"TREMENDOUSLY AMBITIOUS ... redefines what should be expected of a powered subwoofer"

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"I haven't experienced another subwoofer that I think is as capable, and certainly not when considering the price … extraordinary … deeper and more powerful than I'd ever heard … I never seemed to approach the limits of the SUB 2's output capability. Instead, I reached the limits of my room. Although I'm not sure exactly where the outer limits of the Sub 2's output capability lay, it was clear that it could produce more bass than I would ever need …"

by Jeff Fritz

Bass is one issue with which, at some point, almost every audiophile grapples. Although most serious music lovers will tell you that the lifeblood of music is in the midrange, and the sparkle and excitement in the highs, it's perhaps bass that's most obsessed over. It's a cold, hard fact that meeting the goal of linear reproduction of low bass at realistic output levels is a daunting challenge. First, the physical logistics: Big bass means big drivers, big drivers mean big boxes, and the combination of the two often means big wattage. To pursue low bass is to give up significant floor space in your room and, perhaps more significant, money from your wallet. In fact, some audiophiles choose to live with stand-mounted loudspeakers designed to altogether avoid the problems associated with low bass. But of course, that's a compromise that will affect the very foundation of music.

For the purposes of this article, I define low bass as those frequencies that lie below 80 Hz. A good stand-mounted loudspeaker might play down to 80 Hz, and a little lower if it's on the large side. With some room-boundary reinforcement, that 80 Hz anechoic specification might reach 65 Hz in-room. This would give the listener a modicum of genuine low end when reproducing instruments such as an electric bass and kick drum. But that's not the whole apple cart: Most stand-mounted speakers won't do justice to the lowest notes produced by a double bass or bass tuba.

So instead of stand-mounted speakers, many audiophiles choose floorstanding models. An average but still-capable floor-stander might reach as low as 35 Hz in-room, which will provide significantly more foundation than a stand-mount. However, the lowest note a piano can produce has a frequency of about 27.5 Hz, and the lowest pipe-organ pedal goes lower still. And we still haven't tackled the issue of output capability: a floor-standing speaker that reaches low in the 30 – 40 Hz range might be able to produce those frequencies only at very low levels. Another compromise . . .

A generally accepted figure for defining full-range bass extension is flat (or -3 dB) to 20 Hz. A loudspeaker that can produce appreciable output at that low a frequency – the definition of appreciable output will depend on your taste, but let's say at least 85 dB -– is an expensive proposition.

However, if you want to hear that contra-bassoon, or the lowest notes delivered by a concert grand, you'll need to fully embrace the quest for bass. But if a behemoth floorstanding loudspeaker is out of the question . . . what to do?

SUBWOOFERS TO THE RESCUE

Many audiophiles have abandoned the quest for full-range speakers. Putting aside the money involved (it can be considerable), not to mention the space required to house such beasts, there's also the issue of providing enough power to drive large, multi-way loudspeakers. Bass frequencies are produced by large, sometimes multiple woofers that often need a stout amplifier to control them. Those considerations alone make large, floorstanding speakers more expensive than many can afford. And what if you've found a speaker that does everything you like *except* produce the lowest frequencies?

"… crushing solidity and weight … concert-real … no overhang or boom — just impact in my gut that felt as if a 50-pound dumbbell had been dropped on me …"

You buy a subwoofer. You then work your behind off to integrate it into your audio system and listening space. This is, in most cases, easier said than done. The main problem is how to get smooth frequency response from the sub in your room, and have that bass integrate naturally with the outputs of your main speakers. Bass frequencies reproduced by a large loudspeaker or subwoofer will wildly fluctuate in the frequency domain depending on the placement of the cabinets in your room and your listening position. It's not uncommon to measure dips and peaks in bass response upward of 15 dB, measured from 20 Hz to, say, 150 Hz. Room-related frequency-response nonlinearities, or room modes, of such magnitude are audible enough to ruin a listening experience, and have led many audiophiles who have experimented with subwoofers to give them up altogether.

