

REVIEWS

NEUMANN KH 80 DSP

Near-field monitor



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Neumann.Berlin has added a further model to its monitor range: the KH 80 DSP, first presented at the NAMM Show in January 2017. A typical near-field monitor, the KH 80 is designed for short monitoring distances in small studios, at PC workstations, in broadcasting vans and on the meter bridge of a mixing console or as a rear or height loudspeaker for multi-channel installations. We examined this studio monitor in the laboratory.

Neumann KH 80 DSP

Ultra-compact near-field studio monitor

BY ANSELM GOERTZ

The KH 80 is the smallest monitor in the Neumann monitor range: its housing has a gross volume of just seven liters and a weight of 3.4 kg. This two-way monitor is equipped with an extremely long-throw 4" woofer and the 25 mm (1") aluminum dome with a large

waveguide obligatory in the KH series. The integrated signal processor indicated by the letters "DSP" in the type designation is totally new for the KH series. All previous models had a completely analog design with the exception of the digital input versions. Now, in

the KH 80, all signal processing stages such as filters, crossovers and protection circuits have been realized digitally. The advantages are obvious: the DSP not only combines many more functions in a very small space – you can configure it much

more easily and rapidly too. The fully automated individual calibration of each individual monitor to a linear target frequency response can be completed in seconds, in contrast to the considerable manual work this used to require. The network capability including the software for central setting and alignment, already a must in many monitors, makes it necessary to have a DSP in the loudspeakers too. The state of the art with regard to A-D and D-A converters as well as DSPs themselves means there are no longer any serious reasons not to use digital signal processing, so it was only logical for Neumann to develop a studio monitor with integrated DSP.

Independently of this, no effort was spared in the rest of the development either. The less you have to correct electronically, the better is the overall result, and it is only natural for this to apply in times of digital corrections of all kinds too. In this regard, the woofer of the KH 80 was produced in a painstaking development process that also covered all the new tools necessary for production. The driver unit and the diaphragm suspension were optimized for maximum linear excursion. Of course, what initially sounds like a typical marketing phrase has its own very special background at Neumann. Markus Wolff, Manager of Development Neumann Studio Monitors at Sennheiser, explained the many individual phases of development in detail and pointed out the measurement results with pride.

COMPONENTS AND ELECTRONICS

The housing of the KH 80 is made of composite polycarbonate and is generously rounded on all sides. When examined independently of its acoustic function, this small monitor comes in anthracite and makes a solid but unspectacular and serious impression. The extensive range of accessories includes various tripod stand adapters, mounting plates and brackets allowing you to set up the KH 80 in any position imaginable. Alternatively, the KH 80 is available in white, for example for use by design-conscious home recorders or at lecterns. The tweeter is equipped with a generously dimensioned waveguide built into the front panel which controls the directivity while also providing an increase in sensitivity, thus combining two advantages. The slight bulges surrounding the waveguide and the woofer prevent annoying reflections from affecting the respective other driver. Neumann developed the waveguides according to the MMD (Mathematically Modeled

Dispersion) method. Here, the waveguide is first optimized in a computer simulation and then produced as a prototype and measured. Finally, if the measurement results are satisfactory, it undergoes a listening test. The advantage of this procedure? It is the quickest way to achieve the aim as it is no longer necessary to laboriously build a large number of prototypes in the optimization phase, and the results can be analyzed beforehand in the simulation.

The electronics is located inside the housing at the rear and is partially visible through the cooling vents. Besides the DSP, two newly developed in-house Class D amplifiers with an output of 120 W and 70 W are to be found here. The crossover between tweeter and woofer is achieved using a steep 8th order phase-corrected filter (48 dB/Oct) at 1.8 kHz. In spite of the FIR filtering, the overall latency of the electronics amounts to negligible 2 ms.

4.5 dB at 280 Hz. The effect of the filters is shown in Fig. 1. Another switch marked "Output Level" has the four settings 94, 100, 108 and 114 dB for the sound pressure level achieved at a distance of 1 m and an input voltage of 0 dBu. Next to it is a trimmer with an adjustable range of 0 to -15 dB in case you want to set intermediate values. Another switch concerns the Auto Standby function and the activation of the future network control, for which there is an RJ45 network socket that is not in use at present. This allows you to integrate the monitor into a normal Ethernet network and then control and align it remotely using an app on a tablet or computer. A delay, eight fully parametric bell filters and one high-shelf and low-shelf filter each are internally available for alignment purposes. The matching app has been announced for early 2018. If you are still missing the obligatory ground lift switch on



Bedienelemente auf der Rückseite mit den Neumann-typischen Funktionen für definierte Pegelwerte und einem in vier Stufen schaltbaren Desktop-Filter

The operating elements at the rear have the functions typical for Neumann: defined level values and a desktop filter which can be switched in four steps.

