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NHT Xd

ACTIVE LOUDSPEAKER SYSTEM

Kalman Rubinson

DESCRIPTIONS Active 2.1-channel speaker system with DSP crossover and equalization. Consists of:
XdS Two-way acoustic-suspension, magnetically shielded, stand-mounted loudspeaker with molded composite enclosure and fitted stand. Drive-units: 1" aluminum-dome tweeter with neodymium magnet, 5.25" magnesium-cone midrange unit. Crossover frequency: 2.1kHz. Frequency response: 110Hz–30kHz, ±1dB. Peak acoustic output: 114dB. Dimensions: 10.5" (270mm) H (not including stand) by 6.5" (165mm) W by 8.5" (220mm) D. Weight: 13 lbs (5.9kg). Serial numbers of units reviewed: 100000049-38.
XdW Acoustic suspension powered bass module. Drive-units: two side-mounted, 10" aluminum-cone woofers. Input: balanced (XLR). Controls: level only. Crossover frequency: 110Hz. Frequency response: 28–110Hz, ±1dB. Power: 500W RMS, 700W peak. Peak acoustic output: 116dB at 60Hz. Dimensions: 22.1" (565mm) H by 11.2" (285mm) W by 13" (330mm) D. Weight: 57 lbs (25.9kg). Serial number of unit reviewed: 02000001036-38.
XdA DEQX-based DSP crossover/equalizer/4-channel class-D power amplifier. Maximum output power: 150W RMS (21.8dBW), 400W peak. Controls: Boundary compensation. Indicators: Power, Standby, Fault. Input connectors: XLR, RCA. Output connectors: XLR, RCA, binding posts. Dimensions: 17" (435mm) W by 2.8" (70mm) H by 15.7" (400mm) D. Weight: 12 lbs (5.5kg). Serial number of unit reviewed: 030000000025-39.
FINISHES As reviewed: maroon and cream lacquer (speakers and stands), high-gloss, Dark Chocolate Red and Piano Black will be available by the time this review appears in print; black/brushed aluminum, with blue LEDs (amplifier).
PRICE $6000/system. Approximate number of dealers: 200.
MANUFACTURER NHT, 6400 Goodyear Road, Benicia, CA 94510. Tel: (800) 648-9993. Web: http://nhtxd.com.

NHT XdS loudspeaker with XdW subwoofer and dedicated XdA crossover-equalizer-amplifier.

NHT's Xd system is what audiophiles have been saying they want: a matched loudspeaker system that optimizes the performance of its components for a real-world domestic listening environment. But with their dollars they've voted against just such systems for years. If we put our money where our mouths are, active speaker systems such as Meridian's DSP or those used in recording studios would dominate the High End.

Unlike studio active monitors, the NHT Xd is insidiously easy to use and to like. In configuration it seems to have more in common with 2.1-channel computer speakers, which are designed more for convenience than for performance. However, the Xd system uses sophisticated digital signal processing (DSP) for all its equalization and crossover functions and, since it has only analog inputs, forces all signals through additional A/D and D/A cycles. This may confound purists, but that's the tradeoff for what sets it apart. The Xd arrangement lets the DSP correct for the less-than-perfect performance of the drivers and cabinets while taking into account the abilities and limits of the built-in amplifiers. The result should be as close to acoustic perfection as the design budget and physical elements permit.

The basic Xd configuration tested here was: the XdA, a box containing four channels of power amplification and crossover/equalization for up to two satellites and two subwoofers; a pair of two-way XdS satellite speakers with stands; and the XdW, a powered bipole subwoofer module. Other configurations of electronics, speakers, and woofer can accommodate anything from 2.1 to 6.1 channels and beyond.

Brains in a box

The Xd system may be a significant conceptual advance in home audio, but it will be a tough pill for the traditional audiophile to swallow. Although each component was developed by a different specialist company—speakers by NHT, amplifiers by PowerPhysics, EQ/crossover by DEQX—it is an integrated active system that does not allow easy substitutions of other gear.

MEASUREMENTS

Their active, digitally crossed-over and equalized nature meant that I could examine the intrinsic behaviors of the NHT XdS satellite and XdW subwoofer in some detail. However, it is important when looking at the graphs that follow not to assume that any problems and idiosyncrasies that are revealed in the measurements of the raw drive-units are indicative of problems in the overall Xd system's behavior.

With that warning out of the way, fig.1 shows the impedance magnitude and phase for the XdS satellite's woofer and tweeter. With the speaker intended to be driven exclusively by the system's dedicated XdA amplifier, these curves are really only of academic interest. However, the peak at 73Hz, reaching 26.3 ohms, indicates that the woofer is tuned by the sealed box to a frequency below the satellite's intended passband, meaning that the equalized drive-unit will not be asked to deliver large cone excursions. There are some small discontinuities in the woofer's impedance traces in the treble that might indicate the presence of resonances of some kind; similarly, the glitch at 27kHz in the tweeter's traces is due to the metal dome's primary breakup mode. The XdS's small, rigid cabinet, however, seemed free from enclosure-wall resonances. Fig.2, a cumulative spectral-decay plot calculated from the output of a plastic-tape accelerometer fastened to the center of the sidewall, reveals only a couple of very-low-level modes. I found nothing of note in the XdW's enclosure, so I haven't shown a graph of its vibrational behavior.

Fig.3 is particularly interesting, in that it shows the acoustic responses of the XdS's unequalized drive-units. The tweeter (blue trace) has quite a flat response above 2kHz and is significantly more sensitive than the woofer

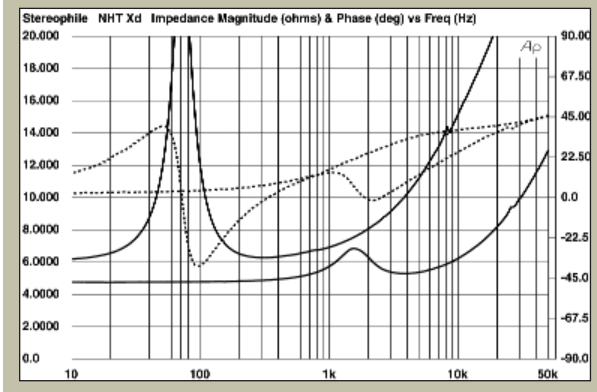

Fig.1 NHT XdS, electrical impedance (solid) and phase (dashed) of woofer (top) and tweeter (bottom). (2 ohms/vertical div.)