ENTER THE SUB 2

Luckily for those searching for real bass, technology and innovation have made the prospect of attaining great bass a bit easier. Nowhere is this more obvious than in Paradigm's Reference Signature SUB 2 subwoofer. The boys from Canada have delivered a new flagship subwoofer with heaps of capability and features designed to give you first-class bass – and lots of it. First is what Paradigm calls their Perfect Bass Kit (PBK), a Paradigm room-correction system built into their newest subwoofers. This, in most systems and rooms, will be critical. Using the PBK is very similar to using the Anthem division's Anthem Room Correction (ARC) software. In fact, the PBK was derived from the ARC, and optimized for implementation within the subwoofer itself (as opposed to a standalone surround-sound processor, such as the Anthem D2v). You can read more about the PBK process in our *Home Theater & Sound* review of Paradigm's Signature SUB 25 (visit **www.paradigm.com**) which uses the same PBK kit as the SUB 2. In my system, the PBK software cleaned up a slight hump at 50 Hz, resulting in cleaner-sounding bass than without this prominent room mode.

The process is fairly simple: upload the PBK software to your computer from the supplied CD, connect the USB microphone (provided) to your computer, link computer and sub with another USB cable, run the software, follow its instructions as to where to place the supplied microphone in your room, then sit back and let the software calculate where the sub's frequency response needs to be equalized. You then load the corrective settings into the SUB 2 via its USB input and you're ready to go. The PBK microphone-and-software kit comes standard with the SUB 2 (it's an option with the SUB 25).

The SUB 2's hexagonal sealed cabinet measures 24 1/3″ H x 22 7/8″ W x 21 1/8″ D and weighs 289 pounds. It has six high-excursion 10″ drivers, in identical vertical arrays of two each on three of the sides. These are driven by Paradigm's Ultra-Class-D power amplifier, which delivers a claimed 7,500W dynamic peak or 3,000W sustained RMS when fed by a 120V line. With a 240V line, the SUB 2's power output, according to Paradigm, can increase to 9,000W (!) dynamic peak or 4,500W sustained. The sheer motor capability of six subwoofer drivers backed by this much power is enough to propel a Hummer H2. (OK, maybe not *quite*.)

The SUB 2 has the expected adjustments of crossover frequency (35 – 150 Hz) and phase (180-degree). Each driver has a ten-layer voice coil, a diecast chassis, and a 12.6-pound magnet/motor assembly. The cones are made from mineral-filled copolymer polypropylene and have dual spiders. The SUB 2 also has auto on/off, a trigger input for turning it on remotely, and circuits that protect it from electrical shorts and thermal overload.

Now there's no question that almost all manufacturers play the game of specsmanship, especially those that make loudspeakers. Paradigm's numbers for the SUB 2 are downright mind-boggling, though I can't claim to have tested their validity. Still, Paradigm doesn't typically embellish its specs much. Given that, consider this: The SUB 2's low-bass extension is claimed as 9 Hz, with output capabilities of 97 dB at 10 Hz, 106 dB at 20 Hz, and 120 dB at 60 Hz, *all measured anechoically*. Remember that in-room levels, because of room gain, will typically be 12 – 15 dB higher! Remind me to never listen to 20 Hz at 121 dB!

"… perfect pace … perhaps because it was using so little of its six drivers' available excursion … There was no question the SUB 2 could rock heavy."

Inputs include stereo RCA jacks, and a single balanced XLR jack for the LFE channel, if your processor is so equipped. Last, a Universal Input Power feature makes it possible to use the SUB 2 with wall power that ranges anywhere from 108V to 265V. But the best performance, according to Paradigm, will be with a 240V line.

