

stereophile

A Reprint from August 1997, Vol.20 No.8

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E Q U I P M E N T R E P O R T

Audio Physic Caldera loudspeaker

Martin Colloms

Good taste, attention to detail, and innovative system design are all keynotes of Audio Physic designer Joachim Gerhard. His loudspeaker creations are based on sound theoretical principles allied to solid engineering and fine cabinetry, and range from the little Step bookcase model to the flagship Medea, which uses no less than six costly, patented Manger drivers

per pair.¹ The subject of this review, the Caldera, is not too dissimilar in size and proportion to the Medea but is substantially less expensive at around \$20,000/pair, depending on finish. The Caldera has been in production for a few summers now, and is here reviewed in its current series 2 iteration.

Caldera

The Caldera is a slim, floorstanding, three-way loudspeaker. Its distinctive appearance reflects Audio Physic's firm practice of omitting grilles to avoid the mild degradations in sound quality that plague even the best-designed examples of the art.

The drivers are certainly visible. The two woofers are located on the sides of the lower enclosure, effectively back-to-back to cancel their reactive vibration forces. Of the two midranges, one is placed on the upper front panel, the other on the inner side. The front-facing tweeter is mounted on the upper section. While the main casing is finely veneered, the topmost section is finished in a contrasting satin-black lacquer, with black fixing hardware. The basic parallelepiped shape is distinguished by a narrow angled facet on the insides of the front corners. In addition to that inner vertical facet, the upper part of the cabinet has a steeply sloped outer edge; this lends it a feeling of almost sculptural asymmetry.

The enclosure is built as three decoupled components. Once the sub-enclosures are assembled, the resulting gaps between them are seen as finely

¹ The German Manger drive-unit is a full-range, single-diaphragm moving-coil device operated in pure bending mode. The semiflexible and highly damped diaphragm is specifically designed to shrink in area with increasing frequency, thus preserving the twin goals of a constant sound angle with focused, near-point-source radiation of high coherence. To optimize the speaker's radiation pattern, drive-units are mounted on the front and side—see my review of the Audio Physic Medea in the August 1996 issue of *Hi-Fi News & Record Review* (Vol.41 No.8).

Description: Three-way floorstanding loudspeaker with two 8½" Kevlar-reinforced-cone woofers, two 7" carbon-fiber-loaded paper-cone midrange units, and a 1.2" (28mm) dome tweeter. Specifications: Frequency response: 32Hz–22kHz, –3 dB. Nominal Impedance: 4 ohms. Sensitivity: 91dB/2.83V/m. Maximum power rating: 250W.

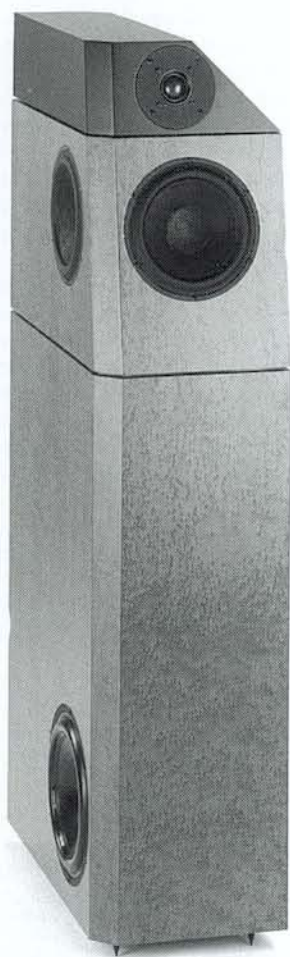
Dimensions: 44" H by 9.9" W by 20" D. Weight: 119 lbs each.

Finishes available: cherry, mahogany, "rosenut," gray birdseye maple.

Serial number of units reviewed: Not noted.

Price: \$18,995/pair; gray birdseye maple finish adds \$1000/pair. Approximate number of dealers: 9.

Manufacturer: Audio Physic, Germany. US Distributor: Immedia, 2629 Mabel St., Berkeley, CA 94702. Tel: (510) 893-2573. Fax: (510) 893-2579.



