

## B&W 800 Diamond loudspeaker



**Description:** Three-way, vented-box, floorstanding loudspeaker.

**Drive-units:** 1" (25mm) diamond-dome tweeter, 6" (160mm) woven-Kevlar FST-cone midrange unit, two 10" (250mm) Rohacell-cone woofers.

**Crossover frequencies:** 350Hz, 4kHz.

**Frequency range:** -6dB at 25Hz and 33kHz.

**Frequency response:** 32Hz-28kHz,  $\pm 3$ dB on reference axis.

**Dispersion:** within 2dB of on-axis response over 60° (horizontal) and 10° (vertical) arcs.

**Sensitivity:** 90dB SPL (2.83V/m).

**Harmonic distortion** (second and third harmonics, 90dB, 1m): <1.0%, 45Hz-100kHz; <0.5%, 80Hz-100kHz.

**Impedance:** 8 ohms nominal, 3.1 ohms minimum.

Recommended amplification: 50-1000W into 8 ohms with unclipped program.

**Maximum recommended cable impedance:** 0.1 ohm.

**Dimensions:** 46.5" (1180mm) H by 17.7" (450mm) W by 25.4" (645mm) D. Weight: 225 lbs (102kg).

**Finishes:** Cherrywood, Rosewood, Piano Black Gloss.

**Serial Numbers Of Units Reviewed:** 0001013, 0001014, listening; 0000505, measuring.

**Price:** \$24,000/pair.

**Manufacturer:** B&W [www.bowers-wilkins.com](http://www.bowers-wilkins.com).

I used DRA Labs' [MLSSA system](#) and a calibrated DPA 4006 microphone to measure the B&W 800 Diamond's frequency response in the farfield, and an Earthworks QTC-40 for the nearfield responses. For logistical reasons, the loudspeaker I measured was not one of the samples auditioned by Kal Rubinson. My estimate of the B&W's sensitivity was 90.2dB(B)/2.83V/m, which is within experimental error of the specified 90dB. This is higher than average, but is offset by the fact that the speaker's impedance drops below 4 ohms for most of the midrange and some of the bass (fig.1). There are minima of 3.15 ohms at 91Hz, 3.1 ohms at 620Hz, and 3.67 ohms at 21kHz. Given that there are current-hungry combinations of 4 ohms and -52° electrical phase angle at 62Hz and 5.3 ohms and -39° phase angle at 8.6kHz, I believe this speaker should be rated as a 4 ohm load rather than the specified 8 ohms.

The traces in fig.1 are free from the discontinuities that would imply the existence of cabinet vibrational resonances; using a simple plastic-tape accelerometer, I found nothing. Fig.2, for example, is a cumulative spectral-decay plot calculated from the accelerometer's output while it was fastened to the side of the 800's bass enclosure, level with the upper woofer. There is almost nothing to be seen.

