Reprint from PROSOUND Nr. 6/2005

Flat-four

New compact floor-monitor Outline H.A.R.D. 45

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Although there is of course a certain range of variation in the design and the construction details of floor monitors, they nevertheless come as old acquaintances most of the time. The majority of constructions use - according to the respective low frequency requirements - 12" or 15" low-mid-speakers along with horn-loaded compression drivers. For high-SPL demands there are also designs using two cone speakers. However, these are considerably more rare because for most applications floor monitors should be audible but not visible, if at all possible. With conventional constructions, the range of design compromises is rather narrow: Small and flat means shorter or generally smaller horns and less cone area for the low-mid-speaker. By presenting their newest addition to their floor-monitor range, the H.A.R.D. 45, the Italian loudspeaker manufacturer Outline shows that also a totally different approach is possible.

Unpacking the unit, the H.A.R.D. 45 turns out to be really compact, handy and lightweight for a floor monitor with a built-in power amplifier. At first sight one presumes a high-frequency unit consisting of a tweeter and a waveguide, because a regular horn with compression driver would either not fit into the case or would inevitably be too small to exhibit considerable directivity within the speech frequency range.

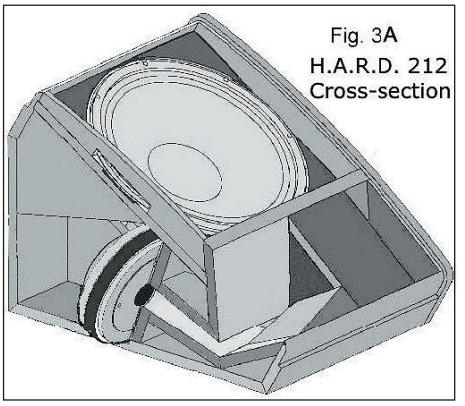
A second glance unveils two interesting details. First: This monitor uses not only one, but no less than four cone speakers. Second: The horn mouth is located at the bottom.
„? ... but it can't work that way!" one is lead to think at first. Then it becomes clear: What we have at hand here, is an artfully folded horn which partly also uses the case walls as part of the horn contour and hence has the maximum size possible with the given case size. Outline calls this horn „single Parabolic Reflective Wave Guide", which relates to the fact that we do not deal with a regular CD horn here. Good idea, but it also has to work in practice. More about this later.

The four 5"-low-mid-chassis make up a clever design trick, because they have a lower construction depth than e.g. a customary 12"-chassis. However, four such 5"-drivers have the same membrane surface like a 10"-chassis, and if the developer selects the proper ones, they can develop as much output like a 12"- or even a 15"-loudspeaker in the speech range (above 150Hz). Making use of modern loudspeaker technology, no fundamental problems are to be expected here. By the way, the 5"-drivers used in the H.A.R.D. 45 are old acquaintances - they are also used in the Micra II monitor (see review in PROSOUND 2/05).

Directivity of the four-speaker-array

The lower construction depth of the 5"-speakers frees some space which the Outline developers have used to accommodate the 1"-compression driver there without having to increase the construction depth of the box for that purpose. Using the „normal", steeper of the two angles of attack available, the H.A.R.D. 45 is actually very flat and therefore might also be suitable for critical applications, like for example TV-shows or similar TV-events where nothing perturbing is expected to appear in the picture.
Another interesting feature of the H.A.R.D. 45 is the fact that it is an active loudspeaker. So, a built-in amplifier should be expected to be found.

The Horn uses a parabolic reflector and a wide diffraction slot which acts like a large ribbon tweeter. The basic construction of this waveguide is shown in the illustration below using the H.A.R.D 212 monitor as an example.



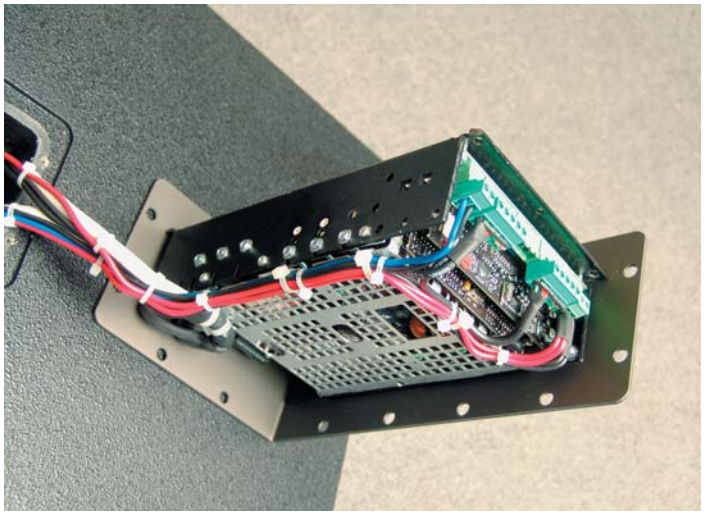
Cross-section of the H.A.R.D 212 (Src.: Outline)

