Barefoot MM35 Gen 2

Three-way Active Monitors

Nearfield monitors are usually a compromise — but not in the case of these impressive three-ways from Barefoot Sound.

PHIL WARD

US company Barefoot Sound are relatively recent entrants to the studio monitor business, but have already made an impression with their innovative and technology-driven approach to active monitor design. Over the company's life their products have collected an impressive list of celebrity endorsements, with engineers such as Bob Ezrin, Junior Sanchez and Butch Vig not shy with their enthusiastic opinions.

Out and about, however, and especially in the UK, you don't see Barefoot monitors perhaps as often as might be expected given their growing reputation. There's probably just the one reason for that: they are expensive. So the first thing you need to know is that the subject of this review, the MicroMain 35 Gen 2 (to be known in these pages simply as the MM35), will set you back a not inconsiderable £6360 per pair. Now, on the one hand, six grand is the sort of sum that will commonly result in a sharp

Barefoot MM35 Gen 2
£6360

PROS
- Very wide bandwidth with accurate time-domain performance in a compact enclosure.
- Very high-quality drivers that genuinely deliver the goods.
- One of the most technically impressive monitors, of any type, that money can buy.

CONS
- Technology and quality like this doesn't come cheap.
- They're heavy and bigger than you might expect.
- MEME technology works, but is it actually useful?

SUMMARY
They may be expensive, but they're worth every penny.

intake of breath, but on the other hand, it could be argued that monitors are the most important piece of gear in any recording environment, so really ought to have significant cash thrown at them: assuming the cash actually results in the necessary performance. That's certainly what I tend to think. However, the pages of this very magazine are, month on month, full of references to active nearfield monitors that can be had for significantly less than a 10th of the price of the MM35s. So, before I get to the review, I'm going to kick-off by musing on what might make them worth the price of a very good holiday, or at least 10 pairs of budget active monitors (I'll take the holiday, thanks).

Monitoring Economics

It really isn't rocket science, these enlightened days, to bring to the market an active nearfield monitor that reaches a basically competent level of performance at an entry-level price. Given a big wad of cash, you or I, or any pro-audio distribution or manufacturing company, could buy a container load or two of near-generic product with 'our' logo attached from one of many Far Eastern OEM manufacturers. We *SOS* readers could maybe even crowd-fund the purchase of a batch of, say, 1000 pairs of active nearfields to get them even cheaper than we could through traditional channels. If we specified and selected carefully, the monitors might even be pretty good value for money. It seems to me, however, that there really wouldn't be much point, because one of the first lessons you learn in speaker design is that if you want to push the limits of electro-acoustic performance (and if we clubbed together to buy a batch of nearfields we'd want them to be really special, right?), you need to spend some serious money on the bits that actually make the noise — the drivers in particular. Ordinary, cheap-as-chips, generic drivers — the kind of thing often found in inexpensive monitors — will likely result in no better than ordinary performance.

Before getting back on piste and describing the MM35, however, I'll offer you one example of why I believe that's so. All speakers compress the audio signal to some degree, and the more economically built their drivers, the greater that compression is likely to be. Traditional moving-coil speakers are typically under three percent efficient at turning electrical power into acoustic power, and the 'missing' 97 percent is converted into heat. If that heat isn't carried away from the voice-coil heart of a driver, the voice coil's electrical resistance will rise and the driver's acoustic output will fall. It's not unheard of, with an inexpensive driver that's being driven hard, for the voice-coil resistance to double, which, all other things being equal, will result in 6dB of compression (with really slow attack and release times).

The only effective options for getting the heat away from the voice-coil, or making it inherently less prone to thermal compression, are to get some significant chunks of metal around it or to make it bigger. Both options are expensive and come with all sorts of similarly expensive knock-on implications. So, at its elevated »

price, the first enquiry to make of the MM35 is to ask if a good proportion of the cash has been spent on the noisy bits. The answer is an unequivocal yes, so let's take a look at why this is in the case of the MM35.

Big Footprint

The first thing I discovered about the MM35 was that it is bigger than I'd imagined. When the delivery driver went back to his van for the second box I thought for a moment that there'd been a mistake and I was getting two pairs (I would have owned-up, honest). But no, a pair of MM35s comes in two, heavy, boxes. The source of my mistaken assumption was that I hadn't appreciated just how deep the cabinets are. The overall dimensions are 248 x 362 x 442 mm (WHD), and while the height and width are reasonably typical of compact nearfield monitors, that 442mm depth is pretty huge and could well be an issue if they are to be shelf mounted. The shelves either side of my workstation did in fact need some modification before I was happy perching £3000's worth on monitor on each. And the modification didn't just involve making them deeper; they got some extra bracing too because, as well as being deep, the the MM35s are a not insignificant 20kg each.

