▸▸ NEUMANN.BERLIN

KH 80 ANSWERS

Why is the KH 80 DSP a DSP monitor and what are the advantages and disadvantages?

DSP components have become so cost efficient that they rival analog designs. Additionally, DSP brings many more possibilities for the user in terms of control, flexibility and product performance, especially when combined with a control network. Furthermore, DSP components are now so good that self-generated noise and other audio artifacts are comparable to or better than analog solutions.

Compared to an analog loudspeaker, the only disadvantage of a well-designed DSP system is latency: it takes time for the signal to be converted to digital, pass through the signal processing and then be converted back to an analog signal for the power amplifiers. We have done our best to keep this time short enough that it does not present a problem in practical installations.

Why is there is no ground lift switch on the KH 80 DSP?

The KH 80 DSP has a two-pin mains connection because it is double insulated. As there is no earth pin on the mains connector, there is no possibility for a ground loop to occur, therefore a ground lift switch is not needed. If there is a mains hum, it is due to incorrect wiring of the audio cables and/or a poor quality (not gold plated) ground connection on the connectors. The most common situation in which a mains hum will be heard is when the KH 80 DSP is connected to a laptop.
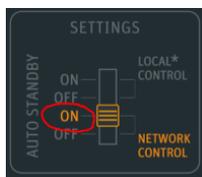
KH80 Stand By

The KH80 goes into standby depending on the applied input level, standby time, the output Gain level settings and the position of the Settings switch on the KH80.

- In back plate mode:

    the standby time is fix to 90 mins, output level is depending on the switch

    settings on the back of the loudspeaker.

    Ensure that standby is switched on at the back plate.

- In network mode:

  the standby time (time until the loudspeaker falls asleep if the input level is below the threshold) can be set individually.

  The threshold (level below the KH80 goes into stand by) can be adjusted individually.

  The output level can be adjusted individually.

  Ensure standby is switched on at the back plate.

Too sensitive stand by behavior:
The loudspeaker doesn't go into standby or wakes up from standby but shouldn't do so.

If the KH80 switches on again or doesn't go into standby a reason for that can be that your source still has some noise or spikes which wake up the loudspeaker again. This can be the reason why one KH80 behaves differently to the other.
To find out if there is noise or spikes which could lead to randomly wake up the loudspeakers try to identify issues following this description:
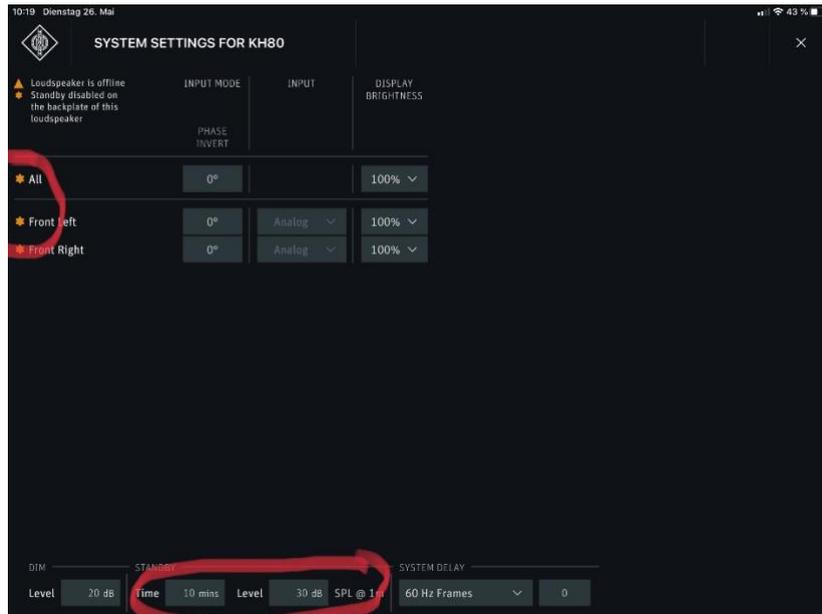
- Switch off the auto std by function to identify the problem
- Set the loudspeaker output level to 114 dB to be able to hear the disturbing signal
- Listen to any spike or record the loudspeaker output with a microphone
- Try to identify if there is any correlation to anything switching off and on in the house (e.g. refrigerator…)

You can test if stand by works if you connect a short XLR cable to the input of the loudspeaker with no further device connected to it.