At first sight, that is not as easy as expected because it seems that there is no power supply connector, no power-switch, no level control and no indicator lamps on the H.A.R.D. 45. Indeed: The putative Speakon socket at the right side of the case is in fact a Powercon - the mains connection. It has a counterpart on the other side that is used to forward the electricity supply to the next monitor. Examining the monitor more carefully one finds a female and a male XLR connector in the narrow front edge of the monitor for receiving and forwarding the audio signal.

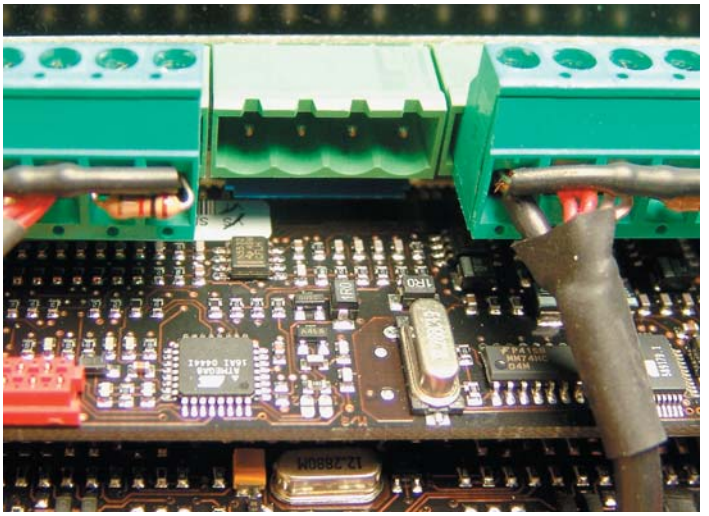
Operating instructions were not included with our H.A.R.D. 45. This means: Everything must function intuitively, exactly as expected by the average user. When first powering up the unit, it turns out that this is exactly the case.

When the Powercon connector is plugged in, the built-in amplifier powers up and lets the user know by a quite soft click after some seconds that now the internal loudspeakers are connected and the monitor is ready for use. Because there is no level control (accessible from the outside), the amplifier always works with it's preset nominal gain. This also means that for safety's sake one should have made all necessary connections and also have switched on the signal source (e.g. a mixing-console) prior to turning on the monitor, in order to avoid any power-on or plugging noises to be audible through the H.A.R.D. 45.