SETUP

I used the SUB 2 in my Music Vault listening room, which has been extensively described on *Ultra Audio* in my column, "The World's Best Audio System." The SUB 2 was fed by the outputs of a Behold APU768 preamp-DAC-processor. Speakers were, for the most part, Genesis G7.1fs, but for fun I also did some high-power listening with the Rockport Arrakises. The amplifiers were Classé Audio's Omega Omicron Monos, and my digital source was an Apple MacBook running Sonic Solutions Amarra software. I used Shunyata Research Aurora-IC interconnects, Aurora-SP speaker cables, a Hydra V-Ray II power conditioner, along with Anaconda Helix Alpha/VX, Python Helix Alpha/VX, and Taipan Helix Alpha/VX power cords. I used the stock cord on the SUB 2 and connected it to a dedicated 20A outlet.

"With more subtle music, but an album whose bass is just as dramatic — the SUB 2 seemed to feel just as at home … quick enough to reproduce the drum perfectly … deft enough that it never fell behind the rest of the music, or sounded loose … punchy and powerful … could easily scale with whatever volume level I chose."

I crossed over the Genesis G7.1f speakers to the single SUB 2 at 80 Hz, and ran a stereo signal into the SUB 2 via its left and right RCA inputs. I dialed in the phase and level until I attained a fairly smooth frequency response in the bass. Might it have been better to have had two SUB 2s? Perhaps, but one provided more than enough headroom. Two SUB 2s, however, might have resulted in an even smoother in-room response. I placed the SUB 2 in the front left corner of my room, slightly behind the front left speaker and about 5 feet away from any walls.

PERFORMANCE

Experienced subwoofer users know that most of them can be slotted into one of two categories:

1) Subwoofers that play in a room can provide exceptional bass response that a listener can be very happy with. They can provide the underpinning needed to give more than just a taste of the instruments that play into the lower registers. It can be worth your while to add such a subwoofer, even if it isn't one that possesses the greatest power and headroom in the really low bass.

2) Subwoofers that control a room provide a very different experience, one characterized by a sense of unlimited bass capability: it feels as if the bass frequencies produced could physically move the entire structure containing them. This level of bass response – extreme output capability plus the ability to play super-low – re-creates a sense of space, particularly the type found on good live recordings, that can make your room's walls seem to melt away. Oh, sure, they can shake the foundations with home-theater-type sound effects, but they can also evenly disperse huge amounts of bass that can leave the listener in awe of their sheer acoustic power. The Paradigm SUB 2 belongs in this category, which is inhabited by only a few other notable contenders.

Recently, in "The World's Best Audio System (TWBAS) Five-Song Demo," I described some of my reference music recordings, and highlighted what has been a favorite bass reference for the past several years: 'Norbu,' from Bruno Coulais's soundtrack album for the film *Himalaya* (CD, Virgin France 848478). I said, "The massive drum *thwacks* should roll through your room with supreme authority and frequency extension. You should hear the initial stroke of mallet on drum head, followed by an evenly distributed, natural decay that moves like a huge ocean wave from the front to the rear of your room." The Paradigm SUB 2 passed this test with flying colors.

"Until the SUB 2 arrived, my reference for subwoofers had been JL Audio's Gotham g213 … Both products are simply extraordinary purveyors of bass … SUB 2 also delivered what sounded to me like tighter bass … The fact that the SUB 2 costs substantially less than the Gotham g213 means it's the clear choice. And if you can buy two SUB 2s for not much more than the price of one Gotham, well, that's just silly: get a pair of SUB 2s."

An interesting aspect of this track as reproduced by the SUB 2 was how the "wave" could be scaled with the output level. With 'Norbu,' it's easy to hear when most speakers and subwoofers have reached their limits. In fact, the ultimate output capability of most transducers is found very quickly – and sometimes raucously. I had this experience with the Genesis G7.7f loudspeakers – the drivers of their powered woofer sections were banging against their stops and crying for mercy. But playing 'Norbu,' I never seemed to approach the limits of the SUB 2's output capability. Instead, I reached the limits of my room. At some point well above 100 dB, the Music Vault decided that enough was enough – the room's acoustics turned to mush. Although the track was getting louder, I could hear the room booming more than I could hear the SUB 2 playing. At this point, the articulated detail from the drum was swamped by the room convulsing and twitching. Although I'm not sure exactly where the outer limits of the SUB 2's output capability lay, it was clear that it could produce more bass than I would ever z Output Capability: check.