Audio Physic Caldera loudspeaker

toleranced styling "grooves" of perhaps 1/10" in thickness. The bass system, heavily crossbraced, is secured to the floor via high-tensile spiked locking bolts. The mid enclosure sits on it, decoupled via a nonslip resilient polymer mat. The treble enclosure in turn is decoupled from the midrange enclosure via resilient cylindrical polymer feet.

It's possible to invert the bass enclosures if required—there are threaded inserts for the floor spikes on both upper and lower surfaces—and the left enclosure may be exchanged for the right to preserve the overall styling contour. In the normal configuration, the woofers are low down, compensated near the floor boundary, while the inverted mode positions them much higher, just below the midrange drivers. This is an option for matching to more difficult rooms. Subtle changes in driver integration and sound balance result from this change, but the spacing of the

woofers from the floor is more important. The greater woofer height allows for fine-tuning of the low-frequency sound and speaker placement. With the woofers set "high," a position near the back wall would be permissible, and in some cases a mild excess of midbass might be brought under control.

System engineering

The Caldera employs a fine driver lineup, all units made by ScanSpeak of Denmark and distinguished by that company's latest "SD" distortion-controlled magnet systems. Their motor systems are built on a generous scale, allowing greater peak travel than most other comparably sized drivers.

Bass is provided by a pair of 8½" woofers working in tandem, equivalent to a 12" unit. The black cones are reinforced with Kevlar. The midrange is

covered by two 7" units, this a deservedly popular ScanSpeak design fitted with a dense pulp cone loaded with carbon-fiber (and also seen in Wilson Benesch, QLN, and Wilson Audio Specialties

The crossover network is built using top-quality components of the lowest possible complexity.

loudspeakers). The use of two such units for the midrange confers very high power handling on the Caldera; however, the design aim was to provide an inward-directed wavefront shape rather than a high absolute power capacity.

ScanSpeak's D29-series 28mm soft-dome tweeter is as good as they get. It

has an intrinsically wide, coloration-free response, and, thanks to the rear-chamber design, an extended bandwidth suited to low-order crossovers. With no paralleled edges in the vicinity of the tweeter, the cabinet diffraction signature usually imposed on a tweeter is greatly ameliorated.

The crossover network is built using top-quality components of the lowest possible complexity. Thus the tweeter network is first-order, using film capacitors. This carries through to the midrange, also first-order, while the network includes some additional components associated with response shaping and impedance matching.

Crossover to the bass is specified at 120Hz, and here the network complexity advances to third-order, compensated and damped. Such a technique is generally required to control the low-

M E A S U R E M E N T S

By careful calibration, I was able to establish that the measured sensitivity of 90.5dB matched almost exactly the specified 91dB/2.83V/m. This figure is better than average and, in conjunction with the 250W peak program power handling, allows for a generous peak sound level of 110dB to be generated in a typical listening room. However, the fine sensitivity needs to be set in the context of the load impedance. The Caldera is nominally specified at 4 ohms; so the usual 2.83V test level results in 2W being drawn from the amplifier. A gain of 3dB in voltage sensitivity is obtained at the expense of a doubled current draw from the amplifier. This leaves the true sensitivity at 88dB/W.

Looking at the Caldera's impedance (fig.1), you can see the amazingly unreactive nature of the load. The electrical phase angle is the lower trace in this graph and is almost flat, better than +20°, -10° over the whole 20Hz-20kHz bandpass. Low phase shift generally results in a better match to the amplifier and reduced coloration. The impedance magnitude (upper curve) did not fall below 3.2 ohms, thus defining a genuine 4 ohm loading. The average value was 4 ohms, very constant from 20Hz to 2kHz. There was a mild but harmless rise at higher frequencies, averaging 6 ohms up to 10kHz. This smooth characteristic will help to maintain a consistent tonal balance with different cabling and with the higher output impedance of tube power amplifiers. (Use a 4 ohm output transformer setting where possible.)

The impulse response (not shown) was very tidy and very well controlled

by present standards. The unweighted result for energy plotted against time (fig.2, solid trace) was confusing due to inter-unit delays. But the Blackman-Harris-windowed ETC (fig.2, dotted trace) was excellent, and in my view gives a clearer picture of the available performance: 50dB of decay in 1 millisecond is very quick.