The weight and depth the MM35 have at their root a fundamental technical difference between this and the vast majority of compact active nearfield monitors: the MM35s are built around a three-way acoustic system. Where compact active nearfields are typically two-way systems incorporating just a bass/mid driver, a high-frequency driver and two channels of amplification, the MM35s have separate bass, mid- and high-frequency drivers, and three channels of amplification. In fact there's yet more electro-acoustic innovation in the MM35 than that, because rather than incorporating just one bass drive-unit they have two — one in each side of the cabinet. More on that later.

The MM35's noisy bits in detail comprise the aforementioned bass drivers (twin 180mm aluminium-diaphragm units featuring large 38mm under-hung voice-coils); a single 130mm composite diaphragm bass/mid driver, again with a 38mm voice-coil; and a 25mm ring-radiator high-frequency driver. While the bass and bass/mid drivers hide all their technology behind decidedly conventional-looking front views, the high-frequency driver at least looks a little out of the ordinary. Its 'ring radiator' construction comprises a flattened textile dome with an unusually large roll surround that's constrained in the middle by a structure that combines the constraining role with that of a bullet-style phase-plug. The resulting acoustic performance combines flat and well-extended high-frequency response with dispersion that reduces above 10kHz or so rather less quickly than is the case with conventional dome radiators. While that aspect is nice to have (despite the fact that once we reach our 30s we all start to loose hearing above about 12kHz or so), my feeling is that it's the performance at the other end of its bandwidth that confers the bigger advantage. The ring radiator construction, you see, endows the driver with a significantly lower fundamental resonance than is typical of most conventional soft-dome drivers. This helps the driver behave more predictably and accurately through the vital mid-range/high-frequency crossover region, and is also likely to result in both lower distortion and a cleaner time-domain performance. The significance of the ring radiator's performance at the lower end of its bandwidth obviously wasn't lost on the designers of the MM35, because at the back of the driver is a torpedo-shaped damped enclosure that also helps ensure that its lower-frequency performance is optimised.

On the left is the bass/mid driver, with its over-hung voice coil, and on the right the HF driver assembly, complete with bullet-shaped phase plug.

Low & Behold

Let's move on to the bass driver. It's a 130mm paper and thermoplastic composite cone unit that appears from the outside to be nothing particularly unusual. However, as with the HF driver, there's more to it than meets the eye. Firstly, you might think it a little strange that I've christened it the 'bass/mid' driver, because typically in a three-way system the role of the 'middle' driver would be the decade between say, 400Hz and 4kHz, and while that range definitely includes 'mid', it doesn't have much to do with bass. The MM35, however, as perhaps I'm beginning to establish, is not typical.

Rather than sporting the usual 300Hz to 500Hz low/mid crossover frequency for a three-way system, the MM35 bass drivers hand over to the 'mid-range' driver down at 100Hz. Not only does this mean the usual 'bass, mid and HF' terminology doesn't fit ('sub-bass, bass/mid and HF' is more appropriate), it also has some significant technical implications. One up-side to the 100Hz crossover is that it is distanced from the region where the human ear is most sensitive, and where the most fragile and important information in music usually resides: the voice region (unless you happen to be Leonard Cohen). No surprise that evolution gave us ears that are at their most sensitive around the same frequency band at which we speak.

Another up-side is that the wavelength at 100Hz is four times longer than at 400Hz, so the physical distance between the bass and mid drivers is far less significant in terms of changes of phase with listening position. As ever, of course, there's no such thing as a free lunch, and

Alternatives

Monitors of a similar calibre include the **ATC SCM25A**, **Focal SM9** and **Genelec 8260A**.

» moving the bass/mid crossover down to 100Hz has a down-side too: the bass/mid driver has to work much harder than it would if its responsibilities didn't begin until 400Hz. A driver working harder is more likely to compress and distort than one that's under less stress, but as I've already described, if you have the design and manufacturing budget to throw at a driver it can be engineered to keep performing optimally far past the point where lesser units have thrown in the electro-acoustic towel, and that appears to be the case with the MM35 bass/mid driver.

Like the HF driver, the bass/mid driver is a custom-made unit that looks to me to be sourced from one of the Scandinavian specialist manufacturers (there's a long and celebrated history of speaker driver design and manufacture in Scandinavia, and a really special-interest book should probably be written about it). Perhaps the most impressive and significant aspect of this driver is its magnet and voice-coil system. The neodymium-based magnet drives an over-hung voice coil that, at 38mm in diameter, is around one and a half times the normal diameter for a 130mm driver. And the design of the magnet system employs pretty much every trick possible to minimise distortion and compression.

