Pioneer X-Z9 Compact Stereo System, Pt. 2

By David A. Rich

MEASUREMENTS

The midrange sounded smooth, but lacked detail. Annoying brightness at the top-end could be moderated with the treble control. The coax did its job in stand-up tests, where the upper midrange was unchanged. Frankly, I was expecting more, so I brought out the test equipment.

Figure 1 is the on-axis response of the speaker, the mike 1m from the speaker using the Acoustisoft ETF quasi-anechoic measurement system. I applied one-sixth octave smoothing to the graph. I achieved the best results with the microphone 8″ below the tweeter, slightly below the woofer center. This graph also plots the horizontal radiation pattern of the speaker.

The overall response is smooth except for the giant, puzzling dip starting at 2kHz and declining by 4dB. Baseline returns at 6kHz. The dip hardly changes even out to 60° off-axis. There is some reduction in amplitude at wider angles above 4kHz, but the amplitude reduction at 3kHz is nearly identical at 12kHz. Clearly, the handoff from the midrange to the tweeter is fine.

The tweeter response is remarkably smooth given the speaker's coax design and the fact that the graph is smoothed to only one-sixth octave. There are no significant ripples typical of a coax as the tweeter interacts with the midrange cone. The ripples are larger relative to the KEF Reference 205, but the bookshelf speaker in the KEF Reference line is $6000. No bookshelf or free-standing KEF speaker exhibits the upper midrange dip, but some of the lower priced units show more ripple at the high-end from the coax design.

Take a look at the vertical radiation patterns. **Figure 2** is the response starting at the woofer axis and moving down to 25° off-axis. There are no crossover effects! A slight reduction at the high-end is an expected off-axis effect at the tweeter. This is an excellent result in the absence of the aforementioned dip. Again, this graph is shown with one-sixth octave smoothing applied to the graph.

A rise (**Fig. 3**) in the vertical direction highlights woofer/midrange interaction at the 800Hz crossover, typical of a well-executed 12dB octave crossover for non-coincident drivers. At the midrange–tweeter crossover, there is no change out to 30° off-axis. The dip cannot be a crossover artifact because it persists as the vertical and horizontal angles change. Indeed, it seems to be some sort of electronic filter in the crossover path.

My in-room speaker measurement (**Fig. 4**) is an average of nine measurements taken around the listening point using the Acoustisoft RplusD software. The one-second gate time is equivalent to an RTA measurement but with 100 band because I used tenth octave smoothing. Ignoring the room modes and the speaker room interactions (Allison effects) below 150Hz, the speaker is admirably flat with the same dip unchanged in magnitude or bandwidth. Remember, this graph is smoothed to a tenth of an octave, not the traditional third octave smoothing.

The high-end is a little rolled off—as expected—from an in-room measurement that is off-axis to the speaker.

I also made an average of 20 measurements with the microphone deployed at a variety of positions throughout the room (not shown) to gauge the speaker's power response. The curve was similar to **Fig. 4**, with a similar smooth response except for the dip unchanged in magnitude or bandwidth. Measurements with the speaker in other placements in the room or in other rooms did not show any significant change in the dip.

DIP EFFECTS

Figure 4 confirms the hypothesis that the dip is not driver- or crossover-related. It looks as though a filter was deliberately placed in-line with the speaker because the dip is invariant to the type of acoustic measurement. The dip looks to be an intentional voicing, often called a BBC or Gundry dip. The BBC observed the dip's ability to produce an artificial sense of depth and spaciousness.

Pioneer may have applied the dip to the S-Z9 expecting that it would either be pushed against a wall and the pair spaced close together (4′ or less), which is the appli-

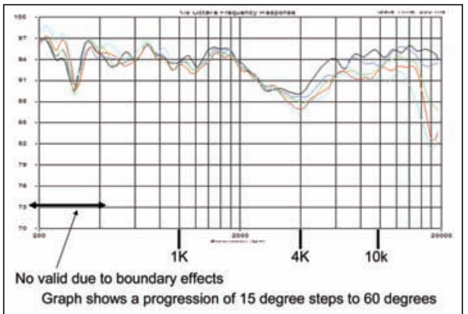

FIGURE 1: Horizontal radiation pattern with the vertical axis centered at slightly below the woofer's center.

