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MONITOR FOR CONTROL ROOMS AND STUDIOS

Meyer Sound Amie

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Meyer Sound monitors for stereo or multichannel listening

Copy and measurements: Anselm Goertz | Images: Meyer Sound

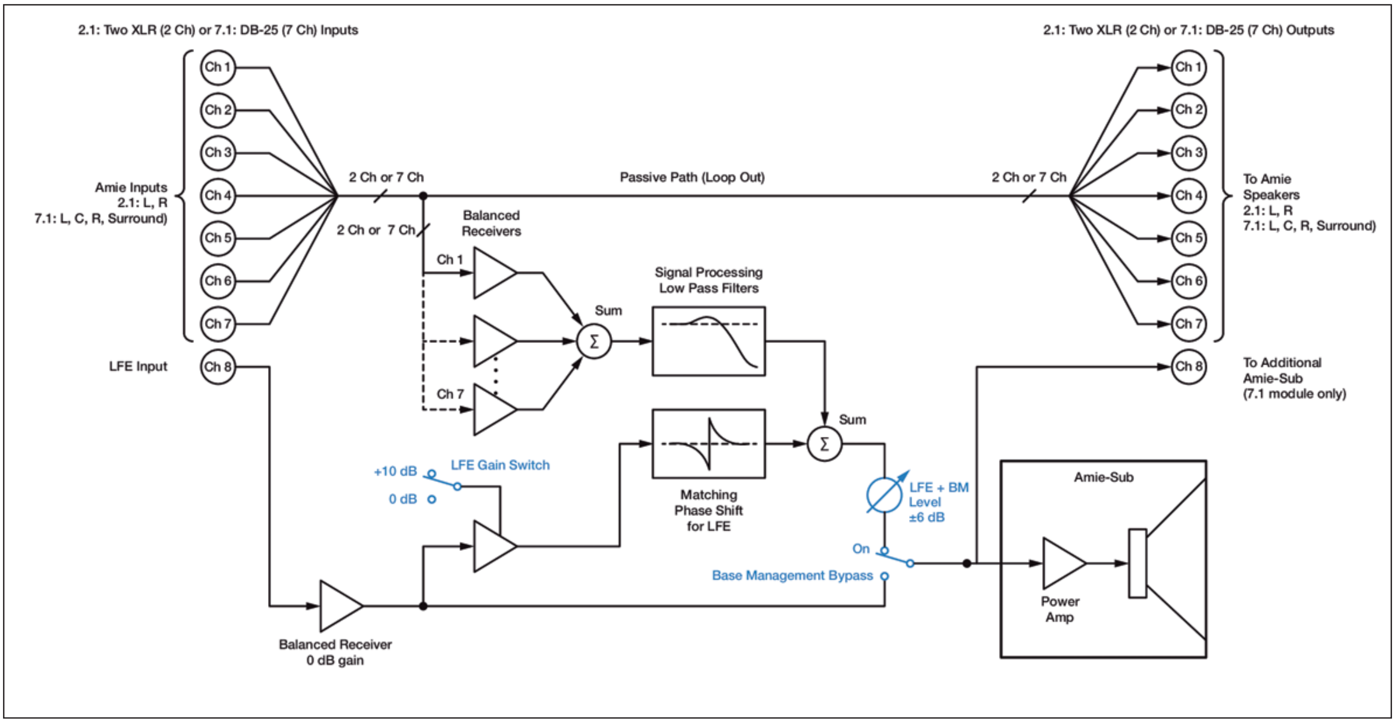
Bass management is already built into the Amie system's subwoofer

With the Amie system, US manufacturer Meyer Sound presents a main & subwoofer combination that can be used as a stereo or multichannel monitor for all configurations from simple 2.0 setups to 7.1 systems. Possible applications range from streaming or film mixing rooms to desk-based workplaces and OB vans and even include ambitious home cinema projects. Of course, nothing stands in the way of using the Amie system for pure music reproduction.

