

Krell Resolution 1

LOUDSPEAKER

Michael Fremer



Krell Resolution 1 loudspeakers

DESCRIPTION Four-way, reflex-loaded, floorstanding loudspeaker. Drive-units: 1" ring-radiator tweeter, 4" polypropylene-cone midrange, 8" magnesium-cone mid-woofer, two 10" aluminum-cone woofers. Cross-over frequencies: 119Hz, 422Hz, 2860Hz, 3550Hz. Frequency response: 25Hz–22kHz, ± 3 dB. Sensitivity: 90dB/2.83V/m. Nominal impedance: 4 ohms.

DIMENSIONS 58" H by 13.2" W by 19.7" D. Weight: 195 lbs.

FINISH Cherry veneer.

SERIAL NUMBERS OF UNITS REVIEWED not noted (auditioning); 25704060091 (measuring).

PRICE \$11,000/pair. Approximate number of dealers: 200.

MANUFACTURER Krell Industries, Inc., 45 Connair Road, Orange, CT 06477-3650. Tel: (203) 799-9954. Fax: (203) 891-2028. Web: www.krellonline.com.

Sometimes you have to make peace with a loudspeaker. You have to accept it on its own terms rather than ask it to bend to your sonic wishes, or to be something it's not. This is especially true when you're auditioning a seemingly endless succession of them, as I have this year. Like beauty-pageant contestants parading across the stage, all different-looking yet all enticing in one way or another, each speaker I've listened to of late has sounded different from the rest, and each has had a unique combination of strengths and weaknesses—yet each has been sufficiently "in the pocket" to paint a credible musical picture. Nonetheless, some required more bending on my part than did others, in order for me to *believe* the musical portraits they were attempting to create.

That was not the case with Krell Industries' Resolution 1. From the first minute I heard it in my room, I believed what I heard. I accepted its musical truth without reservation or accommodation. Over time, and the more I listened, I came to understand that immediate reaction, but to go from a stellar and in some ways singular performer, such as mbl's \$45,000/pair 101E Radialstrahler that I reviewed last month, to Krell's \$11,000/pair Resolution 1 and not be in some ways disappointed, is itself a major achievement.

Resolution 1

While most audiophiles think of Krell's Dan D'Agostino as an electronics guy, he began his audio career as a speaker designer, and was once the importer of Sonus Faber speakers. His continuing friendship with Sonus's Franco Serblin is what allows Krell to borrow directly from Sonus (and acknowledge the loan) the Resolution 1's grille of stretched rubber strings. But between Krell's Resolution series

and the Sonus Faber designs, no other strings appear to be attached.

The 1 tops the Resolution line, which also includes a smaller floor-stander, a bookshelf model, a center-channel, and a subwoofer. The 1 is a big speaker—4' 10" tall and weighing 195 lbs—yet its relatively slender (13") baffle let it fit comfortably in my listening space. The tall, graceful cabinet of MDF has curved side walls and a flat rear panel. It's nicely finished in an

attractive veneer of opaque cherry (the only choice), and, despite its height, blended pleasingly into my listening room. Knuckle-raps over a wide area of the cabinet indicated that it's reasonably well braced; subsequent to that bout of self-bruising, I read that a subenclosure within the main cabinet houses the midrange and treble drivers.

Two custom 10" aluminum-cone woofers in a rear-ported bass reflex configuration anchor the design. These

MEASUREMENTS

The size and weight of the Resolution 1 worked against my being able to raise it high into the air for the acoustic measurements. I therefore had to window the time-domain data more aggressively than usual to eliminate the interfering effects of a reflection from the floor between the speaker and the microphone. As a result, the measured response will have less midrange resolution than usual, though this does not interfere with the reliability of the measurements.

The big Krell's voltage sensitivity came in slightly below the specified 90dB/W/m, at 88.7dB/2.83V/m. This will be due in part to the speaker's subdued high treble (see later). This is still usefully higher than average, but working against this is a truly brutal impedance character. As can be seen in fig.1, the impedance remains at or below 3 ohms for two-thirds of the audioband, relieved only by the reflex peaks in the low bass and a region between 4 and 6 ohms in the upper midrange/low treble.