Audio Physic claims low distortion for the Caldera. No problem here—I can verify that distortion *was* unusually low, confirming that "sweet yet natural" tonal quality appreciated in the auditioning. Good bass power was available in-room down to 35Hz, the output falling away by 30Hz, where inputs above 50W (8 ohms) resulted in mild but audible doubling (second harmonic greater than 5%). A 75W input at 35Hz was subjectively clean and, of course, free from port chuffing or whistling noises—the Caldera has no port! The only distortion present at this level was just 2% of second-harmonic distortion and 0.5% of third, both inaudible. At 100Hz at the same level, second harmonic was 0.15% and third 0.1%, both

excellent results. In the midrange, 500Hz came in at 0.12% of second, 0.03% of third; the data at 2kHz were very similar. In the treble, for 3kHz the second harmonic bettered 0.1%, while third didn't register at all. Similar results were obtained up through the treble range, these figures comparing well to the superb performance of a good push-pull electrostatic. At a higher 100dB spl, midband second harmonic was held to 0.3%, with the more significant third harmonic controlled to a magnificent 0.03%. The observed tonal purity of the Caldera was real enough, founded on very good linearity.

Two "waterfall" displays are presented for the Caldera speaker. The first (fig.3) was plotted with a 0.2ms filter risetime and 10dB/div. vertical scaling; this gives the best resolution in the frequency domain. There is some "clutter" in the treble, very likely the rollout of the mid cone; the tweeter itself has very good decay responses. Although visibly present, this clutter wasn't of great aural significance since the main decay was pretty good.



Fig.1 Audio Physic Caldera, electrical impedance (upper trace) and phase (lower) (1ohm/vertical div.).

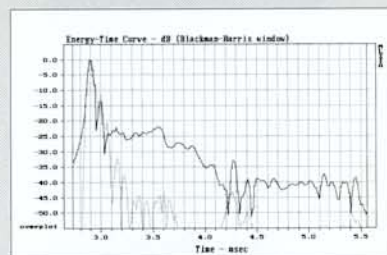


Fig.2 Audio Physic Caldera, energy-time curve on HF axis at 1m, unwindowed (solid) and Blackman-Harris-windowed (dotted).

frequency passband, where the crossover and the impedance characteristic of the bass driver can otherwise result in unacceptable response errors.

The rated impedance is 4 ohms, and despite the above-average claimed sensitivity of 91dB/W (8 ohm/W), few tube amplifiers will be able to drive it to its practical limits. A uniform frequency response is implied, with the claimed 32Hz–22kHz bandpass merely limited by a closely toleranced –3dB designation defining the decline in output at the frequency extremes.

The Caldera is supplied ready for tri-wiring, or passive tri-amping for that matter, with input terminals separated for each enclosure's frequency range. It is also supplied with a custom cable harness for immediate bi- and single-wire usage. The terminals are five-way gold-plated binding posts with 4mm compatibility.

Sound

The loudspeakers arrived stone cold—literally just a few degrees above freezing—and needed a day or so to stabilize at room temperature before any serious listening could be attempted.

Once they were broken in, the Calderas hit the spot.

But once they were broken in, the Calderas hit the spot. Unashamedly a dynamic (*ie*, nonplanar) system, its configuration and drivers worked seamlessly, sounding well blended.

Audio Physic's Caldera is one of the few loudspeakers that is instantaneously recognizable as a thoroughbred. There's no hint of any shortcut, of cheap effects,

or false emphases covering up problem areas. A product of refined development, it sounds complete and completed, and is emphatically not a prototype rushed to market.

Tonal balance proved highly accurate—a shade on the sweet side by current standards, but none the worse for that. The silky purity heard in the treble sounded more like a fine electrostatic than most dynamic designs.

There was something different about the overall sound: Gradually I became aware that the tonality was warmer than I am used to, this maintained over a wide range of sounds and loudnesses. This warmth was not a function of frequency balance, but more a product of the low-distortion driver technology. This accounts for some of the differences between planar speakers (ribbon and electrostatic types) and most "dy-

M E A S U R E M E N T S

Proof of the Caldera's transient speed was seen in fig.4, the second waterfall presentation of energy decay, now plotted with a 0.1ms filter risetime, and 5dB/div. vertical scaling. The fast, clear rear section of the graph shows topflight performance, probably the best I've yet seen from a big three-way design such as this.