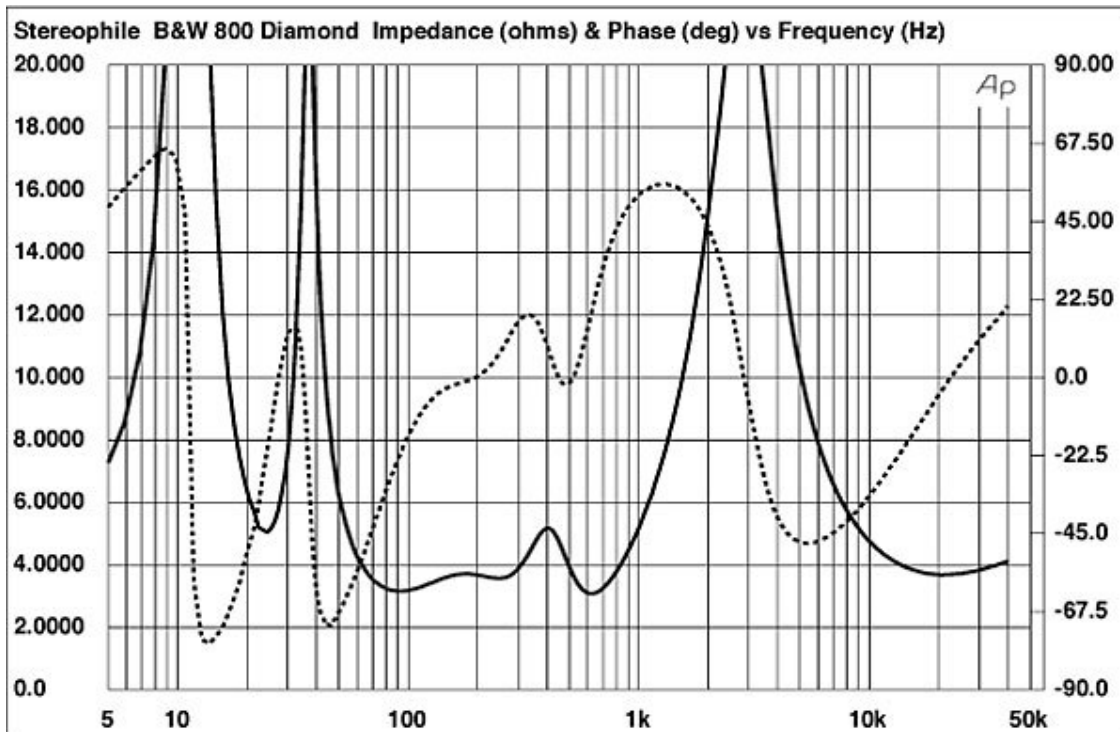


Fig.1 B&W 800 Diamond, electrical impedance (solid) and phase (dashed). (2 ohms/vertical div.)

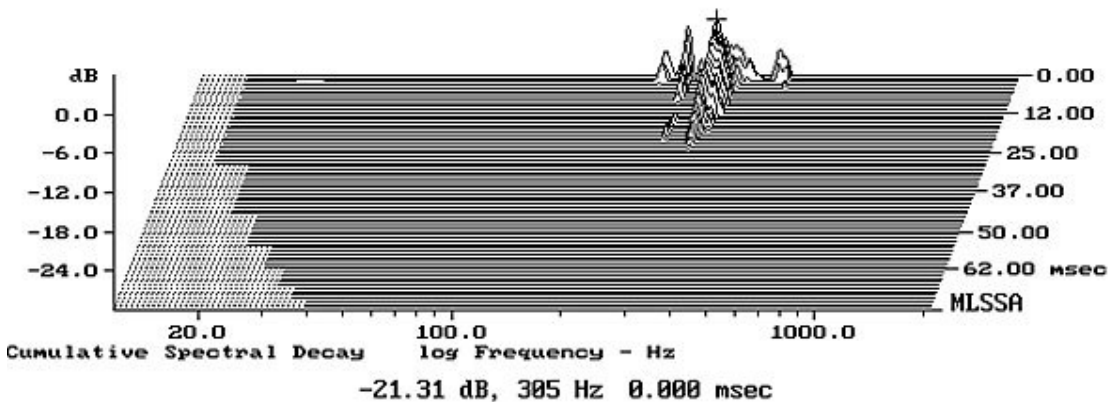


Fig.2 B&W 800 Diamond, cumulative spectral-decay plot calculated from output of accelerometer fastened to center of side panel adjacent to upper woofer (MLS driving voltage to speaker, 7.55V; measurement bandwidth, 2kHz).

The blue trace in fig.3 shows the response of the woofers (which behaved identically), measured in the farfield above 350Hz and in the nearfield below that frequency. The upper-bass peak in their output will therefore be due to the assumption in the nearfield measurements that the drive-units are operating in a  $2\pi$  acoustic environment; *ie*, mounted in a baffle that extends to infinity in all directions. The notch in the woofers' output at 25Hz confirms that this is the tuning frequency of the flared, downward-firing port, as suggested by the minimum in the impedance magnitude (fig.1, solid trace) at the same frequency. The port's output (fig.3, red trace) covers the range from 13 to 60Hz, making this speaker a true full-range design. The woofers cross over to the midrange unit (fig.3, green trace) at around 370Hz, but the speaker is not as flat in the treble as I would have expected, there being a small peak evident at 3.5kHz, and a broad plateau between 7 and 15kHz.