Compounding the drive difficulty of this low impedance is an electrical phase angle that varies considerably. So not only is the minimum impedance a current-hungry 1.8 ohms at 58Hz, this is combined with a phase angle of -25° . And a little lower in frequency, even though the impedance has risen to a more manageable 3.8 ohms at

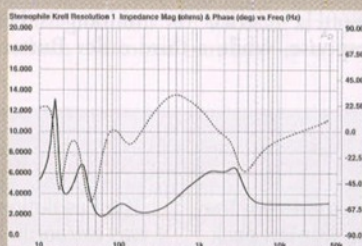


Fig.1 Krell Resolution 1, electrical impedance (solid) and phase (dashed). (2 ohms/vertical div.)

43Hz, the phase angle is now -61° . This behavior should not present any problems to Krell's own amplifiers, which have traditionally offered high current delivery, but some tube amplifiers are going to be gasping for breath when hit with high levels of bass information.

The traces in fig.1 are free from the glitches that would indicate the presence of panel resonances. I could find only a few low-level modes when I investigated the cabinet's vibrational

behavior with a simple plastic-tape accelerometer. Fig.2, for example, is a cumulative spectral-decay plot calculated from the accelerometer's output when it was fastened to the front baffle between the tweeter and the woofers. Only the mode at 762Hz rises to the point where it might have subjective consequences, but this is high enough in frequency that the delayed energy drops rapidly, working against its audibility. Despite the large panel areas, the enclosure's sides are well-braced and -damped.

The saddle at 21.5Hz in the impedance magnitude trace suggests that this is the tuning frequency of the twin ports, which in turn implies excellent bass extension. The output of the ports (fig.3, black trace) peaks at around 20Hz, though it doesn't start rolling off until 50Hz. The output of the two woofers (red trace) has its minimum-motion point—*ie*, where the back pressure from the port resonance holds the cones still—at 25Hz, a little higher than suggested by the impedance

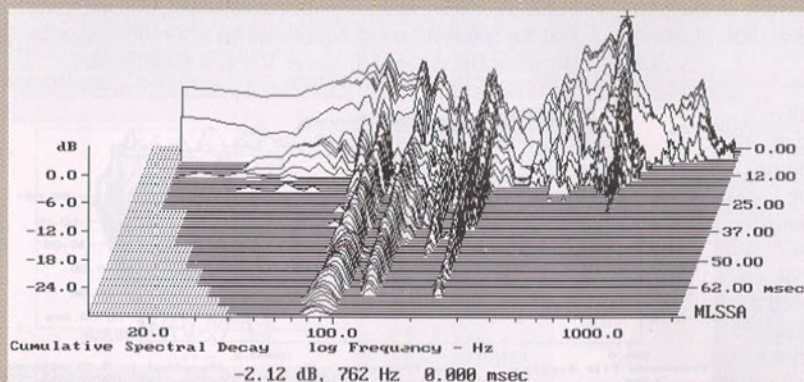


Fig.2 Krell Resolution 1, cumulative spectral-decay plot calculated from the output of an accelerometer fastened to the cabinet's front baffle between the tweeter and the woofers (MLS driving voltage to speaker, 7.55V; measurement bandwidth, 2kHz).



Fig.3 Krell Resolution 1, nearfield responses of the midrange unit (blue), upper woofer (green), lower woofers (red), and ports (black), with the complex sum of the nearfield responses (magenta), weighted in the ratio of the square roots of the radiating areas.

feature big motors to maximize control and minimize distortion, and vented voice-coils to increase power handling.

Above the woofers is, essentially, a three-way speaker turned on its head: on the bottom, slightly above the baffle's vertical center, is an iteration of Vifa's ring-radiator tweeter; above that is a 4" polypropylene-cone midrange driver, and at the top a 8" mid-woofer, mounted in a sealed container. The ferrofluid-cooled midrange driver features a one-piece cone and surround and a custom voice-coil former, while the mid/bass unit sports an ultralight magnesium cone and brass phase plug to prevent beaming at the top of its passband.

The woofer crossover point is 119Hz (via a second-order Chebyshev low-pass filter), while the mid-woofer driver has a second-order Chebyshev high-pass filter set at 118Hz and a second-order Butterworth low-pass at 422Hz. (The Chebyshev filter has a steeper cutoff than the Butterworth at the expense of some passband ripple.) The midrange's natural low-frequency rolloff is used for high-pass filtering, with a second-order Bessel high-pass filter added at 126Hz to improve its power handling at the bottom end of its range. A third-order Butterworth low-pass filter at 2860Hz restricts the midrange's HF response, while a third-order Butter-

worth high-pass filter rolls the tweeter in at 3550Hz.