The Amie system consists of the Amie precision studio monitor and the associated Amie-Sub compact subwoofer as well as its two integration input modules for 2.1 or 7.1 systems. The Amie monitor is equipped with a 6.5" woofer and a 1" dome tweeter working on a large waveguide of 80 × 50 degrees. A compression driver was deliberately omitted. The advantages of a higher maximum sound pressure level in combination with a 6.5" woofer could not be exploited, while disadvantages of higher distortion values due to the compression chamber would be created. The situation is quite different when it comes to the waveguide or horn, which is especially important for devices that are used as a studio monitor and enables controlled dispersion over a wide frequency range. At the same time, this does not result in disadvantages. On the contrary, the waveguide even ensures a better adaptation of the tweeter cone to the sound field and a significant increase in on-axis sensitivity. As is the case for all Meyer Sound systems, the Amie is fully self-powered, with two internal Class-D power amps and a DSP system for filter and limiter functions. The same applies to the Amie-Sub, which is designed as a compact bass reflex system with a 15" woofer and also features an integrated Class-D amplifier module.

LFE channel and bass management

Despite its compact construction with dimensions of 229 × 389 × 336 mm, the Amie monitor is designed as a true full-range system with, according to the data sheet, a usable frequency range from 42 Hz to 22 kHz. Especially when it comes to film sound, however, the lowest octave of the audible frequency range of 20-40 Hz is also important, as it is often used in action scenes, where it provides the



Bass management Signal components below 50 Hz and, if present, LFE signals are routed to the subwoofer. There is no explicit high-pass filter for the outputs to the tops. An all-pass filter for phase compliance is included for the LFE way (Fig. 1).

desired emphasis. Film sound uses the LFE channel for this purpose. LFE stands for low frequency effect (Dolby) or low frequency enhancement (DTS). The LFE way can be seen as an additional channel that can be used for effects, but does not per se take over the low-frequency components of the main speakers. The mix in the film therefore first assumes that all main speakers, including the surround systems, are full-range capable. If they do not reach low enough frequencies or if users simply want to reduce their load, the low-frequency components can be filtered out of the respective channels and redirected to the subwoofer with the help of bass management.

Amie-Sub 2.1 module Inputs and link receptacles for the monitors and an LFE input that can be used exclusively or via bass management (Fig. 2)

Amie-Sub

The bass management mentioned above is already built into the Amie system's subwoofer. Using the input modules, the Amie-Sub can be equipped with bass management for 2.1 or up to 7.1 systems. The block diagram in Fig. 1 shows the design of the 7.1 version. The 2.1 version features only two ways plus LFE instead of seven plus LFE. The signals for the front and surround speakers are passed through unprocessed. The Amie monitors do not require any particular high-pass filtering because, as full-range systems, they are already equipped with their own high-pass filter matched to the system. For the subwoofer, the signals from all front and surround speakers are summed in the bass management and then filtered with a low-pass filter. This filter is tuned in such a way that only those components are ex-

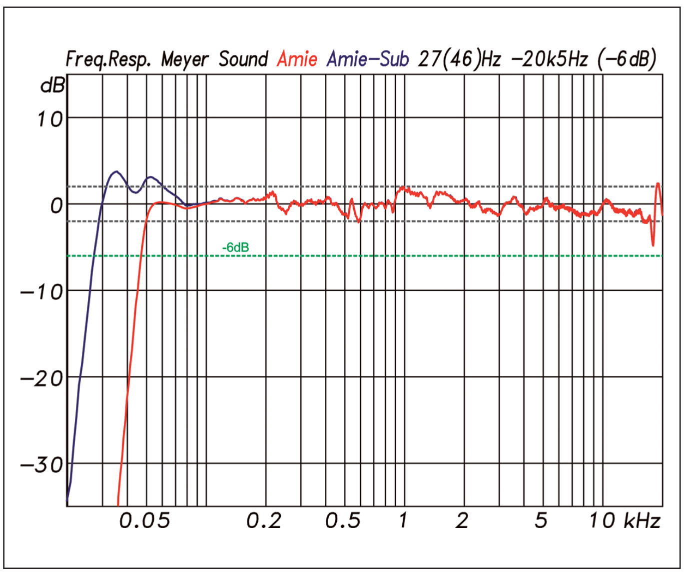
The Amie monitor is equipped with a 6.5” woofer and a 1” dome tweeter working on a large waveguide of 80 × 50 degrees

tracted from the signals that lie below the Amie monitors’ frequency range, which is approximately everything between 25 and 45 Hz. The subwoofer thus acts as a downward extension of the frequency range by one octave. In addition to the front and surround channels’ low-frequency components, the subwoofer also receives the LFE signal, which requires no further filtering and is only adjusted in phase and level.