- In back plate mode:
  Switch the output level of the KH80 to 100 dB SPL. The loudspeaker then should go into standby after 90 mins.

- In network mode:
  - Set the standby time to the desired time
  - set standby level to 30 dB
  - activate standby on back plate (*must be off)

Since the loudspeaker continuously watches the input signal even spikes from the source or induced into the cable could prevent the loudspeaker from going into standby. Ensure that no signal spike from the source or spikes induced into the cabling can let wake up the monitor.

Too insensitive stand by behavior:
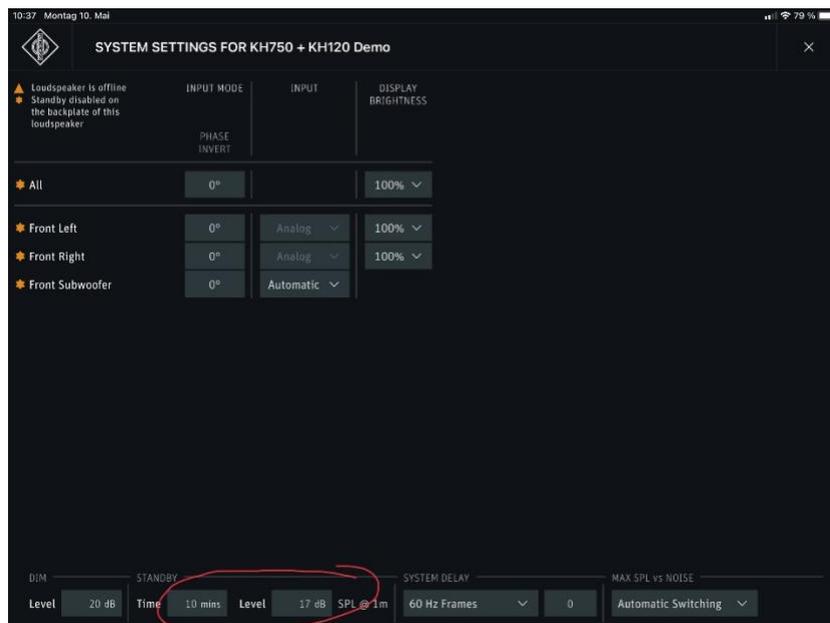The loudspeaker goes into standby or doesn't wake up from standby but should do so.

If the KH80 doesn't wake up from stand by or goes into standby even at reasonable signal level the threshold level stand by is above the signal level.
The reason for that can be that the input and output level at the KH 80 is set to very low level and a quite high source level still leads to very low audible output signal.

- In back plate mode:
  Increase output level of your source or in- and output level of the KH 80s to increase the SPL above the standby threshold.