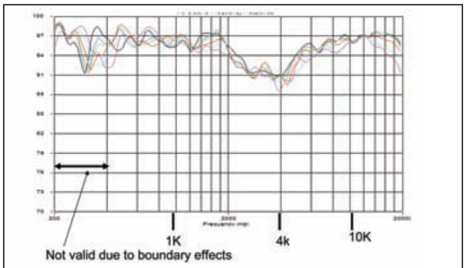

FIGURE 2: Vertical radiation pattern starting at woofer axis and going down by 5° to 25° below the speaker.

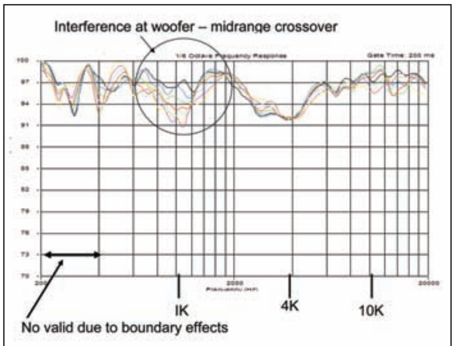

FIGURE 3: Vertical radiation pattern starting at woofer axis and going up by 5° to 30° above the speaker.

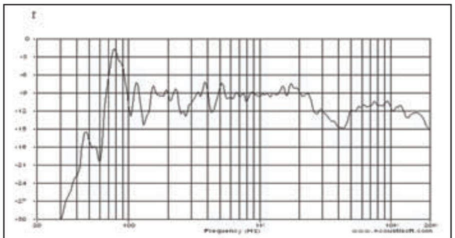

FIGURE 4: In-room response in using speaker in position 1.

cation demonstrated on the Japanese website. Larger room sizes in the States should provide more latitude for speaker positioning. The instruction manual says absolutely nothing about speaker placement.

The dip in this speaker is not a signature Pioneer effect; it is absent in the top-of-the-line Pioneer S-2EX bookshelf speaker and the larger members of the family, which have been independently measured by *Stereophile* and *Ultimate AV*. The Japanese website pays much attention to the X-Z9's "AIR Studios™ Sound Tuning." The British Air Studio is well known for producing highly marketable albums. Could the "Sound Tuning" introduce the dip? I do not know, and Pioneer America could not shed any light on the situation.

I find the dip in this speaker to be a defect that should be fixed. This is readily accomplished by modifying the components in the crossover that introduce the dip. Ignoring the dip (**Figs. 1–4**), the speaker is exceptionally flat on-axis, off-axis, and in the room.

To simulate how the speaker sounds without the dip, I applied the pricey ($4000) Lyngdorf RP-1 room equalizer to neutralize it. The equalization curve did little above 300Hz aside from filling the dip. Not surprising, because the speaker is otherwise flat in anechoic measurement and in a room, so it does not need to be equalized outside the vicinity of the dip in the speaker-dominated frequency spectrum.

The change was remarkable. The high-end brightness disappeared with the tone control set to flat. I was clearly using the 3-4kHz minimum dip level as a reference and preserved the increase in level above 4kHz (as the dip recedes) as an out-of-balance high-end. John Atkinson of *Stereophile* reports other reactions are possible for a speaker with an upper midrange suckout.

While the S-Z9 sounds pleasant enough in the upper midrange with the dip and the treble control engaged, the speaker blossoms with rich harmonic information restored in the absence of the dip. The effect was notable in the strings; all instruments with harmonics above 1kHz and vocals also benefited.

The resulting sound could challenge mini-monitor speakers at more than twice the price of the entire X-Z9 complex. This is a function of the properly executed crossover design packaged in a genuine three-way speaker with a highly innovative coaxial driver. The execution leads to an extremely flat response of the speaker, where the drivers and enclosure are free of resonances. Most speaker manufacturers could not pull this off because they source their drivers from third parties, opting not to customize their drivers given the huge expense. Even the few speaker manufacturers who develop drivers would be challenged to execute a speaker as flat and free of radiation pattern abnormalities as the S-Z9.