In other words, the Resolution 1 is a complex, multidriver design of the sort that makes for interesting measurements and a wideband response, but often—though not always—disjointed, incoherent sound.

Installation and placement

When the Resolution 1s were installed, Krell's Bill McKiegan took great pride in showing me the four complex-looking crossover networks built up on 1/8"-thick glass-epoxy circuit boards. Each was packed with high-quality parts, including unusually massive inductors. McKiegan told me that Krell's goal was

measurements, continued

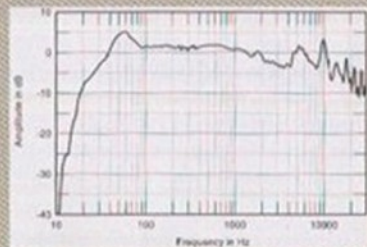


Fig.4 Krell Resolution 1, anechoic response with grille on the midrange axis at 50°, averaged across 30° horizontal window and corrected for microphone response, with the complex sum of the nearfield woofer and port responses, taking into account acoustic phase and distance from the nominal farfield point, plotted below 350Hz.

graph shows the complex sum of these individual outputs, weighted according to the square root of the radiating areas. It is pretty flat, other than a rise in the region covered by the twin woofers. However, to a large extent this rise will be due to the nearfield measurement technique; the Krell's reflex alignment is usefully overdamped, which will give the best combination of extension and control in a typical room.

This summed LF output is repeated on the left-hand side of fig.4, spliced at 350Hz to the farfield response, which is averaged across a 30° horizontal window centered on the 41°-high midrange axis (the listening axis Krell recommends). The midbass boost is evident, but as this is most probably a measurement artifact, I must assume that Mike's thinking the Resolution 1 sounded a bit "rich" in the upper bass is due more to the woofers' restricted passband. (The more you limit a drive-unit in the frequency domain, the less well defined its output will be in the time domain.)

measurement. The two woofers peak between 40 and 120Hz, handing over above that frequency to the lower-midrange driver (green), which in turn hands over to the midrange unit (blue) near 450Hz. The acoustic crossover slopes all appear to be second-order.

The magenta trace in this

The Resolution 1 was extraordinarily flat in the midrange, but a gently sloped-down trend is apparent throughout the treble—noted by MF in his auditioning, which was performed with the grilles in place—broken by a series of peaks and dips.

As shown in fig.5, both the subdued treble balance and the peaks/dips are due to the grille, which offers significant acoustic interference. (Although the grille superficially resembles the vertical strings used by Sonus Faber, the latter are thinner and are more widely spaced than Krell's.)

The Resolution 1's lateral dispersion on the midrange axis (fig.6) is even, with no off-axis "hot spot" frequencies. Although it is hard to see from this graph, the off-axis responses are actually flatter than the on-axis response, the treble dips filling in and the peaks flattening out, meaning that the speaker's room sound will be smoothly balanced.

However, the dispersion above 10kHz is quite limited,

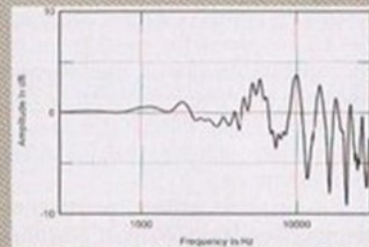


Fig.5 Krell Resolution 1, effect of the grille on the farfield response on the midrange axis (5dB/vertical div.).