- In network mode:
  Increase output level of your source or in- and output level of the KH 80s to increase the SPL above the standby threshold.
  - set the standby time to the desired time (for test purposes you can set it to a shorter time)
  - set standby level to a lower level (e.g. 17 dB)
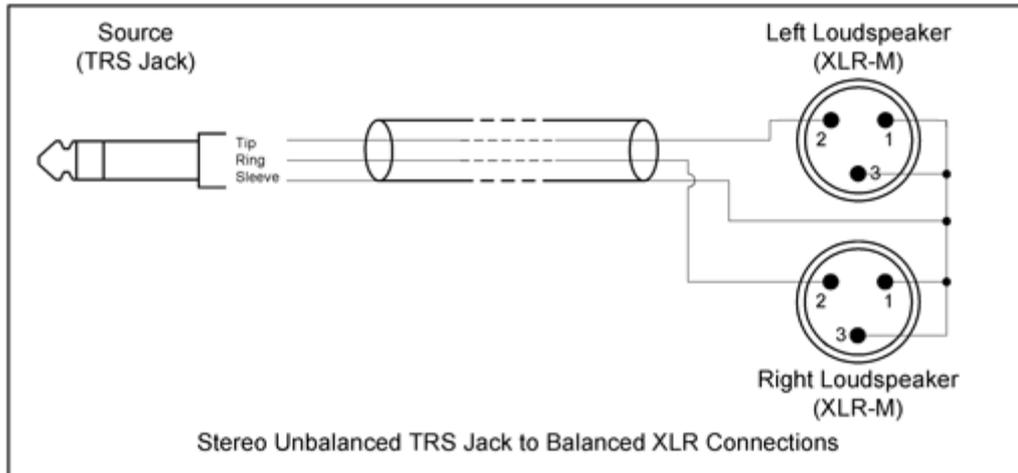 - activate standby on back plate (*must be off)

In general you should keep the gain settings at the monitor as low as possible (e.g. Gain pot max, Output Gain 94 or 100 dB SPL) and the level of your source as high as possible to get to the best S/N ratio and keep induced disturbances as low as possible.

The wakeup signal depends on the level which is connected to pin 2 of the XLR (Tip of the TRS jack) connector. If an unbalanced signal is connected to pin 3 of the XLR connector (ring of the TRS jack) the signal cannot be detected. In this case the signal is also inverted in phase.
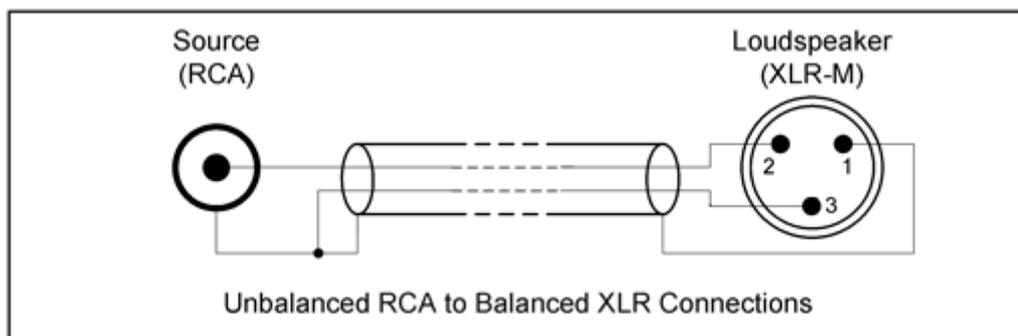Ideally the source should be connected via a balanced XLR to XLR or XLR to TRS jack cable with the loudspeaker. If just an unbalanced source is available, the connection should be done according to the following diagram.

Mini-jack (3.5 mm) or jack (6.3 mm) headphone output from a television or hi-fi system:

Stereo Unbalanced TRS Jack to Balanced XLR Connections

RCA line outputs from a television (if level is adjustable) or **RCA pre-amp outputs from an AV receiver** (one cable is required for each loudspeaker):

Unbalanced RCA to Balanced XLR Connections

To be sure that there are no unreasonable values set for standby it may help to reset the KH 80s. This can be done via this procedure.