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The kickdrum on Audioslave's 'Show Me How to Live,' from their eponymous first album (CD, Epic 86968), was delivered with crushing solidity and weight. I could make this hard-rock track sound concert-real in my room with a twist of the volume knob — and let's face it, the louder it gets, the better lead singer Chris Cornell sounds. There was no overhang or boom in the bass, just impact in my gut that felt as if a 50-pound dumbbell had been dropped on me. Now isn't *that* fun? I had no sense that the SUB 2 was loafing behind the Genesis main speakers. No, it was keeping perfect pace with them, perhaps because it was using so little of its six drivers' available excursion — it was at ease. There was no question that the SUB 2 could rock heavy.

With more subtle music, but an album whose bass is just as dramatic — Patricia Barber's *Café Blue* (CD, Premonition 737) – the SUB 2 seemed to feel just as at home. 'Nardis' features a drum solo that starts about 5:30 into the track. Mark Walker's kickdrum is much more subdued than that on the Audioslave track – more damped, and even tighter in delivery. But if it isn't reproduced with good articulation and agility, it can start to sound mushy, woolly, or just plain weak. The SUB 2

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"As a test of how subterranean the SUB 2 could play, I used Rosanne Cash's 'Western Wall,' from The Very Best of Rosanne Cash (CD, Columbia/Legacy 86996). At exactly 24 seconds into the track are three deep yet subtle foot stomps. I've heard speakers that can play flat to 35 Hz that couldn't even begin to reproduce these, and most systems miss them completely. Most subwoofers do get these stomps to some degree, but they typically sound weak and indistinct. The SUB 2 reproduced them with a dose of reality: they sounded deeper and more powerful than I'd ever heard, even with a subwoofer, and were revealed in a quite obvious fashion – you'd never be able to miss them. In fact, outside of the Rockport Arrakis speakers, I've never heard this track played back with bass so good."

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OTHER CONSIDERATIONS

Until the SUB 2 arrived, my reference for subwoofers had been JL Audio's Gotham g213, a pair of which I reviewed in the past. These magnificent beasts ($12,000 each) set a standard for bass that I had never experienced before. In fact, as I stated in that review, "After listening to tons of bass-filled music and lots of film sound-tracks, I can tell you that, when integrated into a very-high-end audio system in a very good room, the Gotham g213 had essentially no sonic limitation or shortcoming." I can't say the SUB 2 was "more unlimited" than the Gotham, because I never reached the limits of either subwoofer. Both products are simply extraordinary purveyors of bass, and either will shake your room and tickle your fancy. Although I didn't have the Gothams in-house while the SUB 2 was here, I can tell you that the SUB 2 could easily play as deep, loud, and clean as I remember the g123s playing. The SUB 2 also delivered what sounded to me like tighter bass than I remember ever getting from the Gothams. The fact that the SUB 2 costs substantially less than the Gotham g213 means it's the clear choice. And if you can buy two SUB 2s for not much more than the price of one Gotham – well, that's just silly: get a pair of SUB 2s.

CONCLUSION

High-end audio never stands still. The industry is always changing, and the components that rank at the top of a particular category can vary quickly, depending on which really good company decides it's time to tackle a particular market segment. Paradigm has the engineering expertise and the research-and-development budget to take on such lofty goals as creating the most ambitious powered subwoofer, and with the SUB 2, they've catapulted themselves into the annals of subwoofer history. The Paradigm Reference Signature SUB 2 is a tremendously ambitious effort that redefines what should be expected of a powered subwoofer. I haven't experienced another subwoofer that I think is as capable, and certainly not when considering the price.

My Recommendation: Find a SUB 2 you can demo, and I think you'll come to the conclusion I have. Get it. Play it. Be moved by it.

Paradigm Perfect Bass Kit™ is included with every SUB 2 purchase.