Measuring the Caldera's frequency response proved a most awkward affair. The Audio Physic is one of those speakers that cries out for true free-field measurement, supplemented by an analysis of its reverberation energy summation. Circumstance meant that I had to measure the speaker in the relative nearfield in my listening room, so the results are not truly representative of its performance. Problems result from the extra side-firing midrange unit and the substantial separation between the mid and bass drivers, the former operating free-field, the latter boundary-loaded by the floor. No single mike position can adequately sample the Caldera's overall acoustic output.

I was thus reduced to taking bites at the measurements, ultimately looking to the spatial room average for an overall view of the sound, which should relate better to how the Caldera actually voices in my room. Only then did matters fall into place.

Pair matching was excellent, within ± 0.5 dB overall. No grille problems were present—the Caldera has no grilles! Low diffraction was evident from the very flat responses achieved over bandpass sections for the three driver sets. The combination of separated box construction, composite walls, and the extensive bracing has resulted

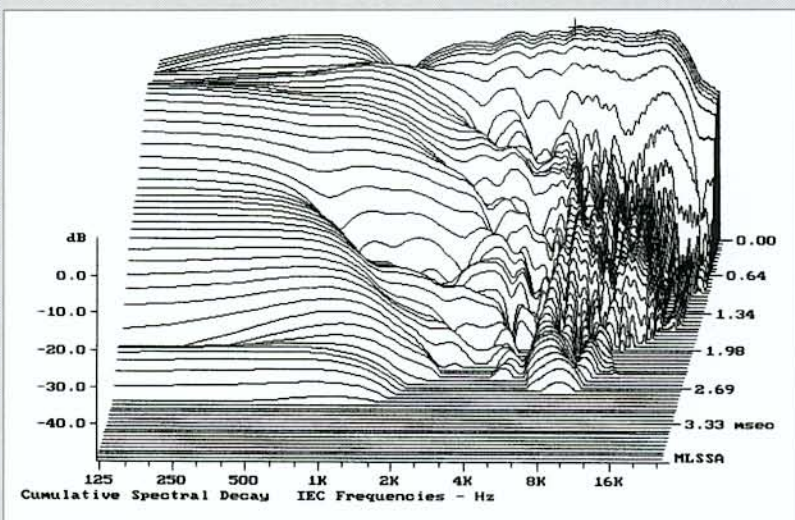


Fig.3 Audio Physic Caldera, cumulative spectral-decay plot at 1m (0.2ms risetime, 10dB/vertical div.).

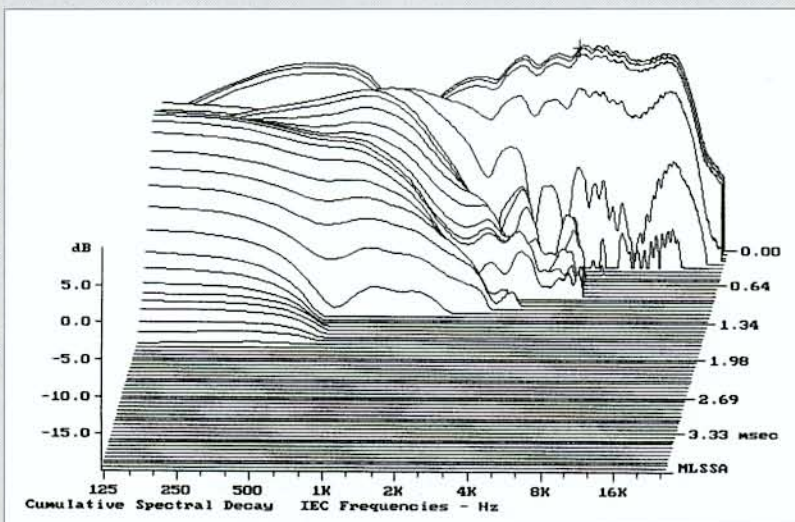


Fig.4 Audio Physic Caldera, cumulative spectral-decay plot at 50° (0.1ms risetime, 5dB/vertical div.).

namic" moving-coil technology. (This particular warm tonal quality is also audible in the midband of the Wilson WATT System 5, which uses a driver similar to the Caldera's.)