To reset the KH 80 DSP internal controls to their factory default values:
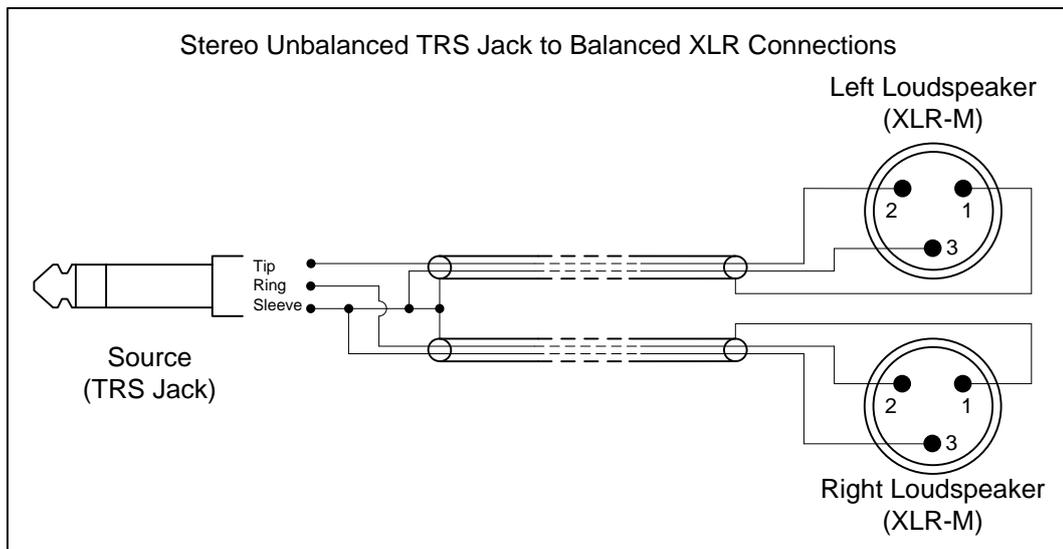- Switch on the KH 80 DSP.
- While the logo is still red indicating boot up move the SETTINGS switch up and down repeatedly until a few seconds after it turned white.
- The logo will then start flutter flash red for a few seconds before reverting to white.

After that is done create a new system with the Neumann.Control app (if it was in use before) to avoid original values are transferred into the loudspeakers again.
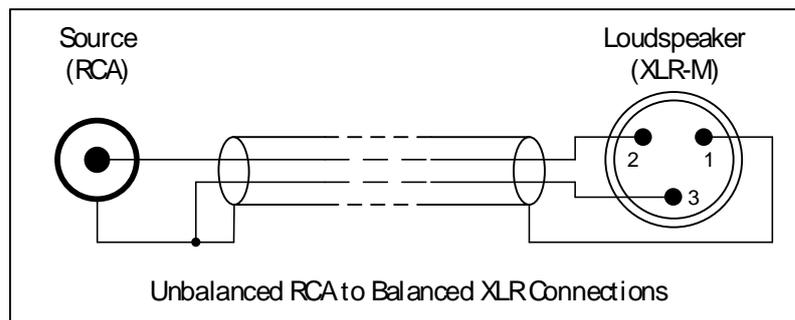
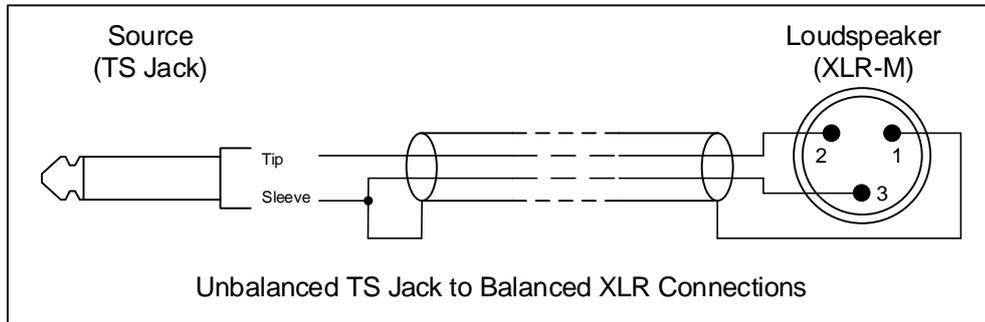**Why does my KH 80 DSP hum when connected to a laptop?**
Audible mains humming when connecting a KH 80 DSP to a laptop is quite common. This is due to incorrect cable wiring and/or poor-quality audio ground connections. Below is the cable wiring diagram that will avoid mains humming. In addition, use gold plated connectors to ensure a good ground connection. Unfortunately, to save money, most commercially available cables are incorrectly wired using a single core cable to each loudspeaker and in many cases, good quality gold plated connectors are not used.