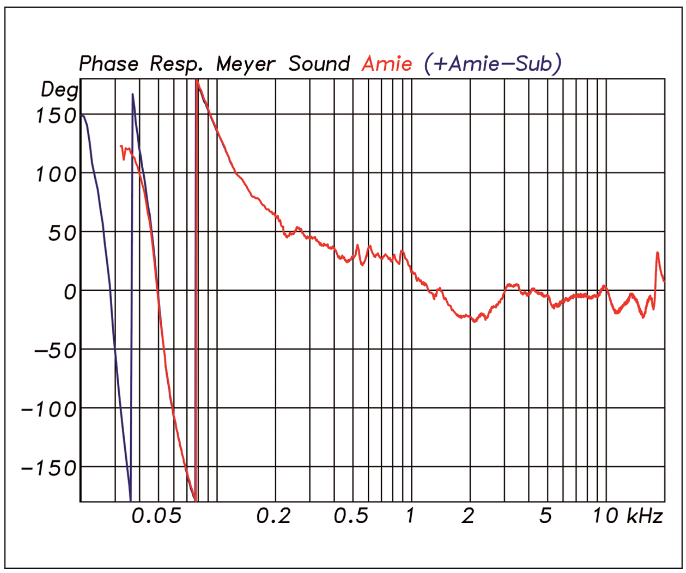
With the help of an all-pass filter, the LFE channel’s fixed phase response matches the other channel’s low-pass filter phase response. The LFE signal can be boosted by 10 dB in case a film sound signal is played back directly, by using the LFE gain switch. Decoders in surround processors or DVD players usually add the 10 dB amplification on their own. In such cases, a 10 dB gain in the subwoofer’s LFE input is not necessary. The subwoofer is also equipped with a potentiometer with a range of ±6 dB for adjusting the level of the summed signal of all channels including the LFE. In the 7.1 version, the subwoofer signal is still made available through an additional output, to which further Amie-Subs can be connected if required. For these, the bass management’s bypass switch would then have to be activated.

Measurements

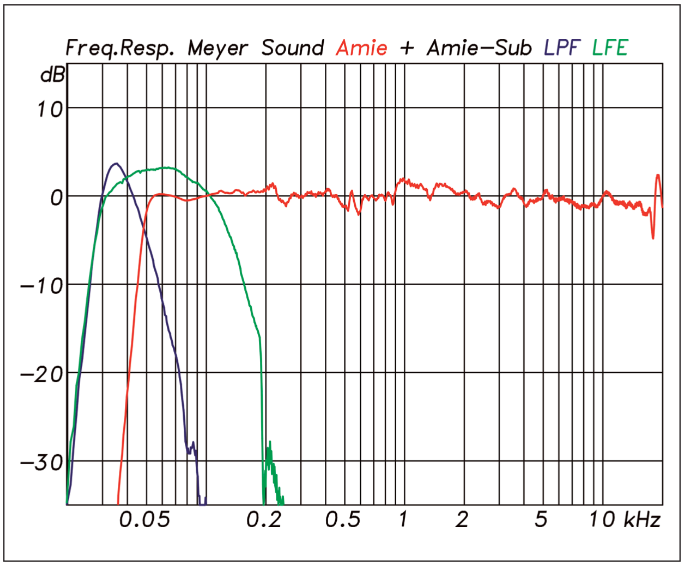
As always, in addition to the functional and listening test, Meyer Sound’s Amie also had to prove itself in our lab. Frequency responses were measured with sweep signals at a distance of 4 m on-axis to the monitor. The result without any further smoothing is shown in Fig. 3. The Amie’s corner frequencies without a subwoofer are 46 Hz at the low end and 20.5 kHz at the high end, when using a 6 dB level drop with respect to the mean level between 100 Hz and 10 kHz as a benchmark. The fluctuations in the unsmoothed fre-



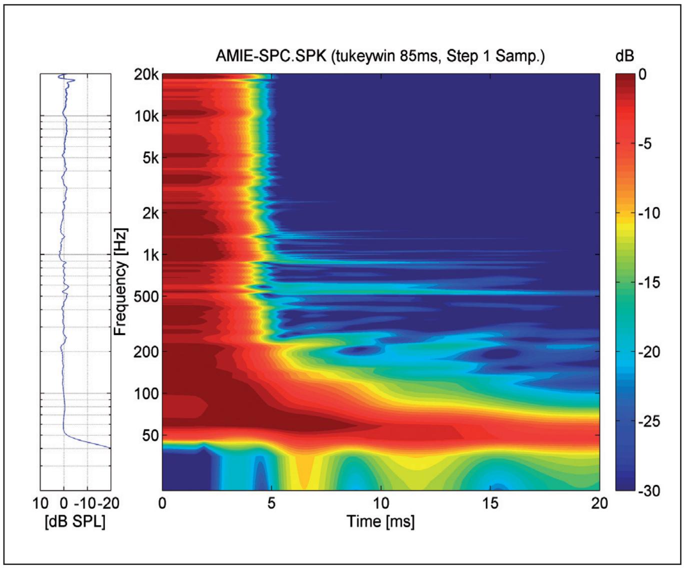
Frequency response Amie monitors (red) and together with the Amie-Sub (blue). The frequency response ranges from 27 (46) Hz to 20.5 kHz (-6 dB, green line). The ripple in the curve is a maximum of ±2 dB (grey lines) when unsmoothed (Fig. 3)