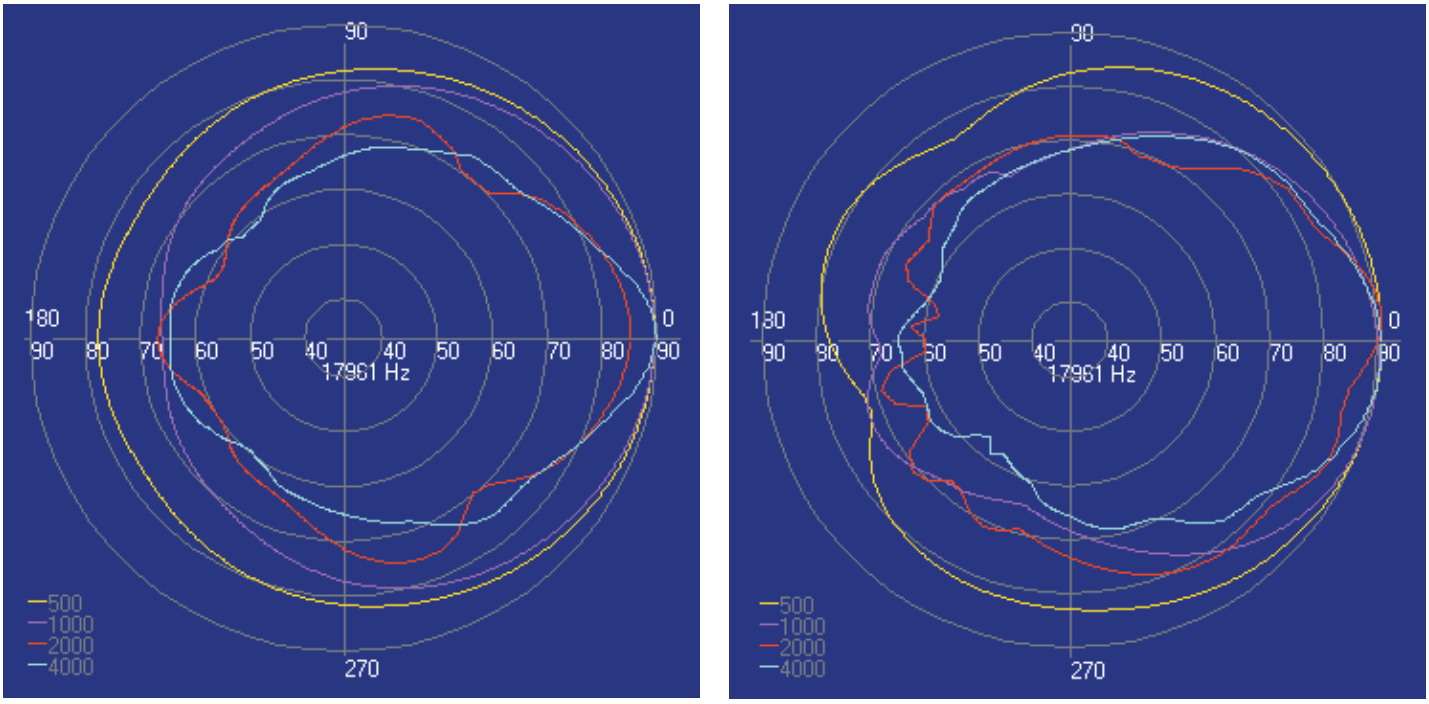
The built-in amplifier works without external heat-sinks or even forced ventila-



Power amplifier electronics including heatsink/mounting plate



Detail of the audio board with microcontroller and DSP



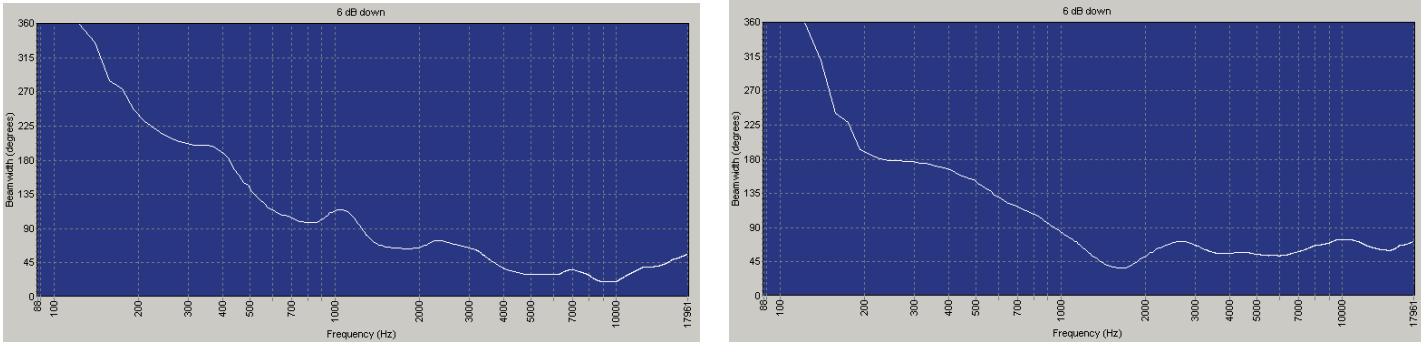
The polar diagrams (left: horizontal, right: vertikal) show a very defined directivity of the H.A.R.D 45.

tion. The bent aluminum monting plate is sufficient as a heat-sink, because the Class-D amplifiers (vulgo: digital amplifiers), which are meanwhile increasingly used in active loudspeakers, produce very little heat thanks to their high efficiency.

