)	± 70 deg
SPL @2.83 V_{rms}/1 m	96 dB @ 3 kHz
Bl(x) linearity	± 0.5% @ ± 0.5 mm
Main break-up freq.	27 kHz
IEC cl. 18.2 power, 2.5k	250 W
Dome material	Hard Anodised Aluminium

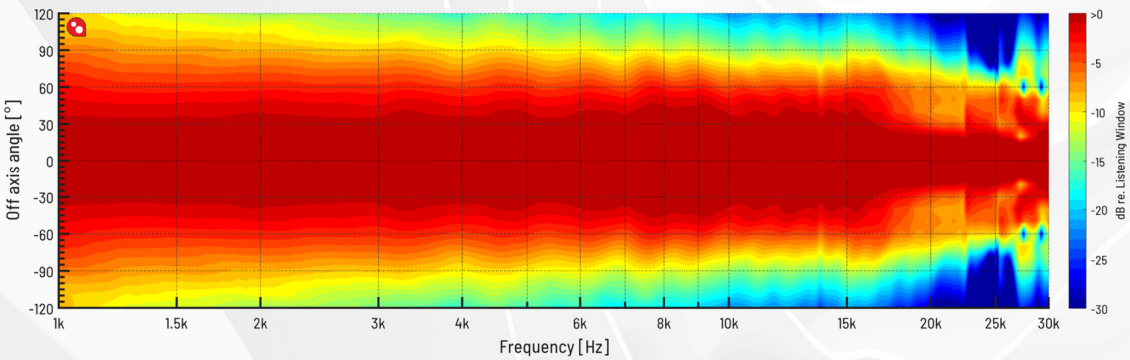


Figure 1 Polar Response normalized to the Listening Window, 4pi , 2.5 m, SPK16

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 Parameters

Parameter		Typ	Unit
Z_n	Nominal impedance	4	Ω
Z_{min}	Minimum impedance above resonance	3.9	Ω
f_{min}	Frequency for minimum impedance	5.1	kHz
Z_o	Maximum impedance	13	Ω
R_{DC}	DC resistance	3.5	Ω
L_e	Voice Coil inductance @ 2 kHz	0.013	mH
SPL	SPL@2.83 V_{rms}/1 m, 3 kHz, ref. 20 µPa (infinite baffle / 2pi)	96.0	dB
	SPL@1 W(Z_{min})/1 m, 3 kHz, ref. 20 µPa (infinite baffle / 2pi)	92.9	dB

Table 2 Electrical & Acoustical Parameters

1.2 T/S & Lumped Parameters

Parameter		Typ	Unit
f_s	Resonance frequency (impedance maximum)	680	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}	Safe mechanical excursion	± 0.5	mm
	Bl(x) linearity @ ± 0.5 mm stroke, see Figure 9	± 0.5	%
Physical Dimensions			
	Faceplate diameter	147	mm
	Cutout diameter	123	mm
	Mounting hole pattern diameter	138	mm
	Mounting hole diameter	4	mm
	Magnet diameter	80	mm
	Outer flange thickness	3.8	mm
	Build-in depth	52	mm
	Weight	0.76	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	250	W
	Rated noise power, 100h (IEC268-5 18.4), 2nd order Butterworth HP @2.5 kHz	100	W