Phase response Amie monitors (red) and together with the Amie-Sub (blue). From approximately 200 Hz upwards, the monitor acts largely in linear phase; at low frequencies, the high-pass behaviour and the coupling to the subwoofer inevitably lead to phase rotations (Fig. 4)



Amie and subwoofer Amie monitor (red) together with the Amie-Sub for low-pass filtered signal components from the main ways (blue) and for the LFE signal (green, Fig. 5)



Spectrogram Amie monitor with only a few, small resonances (Fig. 6)

quency response between 50 Hz and 17.5 kHz amount to only ±2 dB and, without question, demonstrate that the Amie is a high-quality studio monitor. In combination with the subwoofer, there is a slight increase of 2-3 dB in the low frequencies for the 0 dB gain setting. The bottom cut-off frequency at -6 dB with subwoofer lowers to 27 Hz, extending the frequency range downwards by little less than one octave.

The corresponding phase responses can be found in Fig. 4. Above 200 Hz, the phase is largely linear. The transition between tweeter and woofer is not visible in the phase response, which points to the use of FIR filters for the crossover function. At the lower end of the frequency range, the high-pass behaviour and the coupling to the subwoofer inevitably lead to strong phase rotations. Phase linear filters cannot be used here because of the associated latency.

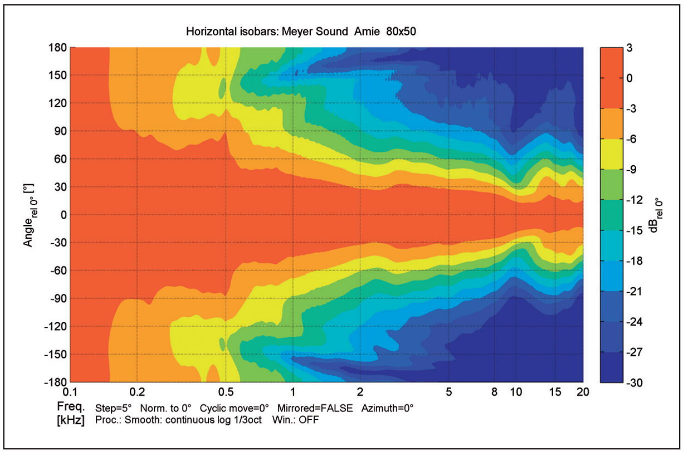
In Fig. 5, the Amie and the corresponding subwoofer are displayed separately. The higher level of the blue curve by approximately 3 dB, presumably by design, corresponds to the 0 dB gain setting and leads to the already discussed slight increase of the lowest frequencies in the combined response. The green curve in Fig. 5 shows how the Amie-Sub reproduces LFE signals. The usable frequency range (±4 dB) for the LFE way ranges from 25 Hz to 145 Hz.

Finally, on the subject of “linear transmission behaviour”, let us take a look at the spectrogram in Fig. 6. The decay behaviour is flawless except for two narrow resonances at 540 Hz and around 1 kHz. The tweeter in particular stands out positively. Here, the design advantages of a dome tweeter and a horn versus a compression driver become apparent.

