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# "EXTRAORDINARY SURROUND SOUND"

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**"...it is quite clear...the Paradigm Reference 450 system is certainly one of the most completely engineered and best sounding home theater systems available at any price."**

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**A**lso part of the new Reference group of speakers from Paradigm, these home theater speakers join the *LCR-450* (Wtr 96) to complete the company's upscale home theater package. All three models also use the same drivers, though the way they are used varies.



The main home-theater-specific design goal was timbre matching of the five speakers for totally seamless integration and the ability to have dialogue and effects, not to forget music, able to smoothly move from one location to another without any tonal change. This is especially important in the new era of AC-3 Dolby Digital, where sounds can and do move discretely around the listener. Of course, the general design goals were the usual, as outlined in the *Studio/80* review: flat frequency response on all axes, high power handling with low distortion, and the highest level of acoustic coherence. Extended low frequency response was not a big issue, this system intended to be used with a subwoofer such as the *PS-1200* (Wtr 96), and adds up to a fairly high-end system.

Well, anyone wondering about timbral matching need only look at the measurements for confirmation. Both the *LCR* and *CC-450* are impressively flat, especially in the Pink Noise Sweep (PNS) that reflects their overall radiated energy into the room. The curves also demonstrate how the driver configuration in each case affects the way they measure, but more on this below. That the Summed Axial Response (SAR) and PNS are so close in both cases underscores the even dispersion of sound to 30° and beyond, meaning that all listeners at either end of the couch and in between will hear the same tonal balance and a good image spread.

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Looking specifically at the *ADP-450*, we can see that it is impressively linear in the SAR/PNS overlaid curves, close to  $\pm 1$  dB from about 200 Hz almost to the limits of audibility. Looking at the quasi-anechoic curves below (and here it is the front and back radiation that are overlaid) we see  $\pm 2$  dB accuracy through the midrange and treble, indicating remarkable on-axis neutrality; this is not only a very accurate surround speaker, this is an extremely neutral high fidelity reproducer, which would serve well in any audio system. Like the *LCR-450*, the *ADP-450* is an impressive speaker, period.

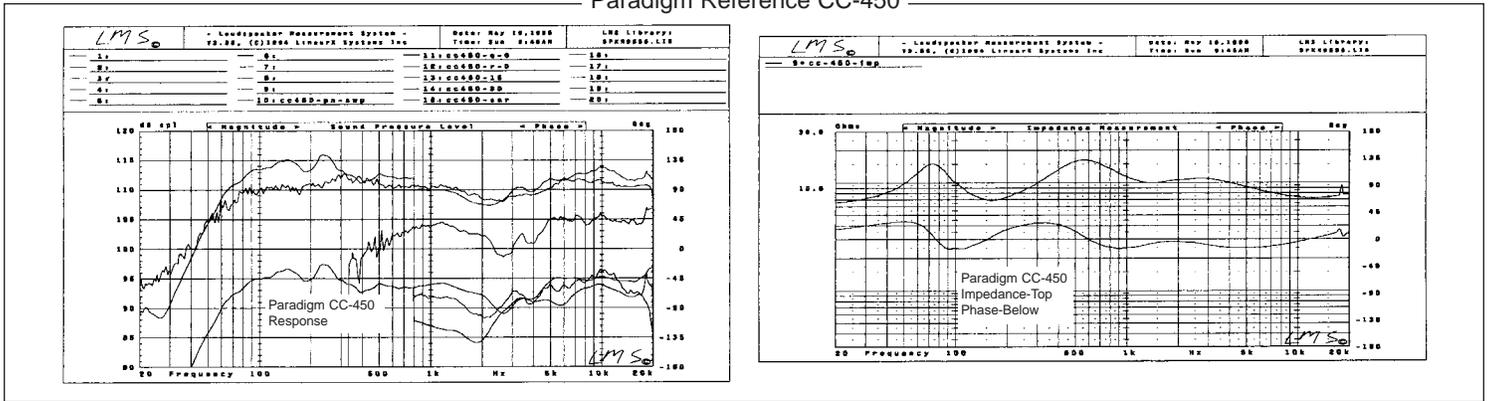
Also worth explaining is the disparity in the SAR/PNS curves in the lower octaves: since this component of the SAR is derived from nearfield measurements, it does not take into account the acoustic cancellations involved, which are here more complex as a result of the crossover, which actually flips the phase of one woofer/midrange driver around 200 Hz so that the speaker goes from being a dipole above to being a bipole below that frequency. This acoustic trickery results in better bass from the rear. Depending on how the surrounds relate to