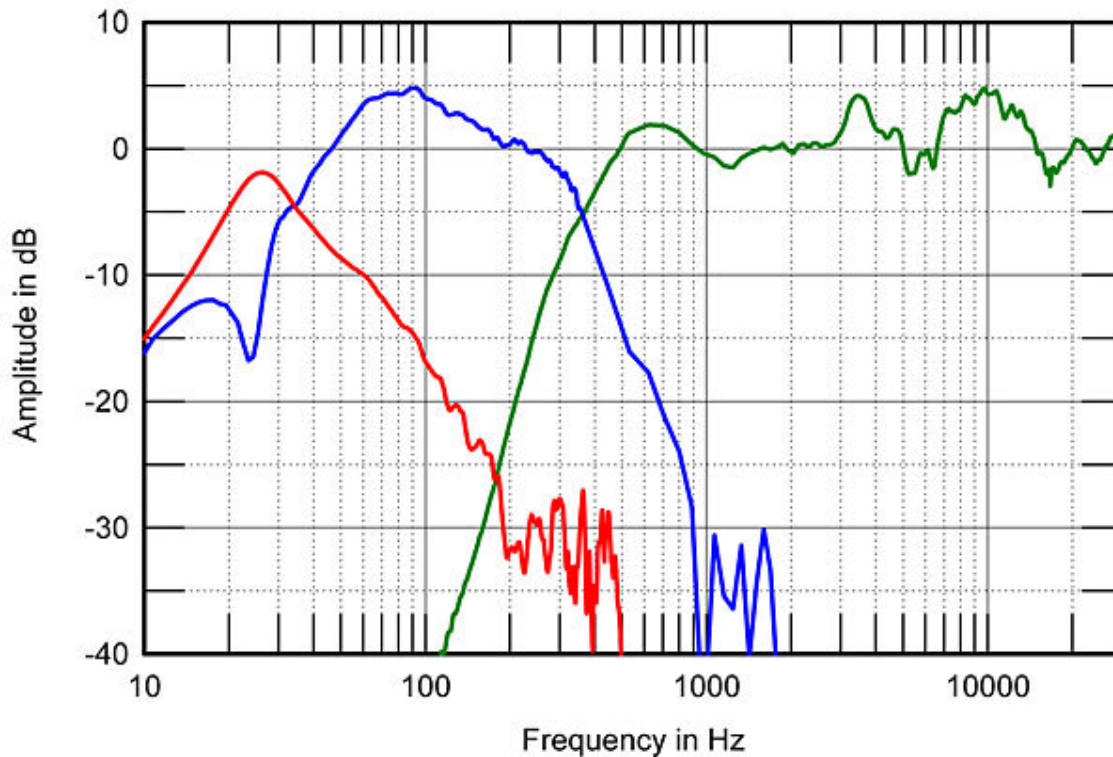


Fig.3 B&W 800 Diamond, low-frequency acoustic crossover on tweeter axis at 50", with nearfield responses of midrange unit (green), woofers (red), and port (blue).

Fig.4 shows the B&W's response averaged across a 30° horizontal window centered on the tweeter axis. Below 300Hz, this graph shows the sum of the individual nearfield responses, taking into account both acoustic phase and the differing distances of each radiator from a nominal farfield microphone position. Again, the boost in the upper bass is an artifact of the nearfield measurement condition. Under anechoic conditions, this speaker will offer full-range low frequencies. And again, the small peaks in the treble behavior can be seen.