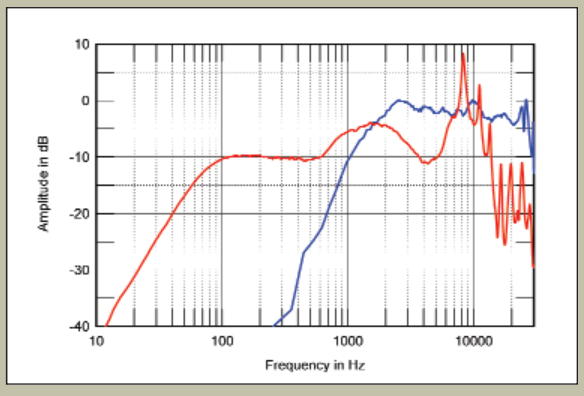

Fig.3 NHT XdS, responses of unequalized woofer (red) and tweeter (blue) on tweeter axis at 50", corrected for microphone response, with nearfield response of woofer plotted below 300Hz.

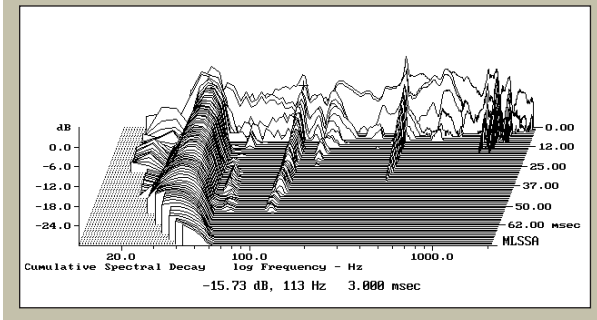

Fig.2 NHT XdS, cumulative spectral-decay plot calculated from the output of an accelerometer fastened to the center of the cabinet's side panel (MLS driving voltage to speaker, 7.55V; measurement bandwidth, 2kHz).

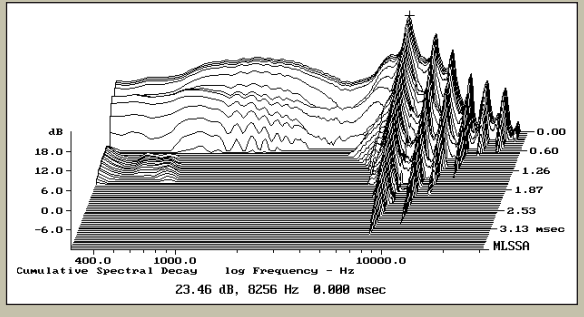

Fig.4 NHT XdS, cumulative spectral-decay plot of unequalized woofer at 50" (0.15ms risetime).

I first came upon DEQX (www.deqx.com) at the Consumer Electronics Show several years back. The DEQX system measured the response of a speaker's individual drivers and synthesized both digital filters to linearize phase response, time alignment, and amplitude response in the frequency band where each performed best, and crossovers operating in the digital domain. By moving the test microphone farther from the speakers, the influence of the room could also be measured, compensated for, and included in the filters. As the designer, Kim Ryrie, switched from the passive factory crossover to the active DEQX crossover, I was amazed. The system sounded like an absolute winner.

Several things prevented DEQX's rampant popularity. One was that not everyone is ready to gut his pride-and-joy speakers and void his warranty by bypassing their stock crossovers.

(red). The latter rolls off at 12dB/octave below 100Hz due to its sealed-box alignment, but features both a rising response above 600Hz and some sharp spikes in its output at 8kHz and above. That these are due to resonances in the small-diameter magnesium cone is revealed by the raw woofer's cumulative spectral-decay plot (fig.4). The fact that these resonances are well above the driver's intended passband and should therefore have little or no effect on sound quality will become evident in a moment.

First, fig.5 looks at the other end of the woofer's frequency range. The black trace is the same unequalized nearfield response shown in fig.3; the colored traces to the right of this graph indicate the nearfield response of the XdS's woofer with the appropriate equalization applied by the XdA amplifier. (I didn't have any ground-loop problems with the XdA and XdW.) The red trace is with the front-panel mode set to "1," magenta is with it set to "2," green "3," and blue "4." Each mode applies a slightly different amount of lower-midrange boost to compensate for a different placement option. More important, the XdA flattens the XdS woofer's output in the midrange and rolls it off steeply below 150Hz or so, thus removing the need for the little cone to handle frequencies that require significant excursion.

The red trace to the left of fig.5 is the unequalized nearfield response of the XdW powered subwoofer. It can be seen to roll off below 60Hz and above 150Hz with intrinsic 12dB/octave slopes. When driven by the XdA (fig.6, left-hand trace), its output is increased for an octave below 60Hz to give excellent bass extension, but is rolled off rapidly below 28Hz to avoid overloading the twin 10" drive-units. At the other end of its passband it is rapidly rolled off to give a measured crossover point to the XdS satellite of 110Hz. The equalized satellite's woofer and tweeter can be seen from this graph (middle and right-hand traces) to have basically flat responses within their passbands when driven by the XdA with the crossover between them set to 2.5kHz, as specified. Note the very steep filter slopes achieved by the XdA's digital-domain crossover: greater than 40dB/octave. The woofer-cone breakup modes seen in figs.3 and 4 should not be excited to any significant extent when the XdS is driven by its partnering amplifier.

Fig.7 shows the overall response of the XdS and XdW,

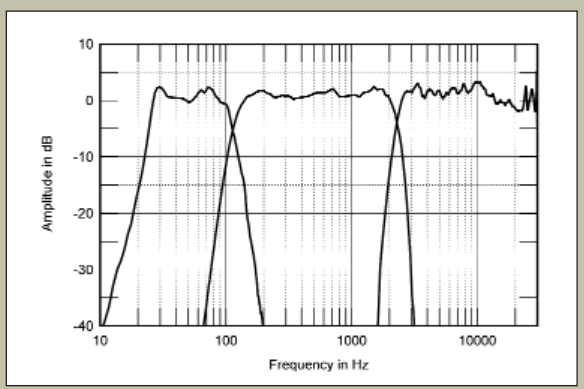

Fig.6 NHT XdS & XdW driven by XdA, acoustic crossover on tweeter axis at 50", corrected for microphone response, with nearfield responses of woofer and subwoofer plotted below 300Hz.

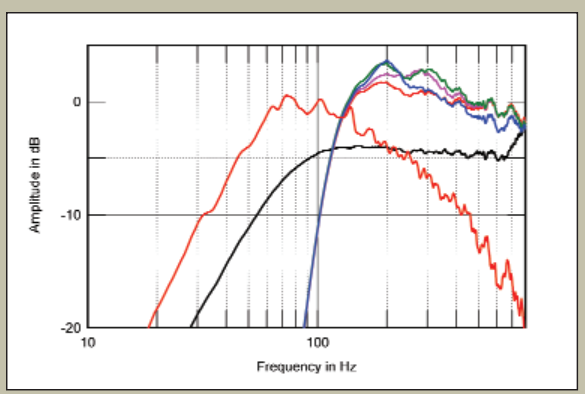

Fig.5 NHT XdS, nearfield response of unequalized woofer (black), and of equalized woofer set to Mode 1 (red), Mode 2(magenta), Mode 3 (green), and Mode 4 (blue). Left-hand red trace is the nearfield response of the unequalized XdW.