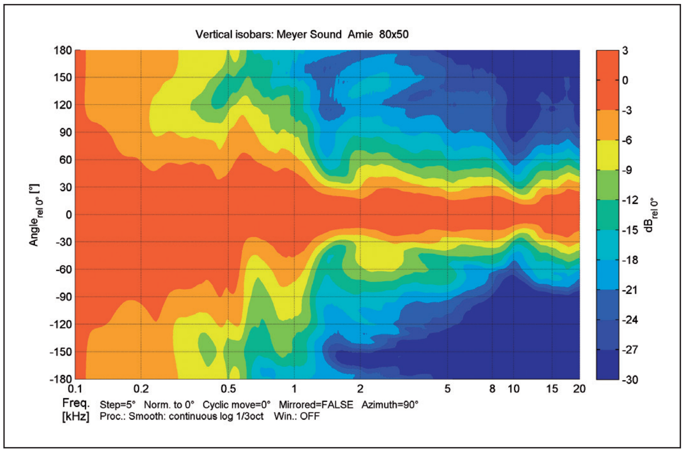
Directivity

If one takes a look at the surround sound forum’s relevant guidelines for monitoring rooms and its auditioning requirements, one will see that they call for avoiding early reflections. To be precise, the recommendation is to reject reflections that are not at least 10 dB weaker than the direct sound within the first 15 ms after its arrival. Early reflections can lead to errors in spatial imaging and source location. Primarily, this constitutes a recommendation for the placement of the loudspeakers and other objects in a room and for possible room acoustic measures to avoid reflections by using absorbers and diffusors. However, there are also boundaries, such as the mixing console surface or a desktop, where reflections cannot be avoided. This is where the monitor’s dispersion behaviour comes into play: it should have a narrow vertical and more or less broad horizontal dispersion angle. Reflections of the mixing console surface are thus reduced, while freedom of movement at the listening position is maintained.

The Amie’s horn is designed in line with these specifications. According to the data sheet, the nominal dispersion



Horizontal isobars The Amie is specified with a nominal dispersion angle of 80°. There is a tendency for the dispersion angle to narrow slightly at high frequencies (Fig. 7).

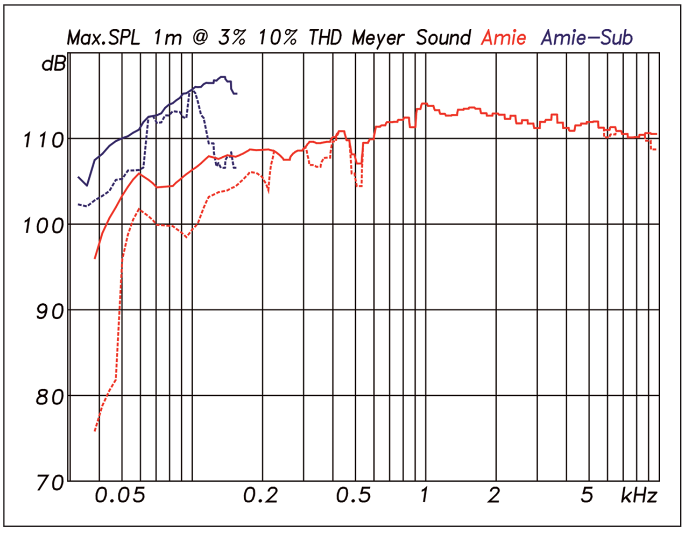


Vertical isobars Meyer Sound specifies a nominal dispersion angle of 50° for the Amie, which is largely maintained from approximately 1.3 kHz upwards (Fig. 8).

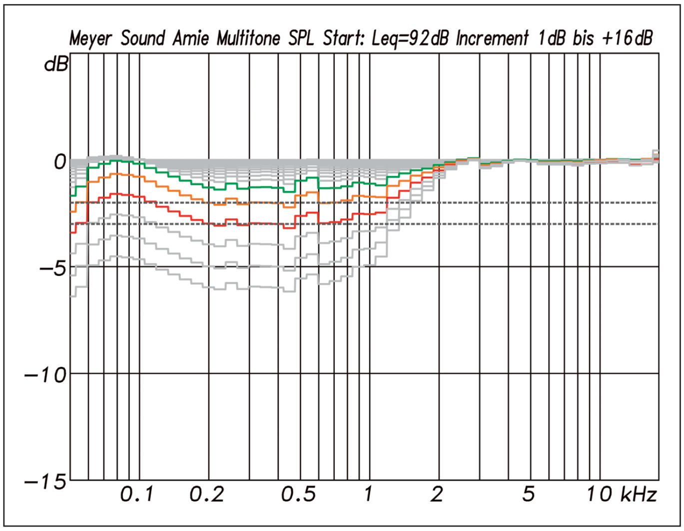
angle is 80 × 50 degrees, which is largely confirmed by a look at the isobaric curves in Figs. 7 and 8. In the vertical, the angle is reached from approximately 1.5 kHz upwards; in the horizontal from approximately 2 kHz upwards. In addition, towards higher frequencies, there are some slight fluctuations in the isobars and a slight increase in horizontal beaming. The latter inevitably occurs when the source itself– in this case, the tweeter dome diaphragm – begins to develop a directivity that is stronger than that of the horn in front of it.