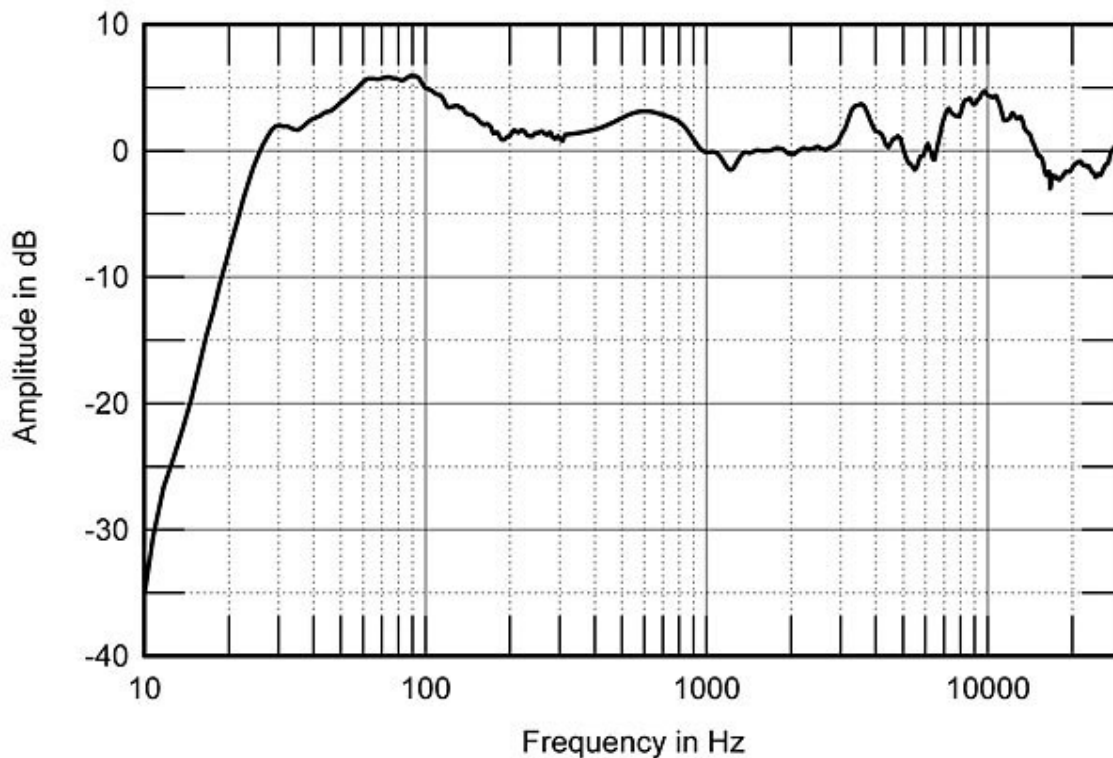


Fig.4 B&W 800 Diamond, anechoic response on tweeter axis at 50", averaged across 30° horizontal window and corrected for microphone response, with complex sum of nearfield midrange, woofer, and port responses plotted below 300Hz.

How these peaks are perceived will also depend on the speaker's dispersion. Fig.5 shows the lateral dispersion, normalized to the response of the tweeter axis. Although B&W claims that its large-diameter midrange unit has wide dispersion, you can see from this graph that the midrange driver becomes quite directional above 1kHz. In all but small rooms, this will work against the audibility of the small presence-region peak in the on-axis response, meaning that the 800 Diamond will sound more neutral in this region than is suggested by the on-axis measurement. Similarly, what appears to be a narrow off-axis flare at 5.3kHz is actually a small on-axis suckout filling in to the speaker's sides. Finally, this graph shows that the tweeter is a little more directional in the top audio octave than is typical for a 1" diaphragm; again, this will ameliorate the effect of the on-axis boost in the same region in all but small rooms.