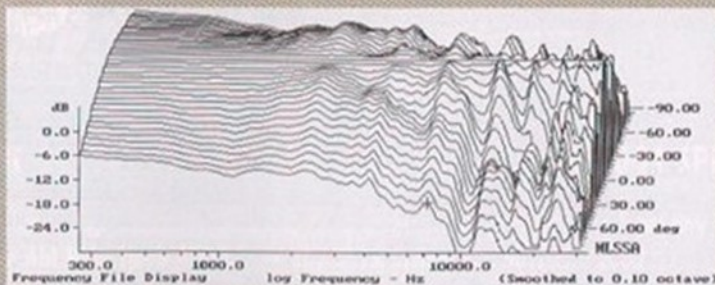


Fig.6 Krell Resolution 1, lateral response family at 50°, normalized to response on midrange axis, from back to front: differences in response 90°-5° off-axis, reference response, differences in response 5°-90° off-axis.

to pass as much power as possible through the networks in order to preserve the widest possible dynamic range of the 90dB-efficient Resolution 1. With the help of publicist Joe Hageman, McKiegan placed the Krells where masking tape outlined the spots usually occupied by my Wilson Audio WATT/Puppy 7s. The 1s were run biwired throughout the review period. Aside from some toe-out adjustment, that's where the speakers remained. What could be simpler?

Sound

I didn't move the twin towers of the Resolution 1s from their initial placements because they sounded right just

where they were. I can't recall being put so quickly at my ease by a new pair of speakers in my system as I was when I first fired up the 1s—despite their presentation being very different from that of the mesmerizing mbl 101Es.

The Resolution 1s produced an immense and particularly lofty soundstage with a palpable and equally impressive phantom center image. The aural picture was dense and three-dimensional without being thick or sluggish. Stage depth was particularly well developed. Despite their size and complexity, the 1s "disappeared" immediately, neither giving away their physical positions nor creating a stage in which the sound bunched up when

instruments had been mixed close to baffle locations. Because of all of these factors, it was easy to just sit back, relax, listen to music, and never sense that I could discern sound coming from any driver in particular, or the speaker overall. That's how it's supposed to be but often isn't—at least not without a great deal of moving and shifting. With the Resolution 1s, right from the start, I settled in comfortably and began to enjoy the music.

Given their driver array and size, I was taken by surprise by the ease with which the Resolution 1s settled in and made music without calling attention to themselves. I was expecting to have to work to get the drivers to integrate

measurements, continued

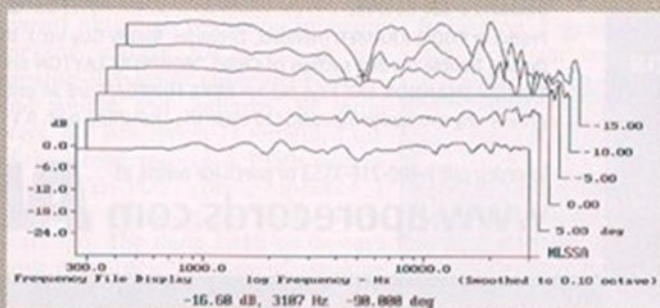


Fig. 7 Krell Resolution 1, vertical response family at 50°, normalized to response on midrange axis, from back to front: differences in response 15°–5° above axis, reference response, differences in response 5°–10° below axis.

which will rob the speaker's balance of top-octave air. In the vertical plane (fig. 7), the Krell's balance doesn't change significantly as long as the listener sits with his ears between the lower-midrange unit and the top of the lower woofers. However, a standing listener will perceive a suckout at the upper crossover frequency of 3.1kHz, as well as top octaves that are even lower in level than on the midrange axis.

Fig. 8 shows the Resolution 1's step response on the midrange axis. The short, positive-going spike is the tweeter output, followed by the lazier rise, again positive-going, of the midrange unit. This leads into the negative-going output of the lower-midrange unit, which in turn is followed by the

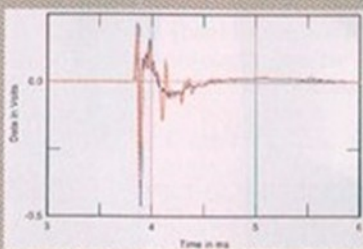


Fig. 9 Krell Resolution 1, impulse responses on midrange axis at 50°, with (red) and without (blue) grille (5ms time window, 30kHz bandwidth).

positive-going output of the woofers. Some reflections can be seen in this graph: the one just before 8ms is the reflection from the floor that resulted from my inability to

hoist the Krell off the ground for the measurements; those marking the midrange unit's step are from the grille.

This is shown graphically in fig. 9, which overlays the Resolution 1's impulse response with and without the grille (red and blue traces, respectively). The grille reflections can easily be seen.

As I mentioned earlier, these reflections don't affect the speaker's perceived balance, other than to subdue the tweeter's output in the top two octaves. However, they do mess up what would otherwise be a clean cumulative spectral-decay plot (fig. 10).