Maximum level

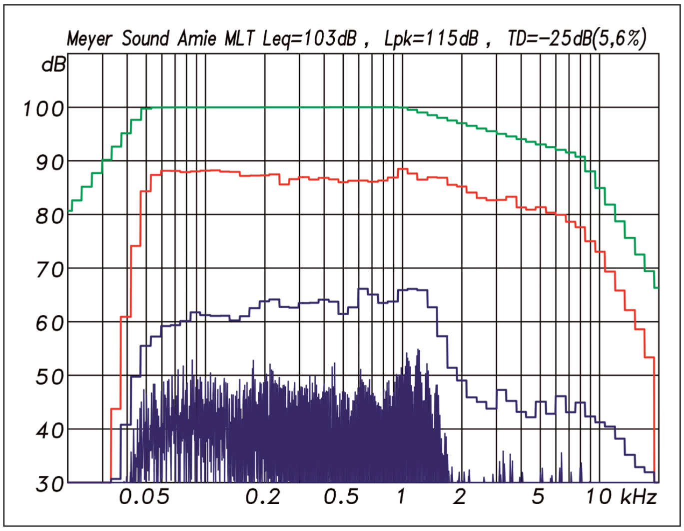
To determine the possible maximum level, measurements with two proven methods were carried out: firstly with 185 ms long sine burst signals and secondly a multitone measurement. In the sine burst measurement, the sine signal's level at a given frequency is increased until a certain distortion percentage, typically 3% or 10%, is reached. The measured sound pressure averaged over the duration of the measurement is documented as the measurement's value. This measurement is carried out over a defined frequency range in frequency steps of 1/12 octaves. This stepped sine wave signal allows for a direct evaluation of the resulting harmonic distortions (THD) via FFT. For the curves in Fig. 9, this type of measurement was carried out separately for an Amie monitor and for the Amie-Sub. The measured values are average levels for the duration of the burst signal, referenced back to 1 m distance. Since the measurement was carried out using a sine signal, the peak level in this case is 3 dB higher. The measurements were taken at a distance of 4 m and then calculated back to 1 m according to the 1/r law (-6 dB per doubling distance). The measured curve for the Amie is exemplary even, without weaknesses or dips. For frequencies where both curves for a maximum of 3% and 10% THD collapse, the level reached a maximum of 3% distortion. The use of the internal limiter prevents higher distortion values that would otherwise be caused by distortion of the drivers or clipping of the power amplifiers. It is only below 200 Hz that the two curves begin to separate, since here, the distortion starts to rise due to



Maximum level for a maximum of 3% (dashed) or 10% THD for the Amie (red) and for the Amie-Sub (blue). The curve of the 10% measurement series is primarily caused by the onset of the limiter rather than reaching the distortion values. Both systems perform at a high level and are free of weaknesses (Fig. 9)



Power compression Measurement of the Amie with multi-sine signals, starting with a time-averaged sound level L_{eq} of 92 dB (0 dB reference). For the further measurements, the input level was increased in steps of 1 dB up to +16 dB. For the woofer, a clear compression starts at +12 dB (yellow curve). For the measurement in Fig. 11, a level setting corresponding to the yellow curve with a compression <2 dB was selected (Fig. 10



Multitone measurement with an EIA-426B spectrum (green curve). The achieved time-averaged sound level L_{eq} is 103 dB, while the peak sound level L_{pk} is 115 dB with -25 dB total distortion (TD = THD+IMD). Both values refer to 1 m distance in free field under full space conditions (4π). The measurement's termination criterion was a signal compression (see Fig. 10) of a maximum of 2 dB (Fig. 11)