The Caldera had a more fluid sound than much of its competition, evident as reduced "grain." For some ears this might translate into a quieter, less dynamic presentation, while others will welcome the resulting sense of stability and inner calm. Some speaker designs have a restless quality that is initially exciting and impressive but that may become wearing in the long run. The Caldera represented the antithesis of this. Impressive on grounds of pure quality alone, it quietly grew on me. Its introspectiveness, even-handed powers of resolution, and ability to surprise by telling more about the inner harmony and balance of favorite

works continued to satisfy.

Both analog and digital sources were handled very well, the speaker's mellow character helping to balance some of the older, harsher digital recordings.

When the enclosures were optimally placed in the room, the output of this speaker was essentially seamless. All the drivers seemed in harmony with each other, none of them drawing undue attention to themselves.

The Caldera's presentation of stereo images was different from, for example, that of the Wilson WATT. It was possible to involve reflections from the side walls to create a soundstage wider than the distance between the speakers' outer edges, yet at the same time maintain a high level of central focus. Conversely, the Caldera illuminated the inner space with near-holographic stability and preci-

sion. The Calderas' perspective was a little distant, vocal soloists appearing a little behind the frontal plane, the sound shifted away further down a classic shoebox concert hall. But what could have been a "down the tunnel" effect was avoided by the Calderas' excellent clarity and spatial resolution. Transparency was genuinely high, and imaging extended far into the backstage area. Recovery of hall ambience was at the highest level, the Caldera placing focused sound images in their natural, local acoustics.

While not quite as fast-sounding or rhythmic as well-installed Wilsons, the Calderas were more dynamic and rhythmically involving than most of the competition. In addition, their high sensitivity allowed them to cruise at good sound levels with relatively modest power inputs. I tried a Conrad-Johnson Premier

M E A S U R E M E N T S

in very low resonance levels from the enclosure walls. Accelerometry revealed nothing of significance, showing that the skills applied to the system design have been matched by equal skills in enclosure construction.

The central solid curve in fig.5 shows the result of crossover interference measured at a single mike position on the median axis at 1m. Separately measured (dashed curves), the drivers showed excellently tailored passbands, each almost ruler-flat. The treble output extended to 18kHz, -3dB, as uniformly

as you could wish. The bass was also uniform, correctly stepped down to account for the power increase at the floor boundary. Against its own reference level, the bass extended to 42Hz, -6dB, conferring a practical in-room limit of around 35Hz, depending on room gain. The Caldera doesn't operate in the lowest bass octave; here the matching Terra subwoofer would play its part.

A sample of off-axis responses is given in fig.6. Above-axis, the mild interdriver delays tend to balance and the previously noted upper-crossover notch is filled in, even reinforced a little. However, the tweeter response barely changed with measurement angle, confirming the very low diffraction of this enclosure. Likewise in the lateral plane, the variation seen against the "reference" axial response is quite small; a good directional performance is hidden in the nearfield measurement clutter.

I moved out to an unselected far-field mike position and took a sample measurement. "Surely a fluke," I thought of the very flat in-room response (fig.7), and moved the mike—

to get much the same result. The full in-room spatial average (fig.8) only marginally benefited from multiple microphone and speaker placement averaging. But a ± 2 dB result in-room, from 36Hz to 7kHz, with a properly

The Caldera has been designed to sound right at the listening position.

presented seamless "house curve" roll-off thereafter, is textbook performance. There is nary a sign of a crossover in fig.8, nor a power interchange or any step between drivers. No wonder the Caldera sounded so uniform and neutral.

Now it all falls into place. The Audio Physic Caldera has been designed to measure and sound right at the listening position, *not* at the arbitrary and typical 1m microphone distance.

— Martin Colloms

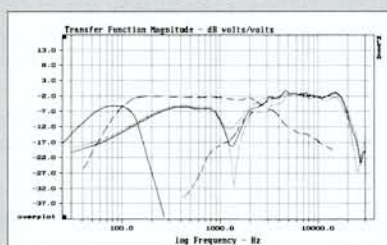


Fig.5 Audio Physic Caldera, anechoic response on HF axis at 1m (solid trace), with nearfield woofer response plotted below 300Hz (solid trace), midrange and tweeter responses (dashed).