Table 5 Power Handling

1.5 Typical Performance, Graphs

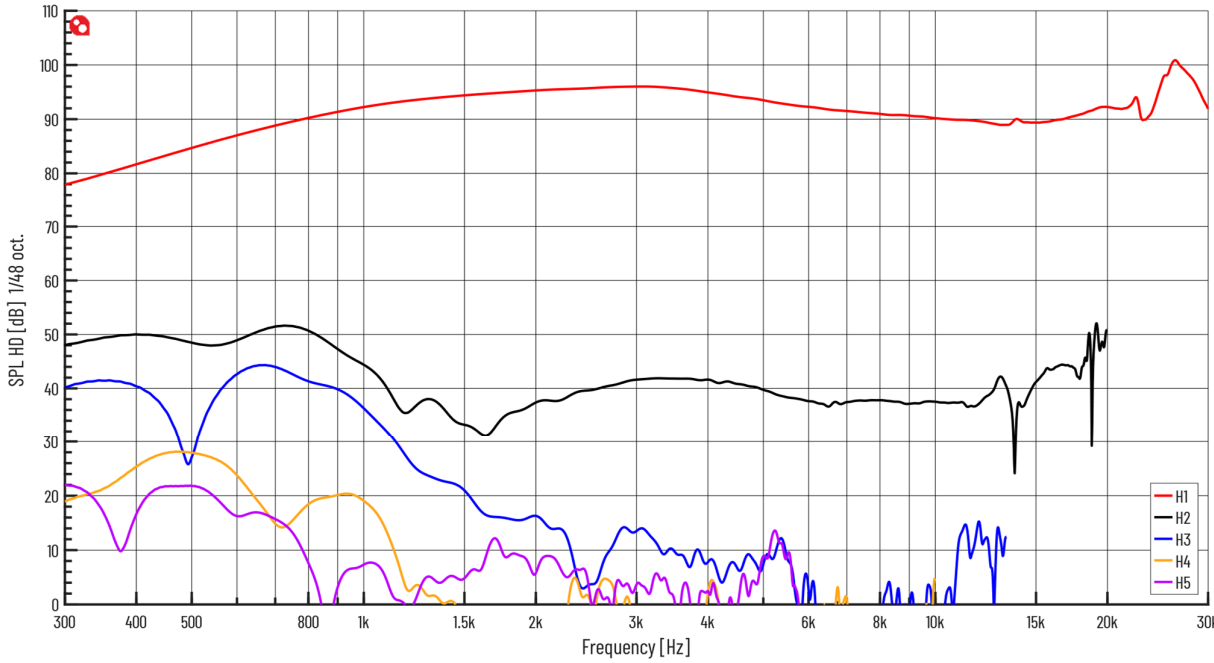


Figure 2 Frequency Response @ 1 m, 2.83 Vrms

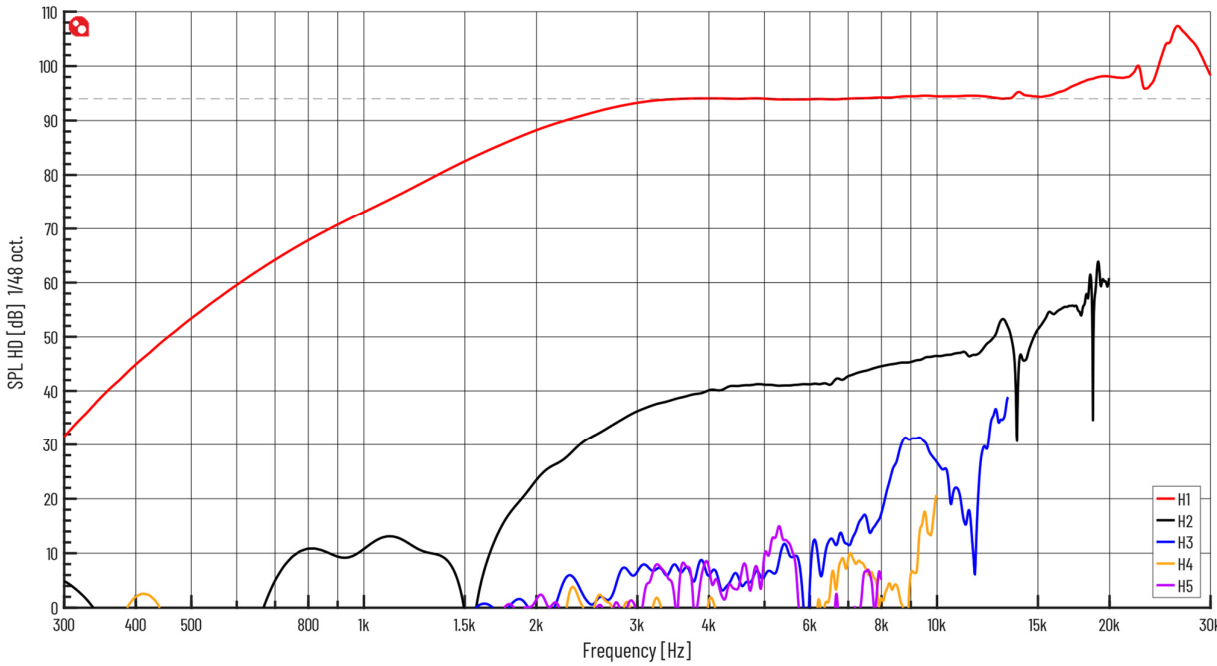