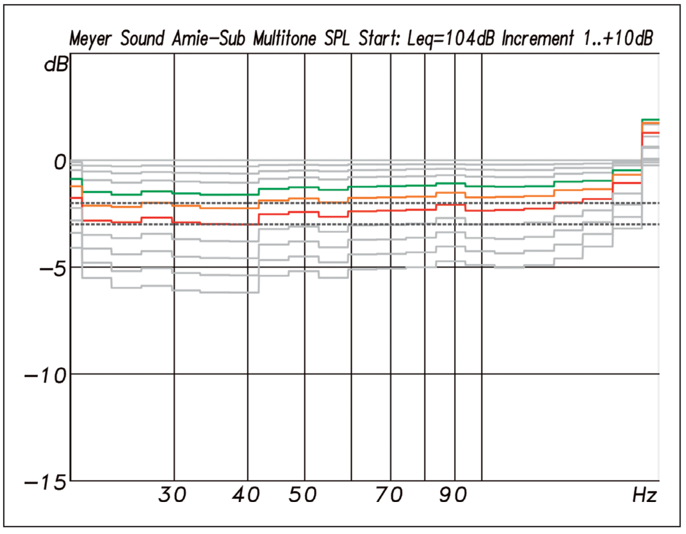
the woofer's increasing cone excursion. Nevertheless, a remarkable average of 105 dB is achieved between 50 and 100 Hz. In its operating range, the Amie-Sub achieves approximately 10 dB higher maximum levels, which would be somewhat oversized in a 1:1 combination. However, it is well suited in combination with two, five or even seven Amies for the front and surround channels.

The second method used to determine the maximum level is the multitone measurement. The measurement signal consists of a 60-tone signal with random phase and a weighting according to EIA-426B. The measurement signal's crest factor synthesised in this way is a practical value of 4 (corresponding to 12 dB). A major advantage of this measurement method is the possibility to measure synchronously and obtain the signal spectrum directly via FFT, from which all newly added distortion components can be easily analysed. This is the case both for total harmonic distortions (THD) as well as for all intermodulation distortions (IMD). The sum of all distortions is then called total distortion (TD). As with the sine burst measurement, a certain distortion value can also be defined as a limit value for the multitone measurement.

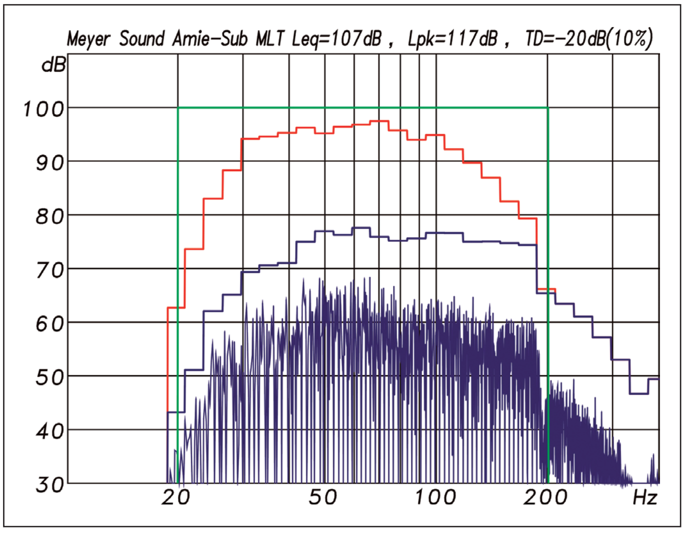
As a second criterion in addition to the distortion components, power compression can also be evaluated with this measurement. To do this, one starts the measurement series with a low level in the speaker's linear operating range, at which no power compression occurs. Starting from this value, the level is then further increased in steps of 1 dB. At some point, the loudspeaker no longer tracks these level increases – either broadband or for individual frequency bands. The limit values for power compression were defined as no more than 2 dB for broadband and no more than 3 dB for individual frequency bands.

Fig. 10 shows the evaluation of the power compression for the Amie monitor. Starting with an average level of 92 dB, the limit for power compression was reached at +12 dB (yellow curve in Fig. 10). The spectra measured in the process are shown in Fig. 11.

The time-averaged sound level L_{eq} measured in this way is 103 dB, while the peak sound level is 115 dB with -25 dB (5.6%) total distortion. Without power compression, a calculated L_{eq} of 104 dB would have been expected, which is reduced by 1 dB over a wide frequency range due to the 2 dB compression. The fact that the evaluation of the power compression in addition to the distortion values makes sense is shown by the fact, when looking only at distortion,



Power compression sub Measurement of the Amie-Sub with multi-sine signals starting with an time-averaged sound level L_{eq} of 104 dB (0 dB reference). For the further measurements, the input level was increased in steps of 1 dB up to +10 dB. For the woofer, a clear compression starts at +5 dB (yellow curve). For the measurement in Fig. 13, a level setting according to the yellow curve with a compression <2 dB was chosen (Fig. 12)



Multitone measurement with a bandpass spectrum of 20-200 Hz (green curve). The achieved time-averaged sound level L_{eq} is 107 dB, while the peak level L_{pk} is 117 dB with -20 dB total distortion (TD = THD+IMD). Both values refer to 1 m distance in free field under full-room conditions (4π). The measurement's termination criterion was a signal compression of a maximum of 2 dB (see Fig. 12). Under half-space conditions (2π), 6 dB higher values are achieved (Fig. 13)

one could have theoretically increased the level further. However, in such a case, only the tweeter's volume would have gone up and the timbre would be completely out of balance.