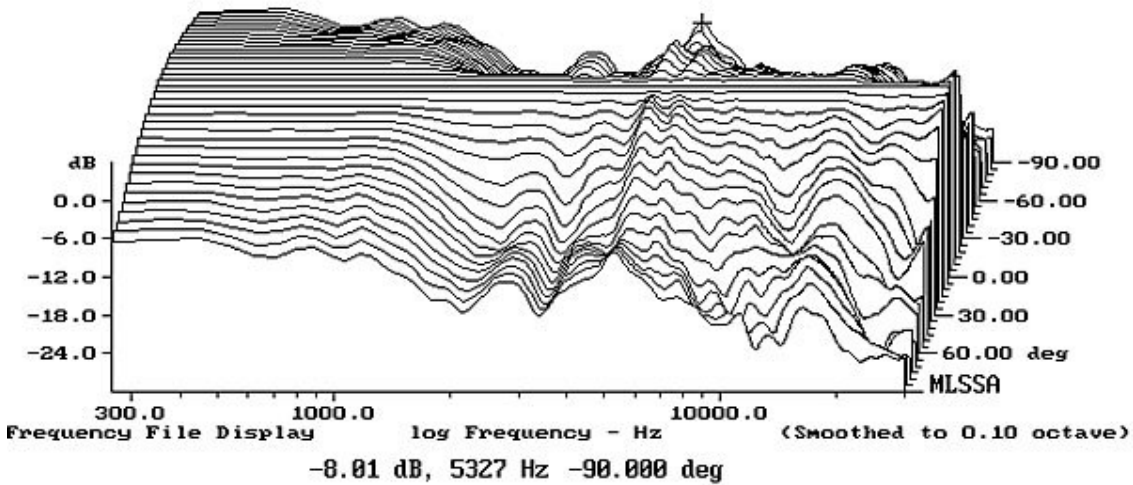


Fig.5 B&W 800 Diamond, lateral response family at 50", normalized to response on tweeter axis, from back to front: differences in response 90–5° off axis, reference response, differences in response 5–90° off axis. The B&W's tweeter is a high 45.5" from the floor; fortunately, its plot of vertical dispersion (fig.6) indicates that the balance changes only slightly below that axis. A suckout at what I assume is the upper crossover frequency, 3.5kHz, develops more than 5° above the tweeter, however. The blue trace in fig.7 shows the average of the left and right loudspeaker responses, taken at 1m in Kal Rubinson's listening room with XTZ. (Ignore the dropoff above 20kHz, which is due to the measurements being taken with a 44.1kHz sample rate.) The midrange and treble show a broadly flat response trend, though there is some peakiness evident between 3 and 4kHz. The trace is shelved-down below the middle of the midrange in this graph, due to the necessarily short time window used for the FFT analysis, so I have also shown the spatially averaged low-frequency response of the left speaker, taken across a 48" horizontal window centered on the listening position (red). The peaks in the upper and mid bass are due to the resonant modes of Kal's room, but this trace shows that the 800 Diamond's in-room response does extend almost down to 20Hz.

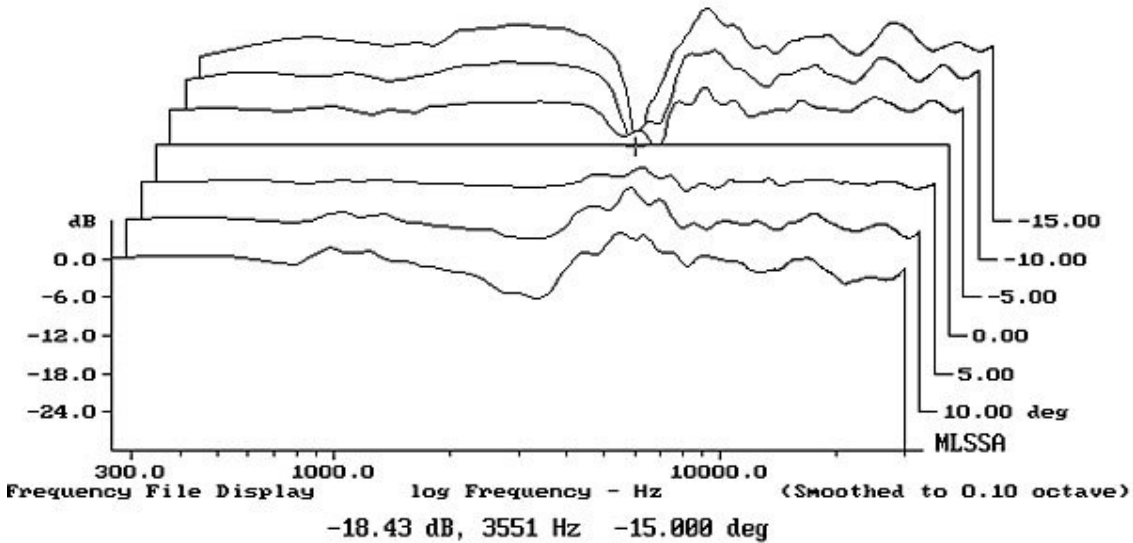


Fig.6 B&W 800 Diamond, vertical response family at 50", normalized to response on tweeter axis, from back to front: differences in response 15–5° above axis, reference response, differences in response 5–15° below axis.