With its low-bass to bass/mid crossover frequency and relatively compact frontal dimensions, positioning two bass drivers in the side panels is really a no brainer — even though intuition perhaps says it's wrong. Acoustics is sometimes a little like aerodynamics, however, in that intuition and reality don't always inhabit the same planet. The first thing to get your head around is that at 100Hz, where the bass drivers hand over to the bass/mid driver, the wavelength of sound is around 3.5 metres. Drivers begin to become directional as frequency rises only when the wavelength approaches the dimensions of the diaphragm. The MM35 bass driver diaphragms are 0.17m in diameter — more than two orders of magnitude less than the wavelength at the crossover frequency. So in terms of dispersion, the MM35 bass drivers could be facing backwards, upwards or downwards for all the difference it makes.

"It is one of the most impressive nearfield monitors I've heard."

Having two side-facing drivers (rather than one) also brings a huge advantage in terms of mechanical energy cancellation. The drivers work acoustically in opposition, so that their twin diaphragms move outward and inward simultaneously (if they were in reverse phase their acoustic outputs would cancel). This means the mechanical reaction to the movement of the diaphragms cancels and no mechanical energy is imparted to the cabinet. The cabinets don't vibrate, which also means that whatever they are stood on also stays still (my old Alfa Romeo Alfasud Sprint had a horizontally opposed engine, and that was sewing-machine smooth for the same kind of reason).

The rear panel houses both analogue and digital inputs, as well as an input-sensitivity control and LF EQ switch.

As with the other drivers the bass drivers aren't short of advanced technology. They feature pressed-aluminium diaphragms and sophisticated neodymium-based magnet systems with under-hung voice coils that allow for an extraordinary ±9.5mm of liner diaphragm movement. The norm for a typical bass driver is around ±6mm. The bass drivers also reap maximum benefit from their opposed mounting by being joined internally across the width of the cabinet by a heavy metal brace.

The Amps

So the MM35 passes my "are the noisy bits special?" test in its sleep. But of course there's much more to an active monitor than just its drivers: its amplifiers, for example, which, along with the controls and connection sockets, is located in the usual place. Around the back you'll find a heatsink panel that carries a mains socket, analogue and digital (AES3) input sockets, a calibrated gain control, input and channel selection switches, an LF EQ switch, a USB socket (for service use only), and a mysterious 3.5mm jack input socket labelled 'voice'. I'll describe the function of the mysterious voice socket a little later because there's some more fundamental amplifier ground to cover first.

I will get to describing the amplifiers, I promise, but to understand their significance there's a little background necessary first. The MM35 is not only unconventional in its electro-acoustic format, it's also unusual in its electro-acoustic performance. Despite its nearfield monitor proportions it has low-frequency bandwidth that would traditionally only be found in speakers of far larger dimensions. The MM35 reaches down to 35Hz at -3dB and, being a closed-box system, its output below that frequency reduces relatively gently at 12dB/octave. This is main/mid-field monitor territory in a nearfield package, and the foundation of that extended low-frequency bandwidth is not so much to be found in the MM35's drivers but in its amplifiers. There's a simple three-way trade-off inherent in the low-frequency performance of any speaker that works by shoving a diaphragm backwards and forwards. The three variables are efficiency (electrical power in for acoustic power out), low-frequency cut-off, and enclosure volume. So, if you want a small enclosure volume with extended low-frequency bandwidth, like the MM35, you have to accept that your speaker will be inefficient. And if you have an inefficient speaker, you need to be generous with amplifier power.

The power rating for the MM35's LF amplifier is 250W, which again in comparison to similarly dimensioned monitors is decidedly healthy — but it has to be, because the MM35 achieves its extended low-frequency bandwidth »

through equalisation. I don't know the details of the MM35's unequalised low-frequency performance but, just from its cabinet size, I'd expect it to be at least 12dB down or more by 35Hz. So for its specified bandwidth of -3dB at 35Hz the equalisation is likely to include around 9dB of low-frequency gain, hence the need for a 250W power amp (and the need for bass drivers that can manage ±9.5mm of linear diaphragm movement).

In years gone by, a traditional 250W Class-AB amplifier with maybe 60 percent efficiency would need some pretty significant metalwork attached in the form of heat-sinking. The MM35, however, features Class-D, switching amplifier technology (from Dutch specialist Hypex), and in offering far higher efficiency than Class AB it could be argued that it's actually the amplifier technology that makes the MM35 possible. Along with its 250W sub-bass amplifier section the MM35 incorporates Class-D bass/mid-range and high-frequency power amplifier sections, both rated at 180W. It's not short of power.