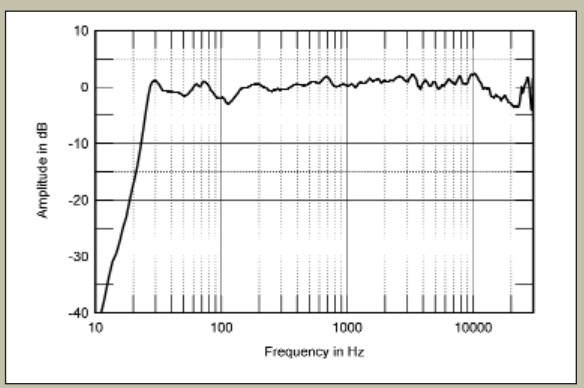

Fig.7 NHT XdS & XdW driven by XdA, anechoic response on tweeter axis at 50", averaged across 30° horizontal window and corrected for microphone response, with the complex sum of the nearfield woofer and subwoofer responses, taking into account acoustic phase and distance from the nominal farfield point, plotted below 300Hz.

Another was that the basic DEQX unit cost about $3000, and the price rose with the addition of A/D, D/A, and preamp-type controls. Yet another was the need to have a PC or laptop to do the number crunching for the measurements, calculations, and setup. Still, the DEQX enjoys deserved popularity in recording and mastering studios and with DIY speaker builders.

The DEQX processing in the XdA does all the hard work for the user. Crossover and EQ are customized for the two-way XdS satellite and XdW woofer to endow the XdS with a flat response on-axis and optimal dispersion in the horizontal plane. Perfection in the vertical plane is thwarted by the physics of stacked drivers, but due to the very high (108dB/octave!) crossover slope, the suckouts above and below the listening axis are narrowly restricted. The steepness of the slope makes possible a relatively low crossover frequency for the tweeter (just above 2kHz) without compromising its power handling. This, and a smoothly shaped cabinet devoid of edges on its front surface, contribute to the smoothness of the XdS's off-axis response. In addition, some low-end boost is provided at around 26Hz, which makes the XdW's in-room response fairly flat into the 20Hz range before it begins to roll off.

The XdA also includes four PowerPhysics class-D (switching) amplifier modules (www.powerphysics.com) to biamplify the two XdS speakers. While

measurements, *continued*

averaged across a 30° horizontal window centered on the satellite's tweeter axis. Below 300Hz, this graph shows the combination's estimated farfield response, calculated by adding the nearfield responses of the subwoofer and woofer and taking into account acoustic phase. The region covered by the subwoofer, below 110Hz, can be arbitrarily raised or lowered using the XdW's rear-panel volume control. However, it does look as though the integration between the two units is not quite as perfect as that between the woofer and tweeter. Other than that *very* slight lack of lower-midrange energy, and the slight shelving-down of the speaker's output above 12kHz due to the tweeter becoming more directional in this region, the NHT speaker system offers extraordinarily flat response!

It is not only a flat on-axis response that contributes to a speaker having a neutral balance; its radiation pattern also has an effect in all but anechoic rooms. Here the NHT XdS also offered superb performance. Fig.8 shows its lateral dispersion referred to the response of the tweeter axis, which has been subtracted from all the traces so that only the changes are apparent. The contour lines are evenly spaced, and there is only a trace of the usual off-axis flare at the bottom of the tweeter's passband. Other than its restricted dispersion above 12kHz or so, this speaker's radiation to its sides is not significantly different from what it puts out in front. In the vertical plane (fig.9), the use of noncoaxial drive-units means that suckouts in the crossover region between the XdS's tweeter and woofer appear at extreme off-axis angles. But the use of very steep crossover filter slopes means that the XdS is otherwise *very* tolerant of listener ear height.

Performing a loudspeaker's crossover and equalization functions in the digital domain means that its acoustic performance, in theory, can be optimized in both the frequency and time domains. So, when examining the XdS's time-domain performance, I first looked at the step responses of the raw drive-units (fig.10). Without the XdA equalization, the tweeter (red trace) leads the woofer (blue) very slightly, with the tail of the latter's step overlaid by the high-frequency ringing of the cone breakup modes noted earlier. Repeating these measurements with the XdS driven by the XdA gave the steps

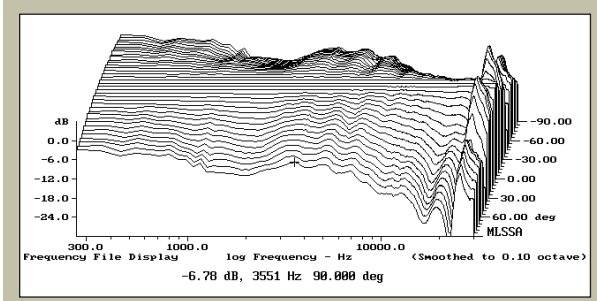

Fig.8 NHT XdS driven by XdA, lateral response family at 50", normalized to response on tweeter axis, from back to front: differences in response 90–5° off axis, reference response, differences in response 5–90° off axis.

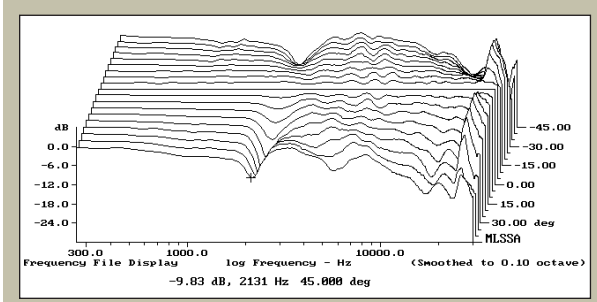

Fig.9 NHT XdS driven by XdA, vertical response family at 50", normalized to response on tweeter axis, from back to front: differences in response 45–5° above axis, reference response, differences in response 5–45° below axis.