Stereo Unbalanced TRS Jack to Balanced XLR Connections

Left Loudspeaker
(XLR-M)

Tip
Ring
Sleeve

Source
(TRS Jack)

Right Loudspeaker
(XLR-M)

How do I connect the KH 80 DSP to unbalanced outputs?
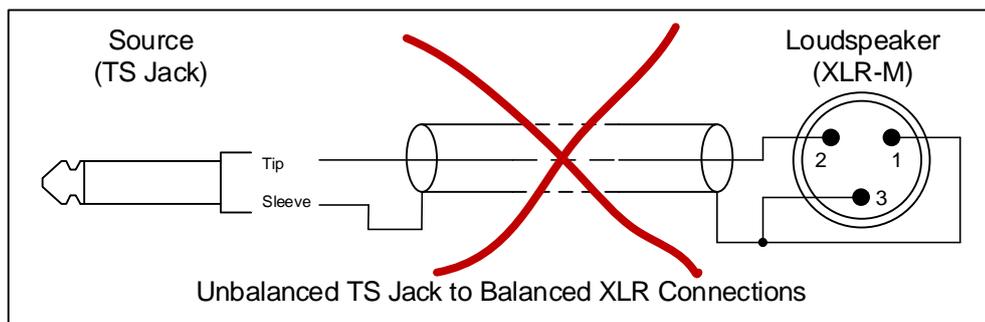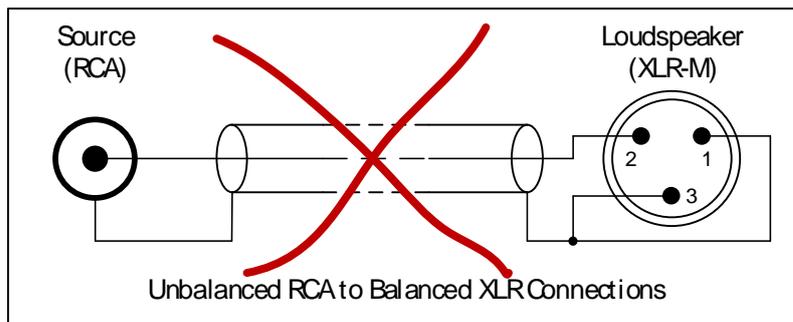It is highly recommended that balanced connections are used whenever possible. Failing that, here are the wiring diagrams for the cables:

Source
(RCA)

Loudspeaker
(XLR-M)

Unbalanced RCA to Balanced XLR Connections

Unbalanced TS Jack to Balanced XLR Connections

As the quality of the ground connection in unbalanced cabling is more important than in proper balanced cabling, gold plated connectors must be used.

Unfortunately, to save on the cost of using two-core cables, many commercially available cables are wired in this way and should not be used:

Unbalanced RCA to Balanced XLR Connections

Unbalanced TS Jack to Balanced XLR Connections

What are the differences between the analog KH 120 and the KH 80 DSP?

Feature	KH 80 DSP	KH 120
Bass driver	4"	5.25"
Magnetic shielding	No	Yes
Amplifiers	120 / 90 W	80 / 80 W
Bass extension (-3 dB)	57 Hz	52 Hz
Max SPL	102.8 dB	105.1 dB
Controller	DSP at 48 kHz	Analog
Crossover	1.8 Hz, 8th order	2.0 Hz, 4th order

Back panel acoustical controls	Low-mid	Bass, Low-mid, Treble
Internal acoustical controls	8 x full parametric IIR + low / high shelf global balance	None
Phase correction	Yes	No
Latency	2 ms or 0.65 ms	0 ms or 0.22 - 1.85 ms in D version
Delay	0 - 70 ms	0 - 409.5 ms (D version only)
Input	XLR/Jack	XLR
Standby function	Yes	No
Max power consumption	180 W	200 W
Size	233 x 154 x 194 mm (7.0 liters)	277 x 182 x 220 mm (9.7 liters)
Weight	3.4 kg	6.4 kg

For most other functions there are no differences or any differences are very small.