ALIGNMENT AND OPERATION

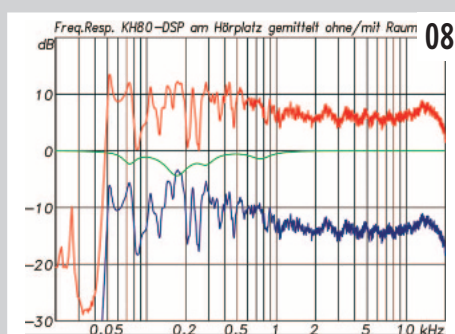
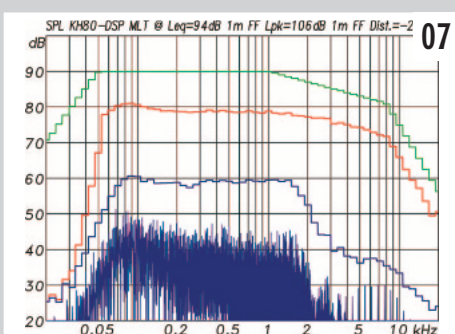
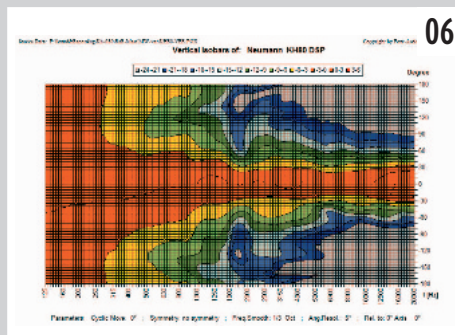
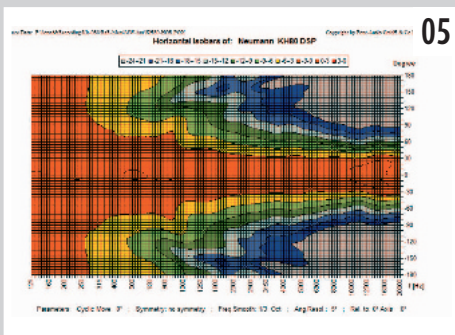
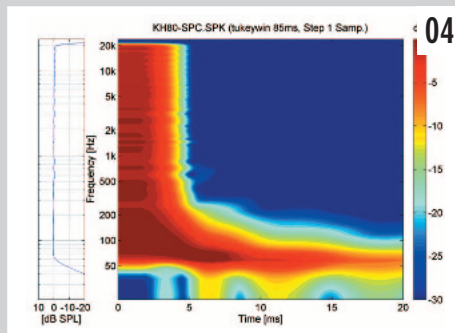
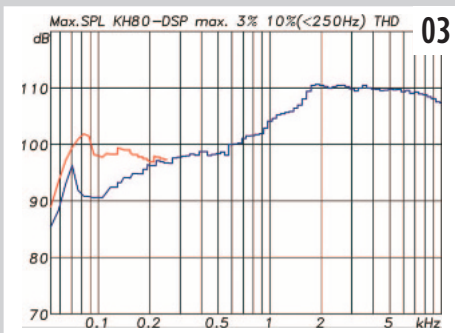
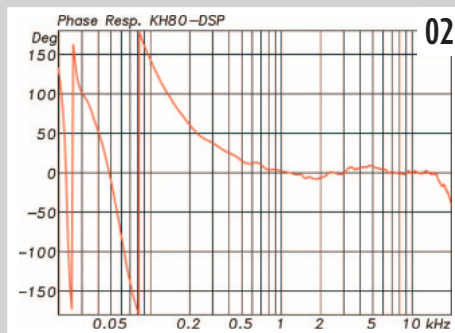
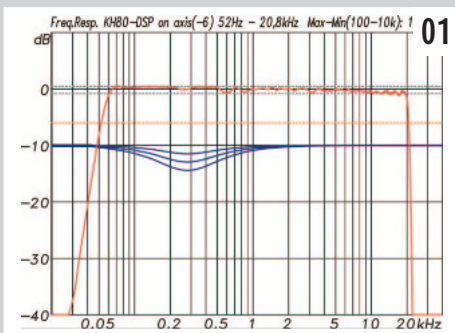
Great care was taken when developing the limiters as there is a thermal limiter with a long time constant for each driver as well as a peak and excursion limiter for the woofer. As soon as one of the limiters is activated, the Neumann logo at the front lights up red. All operating elements are securely engaging easy-to-operate slide switches and are located at the rear. Once you know the functions of the switches, you can identify the current setting without looking by putting your hand behind the box. The "Acoustical Control" switch activates a low-mid desktop filter with four settings and an attenuation of 1.5, 3 or