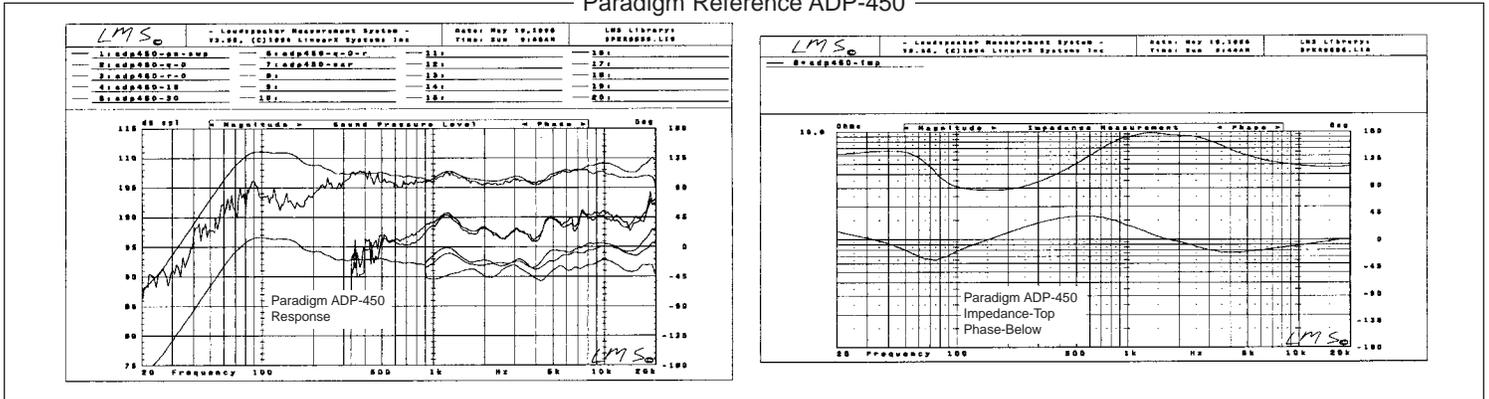
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Paradigm Reference CC-450



Paradigm Reference ADP-450



the adjacent boundaries and the drivers to each other with respect to these walls and corners, the bass output of the ADP-450 will vary. The PNS curve shows them in what is pretty close to a free space situation.

**“...flat frequency response on all axes, high power handling with low distortion, and the highest level of acoustic coherence.”**

Impedance and phase measurements of both speakers show them to be very easy to drive with the requisite solid state electronics. Phase angles are easy, making them very coherent, impedance in the case of the CC-450 is 7 ohms, the lowest point for the ADP-450 is 5 ohms.

And looking a bit more closely at the response of the CC-450, a little bit of midrange cancellation as you move off axis, typical of a center channel that flanks the tweeter with a pair of woofer/midranges; however, careful tweeter faceplate design has minimized this inevitable acoustic effect.

Finally, the result of all this timbre matching and careful acoustic design: extraordinary surround sound. I set this system up with the PS-1200 almost in the middle of the room; it sounded best that way for reasons that will become apparent in our Fall issue feature on speaker phase by Green Mountain Audio designer Roy Johnson. Most subwoofers are acoustically well behind the midrange in terms of time alignment, and therefore integrate best much better closer to the listener. In a surround system, this means the ideal spot may be in the center of the room just in front of the best seat. Try it.

I was fortunate enough to be able to audition this system with the Pioneer Elite SP-99D AC-3 processor, and on movie after movie, the seamless but spectacularly well defined surround soundstage made movie sound, whether effects like those in *Species*, or environmental ambience like that heard in *Braveheart*, incredibly natural and dynamic. The speakers just seemed to disappear, and the sound could come from anywhere in discrete surround, and did.

**“Both the LCR and CC-450 are impressively flat...the ADP-450 impressively linear...remarkable neutrality...this is an extremely neutral high fidelity reproducer, which would serve well in any audio system.”**

It was also very well integrated with Dolby Pro Logic, as you would expect, the surround effects less spectacular, but still adding a great deal in terms of realism. After some experimentation with the ADP-450s based on previous experience with the smaller ADP-150 pair, I decided that for both AC-3 and Pro Logic the best setup was with the surround directly beside the listener, but angled out from the walls at about 45°, that is, the in-phase side aiming at the center rear wall. This way, the Pro Logic dispersion (or decorrelation) is accomplished, along with a strong, coherent location with AC-3 program material. I did not find this to be the case with them flush against the walls,

but with surrounds it's always a case of different zooms for different rooms.

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You can buy a wide variety of home theater speakers with about \$3,000 to spend, and you can bet that they will all sound different from each other. In my view, there is too much tailoring, THXing, and other manipulation going on in this field. If that has to be done to make any movie soundtracks acceptable, then it should be done in the electronics, not the speakers. That said, it is quite clear to me that for most medium to large rooms, the Paradigm Reference 450 system is certainly one of the most completely engineered and best sounding home theater systems available at any price. For a big room, you'll probably have to spend a lot more for bigger floorstanding speakers, while for a smaller room, you might get away with something like the Tannoy or Celestion systems also reviewed here. But in most applications in a normal home theater room, this Paradigm Reference will clearly (pun intended) and dynamically live up to its name.