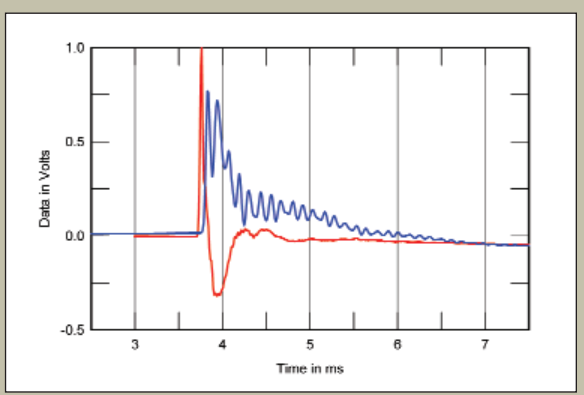

Fig.10 NHT XdS, step responses on tweeter axis at 50" of unequalized tweeter (red) and woofer (blue). (5ms time window, 30kHz bandwidth.)

the general design of class-D amps is well known, the PowerPhysics designs are claimed to offer better fidelity, especially in the higher frequencies, because of a proprietary feedback design that provides output correction on each output cycle, even though the switching is at rates of 250kHz or more. Particular attention was paid to the design of matched switching power supplies, which virtually eliminate overheating at high levels but do not require large heatsinks or fans.

NHT has packaged the amps and DSP in an attractive black box that takes up no more space than a stereo power amp. Such integration means that all judgments about the Xd must apply to it as a complete system, without one component or another being singled out.

Many boxes, one system

The Xd system arrived in six separate cartons, but unpacking and assembling it was pretty simple. There's a Setup Guide, but most of the work consists of screwing a long, threaded steel rod into the bottom of each XdS satellite, slipping the sculpted stand shaft over it, and affixing the heavy base to it with a wing nut. Spikes or pads are user options. After the XdS is

measurements, *continued*

shown in fig.11. The first thing to note is the different time scales of these two graphs. Fig.10 shows that the wavefronts from the unequalized drivers took 3.75 milliseconds to reach the microphone, which was 50" away. By contrast, the outputs of the equalized drivers in fig.11 took 7.5ms longer to reach the microphone. This is the time taken by the XdA's digital circuitry to perform its filtering and equalization functions.

What can also be seen from fig.11 is that each drive-unit's step is preceded by some low-frequency ringing. But because the tweeter's and woofer's acoustic outputs appear to have opposite polarities, this pre-ringing should to a large extent cancel, at least on the tweeter axis. That this does in fact happen is shown by the XdS's overall step response (fig.12), the tweeter's positive-going step smoothly handing over to the woofer's negative-going step, this in turn correlating with the superb frequency-domain integration between the two drive-units seen in fig.7.

Finally, the XdS's waterfall plot on the tweeter axis (fig.13) features an impressively clean initial decay across the band. There are two ridges of ultrasonic delayed energy apparent, one at 26kHz and one at 30kHz, at the rightmost edge of this graph. These are high enough in frequency not to have any subjective consequences. However, there is some low-level hash evident in the mid-treble, perhaps resulting from the woofer's residual cone breakup modes.

The combination of the XdS, XdW, and XdA offers superb measured performance in both the frequency and time domains. Is the speaker perfect, therefore? Unfortunately, I have no means of assessing dynamic range, but it must be remembered that this superb performance is obtained by shaping the output of what is still a small drive-unit. Even though the crossover to the XdW will eliminate the low frequencies that would otherwise demand large excursions from the XdS's woofer cone, I felt in my own auditioning that the system would not play quite as loud as I wanted it to in my wilder moments. (I hope to report further on my experience with the Xd in a "Follow-Up.") But other than that minor limitation, this system offers extraordinarily good performance at what is really an affordable price. I agree with Kal Rubinson—the Xd system is the best thing to come down the pike in a long time, and, along with the pioneering designs from Meridian, a harbinger of speakers to come. *—John Atkinson*

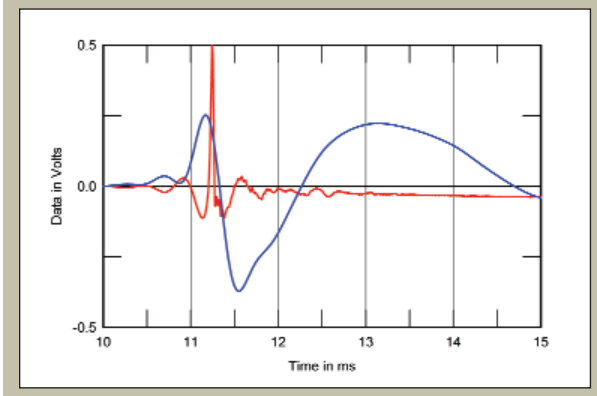

Fig.11 NHT XdS driven by XdA, step responses on tweeter axis at 50" of equalized tweeter (red) and woofer (blue). (5ms time window, 30kHz bandwidth.)

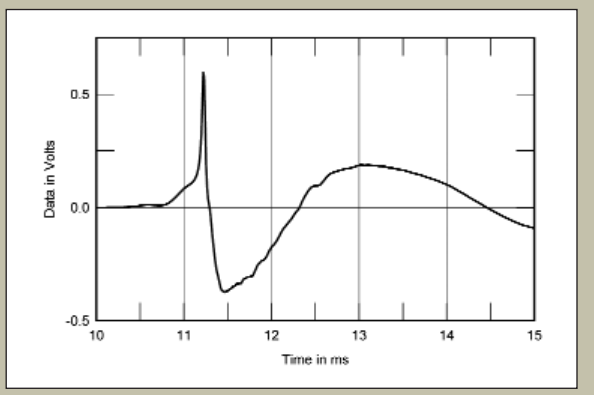

Fig.12 NHT XdS driven by XdA, equalized step response on tweeter axis at 50" (5ms time window, 30kHz bandwidth).

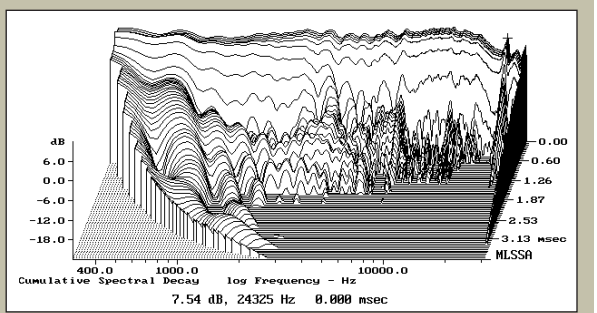

Fig.13 NHT XdS driven by XdA, cumulative spectral-decay plot at 50" (0.15ms risetime).

inverted onto its stand, the cover that protects the drivers can be swapped for a fitted grille. Each XdS connects to the XdA with a color-coded cable terminated, on each end, with a clearly labeled fitting bearing four banana plugs.

The 57-lb XdW comes fully assembled, requiring only the attachment of its IEC power cord and XLR signal cable (both provided). It also has its own power switch and level control; I found the latter correctly calibrated to match the XdS in my room.