Can I use the KH 80 DSP in the same system as analog products?
Yes, but you have to be careful for two reasons:

- The phase response of our analog products is minimum-phase throughout the pass band of the loudspeaker, whereas the phase response of the KH 80 DSP is linear phase above 170 Hz.
- Additionally, DSP systems have latency due to the conversion and the phase correction (2 ms). You can align the KH 120 D, KH 310 D, or KH 420 with a fitted DIM 1 accessory by using the delay feature. If the distances are different, this should also be taken into account: loudspeakers that are closer should be delayed more.

Why is the x-over frequency fix at 80 Hz
Adding a subwoofer to a loudspeaker has a couple of advantages which are:
- Lower cut off frequency (18 Hz, -3 dB)
- More freedom regarding placement
  The directivity of a loudspeaker is quite omnidirectional at low frequencies. This leads to reflections at the front wall which interferes with its direct signal. This interference leads to strong cancelations in the frequency response and should be avoided.

- o Since the lower cutoff frequency of the loudspeaker is increased to 80 Hz, the distance which should be avoided between front wall and loudspeaker is less wide.
  distance to be avoided in full range mode:
  KH 80   0,4 m … 1,5 m
  KH 120   0,4 m … 1,7 m
  KH 310   0,4 m … 2,3 m
  KH 420   0,4 m … 2,9 m
  distance to be avoided in bass managed mode
  KH 80   0,4 m … 1,0 m
  KH 120   0,4 m … 1,0 m
  KH 310   0,4 m … 1,0 m
  KH 420   0,4 m … 1,0 m
  The subwoofer should be placed directly at the front wall
- Higher max SPL
- Less harmonic distortion
- Less intermodulation distortion
- More flexibility with acoustical controls
- Possibility for lateral room mode suppression with subwoofer placement

The x-over frequency between the loudspeakers and the subwoofer has a significant influence on several acoustical parameters.

This is an overview of how a decrease of the x-over frequency influences these parameters

PARAMETER	SYSTEM PERFORMANCE
MAX SPL	drops
GROUP DELAY	increases
LOCALIZATION	decreases
THD	increases
INTERMODULATION DISTORTION	increases

We've carefully chosen a x-over frequency which leads to the best compromise between these advantages and disadvantages of higher and lower x-over frequencies.

As long as the x-over frequency is below the natural cut off frequency of the loudspeaker this relationship is valid for all loudspeakers.
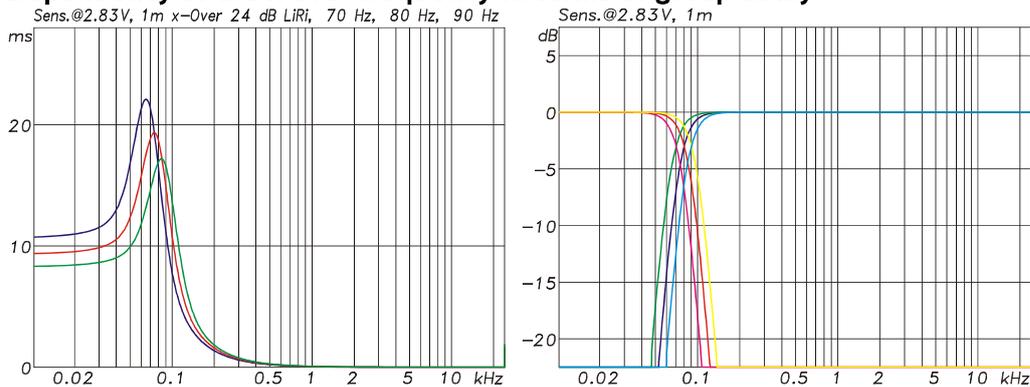
However, depending on the acoustical circumstances inside the room it might be useful to change the x-over frequency. This can for example be the case if the subwoofer stimulates a strong room mode at e.g. 80 Hz while the monitor doesn't. In this case it would help to reduce the x-over frequency.