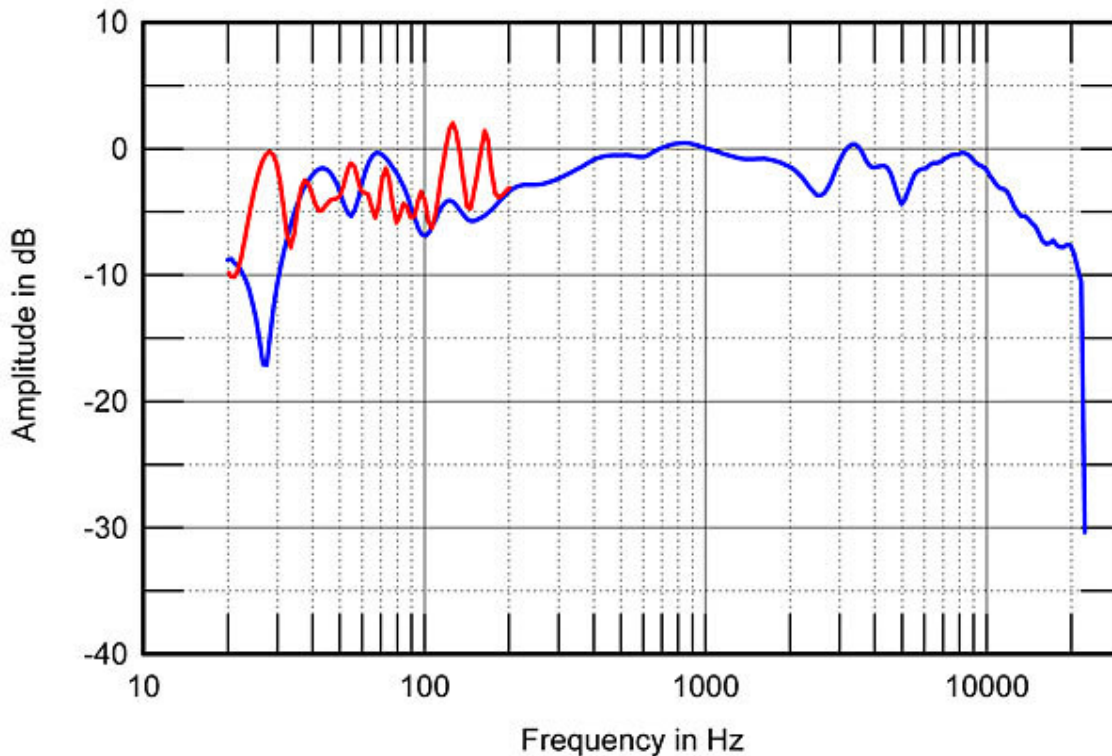


Fig.7 B&W 800 Diamond, 1/6-octave smoothed, averaged response of left and right speakers at 1m in KR's listening room (blue); spatially averaged LF response of left speaker at listening position (4m) in KR's room (red).

In the time domain, the 800 Diamond's step response on its tweeter axis (fig.8) reveals that all four drive-units are connected in positive acoustic polarity, and that the decay of each blends smoothly with the start of the next lower in frequency. This implies an optimal implementation of the crossover, and correlates with the good frequency-domain integration of their outputs seen in fig.4. The speaker's cumulative spectral-delay plot (fig.9) is very clean in the region covered by the tweeter, but less so in the upper midrange. There is a slight ridge of delayed energy centered on 3.5kHz that coincides with the slight peak in the on-axis frequency response. The effect of this is difficult to predict, but I suspect that it might increase the feeling of increased resolution of detail.