The XdA's rear panel has left and right RCA and XLR inputs, L/R RCA and XLR woofer outputs, two sets of four binding posts, one for each L/R amplified output, and AC power and switching facilities. Although that's all that's needed for general use, there are also: a mike input for the future addition of room EQ functions, a USB port for software updates such as modified EQ and crossover curves, and options for remote switching and/or signal-sensing for turning the unit on. The XdA's front panel, stylish in black and silver, has indicators and pushbuttons for each channel that adjust the system EQ for the proximity of the XdS satellites to walls, corners, and other large objects, such as video monitors.

Because all cables and parts are included and all the necessary EQ is already programmed, the system was up and running within half an hour of my opening the first carton. In fact, most of my effort was expended in removing my resident floorstanding speakers so that the Xd could have room to breathe.

Beautiful looks

My oh my, but this is one beautiful speaker system. Even before turning it on, I could appreciate that NHT has put a lot of effort into making the Xd welcome in the home. Each XdS becomes one with its base, and the elliptical XdW is a refreshing relief from the usual cubes and cylinders. While the two-tone scheme may not appeal to everyone, the Xd is spectacularly finished and definitely furniture-grade. Other finishes are promised; if they're executed as nicely as this one, the WAF bugaboo should be gone forever.

At first, I put the XdS's about 7' apart and about 2' from the front wall. The unported XdW was dead center between them but closer to the wall. Damn, it looked nice, and the maroon-and-cream color scheme worked well with our bubblegum-pink walls.

Fed by the L/R outputs of the McCormack MAP-1 preamplifier, the Xd system was plagued with a low, buzzy hum. Because the hum came only through the XdS satellites and not the XdW, I didn't conclude that it was a ground loop until after lots of cable-swapping, AC rerouting, and fooling with ferrites. NHT's Jack Hidley thought the ground loop came from cable TV or a satellite receiver, but neither was the case because I'd disconnected both. However, he did say that "the PowerPhysics switching amplifiers have an H bridge output. The consequence of this is that there will be half of the rail voltage (70VDC) on the plus and minus speaker outputs of the XdA all the time." I suppose that might make the Xd more sensitive than other systems to the leakage of rail-borne noise. Nonetheless, the simple solution suggested by NHT was a ground cheater on the XdA's AC cord. It worked.

When I set the XdA to turn itself on only when it sensed an audio signal, it responded in 3–5 seconds; the XdW, which is always in this mode, took about 3 seconds more. This is not a problem, but you'll become aware of it when you put on your first CD and don't hear its first notes. I was more bothered by the XdA shutting down after several minutes without signal, which occurred during testing when I took 10 minutes to analyze the results of one signal sweep before taking another. All of this can be avoided by setting the XdA to be permanently On.

Beautiful is as beautiful does

My first impression of the Xd system's sound was that it was clean and well-balanced but somehow lacked great projection and weight. Imaging was stable and discrete, with a wide, deep soundstage into which the XdS speakers themselves almost "disappeared." To get more satisfying performance, I tried fiddling with the XdA's speaker position control, which equalizes the system to compensate for the XdSes' distances from room boundaries, but the differences, though easily discernible, were not effective. Later, when I got the graphs showing the boundary-compensation EQ, it was clear why these settings would not affect this range: All of those adjustments affect only frequencies above 200Hz.

This was resolved in two ways. First, I measured an in-room response that dipped several dB in the upper-bass range centered on 130Hz. This detracted from the general impression of weight, warmth, and richness of sound. While the crossover slope between the XdS and XdW may be a very steep 48dB/octave at 110Hz, there is still significant signal overlap between the woofer and satellites; the positioning of the woofer is important. A lower frequency, of course, would compromise the power-handling limits of the XdS's 5.25" driver. I found that moving the XdW forward so that it was the same distance from the listener as the satellites filled in the integrated response, as confirmed by instrument and ear.

BECAUSE ALL CABLES AND PARTS ARE INCLUDED AND ALL THE NECESSARY EQ IS ALREADY PROGRAMMED, THE XD SYSTEM WAS **UP AND RUNNING** WITHIN HALF AN HOUR OF MY **OPENING THE FIRST CARTON**.

ASSOCIATED EQUIPMENT

DIGITAL SOURCES Simaudio Moon Orbiter, Denon DV-5900 universal players.
PREAMPLIFIER McCormack MAP-1.
POWER AMPLIFIER Bryston 9B-SST.
LOUDSPEAKERS Paradigm Reference Studio/60 v.3, Studio/20, Servo-15 subwoofer; Revel Ultima Studio; B&W N802D.
CABLES Interconnect: Harmonic Technology Harmony Rainbow, Crystal Cable Cinemax, Kubala-Sosna Fascination. Speaker: Kubala-Sosna Fascination. AC: Kubala-Sosna Emotion.
ACCESSORIES Echo Buster room treatments, RealTraps. —*Kalman Rubinson*

But I was the real culprit: I was simply too timid with the volume control. Perhaps my long-term bias toward big speakers was making me treat this little system with condescension, but when I stopped babying the Xd, almost all of my reservations about its performance went out the window.

Let's start with the basics: the human voice. The two-way XdS, acting nearly as a point source and with virtually the entire range of the human voice within its compass, reproduced voices naturally, without added bloom or coloration. Well-recorded, closely miked singing, such as Lorraine Hunt Lieberson's on her *Handel Arias* (SACD/CD, Avie AV0030), or the soloists on *La Tarantella* (SACD, Alpha ALPHASACD503), stood out in relief, their accompaniments defining the space behind them. Larger vocal forces, from Polyphony to the Mormon Tabernacle Choir, were rendered as ensembles of individuals, maintaining resolution and image granularity regardless of the dynamic scale.

Instruments, from individual soloists to large orchestras, were just as well defined in tonality and space through the Xd. I was particularly taken with Julia Fischer's new set of J.S. Bach's Sonatas and Partitas for Unaccompanied Violin (2 SACDs, Pentatone PTC 5186 072), recorded with less ambience than is usual for Pentatone—I felt as if I were no more than 5' from her violin. The clarity of the illusion of the central image was so good that even its vertical dimension was convincing.

And it was the Xd system that first allowed me to appreciate the new Water Lily Acoustic SACDs of Yuri Temirkanov's performance of Mahler's Symphony 5 (WLA-WS-76-SACD) and Alexander Dmitriev's of Shostakovich's Symphony 7 (WLA-WS-77-SACD), both with the St. Petersburg Philharmonic. The two-channel sound, somewhat congealed through my big-city system, was clarified enough by the Xd that I could discern the unique perspective and the individual instrumental choirs, even though producer-engineer Kavi Alexander's classic Blumlein miking technique means there's no instrumental highlighting. (See Art Dudley's "Listening" column in the October issue for more about these releases and their creation.) These recordings also revealed the Xd's sheer potency: Normal credulity made it hard to believe that such large-scale events, spread wide and deep, were coming from such small speakers. This is doubtless a result of good matching of the amplifiers to the demands of the speakers.