Figure 3 Frequency Response @ 94 dB with the passive filter shown in section 2.1

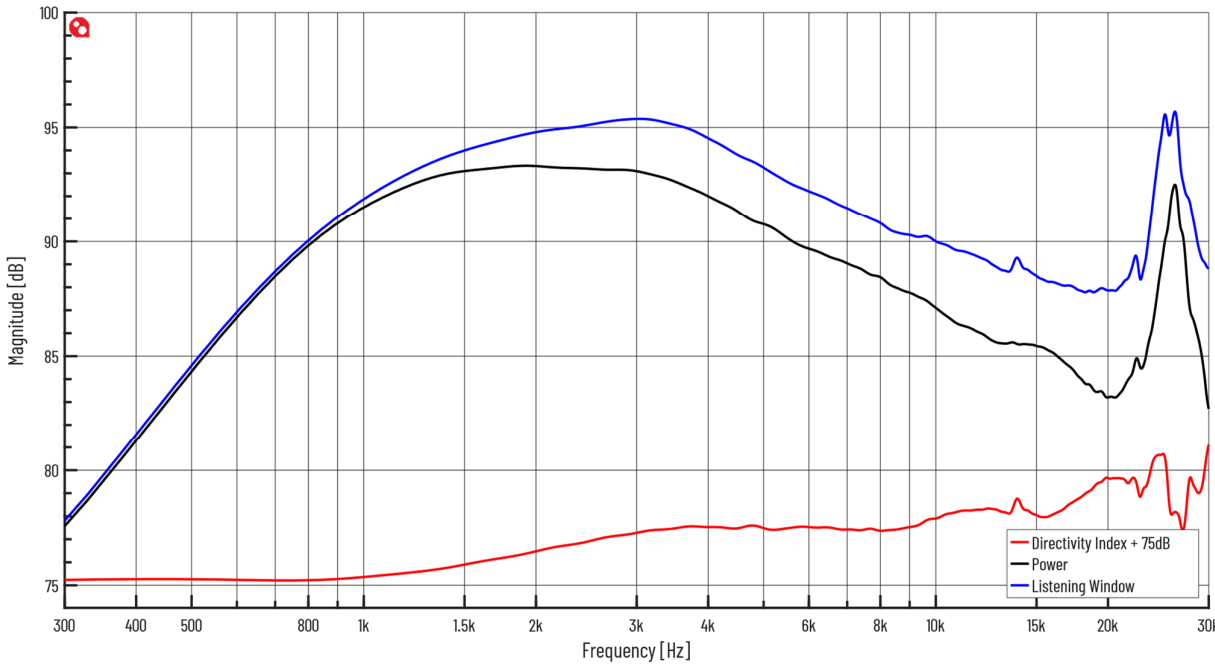


Figure 4 Frequency Response @ 2.83 Vrms

