Neumann KH310A

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The Neumann KH310A is a three-way active speaker comprising a 210mm composite sandwich woofer, a 75mm fabric dome midrange and a 25mm (1-inch) alloy fabric dome tweeter mounted in a compact sealed (infinite baffle) cabinet. The tweeter, which radiates through an elliptical waveguide horn designed to control diffraction and directivity, is mounted above the midrange with the woofer alongside. All the power supply, crossover and power amplifier electronics are built in to the cabinet which has overall dimensions of 383mm wide by 292mm deep by 253mm high and a weight of 13kg.

On the rear panel, alongside a large heatsink with vertical fins, are three equalisation control switches: bass, with settings from 0, -2.5, -5, -7.5dB; low-mid, 0, -1.5, -3, -4.5dB; treble, +1, 0, -1, -2dB, along with switches for output level, 114, 108, 100, 94dB SPL for 0dBu input, ground lift and display brightness. There is also a continuous input gain control (-15 to 0dB), a balanced line XLR input socket and a switched IEC mains socket. These tests were carried out with all equalisation controls set to 0dB. Neumann specifies amplifier power outputs of 70W, 70W and 150W continuous for the treble, mid and bass drivers respectively, which endow the speaker with a claimed maximum short term SPL of 113dB(C) at 1m and a 3% THD limited maximum half-space bass output of 104.5dB SPL at 1m. The crossovers are specified as 4th order with frequencies of 650Hz and 2kHz.

Figure 1 shows the on-axis frequency response and harmonic distortion performance for the KH310A. The response is seen to be remarkably flat and extended, lying between +/-2dB from 35Hz to 20kHz. The low-frequency response is impressive, having a 3rd-order roll-off (sealed box + 1st order high-pass protection filter) with -10dB at around 30Hz. The harmonic distortion performance, measured at a level of 90dB SPL at 1m, is very good with levels of 2nd harmonic below -40dB (1%) at all frequencies above 58Hz and 3rd harmonic above

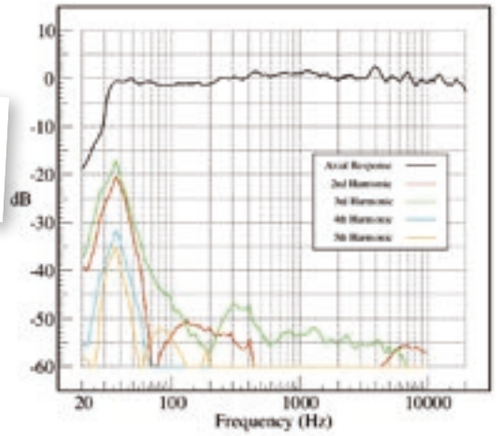

Figure 1. On-axis frequency response and harmonic distortion.

68Hz. The off-axis frequency response is shown in Figures 2 and 3 for the horizontal and vertical planes respectively. The horizontal directivity is well controlled, with only a small amount of mid-range narrowing at the top of the woofer frequency range (550Hz) and a gradual and steady narrowing of coverage angle with increasing frequency. The vertical directivity is similarly well controlled except for the characteristic crossover notch between the mid-range and the tweeter. This notch is, however, shallower than that found in most 2-way speakers and is symmetrical up and down.

The step response, shown in Figure 4, shows good driver time-alignment with the rise in low-mid output occurring about 1.5 milliseconds later than the high frequencies. One advantage of adopting a sealed cabinet design is evident in the acoustic

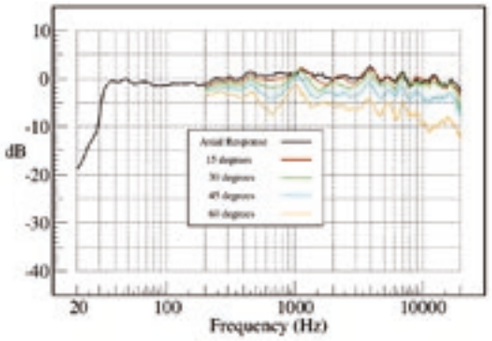

Figure 2. Horizontal directivity.