Extended low bass, a warm midbass, a smooth midrange, a subdued top end: Michael Fremer called it correctly, according to my measurements of the Krell Resolution 1.

—John Atkinson

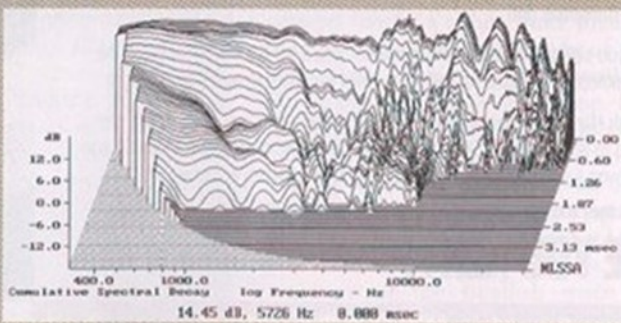
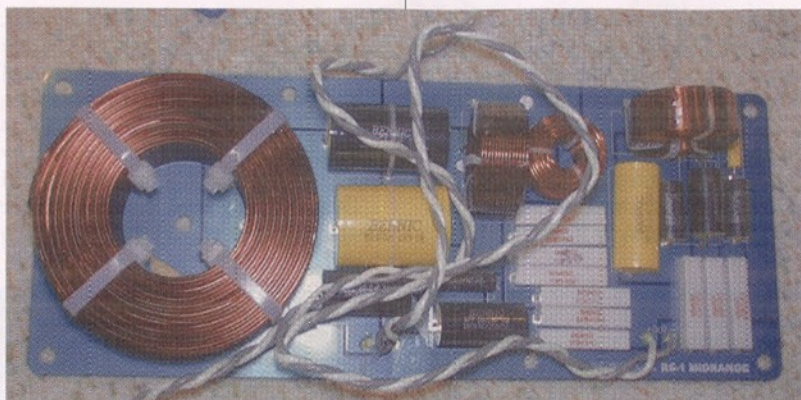


Fig. 10 Krell Resolution 1, cumulative spectral-decay plot at 50° (0.15ms risetime).



Resolution 1's midrange crossover network.

MICHAEL FREMER

and produce a seamless, tonally pleasing presentation in my room.

My second reaction was to brand the Resolution 1 "old-fashioned," in the best sense of the phrase. The race toward ultra-high resolution by many speaker makers has come at the expense of dynamic range and bottom-end weight and authority. In some ways, the Resolution 1s reminded me of the refrigerator-sized, 1950s-vintage Jensen Tri-Plex corner speaker I picked up at a garage sale for \$35 a few years ago. The thing kicks ass in ways most of today's "girlie-men" speakers simply can't. Of course, the Jensen 'fridge can't resolve information or respond as quickly as can a modern speaker like the Resolution 1, and if I had a pair of them I doubt they'd image worth a damn. But once you hear something with that kind of sheer physicality, authority, and *slam*, you want all that added to the modern mix.

I'm not claiming that the Resolution 1 brought back a sonic quality long out of fashion, only that the big Krell had what many of the speakers I've auditioned this year didn't, in terms of both *slam* and an ideal balance of lower-midbass warmth and fullness—and *not* at the expense of clarity or rhythmic suppleness. With a sensitivity of 90dB, the Resolution 1 should be reasonably easy to drive, depending of course on the impedance curve and electrical phase angle.

For reasons I can't explain, the Resolution 1 was not shy about producing prodigious bass. It was almost as if the physical properties of my room had changed, which they hadn't. When I played bass-test LPs such as The Clash's *London Calling* (CBS Clash3), or Davey Spillane's *Atlantic*

Bridge (Tara 3019), or any of the others so often mentioned in my reviews, bass was deep, powerful, rhythmically supple, and tonally convincing—but mostly, it was intensely *physical*. The Resolution 1 gave up some tautness and speed on bottom compared to

ASSOCIATED EQUIPMENT

ANALOG SOURCES Kuzma Stabi Reference, Simon Yorke S7, T+A G 10 turntables; Kuzma Air Line, Immedia RPM-2, Graham 2.2, SME M2 tonearms; Graham Nightingale II, Lyra Titan, Lyra: Helikon SL, Shelter 301, Sumiko Blue Point Special Evo III, T+A C 10 cartridges.