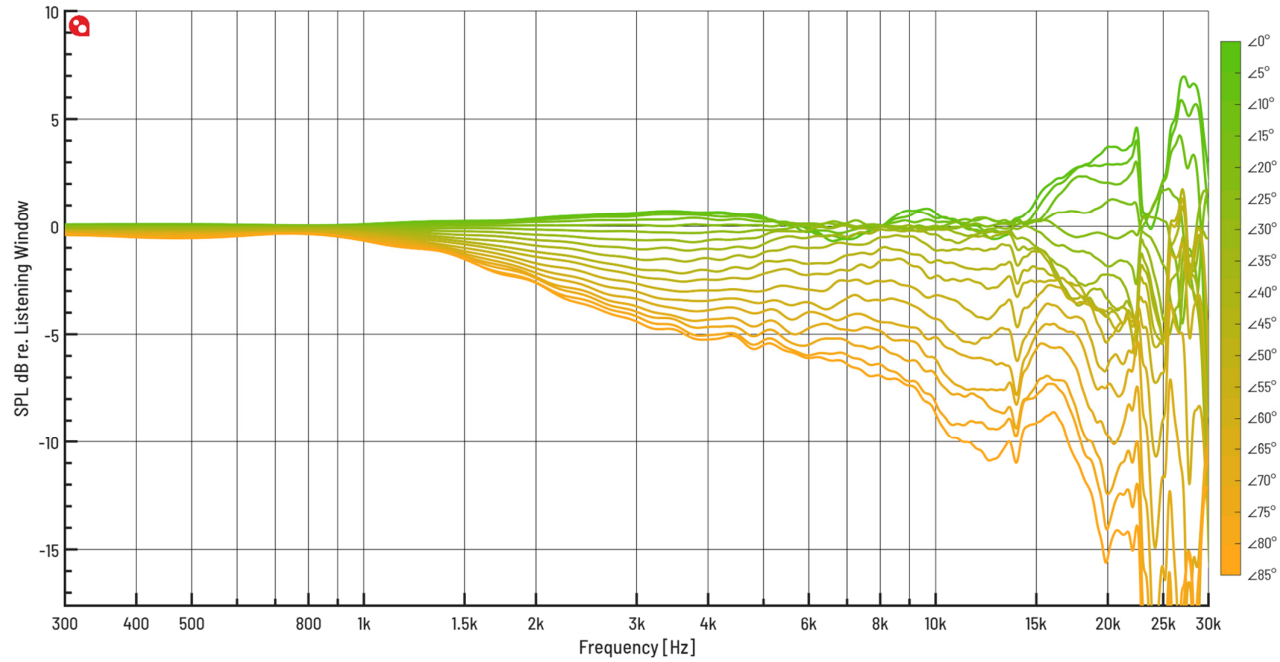


Figure 5 Polar Frequency response relative to the Listening Window

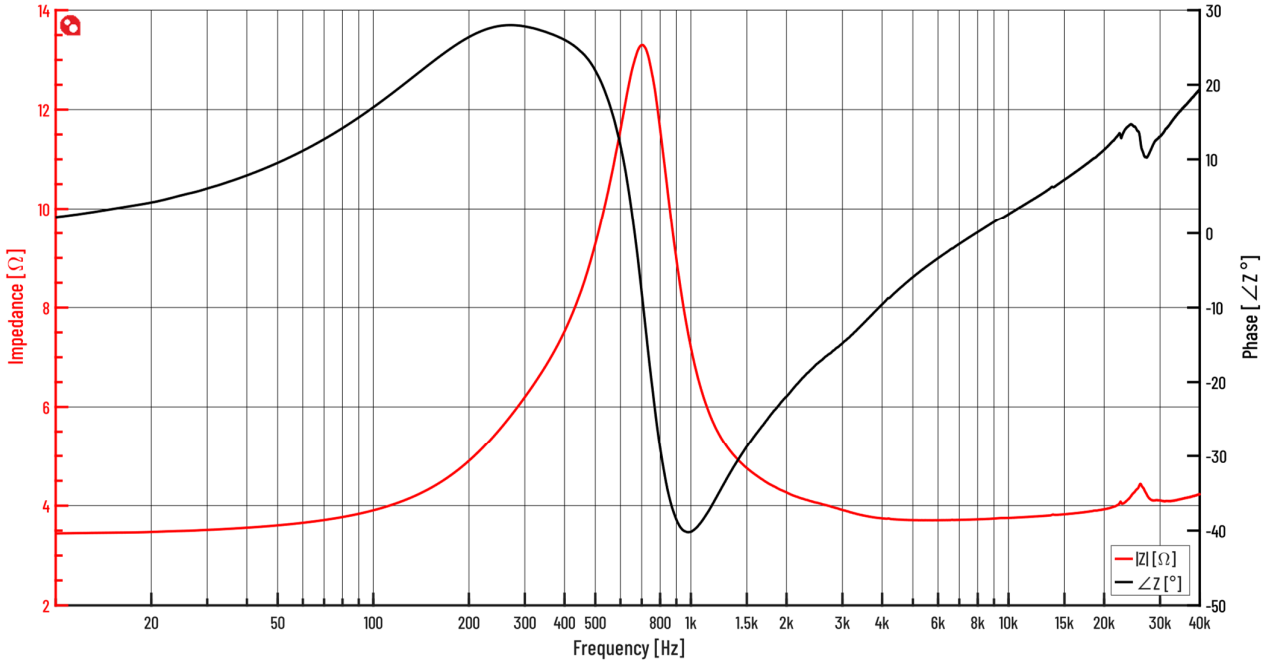


Figure 6 Impedance Response @ 1.41 Vrms, unsmoothed