Not only was the Xd system capable of big, spacious, wide-range sound, it was nearly immune to conventional room problems. You know the principle: Absorb or diffuse the first reflections from the sidewalls so that those early reflections don't screw up the imaging. This is partly because most speakers' off-axis responses only vaguely resemble their on-axis responses and both contribute to the perceived balance. The Xd's accurately customized, extremely steep crossovers are supposed to linearize the XdS's on- and off-axis responses, at least in the horizontal plane. I found that I could remove my freestanding Echo Buster wall treatments and still get a great soundstage from the Xd system without corrupting the imaging specificity.

But the beauty of NHT's approach went beyond freeing me from concerns about wall treatments. The Xd is also less critical of other domestic issues because its DSP options can compensate for boundary proximity. Of the XdA's four settings, I was able to test only two. The default setting is for a freestanding location several feet from any floor, wall, or ceiling, and this was how I enjoyed the Xd most. I also tried the Xd with all three speakers flat against my room's front wall. At normal listening levels, the appropriate EQ compensation reduced the system's tendency, due to its nearness to the wall, to "shout." These problems could return at really high levels, but this was of little consequence—those levels were incompatible with serious listening or even sanity. I couldn't try the EQ setting for corner placement because my room's only unoccupied corner is behind a door. The last EQ setting is for a single XdS placed on a large object, such as a TV. Again, I could not assess that, but I remember that a highlight for me of the 2005 Consumer Electronics Show was a brief demo of a 6.2-channel Xd system—and if I recall correctly, the center XdS speaker was *inside* an entertainment center.

Given a well-recorded ensemble of the size that might rationally fit into my listening room, the Xd system virtually disappeared. This uncanny effect was accomplished by its balanced and open sound, as well as by its complementary room interactions and appearance. On the Chris Lomheim Trio's *The Bridge* (SACD, Artegra ART2004), the piano, bass, and drums were immediate, tight, and focused, with no noticeable confusion from the sidewalls or, indeed, any awareness of the listening room itself—just the music. Because the Xd speakers are so small and so visually unobtrusive, they encouraged the illusion of transport; other speakers demand that I close my eyes to achieve the same level of enjoyment.

Comparisons

While the XdS satellites are a bit smaller than my warmer-sounding Paradigm Studio/20s, the Xd system easily outperformed them in dynamics and bass. The Xd was also more smoothly integrated across the audible spectrum than either the Studio/20s or the Studio/60s. As nicely as the Paradigms work in my room, there are moments when I can hear that each has more than one driver. With the XdSes and XdW the same distance from my listening seat, I never heard anything other than a unified sound source; in that regard, the Xd system approached the performance of the B&W N802Ds that I will be reviewing next month. The presentation, however, did seem more light-weight than the big B&W at low levels, much like small planar speakers such as my old Stax ELS-F81s or Magnepan's MGMC1. This may simply be due to the Xd's radiation patterns not exciting all room modes, or a lack of coupling to them at low levels. Whichever, this reduced interaction with the room contributed to my observation that the Xd system seemed less limited by the room when pushed to very high dynamic levels.

The Xd's bass was nearly as full and extended as that from a pair of Paradigm Studio/60s, but couldn't compete with the output of the B&W N802Ds or the Revel Ultima Studios. Nonetheless, the

WHEN I STOPPED BABYING THE Xd, ALMOST ALL OF MY RESERVATIONS ABOUT ITS PERFORMANCE **WENT OUT THE WINDOW**.

quality of the XdW's bass was competitive with any of them. When I piped the stereo signal through the Outlaw ICBM bass-management system, all frequencies below 40Hz were sent to my Paradigm Servo-15 subwoofer, which added a wallop to the bottom end that the Xd, as configured here, couldn't duplicate. Of course, the XdA provides drive for a second XdW, in stereo or dual-mono, and that might be a better solution if you're as much of a bass addict as I am. But the unassisted Xd did measure nicely to below 25Hz in my room; normal folks need not apply for these extras.

The other area of distinction was the midrange, where the Xd's presentation of voices never seemed lacking but rarely gave me the shiver of eerie recognition that I get from the B&Ws or the Revels.

On balance, the Xd could go toe to toe with any of these speakers. Given its design and physical configuration, it's likely to outperform them in real domestic listening rooms without acoustic treatment or major spousal accommodations.

Conclusions

NHT's Xd is a remarkable system whose small size and flexibility in placement should make it welcome in most homes. Its small drivers do place a limit on ultimate volume levels, and adding more speakers on the same channels might compromise the Xd's marvelous in-room behavior and imaging. That limit, however, is well beyond what even most audiophiles might need. Add in its clarity and a neutral harmonic balance unfettered by output level, and you have a truly outstanding system that works in the average home.

However, the Xd is more than just a speaker. All of its electronics contribute to the result, particularly the digital equalization and crossover, which make a felicitous marriage between amplifiers and speakers that the average audiophile can only dream of accomplishing by the usual mixing and matching of components. Moreover, NHT has designed the Xd as a modular, expandable system that can be configured as necessary for two-channel and multichannel applications.

The NHT Xd is the best thing to come down the pike in a long time. I hope it is a harbinger of designs to come. The current Xd system, however, is completely satisfying in itself–its presence in my listening room is an enhancement both visual and aural. Because the Xd's performance is competitive at the highest levels, anyone interested in high-quality music reproduction must hear it. It might convince you to reconsider a lot of your accumulated equipment, but beware–if you bring along your nonaudiophile spouse, you may have a lot of explaining to do, about why your current system is both more complicated and less attractive-looking. ■

NHT'S Xd IS A REMARKABLE SYSTEM WHOSE **SMALL SIZE** AND FLEXIBILITY IN PLACEMENT SHOULD MAKE IT **WELCOME IN MOST HOMES**.

FOLLOW-UP

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NHT Xd

POWERED LOUDSPEAKER SYSTEM

When Kalman Rubinson reviewed NHT's $6000 satellites+subwoofer loudspeaker system in the November 2005 issue (pp.105–115), he was very impressed, concluding that "The NHT Xd is the best thing to come down the pike in a long time…Because the Xd's performance is competitive at the highest levels, anyone interested in high-quality music reproduction must hear it." I was also impressed enough by the Xd's measured performance that I decided I would do a "Follow-Up."[5]

A "Follow-Up" would also allow me to experiment with different crossover filters that NHT's Jay Doherty had e-mailed me after the November issue had gone to press, and which were claimed to endow the system with greater dynamic range.

"E-mailed…?"