DIGITAL SOURCES Musical Fidelity Tri-Vista, Krell SACD Standard SACD players; Alesis Masterlink CD recorder.

PREAMPLIFICATION Manley Steelhead, BAT VK-10SE phono preamps; Musical Fidelity kWp, Krell KCT preamps.

POWER AMPLIFIERS Musical Fidelity kW, Krell 450Mx monoblocks.

CABLES Interconnect: AudioQuest Cheeta & Sky, various Harmonic Technology (balanced), Harmonic Technology LAM (fiber-optic). Speaker: Harmonic Technology Magic Woofer & Tweeter. AC: Shunyata Research, JPS.

ACCESSORIES Sounds of Silence Vibraplane, Gingko Audio Cloud 11 isolation platforms; Finite Element Pagode equipment stands; Audio-dharma Cable Cooker; Walker Audio Precision Isolated Power Motor Drive; Shunyata Research Hydra 2 & 8 power conditioners; ASC Tube Traps; RPG BAD & Abffusor panels.

—Michael Fremer

some other speakers I've heard of late, delivering instead impressive punch, weight, and richness, at the slight expense of nimbleness.

The bottom-end extension and balance yielded an enormous sense of physical space on live venue recordings, yet intimately recorded male voices—such as Johnny Hartman's on Speakers Corner's outstanding if somewhat mellow reissue of *John Coltrane and Johnny Hartman* (Impulse! AS-40), and S&P's superb new reissue of Nat King Cole's *Just One of Those Things* (S&P508)—were free of annoying low-frequency overhang or boom. Female voices were equally convincing—free of testosterone chestiness, while possessing sufficient body and weight to be believable. A nice balancing act!

Above the bottom end was a rich, coherent midrange with an emphasis on smoothness over resolution and transparency. On top, the familiar Vifa ring-radiator tweeter produced yet more smoothness, though at the expense of the sparkle and air available from, for instance, the Dynaudio Esotar tweeter.

Overall, the Krell Resolution 1's balance was on the warm, mellow, smooth side, designer D'Agostino evidently having been willing to give up some transparency, air, and detail in favor of smoothness in the mids and weight and authority on bottom. If chasing reverberant trails is your hobby, the Resolution 1 might not be to your taste. But if instrumental body, *slam*, and palpable three-dimensionality suit you, the Krell delivered them convincingly.

I spent a great deal of time comparing two vinyl editions of János Starker's renowned performances of Bach's Suites for Solo Cello: Mercury Golden Imports and Speakers Corner's new set, cut from the original tapes by Willem Makkee at Universal's Berliner mastering facility in Hanover, Germany. Both sound really fine, the new set having a richer, more mellow tone that emphasizes the body of the instrument over the bow strokes. Either one will make you weep, but the new reissue's richness produced a more convincing and physical cello tone. The Resolution 1s did an outstanding job of placing Starker in space, convincingly sized and well behind the front baffles, to the right of center. The sensation of the smallish space in which he played was subtly evident, as I'm sure engineer Robert Fine intend-

KRELL RESOLUTION 1

ed when he recorded this set in 1966.

As you might expect, a speaker with this much physical heft and driver power can move a great deal of air. The Resolution 1 did not disappoint, producing stunning dynamic contrasts with ease. Despite the masses of air needing to be moved, the 1 responded quickly, and was as adept at reproducing full

symphonic scores as it was small jazz ensembles, doing so effectively at low levels and when cranked up loud. Needless to say, the 1 could play at ridiculously high volumes in my moderate-size room, with reassuring ease and with no hint of strain or compression. I'm sure it would sound equally relaxed and confident in a large space.

aural palate. One of the reasons it was so immediately appealing was that its top few octaves are probably rolled off—subtly, which is why this wasn't obvious on first listen—and some listeners may wish for greater sparkle and air on top. Limiting a speaker's top-end response suppresses such nasties as tape hiss, grain, and the high-frequency hash pre-

sent on many recordings, analog or digital. The result was a relaxed fit that was easy on the ears. If it's done correctly, as it was here, music sounds coherent and tonally correct, with nothing missing.