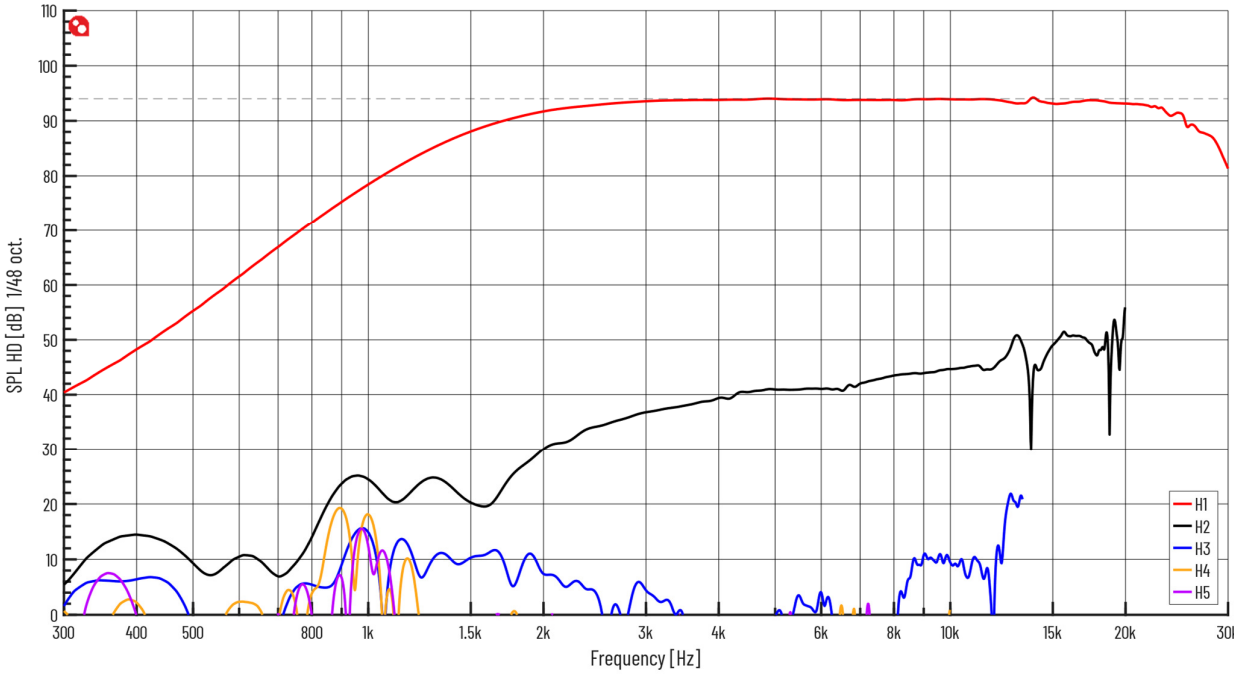


Figure 7 Frequency Response, 94 dB, stimulus EQ'ed for acoustic 1.5 - 25 kHz 4th-order Linkwitz Riley Band-Pass