The heart of the Xd system is the XdA, a four-channel power amplifier that uses PowerPhysics class-D amplifier modules and includes a digital-domain crossover from Australian company DEQX for up to

two XdS satellites and two XdW powered bipole subwoofers. The XdA's equalization and filter parameters are held in nonvolatile memory, and can be updated via a USB link using a Windows XP program (provided you have Microsoft's .NET extension installed).

The three filters NHT sent me were:
1) "flatterhighend.flt"—similar to the original filter set, but, according to Jay Doherty's enclosed notes, "Flatter above 10kHz; crossover point between tweeter and midwoofer moved up a hair (to 2.4kHz from 2.3kHz) to increase power handling; reversed sub phase to try for better sub/satellite integration";
2) "150Hzcrossover.flt"—intended for dual subwoofer use; keeps the inverted subwoofer phase but moves the crossover between the satellite and subs from 110Hz to 150Hz to enable the system to play louder; and
3) "150Hzxovereqto20Hz.flt"—equalizes the subwoofers to be –3dB at 20Hz instead of 26Hz.

There will be more filters to come. According to Doherty, "We are working on a linear-phase filter to use between the satellite and subwoofer. LP filters require firmware changes that we should be able to implement by the time the first room EQ software package is complete. However, this will increase total system processing time to about 18ms (from 7ms), so it might not be usable with video."

Kal had used only a single XdW subwoofer, but as I intended to try the filter sets with the higher crossover frequency, I asked NHT to send me a second subwoofer. This increases the system price to $7200.

Sound: As KR had described, setting up the Xd system was quick and easy. Unlike Kal, I had no ground-loop problems, but this may have been due to the fact that I used balanced connections.

Preamp was first the Mark Levinson No.326S, connected to the NHT XdA power amplifier with 15' runs of Madrigal interconnects; then an NHT Passive Volume Control, connected with 6' runs of Canare interconnects (the only balanced cables I had with the necessary TRS connectors). Digital source was either a Mark Levinson No.31.5 CD transport or a Technics DVD-A10 DVD player, hooked up to my ML No.30.6 D/A processor via Kimber Kable Orchid AES/EBU or AudioQuest SVD-4 S/PDIF datalinks, respectively. The No.30.6 was connected to the preamp with balanced 1m lengths of AudioQuest Cheetah. I also used an Olive Symphony media server to play back uncompressed 16-bit AIF files via a TosLink connection to the Levinson DAC, and an Ayre C-5xe universal player connected to the preamps with 15' lengths of balanced Crystal interconnects.

When he'd first set up the Xd, Kal had remarked on a lack of integration between the satellites and subwoofer: "I measured an in-room response that dipped several dB in the upper-bass range centered on 130Hz. This detracted from the general impression of weight, warmth, and richness of sound. While the crossover slope between the XdS and XdW may be a very steep 48dB/octave at 110Hz, there is still significant signal overlap between the woofer and satellites; the positioning of the woofer is important. A lower frequency, of course, would compromise the power-handling limits of the XdS's 5.25" driver. I found that moving the XdW forward so that it was the same distance from the listener as the satellites filled in the integrated response, as confirmed by instrument and ear."

With first one subwoofer, then two, and using the same filter set Kal had used, I couldn't eliminate the upper-bass discontinuity no matter how I experimented with subwoofer positioning. The bass region was rich and deep, but didn't integrate sufficiently well with the satellites. In addition, while midrange tonalities were reproduced with a delightful lack of coloration, there was a somewhat reticent quality to the highest frequencies. Whether or not these problems bothered me was very dependent on the music played.

I have written before about how the choice of playback equipment can change the choice of music played. The discontinuity between the satellites and subwoofers was more audible with rock music, with its ubiquitous four-in-the-bar kick drum, than it was with classical recordings. For the three weeks I used the Xd system with the original crossover filters, I found myself playing a lot more symphonies and concertos than I had done with other speakers that have recently occupied my listening room.

The Xd's extended low frequencies were a much-appreciated benefit with this kind of music, and the system's somewhat veiled highs were much less of an impediment to musical enjoyment. I dug out discs that I hadn't played much, such as Michael Tilson Thomas' reading of Mahler's Symphony 3 (SACD, San Francisco Symphony 821936-0003-2) and Seiji Ozawa's of Tchaikovsky's Symphony 6 (SACD, Pentatone PTC 5186 107). The double basses in the former's final movement had glorious weight through the Xd system, though I found the system's midrange resolution very revealing of the wayward intonation of the occasional sustained brass chord in the latter. But when I played Eric Johnson's "Desert Rose," from *Live from Austin TX* (CD, New West NW6084, recorded for the *Austin City Limits* TV program), the low bass just grumbled along with the higher frequencies.

There was also something I noticed with the toneburst track on my *Editor's Choice* compilation (CD, Stereophile STPH016-2). This track comprises equal-length tonebursts that move from 32Hz up to 3.2kHz in half steps, then back down again. I created this signal to investigate room and speaker-cabinet resonant problems, but when I played it over the Xd system, I was puzzled to hear what sounded like very faint "ghosts" accompanying the sinewave bursts, almost but not entirely like modulation noise. A puzzle, though I did wonder if this phenomenon had something to do with the veiling I had noticed on music.

Time to install the new filter set. I began with "flatterhighend.flt," but then changed to "150Hzcrossover.flt" because the system was still having difficulty handling music with extreme amounts of upper-bass energy. Stanley Clarke's double-bass solo on Airto Moreira's "Nevermind," from our *Test CD 3* (Stereophile STPH006-2), managed to shut down the left-channel satellite-woofer amplifier at the volume I was finding appropriate for the music. (The image lurched to the right and a red light came illuminat-

ed on the XdA amplifier's front panel. Turning off the amplifier and turning it on again fixed the problem.)

Repeating this torture test with the 150Hz crossover filters didn't result in any shutdowns with the Clarke solo, and the chord that begins "In the Flesh," from Pink Floyd's *Is There Anybody Out There? (The Wall Live)* (CD, Columbia C2K 62058), sounded positively cataclysmic. The low-frequency crash of the wall being demolished on this album gave the XdW subwoofers one *heck* of a workout. However, the drum-and-unvoiced-guitar intro of Eric Johnson's "East Wes," from his live *Austin City Limits* CD, still managed to shut down the left XdS woofer amplifier if I wasn't careful with the volume control. (Setting the NHT PVC's control to –6dB, equivalent to an in-room SPL of around 108dB, could trigger an amplifier shutdown with this track.)

I listened again to the half-step–spaced tonebursts on *Editor's Choice*. Despite the revised filters, I could still hear the slight modulation noise accompanying the tonebursts. Probably not too much should be made of this phenomenon; I mention it only because I had never heard it before with conventional loudspeakers.