There was no comparison between the high frequencies produced by the Resolution 1 and the mbl 101E, for example. The mbl's purity of tone on

So far, so good, eh? \$11,000 isn't cheap, but by today's standards, it's not really expensive for a pair of essentially full-range, driver-packed speakers that really put out and are so well balanced that an experienced listener had trouble finding the seams. So what's the catch?

There isn't any—which is still not to say the Resolution 1 will appeal to every

cymbals, bells, chimes, percussion in general, and other instruments that scale the sonic peaks, was in another league entirely—the Resolution 1 sounded somewhat closed-in and thick by comparison. Recordings with noticeable tape hiss sounded suspiciously quiet through the Krells. However, the balance Dan D'Agostino has struck was so

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— John Atkinson, Chief Editor, *Stereophile*, January 1996



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effective, and the weight and physical clout from the mids down so rich and compelling, that I didn't miss what might not have been there, or how it might have been obscured by a bump or dip somewhere else in the response.

That said, the Resolution 1's sonic excitement came more from its overall richness, weight, and extension than

THE RESOLUTION 1 DELIVERED STOMACH- CRUCHING BASS AND EAR-POPPING DYNAMIC AUTHORITY.

from its ability to portray air, sparkle, and musical "snap." As with the combo of Rockport Technologies' Merak II and Sheritan II (reviewed in the September 2004 *Stereophile*), the Krell Resolution 1 created a picture into which I looked, rather than one that projected sound outward and threw me back in my seat.

A slightly different take

Krell also loaned me a pair of their 450Mx balanced monoblock amplifiers, a KCT preamplifier, and an SACD Standard SACD/CD player.¹ I wanted to hear how, if at all, switching to all Krell electronics might change the Resolution 1's tonal balance, given the received wisdom that Krell gear sounds "bright."

Run in balanced mode, the Krell electronics were anything *but* bright. In fact, they sounded a bit smoother than my reference electronics. In an admittedly short audition, the combination produced a slightly different sonic character, but not one that made me want to reconsider my overall assessment of the Resolution 1.

Conclusion

My month spent with the Krell Resolution 1 loudspeaker was about as pleasing a listening experience as I could have hoped for. Despite the complexity of the design, the five-driver array blended seamlessly, and with unusual ease, to produce a velvety-rich, impres-

¹ Production of the Standard has been temporarily suspended because of lack of availability of its drive mechanism. According to a number of manufacturers who used it, the replacement drive has been delayed because Philips outsourced the software implementation to India, and the software and hardware components aren't yet "talking" to each other.

sively coherent, and tactile sonic picture.

Everything about this speaker, save for its top-end extension, was substantial. There was bottom extension and punch to please the most bass-hungry audiophile, rich upper-bass and mid-band performance that gave instrumental fundamentals satisfying fullness and plenty of body, and a sufficiently developed top end to produce overtones that delivered instruments and voices convincingly. The overall mellow balance emphasized woody overtones over bows scraping strings, and chests over throats, but the balance was craftily presented. If you're going to emphasize weight and authority over delicacy, you'd better deliver stomach-crunching bass and ear-popping dynamic authority—the Resolution 1 did so without showing a heavy hand, though I suspect John Atkinson's measurements will show a slight emphasis in the lower midbass.

While you'll find speakers that are "faster" from top to bottom, and speakers that resolve more information, particularly on top, few speakers in my experience combine so many strengths with a balance—pretty much throughout the full frequency range—that was so easy to listen to and live with, and without sounding slow or plodding. Greater transparency and crystalline clarity can be had by spending this much, but missing in action will usually be the grand dynamic scale, the bottom-end slam and extension, the enormity of soundstage I heard from the Resolution 1s.

No doubt Dan D'Agostino had to make some compromises in cabinet rigidity and driver quality in order to bring to market for \$11,000/pair such an ambitious, grandly scaled loudspeaker. He chose near-full-frequency performance, expansive dynamics, and smooth overall response over the ultimate in transient speed, transparency, and hyper-resolution, and he made it work. Within those limitations he's created a bold, powerful speaker that delivers more than its money's worth. Combined with appropriate associated equipment (skip tube amps, warmish cartridges, and soggy-sounding cables), the Resolution 1 can deliver stunningly full-bodied performance.

If my satisfying month with the Resolution 1s is any indication, chances are good that lovers of all genres of music will find this ambitious design an attractive option, both now and for a long time to come. ■