By having a close look at just some of these relationships users are often inclined to weight these parameters high which then leads to an either increase or decrease of the x-over frequency.
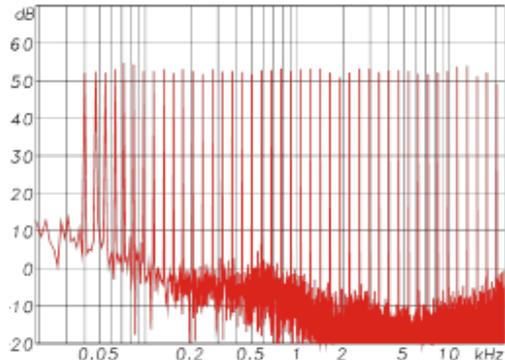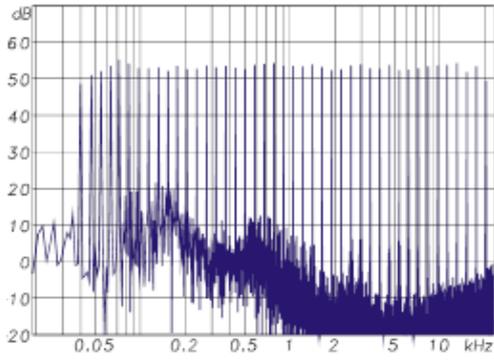
To achieve the best acoustical performance of the system in the by far most conditions we decided to define the x-over frequency at a fixed frequency of 80 Hz knowing that at some rare cases a different frequency may lead to slightly better results.

Dependency of the x-over frequency in terms of group delay

The lower the x-over frequency is the higher the group delay increase is. This leads to a less tight bass impulse.
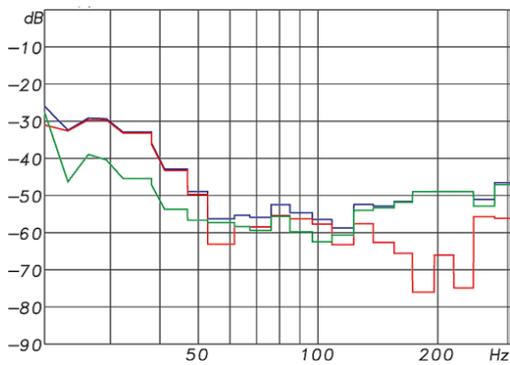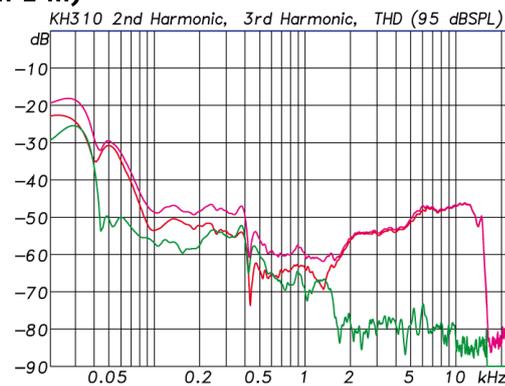
Intermodulation distortion

KH 310 + KH810

KH 310
fullrange

Total harmonic distortion (at 95 dB SPL in 1 m)

KH 810

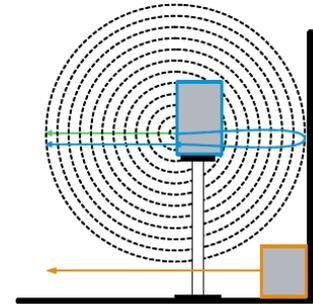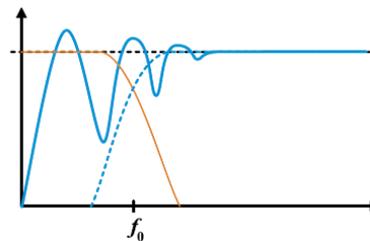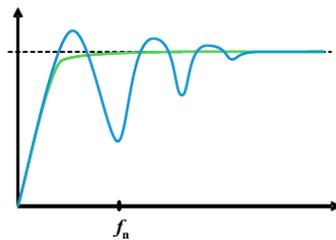KH310 2nd Harmonic, 3rd Harmonic, THD (95 dBSPL)