Figure 5 is an in-room measurement with the speaker placed at a different position. The high-end is strengthened by room effects and a variation in the resonance of the tweeter cone for this speaker sample. These manufacturing tolerance changes are common for less expensive metallic drivers and are amplified in a coax design by variations in the midrange cone that forms the tweeter's waveguide. Pioneer was kind enough to send two more S-Z9s to test, and they matched within 1dB out to 6kHz. All had identical dips.

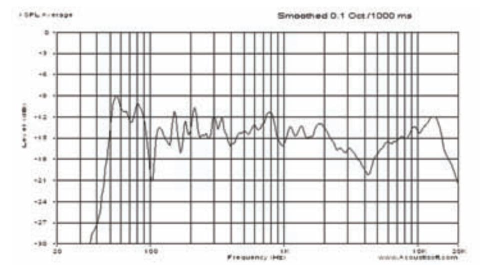

FIGURE 5: In-room response in using speaker in position 2.

The frequencies at which the bass responses in **Figs. 4** and **5** peak are not correlated, indicating the room effects are not from a port tuning that bumps up specific bass frequencies in the speaker. There is an honest 45Hz low-end, admirable for a small speaker with a tiny 5″ woofer. Pioneer gives a low-end response specification of 36Hz, but is silent on its depth. You can't fool Mother Nature, but you can cheat by lowering the efficiency of the speaker. Again, this is not an issue with an integrated system such as the X-Z9, which includes the electronics and speakers and is true to its mission statement: produce great sound in a small- to medium-size room.

From the room response, you wish for the removal of the dip and a smoother bass. Room effects can only be managed with an electronic room equalizer or expensive passive room treatment. I think the XC-Z9 has enough digital signal processing power to perform room equalization just the way it is. Pioneer uses similar Freescale DSPs in 7.1 channel audio/video receivers with room correction. If they can make it work with eight channels, it would be a snap with two. All they need to do is include a microphone and route the signal to the ADC.

Obviously, the cost of software development would need to be recovered, but I estimate the total cost of adding an effective room correction system from 40Hz to 300Hz is no more than $100. You do not need any equalization above 300Hz because this is the area that the speaker and not the room response will dominate. This speaker is so flat (with the dip removed), no equalization is required. Additional reasons equalization would not be required above 300Hz is that the exceptionally uniform off-axis response resulting from the coax designs ensures early reflection responses will be similar to the on-axis response.

To find out what would happen, I used the Lyngdorf as a proxy. Given the Lyngdorf's sophisticated algorithm for flattening the bass (±1dB ignoring room nodes that cannot be filled), I could not expect the same performance from the simpler Pioneer system, but it might be able to hold things to ±3dB below 300Hz, especially because the room correction algorithm would have knowledge of the S-Z9 characteristics. Nonetheless, with the Lyngdorf in front of the S-Z9, the bass became magical provided the speaker was not pushed past its limits (about 85dB). True, some of the low-end was missing, but not that many instruments reside below 45Hz.

WRAP-UP

In summary, the S-Z9 has the right stuff, but somebody painted a mustache on it in the form of a filter that makes a dip starting at 2kHz. In my opinion, this is a defect and Pioneer should eliminate the filter, because the resulting system would be superior to a more costly assemblage of components (SACD player, networked media system, stereo receiver, and three-way speakers) from disparate manufacturers. My thought experiment of adding room correction to a next generation XC-Z9 would take the system to another plane of excellence. Pioneer can bring it all together. I do not know of any other manufacturer that is equally well-positioned given their first mover advantage with the current X-Z9 and the unit's low price.

My message to Pioneer: Please remove that dip, allowing the excellence of the X-Z9 to shine and be known to all. Given the high level of engineering and technology that was needed to produce the electronics and the speakers' performance over nearly all their operating range, I have no doubt that the dip could easily be remedied. *rr*