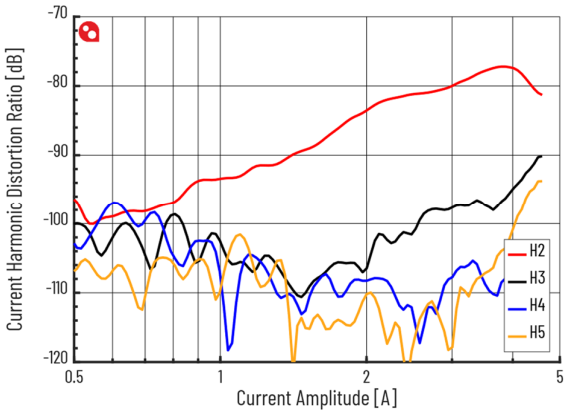


Figure 8 Current Harmonic Distortion @ 4 kHz, 0-14.2 Vrms

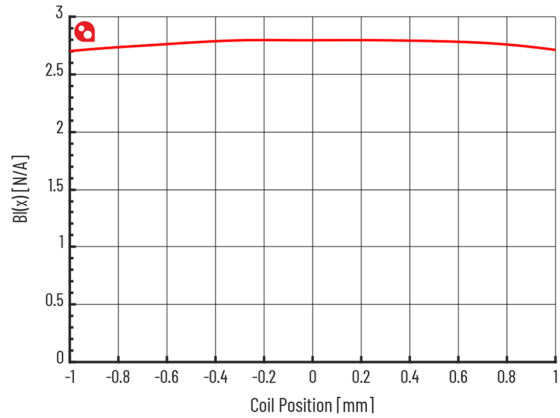


Figure 9 Force Factor Bl vs. Coil Position

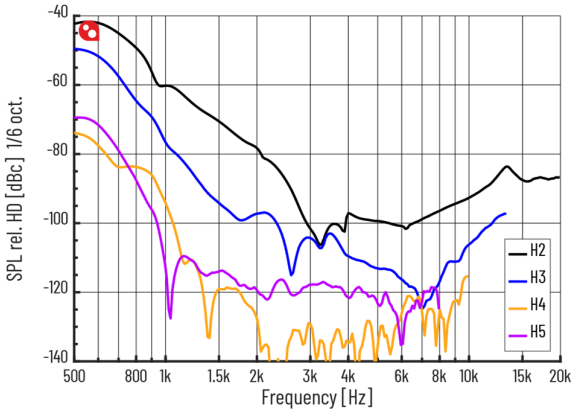


Figure 10 Current Harmonic Distortion vs. Frequency @ 2.83 Vrms

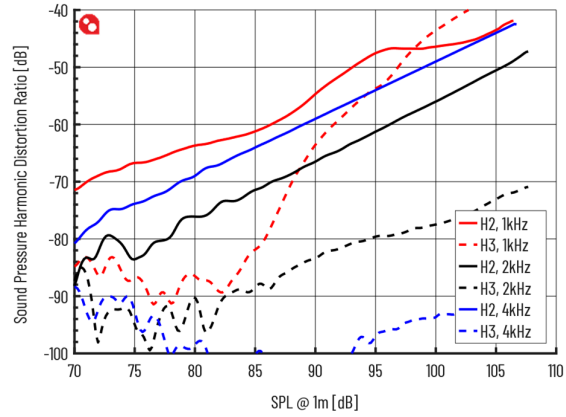


Figure 11 Sound Pressure Harmonic Distortion, 0-14 Vrms

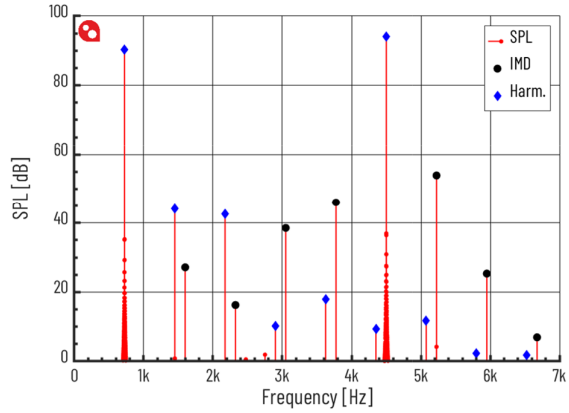


Figure 12 Two-tone Intermodulation Distortion,
725 Hz & 4.5 kHz, each 4 Vp, peak excursion = ± 0.23 mm

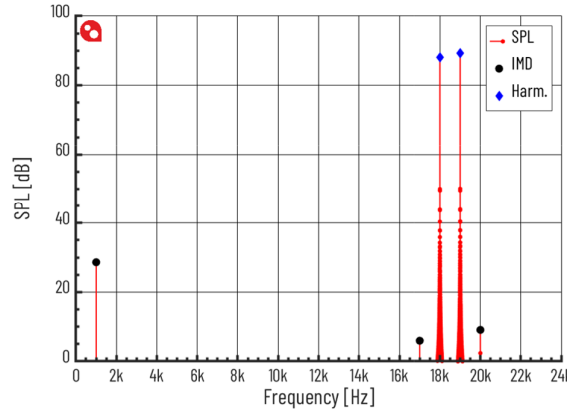


Figure 13 Two-tone Intermodulation Distortion , 18+19 kHz , each 4 Vp

2 Application Information

2.1 Directivity Control

This tweeter is equipped with a 147mm waveguide/faceplate. This provides more directivity control at lower frequencies compared to the 104mm version (PTT1.3T04-HAG-01) and this allows the tweeter to better match a midrange or woofer of up to 6.5" frame size with crossover frequency around 1.8-2 kHz. This waveguide is optimsed for the SPK16 reference design which is a 250 mm wide baffle with a large r=50 mm roundover. However, it will work nicely in most cabinets of similar baffle width. Thanks to the box diffraction (aka baffle step) , we get a maximum sensitivity of nearly 97dB at 2 kHz with a smoothly down-sloping response with constant directivity up to about 20 kHz.