KH 310

Loudspeaker-Boundary Location

- Low frequency energy from loudspeakers is omni-directional
- Direct sound combines with reflected sound
- Constructive and destructive interference (comb filtering) results
- First notch at ¼λ is the strongest
- Move the loudspeaker and/or add a subwoofer
- Also consider the listening position's distance to the back wall (¼λ)
- Also consider other ½λ cancellations from the side walls, floor and ceiling

Full Range Loudspeakers

Distance from Wall			First Notch
[m]	[ft]	[in]	[Hz]
0.20	0	8	430
0.40	1	4	215
0.60	2	0	143
0.80	2	7	108
1.00	3	3	86
1.20	3	11	72
1.40	4	7	61
1.60	5	3	54
1.80	5	11	48
2.00	6	7	43
2.20	7	3	39
2.40	7	10	36
2.60	8	6	33
2.80	9	2	31
3.00	9	10	29
3.20	10	6	27
3.40	11	2	25
3.60	11	10	24
3.80	12	6	23
4.00	13	1	22

Bass Managed Loudspeakers

Distance from Wall			First Notch
[m]	[ft]	[in]	[Hz]
0.20	0	8	430
0.40	1	4	215
0.60	2	0	143
0.80	2	7	108
1.00	3	3	86
1.20	3	11	72
1.40	4	7	61
1.60	5	3	54
1.80	5	11	48
2.00	6	7	43
2.20	7	3	39
2.40	7	10	36
2.60	8	6	33
2.80	9	2	31
3.00	9	10	29
3.20	10	6	27
3.40	11	2	25
3.60	11	10	24
3.80	12	6	23
4.00	13	1	22

© Georg Neumann GmbH 2010 v2.0

How do I integrate a KH 805 or KH 810 subwoofer with the KH 80 DSP?

Cable the KH 80 DSP in the same way as you would cable any other loudspeaker to the KH 805 or KH 810 – see operating manual for details. Calibrate the KH 80 DSP in whichever way you wish (Automatic Alignment, Guided Alignment, Manual Alignment or using the back-panel switches) and then calibrate the subwoofer in the usual way as described in the operating manual. Compared to an analog loudspeaker such as the KH 120, you will end up with a slightly different phase control setting (probably only 45 degrees different). This is due to the latency of the conversion and signal processing, however the end result will still be good if you follow the instructions properly.

What type of router can I use with Neumann.Control and the KH 80 DSP?

Any standard router should work. The only requirements are:

- Wi-Fi is switched on if Neumann.Control is running on a tablet or if the computer is not connected via an Ethernet cable.
- Device detection must be switched on so that the KH 80 DSP can be found automatically on the network. This function can go under a number of different names, such as MDMS, UPnP, IGmP.

What type of switch can I use with the KH 80 DSP?

There are two types of network switches: managed and unmanaged. Either will work fine. If the network switch can provide "power over Ethernet" (PoE), it is recommended to turn it off.

What type of network cable can I use with the KH 80 DSP?
Any regular network cable will work. Crossover cables can also be used, as the crossover wiring will be automatically accommodated. The data rate is not high (<10 Mb/s) on the network connection so CAT-5 is sufficient. CAT-5e, CAT-6 and higher cables will also work.

What is the enclosure material of the KH 80 DSP?
We have used a polycarbonate composite material for the cabinet as it provides a good balance between these features:

- Ability to make the desired shapes: waveguide, corners, rear panel, internal fixings
- Homogenous (even density) material
- Good acoustic behavior
- Unit cost of parts
- Good handling in manufacturing
- Robust
- Can be recycled