I mentioned earlier that the MM35 incorporates a digital input option. In fact there's a whole raft of digital signal processing within the MM35 electronics, so its analogue input too passes through an A-D conversion stage. The DSP is present in the MM35 to do two jobs. Firstly, it handles the active filter networks and driver equalisation required for the basic operation of the speaker, and secondly it is responsible for the one unconventional feature of the MM35 I've yet to describe: the one that results in that mysterious voice socket on the connection panel.

More MEME

The voice socket connects, via a 3.5mm jack-to-jack cable, to a small die-cast box carrying a four-position control. The control positions are labelled 'Hi-Fi', 'Flat', 'OldScl' (shorthand for 'old school') and 'Cube'. With the control box connected to the voice socket on the two loudspeakers (via a cable splitter/connector), turning the knob changes the sound of the MM35 to emulate those of a 'typical' hi-fi speaker, an iconic nearfield monitor (probably one with a white cone), and a slightly less iconic small, cube-shaped, single-driver unit monitor. The fourth control knob position, 'Flat', selects the unadulterated sound of the MM35. The technology behind this goes by

The MEME voice-control box, with its four selectable voicing settings.

the slightly laboured acronym MEME, standing for Multi-Emphasis Monitor Emulation, and in addition to modelling the tonal characteristics of each of the monitor types, it attempts to model some of their dynamic and distortion characteristics too. At a basic level MEME, to my ears, works well, although I wasn't really convinced by the Hi-Fi setting. Turn the knob and you hear pretty much the changes you'd expect.

I'm in two minds, however, about its true value. Firstly, while there's no technical reason why the emulation can't take a stab at the broad brush of tonal, distortion and compression characteristics, the fine detail of a monitor, especially of time-domain characteristics, is much harder to model. Furthermore, one of the fundamentals of the way we hear any speaker is tied up with its dispersion — the geometry of the way it radiates acoustic energy and how that changes with frequency. And dispersion is fundamentally influenced by the physical shape and size of the speaker. MEME can do little to emulate that.

Secondly, I'm not entirely convinced of the value of MEME in terms of a mix tool — although I can see it might be useful in a commercial studio environment when the A&R client asks, "What will it sound like on NS10s?" (I've gone and said it). I say this because the mark, I think, of a really good monitor is not that it always sounds wonderful, or goes really loud, or has bass extension down to DC, but that it works as a trustworthy transfer standard. A good monitor is one that enables us to record audio and construct mixes that we know will work across today's huge variety of playback devices — from headphones, via car audio and FM radio to the highest-quality hi-fi. So it seems to me a little unnecessary, when a monitor is as good at that job as I believe the MM35 is, to have it sound like something else at the flick of a switch. Why would you need to? I suspect, if I had a pair of MM35s, the only time I'd use the MEME knob would be to check that it's still working.

Main Attraction

I rather let the cliché out of the bag towards the end of that paragraph. All the expense of the MM35 and its technology undoubtedly pays off: it is one of the most impressive nearfield monitors I've heard. Its ability at low frequencies is outstanding for a speaker compact enough to mount on wall brackets. The low end is extended pretty much as far as anybody could need — it'll reproduce the fundamental of a low B on a five-string bass, for example, and do it without any reflex port noise, doubt about the pitch of the note, or slovenly overhang. With the speakers set up on wall brackets, I found the -2dB LF setting useful, but once used out in the studio room on speaker stands the 'flat' option worked well. Further up the band the MM35 just gets on with the job of revealing exactly what's going on in a mix. If I had a comment about its inherent balance I'd say there's a slight upper-mid-range emphasis, but even that is benign in that it doesn't get in the way the job in hand.

Listening to the MM35s it more than once reminded me of the kind of clarity and hear-through quality of really good open-back headphones — and that's quite a trick for a pair of speakers to pull off. There's a strong sense with the MM35s of hearing all the way back into the depths of a mix. For example, the effects of alternative compression algorithms and rates were obviously audible. They'd make fabulous mastering monitors. Listening to the MM35 is not always a pleasant experience (a remix I was working on when they arrived got consigned to 'start again' status once I'd heard it on the MM35s). They don't pull any punches, and if there's something wrong with a mix you'll hear it. But then, that's how things should be — the role of any studio monitor is to inform, not to entertain, and they don't get much more informative than the MM35. Worth the money? Yes, absolutely.

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