A comparable measurement with a multitone signal was also carried out with the Amie-Sub. In this case, however, the signal spectrum was chosen as a bandpass spectrum from 20-200 Hz. All 60 sines of the multitone were between 20 Hz and 200 Hz. Here again, the criterion was a broadband power compression of maximum 2 dB according to the yellow curve in Fig. 12. The time-averaged sound level L_{eq} achieved for the Amie-Sub is 107 dB, while the peak sound level L_{pk} is 117 dB at -20 dB total distortion (TD = THD+IMD). Both values refer to a distance of 1 m in free field under full space conditions (4π).

If we summarise the results, the maximum level measurements with a multitone signal yield average levels of 103 dB for the Amie monitor and 107 dB for the Amie-Sub. The measured peak sound levels L_{pk} were 115 dB and 117 dB respectively. For the Amie-Sub it should be noted that the values apply to full space conditions and that 6 dB can be added for installation in half space (floor installation). For the M-Noise test signal, which, with 18 dB has a crest factor that is 6 dB higher, Meyer Sound specifies 120.5 dB as a peak value for the Amie. This fits well with the 115 dB achieved using the signal with a crest factor of 12 dB. For the Amie-Sub, the data sheet specifies a value of 124.5 dB peak under half space conditions for a signal with a crest factor of 11.5 dB. The multitone bandpass signal of 20-200 Hz we used had a crest factor of 10 dB, with which 123 dB were measured for half space. Accordingly, there is also a good match here.

Further measurements

In addition to the measurements and results listed so far, several other important metrics need to be mentioned, especially as we are evaluating a monitor used for film or sound control rooms. These are noise levels, the divergence for a pair of speakers and latency. The latter is a low 2.3 ms for the Amie, which is completely trivial for all use cases. The pair divergence of the two Amie monitors tested was a very low 0.4 dB, which means that even high demands are well met. Judging by these monitors' serial numbers, they are not specially matched pairs, but rather randomly selected from the series. The measured noise level was 10 dBA at a distance of 1 m. Assuming seven monitors are arranged

With the input modules, users can equip the Amie-Sub with suitable bass management for a complete 2.1 configuration

within a radius of 2 m, this results in a total noise level of approximately 13 dBA, which would be barely noticeable in a very quiet environment.

Listening test

Due to practical considerations, the listening test for the Amies took place directly after the measurements in the anechoic room. Those who admonish unrealistic conditions are right on the one hand. On the other hand, the large anechoic chamber is absolutely neutral, reproducible at any time and a very tough test, especially for studio monitors (and speakers from the consumer sector), as there is no supporting diffuse field. At equivalent listening levels, the speakers also reach their limits a lot faster. All the more pleasant was the surprise that the Amies had no problems at all playing at higher levels even under these conditions. In addition, even without the subwoofer, the reproduction was already so powerful and deep that we first had to make sure that the sub was not in operation. Differences with or without sub were only noticeable when explicitly listening to very low frequency material such as Kraftwerk's album "Tour de France". Regardless of the combination with or without the Amie-Sub, the reproduction was very nicely neutral, highly dynamic and always pleasant. A good yardstick for a listening test is its duration: if you make it all the way through all of the reference tracks, the result is mostly better than usual. But if, after the usual tracks and samples, you start playing other tracks and if this takes longer and longer, as it did with the Amie, then the loudspeaker is not only good, but it has that certain je ne sais quoi.

Summary

Our conclusion can be summarised quite briefly: With the Amie system, Meyer Sound has achieved a great success. The system features small, compact monitors with very good measured values and excellent results in the listening test that leave virtually nothing to be desired. Thanks to consistent high sound levels and extreme dynamic reproduction, the Amies can be recommended without reservation for streaming or film control rooms, sound studios, sophisticated home cinemas and much more. If you are looking for good and dynamic hi-fi speakers, you should also take a closer look and listen to the Amies. ■