What about the high frequencies? The veiling that had bothered me was much reduced, the top octaves having more air apparent. Perhaps more significant was the minimizing of a slight mid-treble "shoutiness" that had limited maximum volume with the original filters. The presentation was first-rate in its lack of coloration, superbly stable and detailed imaging, excellent retrieval of subtle reverberation tails, and overall top-to-bottom integration. Wow!

Measurements: Fig.1 shows the response of the Xd satellite (black trace) and the XdW subwoofer (green), as well as the individual responses of the Xd tweeter (red) and woofer (blue), with the XdA crossover running the original digital filters. The crossover points lie at 110Hz and 2.3kHz, and the Linkwitz-Riley filter slopes are a very steep 48dB/octave. A touch of excess energy can be seen in the mid-treble, and the top octave is a little shelved off both on axis (red) and in the 30° averaged response (black). It also looks as if the tweeter's ultrasonic dome resonance has been notched out.

By contrast, fig.2 shows a similar set of response curves taken with the revised filters (NHT's "150Hzcrossover.flt" file). (Because of continued wind and torrential rain during October, the responses above 300Hz were taken indoors at 40" instead of outdoors at 50"; this affects the accuracy of the measurements in the midrange but is otherwise inconsequential.) The filter slopes are still 48dB/octave, and the crossover between the XdW subwoofer and the XdS satellite can be seen to have been shifted up to 150Hz, as specified. While the upper crossover point looks very similar to that in fig.1, the XdS drivers look better integrated overall, with a flatter mid-treble. There is also now slightly more energy apparent between 7kHz and 15kHz, and the tweeter's ultrasonic resonance is unfettered by a notch. The response on-axis (red trace) now extends flat to the tweeter's resonance at 27kHz, though the HF unit's limited dispersion above 15kHz results in less energy in this region in the 30°-averaged curve (black).

But it is the response in the room that matters most. To investigate how the Xd system behaved in my listening room, I ran my usual test of averaging 120 1/3-octave power spectra taken individually for the left and right speakers in a window centered on the position of my ears. The blue trace in fig.3 shows the in-room response of the Xd system with dual subwoofers and the XdA's original digital filters. The lack of energy in the 50Hz and 63Hz bands is endemic to my room and seating position. But note the extension to 20Hz and the very flat midrange, meeting ±1dB limits from 250Hz to 16kHz—superb performance for an in-room, listening-position measurement. There is a slight lack of upper-bass energy, though not nearly as much as I was expecting from my auditioning.

The red trace in fig.3 is the in-room response taken in an identical manner with the 150Hz crossover/EQ. Overall it looks very similar, but there are detail differences that correlate with the listening impressions. There is more energy in the 80Hz, 100Hz, and 125Hz bands, indicating better integration between the subwoofers and satellites. That

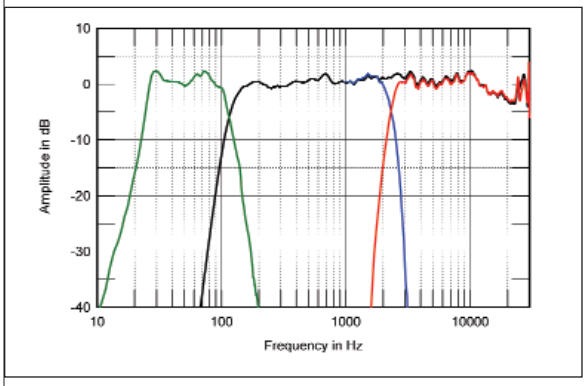

Fig.1 NHT Xd system, original XdA crossover filters, anechoic response on axis at 50", averaged across 30° horizontal window and corrected for microphone response (black), with the nearfield XdS woofer (black) and XdW subwoofer (green) responses plotted below 300Hz, and the individual XdS woofer (blue) and tweeter (red) responses.

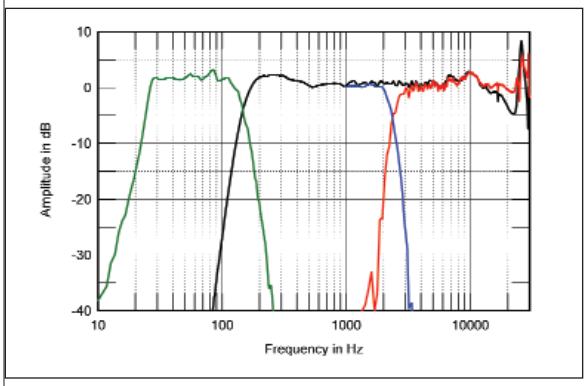

Fig.2 NHT Xd system, revised XdA crossover filters, anechoic response on axis at 50", averaged across 30° horizontal window and corrected for microphone response (black), with the nearfield XdS woofer (black) and XdW subwoofer (green) responses plotted below 300Hz, and the individual XdS woofer (blue) and tweeter (red) responses.

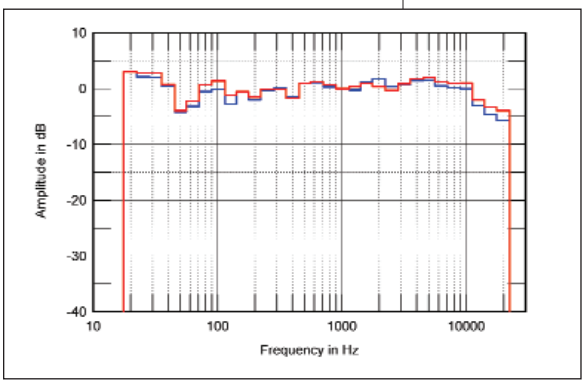

Fig.3 NHT Xd system, ⅓-octave, spatially averaged response in JA's listening room with original crossover filters (blue) and revised crossover filters (red).

slight bump at 2kHz is gone, and the top two octaves are between 1–3dB higher in level. The response now falls between ±1.25dB limits all the way from 80Hz to 16kHz, which is simply extraordinary in-room performance. Extraordinary!

Summing Up: Art Dudley recently wrote that the true test of a component under review is how you feel when it comes time to return it to the manufacturer. In the case of NHT's Xd, I felt bad about having to send it back. It did almost all of what I want an amp and speakers to do, with very little downside. However, I have five pairs of speakers on deck for review and I have to move on.

In the meantime, the revised crossover software, in conjunction with stereo subwoofers, has taken a relatively affordable, excellent-sounding loudspeaker system and made it almost beyond criticism. It's true that the NHT Xd system still lacks ultimate dynamic range, but there's only so much you can ask in terms of ultimate loudness from a pair of drive-units with a radiating diameter of just 3". Highly recommended.

—John Atkinson