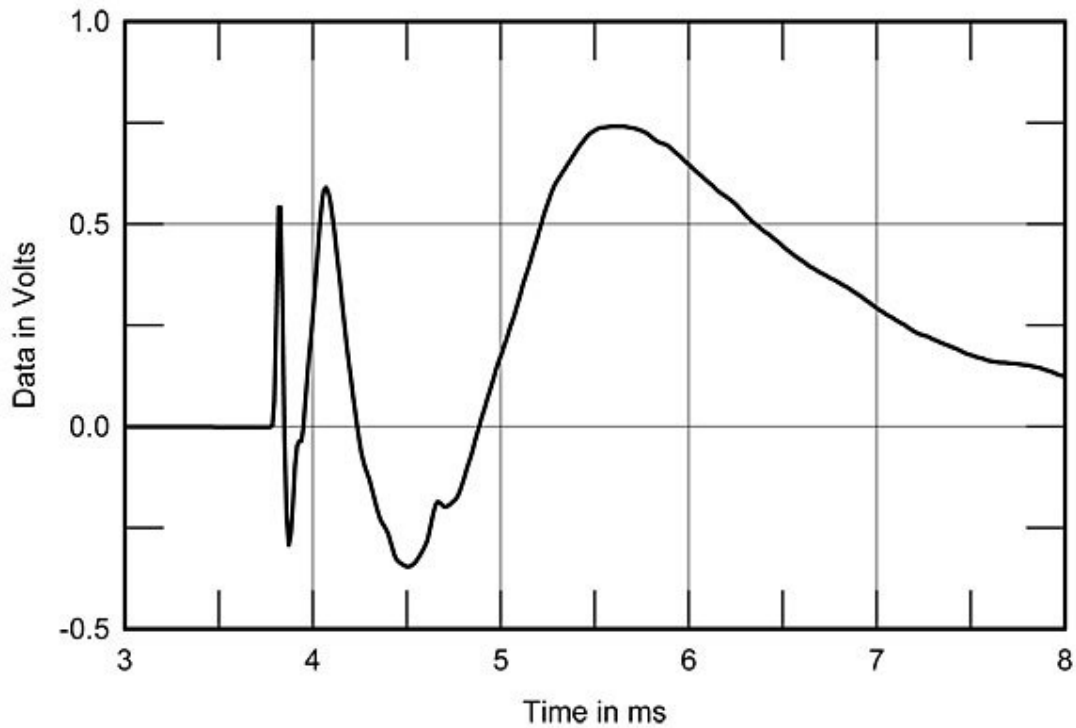


Fig.8 B&W 800 Diamond, step response on tweeter axis at 50" (5ms time window, 30kHz bandwidth).

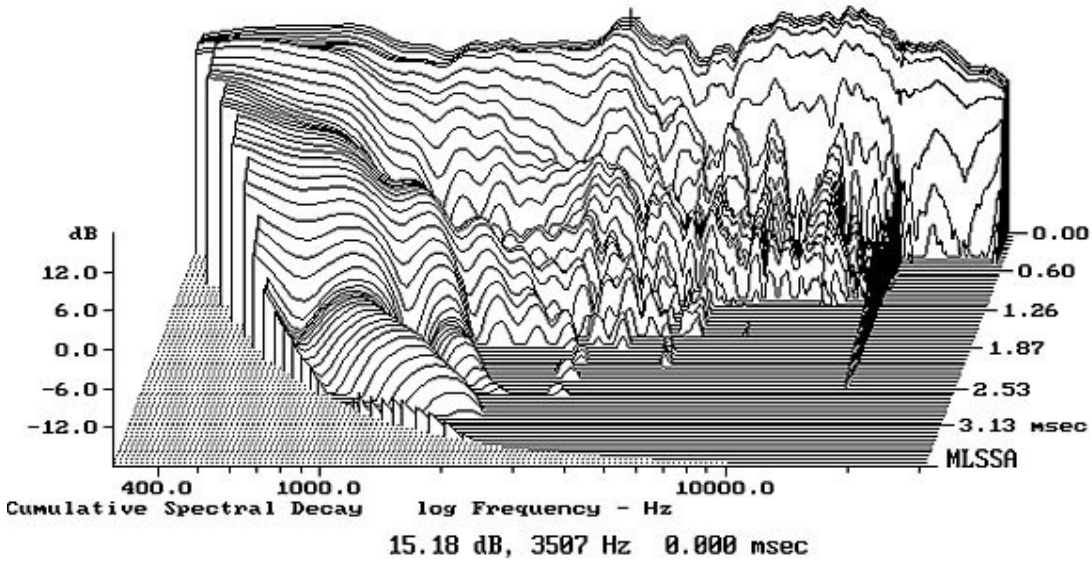


Fig.9 B&W 800 Diamond, cumulative spectral-decay plot on tweeter axis at 50" (0.15ms risetime).

Overall, the B&W 800 Diamond's measured performance suggests that its balance has been optimized by listening; the various small departures from neutrality tend to balance one another. What surprised me was how similar its behavior in the test lab was to B&W's 802D, which Kal Rubinson reviewed in December 2005 (see [www.stereophile.com/content/bw-802d-loudspeaker-measurements](http://www.stereophile.com/content/bw-802d-loudspeaker-measurements)). The sonic differences KR describes lie in the details.—**John Atkinson**