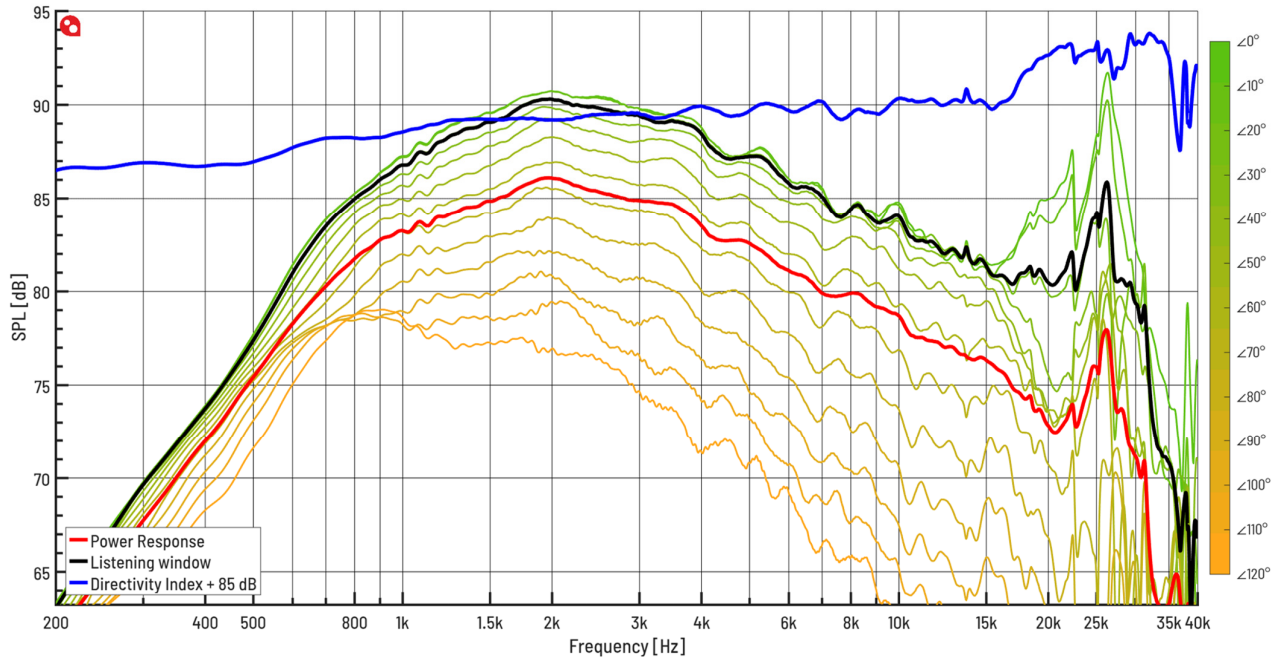


*Figure 14 Horisontal polar response in SPK16, 4pi, 2.5 m, 1/48 oct., **1.41 Vrms** (add 6 dB for 2.83 Vrms), same data as Figure 1 (front page)*

2.2 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 2 kHz (measured in SPK16 in 4pi) 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 for the SPK16 reference design. This filter gives a close to 4th order Linkwitz-Riley acoustic response with a corner frequency of approximately 1.8 kHz combined with attenuation to match the sensitivity of the woofer.

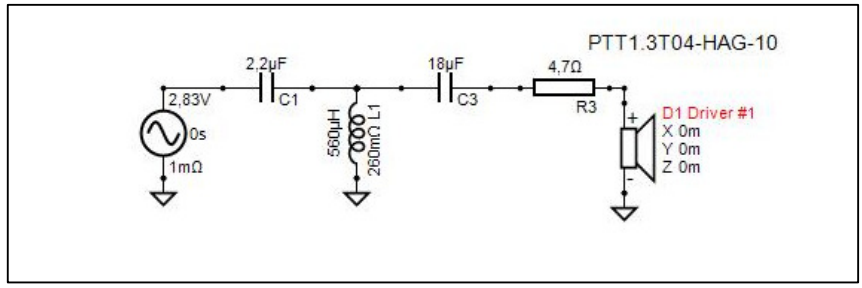


Figure 15 Passive filter for Acoustic 1.8 kHz 4th Order Linkwitz-Riley Response (see SPK16 ref. design)