the KH 80, there's no need to worry about any ground loop hum occurring. The electronics has protective insulation and does not need a protective earth conductor. The power supply is also a wide-range power supply for voltages between 100 and 240 V.

MEASURED VALUES

In the measuring laboratory, the KH 80 showed what is possible today using modern development tools and DSP technology and combining it with the highest possible demands on one's own product. One look at the frequency response shows you just what's going on here: an absolutely linear behavior from 60 Hz to just over 20 kHz within a ± 0.6 dB tolerance band combined with a divergence of 0.23 dB between the monitors. As each monitor is individually calibrated to this curve, you can swap any KH 80 for any other

The following measurements of the frequency response, the dispersion behavior and the distortion values were performed in a measuring laboratory under anechoic conditions. The Class 1 measuring chamber allows measuring distances of up to 8 m and offers free-field conditions upwards of 100 Hz. All measurements are made using a B&K 1/4" 4939 measuring microphone at a sampling rate of 96 kHz and a resolution of 24 bits using the Monkey Forest audio measurement system. Measurements below 100 Hz are performed as combined near-field/far-field measurements.



01 Frequency response measured on the acoustical axis at a distance of 2 m. The orange line shows the frequency response (-6 dB) between 52 Hz and 20.8 kHz. The dashed grey line shows the tolerance range of ± 0.6 dB between 100 Hz and 10 kHz. The three desktop filter curves are offset by -10 dB.#

02 Phase response measured on the acoustical axis at a distance of 2 m. With the exception of the bass range, FIR filtering allows a linear phase response to be achieved.

03 Maximum level based on a distance of 1 m at a maximum distortion of 3 % (blue curve) and a maximum distortion of 10 % (red curve) for the low-frequency range up to 250 Hz.

04 Spectrogram of the KH 80 with a perfect decay behavior

05 Horizontal dispersion behavior shown as isobars. The level fell by 6 dB in comparison with the acoustical axis during the transition from yellow to light green. Above 2 kHz, the opening angle is 100°.

06 Vertical dispersion behavior. Above 2 kHz, the opening angle is 80°.

07 Measurement of the intermodulation distortions using a multitone signal with an EIA-426B spectrum and a crest factor of 12 dB for a maximum distortion content of 10 %. At 1 m in the free field, the level achieved here is 94(91) dB(A) as L_{eq} and 106 dB as L_{pk} .

08 Mean frequency response measurement with 30 positions each for the left and right loudspeaker around the listening position (blue curve). The room EQ derived from it is shown in green and the mean response with EQ is shown in red.

KH 80 without having to ensure that both monitors are pair-matched. The lower corner frequency (-6 dB) of 52 Hz is gratifyingly low for a monitor as compact as this. At the upper end, the limit frequency is 20.8 kHz as a result of the DSP sampling rate of 48 kHz.

Regardless of this, and with the exception of some AMTs (Air Motion Transformers), not many tweeters are in a position to work in a controlled way above 20 kHz. This means that limitation is effective with regard to this aspect too. Things really become interesting

with the phase response in Fig. 2, which shows a largely constant behavior upwards of approx. 300 Hz. The usual phase rotations are compensated for by a short FIR filter. This explains the perfection shown by the KH 80 in the spectrogram in Fig. 4. Not a scrap of

SPECIFICATIONS NEUMANN KH 80 DSP

Frequency response: 50 Hz – 20,8 kHz (–6 dB)

Ripple: 1,2 dB (100 Hz – 10 kHz)

Horizontal opening angle:

110(100) degrees

(–6 dB isobar 1(2) kHz – 10 kHz)

Horizontal standard deviation:

26 degrees (–6 dB isobar 1 kHz – 10 kHz)

Vertical opening angle:

90(80) degrees

(–6 dB isobar 1(2) kHz – 10 kHz)

Vertical standard deviation:

22 degrees (–6 dB isobar 1 kHz – 10 kHz)

Max. SPL:

103 dB (3 % THD 100 Hz – 10 kHz)

Bass capability:

97 dB (10 % THD 50 – 100 Hz)

Max. output level at 1 m (free field) with EIA-

426B signal at full-scale level:

91 dBA L_{eq} and 106 dB peak

Pair deviation:

0,23 dB (max. value 100 Hz – 10 kHz)

Noise level (A-weighted): 20 dBA (10 cm)

Dimensions/Weight:

15,4 x 23,3 x 19,4 cm (W x H x D) / 3,4 kg



The network connection at the rear is intended for future remote functions.

KH 80 DSP Manufacturer/Sales Neumann.Berlin / Sennheiser Sales

Recommended retail price/street price per pair 1,187 euros / approx. 1,000 euros

www.neumann.com

resonance is in evidence here, which is of course no coincidence – again, it has been optimized in detail using meticulous BEM simulations of the drivers, the housing and even the circuit board for the electronics. The isobars in Figs. 5 and 6 show an opening angle of 100x80 degrees. To see the highly uniform lines, you would think a large CD horn was responsible for this value, rather than a compact near-field monitor. The crossover frequency at 1.8 kHz is almost imperceptible. Where the vertical isobars usually show wild interference patterns in the range of the crossover frequency, the steep separation causes nothing but a slight constriction in the KH 80.

Maximum level measurement using sine burst signals (Fig. 3) provides values in the magnitude of 100 dB for the woofer and 110 dB for the tweeter. Both values refer to a distance of 1 m in the free field. The values for the tweeter, the same that is also used in the larger Neumann monitors, are not really surprising, but the 100 dB for the 4" woofer is quite an achievement. Multitone measurement with a spectrum according to EIA-426B and a crest factor of 12 dB (Fig. 7) provides a mean level L_{eq} of 94 dB / 91 dBA and a peak level of 106 dB for the KH 80. Both values match the information given by the manufacturer. Here, too, the values are impressive considering how compact the KH 80 is. In the case of near-field monitors in particular,

you should not forget the self-generated noise level. For the KH 80, this is 20 dBA at a distance of 10 cm from the tweeter. Converted to 1 m, this equals 0 dBA, which is close to the hearing threshold, making it virtually imperceptible.

LISTENING TEST

A typical near-field configuration at a distance of approx. 1.5 m from the listening position was chosen for the listening test. Between the monitors and the listening position, there was a work space with a desk, a keyboard and several computer screens. Prior to the actual listening test, a measurement with 30 averaged positions per loudspeaker was performed and a room EQ set on the basis of it. Fig. 8 shows the measurement and the filter function derived from it. Besides the typical desktop attenuation and a slight weakening of a room mode at 75 Hz, there was not much to be done here. Two KH 310, also from Neumann, were used as reference monitors. It didn't take long for the surprise to come. The KH 80 was absolutely equivalent to the considerably larger KH 310. In terms of sound, no difference could be heard, and with regard to spatial reproduction and source localization, there was a tendency to prefer the KH 80. When the bass got louder or more powerful, the KH 310 was of course able to put its advantages to work, but the capabilities of the KH 80 were still a source of

constant surprise. Contrary to the expectations, thoughts of a subwoofer were far from our minds here.

CONCLUSION

With the KH 80 DSP, Neumann.Berlin has put another studio monitor of the KH series onto the market, and it truly lives up to the great name of Neumann. In all respects, this monitor offers a perfection and love for detail similar to those we know and have come to appreciate in Neumann microphones. In the course of an enormous amount of development work, everything was planned down to the last detail, simulated and measured until the KH 80 was complete. The effort has certainly been more than worthwhile. There is nothing more to add to the perfect measuring results and the similarly convincing result of the listening test. Everything fits and they've got their sums right – that goes for the price too, which is more than reasonable at a recommended retail price of 1,187 euros (RRP) for the pair. We can now wait with much anticipation for the announced remote control and alignment app, which we will present here when the time comes. Front and rear view of the compact KH 80 DSP. ■



Go to www.soundandrecording.de/onlinestories for information on how to read test results.

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Measured values

+++

Sound quality

++

Possible applications

+++

Workmanship and quality

+++

Price-performance ratio