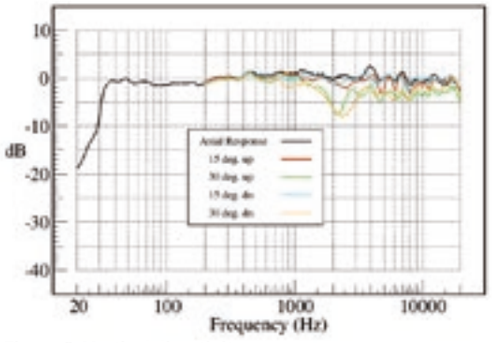

Figure 3. Vertical directivity.

source position (Figure 5). Here, the low frequencies appear to emanate from a position only 2m behind the speaker; this is half of the distance commonly found with ported designs. There is some evidence of a small delay (equivalent to about 30cm in position) in the mid frequency range due to the three-way crossover.

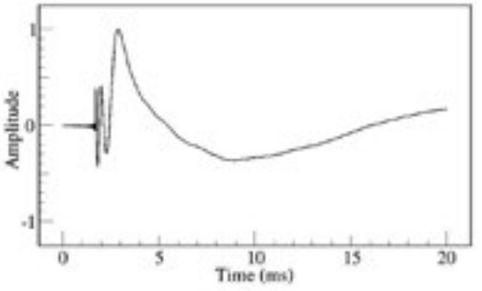

Figure 4. Step response.

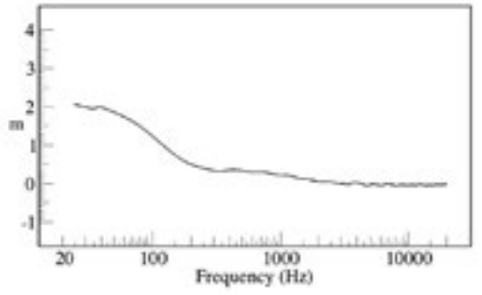

Figure 5. Acoustic source position.

There is very little evidence of echoes or reflections in the power cepstrum, shown in Figure 6 indicating that the smooth, flat frequency response is partly due to a lack of cabinet edge diffraction problems. Somewhat surprisingly, given the low-order low-frequency roll-off, the waterfall plot (Figure 7) shows a slow decay at the very low frequencies. This rate of decay is usually only found in speakers having higher-order roll-offs. The rest of the frequency range decays smoothly except for evidence of a very low level resonance at 1kHz.

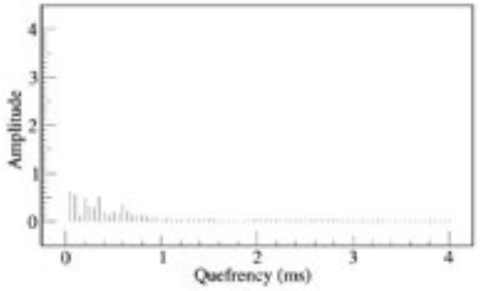

Figure 6. Power cepstrum.

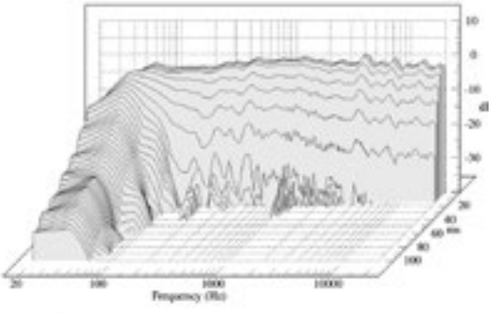

Figure 7. Waterfall plot.

To sum up, the Neumann KH310A is an excellent loudspeaker. The very wide, smooth and flat frequency response and reasonably well behaved time responses, coupled with highly controlled off-axis behaviour mean that it should perform well under a wide variety of conditions.

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