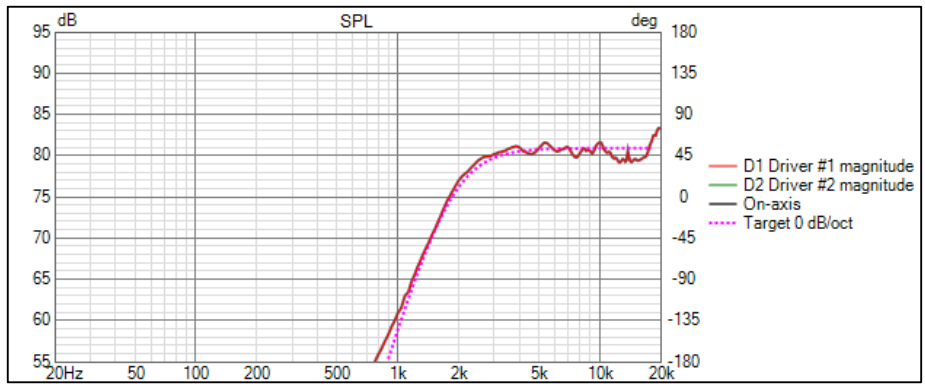


Figure 16 2.83 Vrms Response Graph from Vituix CAD

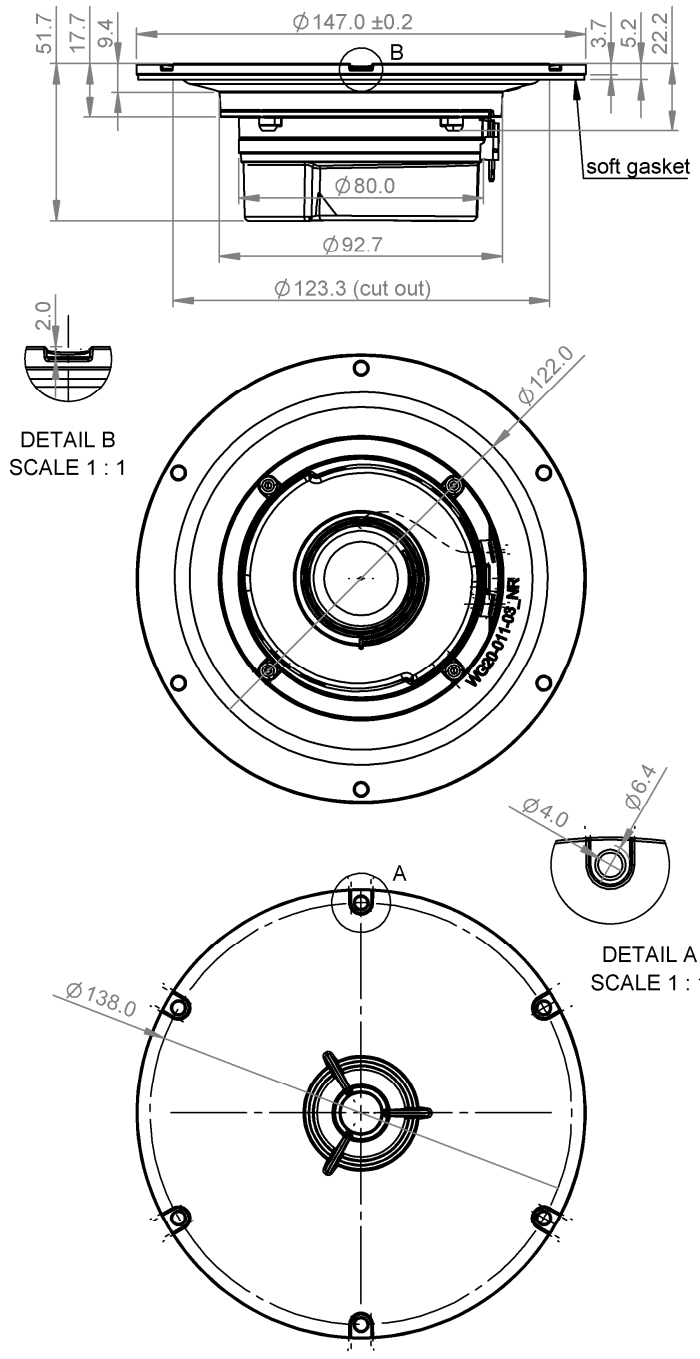
2.3 Dome Cavity Pressure Equalisation

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. 20 Hz 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.

2.4 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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