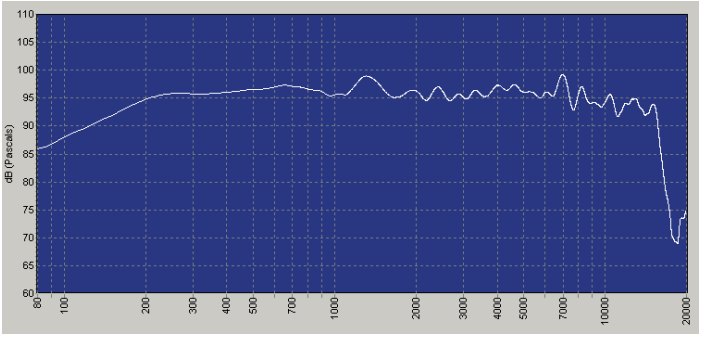
That way, the whole monitor presents itself as being a really uncomplicated device - almost like a passive monitor. Using the recessed handles on both sides one can carry the monitor quite comfortably. Thanks to the prismatic bevelled rear corners the Powercon connectors are easily accessible - the same holds true for the XLR connectors for signal wiring. The loudspeaker grid turns out to be unexpectedly impact-proof - it is not only made of perforated sheet metal with ample thickness, but it is additionally supported by wooden strips at several places across the whole width of the box .

Sound

When - as usual - first listening to the monitor before carrying out any measurements, immediately the hearing impression „clear and direct“ arises. The H.A.R.D. 45 especially places voices audibly into the the foreground without achieving this by means of audible coloration or distortion. This sounds a little bit like a known experience from horn-loaded midrange speakers - only not as distinctively. My first guess was that this was caused by a certain degree of presence accentuation that is not always perceived as such in the first moment.
The measurement results teach me of a better: The H.A.R.D. 45 is almost alarmingly neutral, in particular without any signs of treble accentuation. This is a positive surprise because the monitor‘s ability of getting through is apparently „real“ and is not achieved by tricks. It also reminds me of my first notion regarding a comparison with a horn-loaded midrange.



The course of the horizontal (left) and vertical (right) beamwidth shows that the waveguide works flawlessly and also the 4-driver-array of the 5"-chassis adds positively to the monitor's directivity.



The frequency response ist surprisingly linear.

I presume that the Outline developers achieve this by the operation of 5“-chassis which perform substantially better in the midrange than 12“- or even 15“-speakers. The 5“-Neodymium-chassis used in the H.A.R.D. 45 have a diaphragm diameter of 95mm. According to the rule of thumb for the piston frequency - „circumference equals wavelength“ - it follows that these chassis still work piston-like up to a frequency of approx. 1140 Hz without cone-breakup. The horn-loaded driver already takes over only about half an octave above that, so that the midrange is covered almost without the compromises usually associated with (non-hornloaded) cone drivers.
The polar diagrams and beamwidth measurements show that - in spite of it‘s seemingly complicated construction - the Parabolic Reflective Waveguide works immaculately.

Summary

Real innovations are seldomly found - especially with floor monitors. That‘s also because the conditions of use are relatively fixed and clearly determined, so that also the developers have little elbowroom. It is even more interesting, when a monitor like the H.A.R.D. 45 is on the test bench (or should I write: „before the feet“?), where several construction details immediately strike one‘s eyes. On top of everything, all these work well in co-operation, so that there is nothing to complain about a price of 2,950 EUR excluding VAT.

Technical Data H.A.R.D. 45

Frequency Response	50Hz ÷ 15.5kHz		(-10 dB)
	58Hz ÷ 15kHz		(±3 dB)
Average Dispersion	70° x 80°	500 Hz ÷ 10kHz	(HxV)
	80° x 88°	500 Hz ÷ 4kHz	(HxV)
	45° x 70°	> 5 kHz	(HxV)
Impedance (ohms)	Low (min)	4	(3.0 @ 407Hz)
	Hi (min)	8	(7.6 @ 3.2kHz)
Max Sensitivity (dBSPL 1W 1m)	Low	95	(Full-space)
		98	(Half-space)
	Hi	108	
Max Output Level (calculated)	Cont.	125	(Full-range, Half-space)
Amplifier Power - Watt RMS	Low	500 W @ 4 ohms	
	Hi	250 W @ 8 ohms	
Loudspeakers and Loading	LF	4x5“ NdFeB	
		High pass vented box	
	HF	1x1“ Exit (1.75“ diaphragm)	
		S.P.R.W.G.	
		Folded Wave Guide loaded	

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