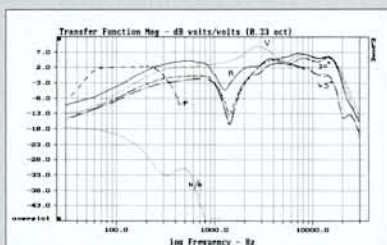


Fig.6 Audio Physic Caldera, off-axis response: 15° above HF axis (dotted); on HF axis (solid); 30° to the side (short dashed); and 45° to the side (long-dashed).

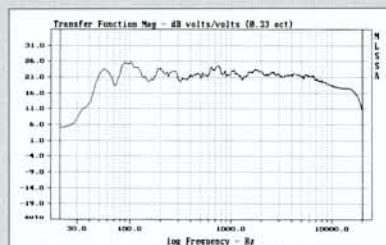


Fig.7 Audio Physic Caldera, 1/5-octave smoothed farfield response at arbitrary position in MC listening room (5dB/vertical div).

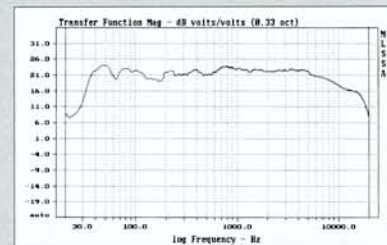


Fig.8 Audio Physic Caldera, spatially averaged, 1/5-octave-smoothed response in MC listening room (5dB/vertical div).

8A (4 ohm internal setting) and achieved clean, effective high sound levels. This proved to be a better match than anticipated, perhaps due to the infinite baffle control in the bass and a cleaner-than-usual impedance characteristic despite the Caldera's low impedance of 4 ohms. (This good behavior was subsequently confirmed in the measurements.)

While the Caldera's bass was not in the earthquake tradition, it did effectively reproduce orchestral bass drum at a natural level. More important, its low frequencies were highly resolved, even, natural, and free from overhang. The speaker is a fine example of the infinite-baffle approach to bass, trading a small loss of dynamics for a genuinely rewarding combination of neutrality and transient accuracy.

It wouldn't be fair to say that the Caldera needed a subwoofer—it didn't. The bass was sufficiently extended that, except in those cases where a room is unduly lacking in low-frequency reinforcement, or where Home Theater levels of heavy bass are needed, the speaker generally won't be found wanting. Recalling my experience of working a pair of Audio Physic Terra subwoofers with the Caldera's bigger sister, the Medea, I found that this subwoofer was most effective in local room corners. I can also confirm that two Terras are more than twice as good as one, delivering a substantially more uniform and more tuneful low end. The Terra is highly accomplished, very fast, extended, and highly neutral-sounding. The effect of a pair of them on the Medea (and very likely the Caldera as well) was to add a sense of scale and foundation and, if you can believe it, more presence—a more reverberant ambience. Add in the appropriate increase of bass power, headroom, and extension, and you may say, "Yes, this is truly a better speaker."

But the Caldera's bass was just fine in my Edwardian brick house, so don't consider those Terras unless you really have to, or if you like the Caldera so much that you're driven to take it to the limit.

Living dangerously, I did a high-level run using the big Krell, capable of nigh on 1000Wpc into the Calderas! With the amplifiers verging on clipping on the bass excavated from Béla Fleck's "Flight of the Cosmic Hippo," the Caldera was then beginning to show signs of mild compression and bass doubling, though without making any real complaint. The manufacturer's 250W power rating is more than fair enough; seriously loud, highly controlled peak sound levels were possible with this system, up to 110dB in stereo in a typical room, this achieved without blasting or pain-inducing hardness.

Conclusion

At just under \$20,000/pair in the top-of-the-line finish of gray birdseye maple, the Caldera is an expensive loudspeaker. Such a price places it in the serious ground already occupied by the Wilson WATT/Puppy 5 and other noted US designs.

Though the Caldera's gaunt, driver-exposed styling may not appeal to everyone, its asymmetric contour could well suit modern rather than traditional room settings. Its true purpose is undisguised, while finish and presentation are both first-rate. You need have no qualms about the quality of build.

I couldn't help but be swayed by the high standard of performance achieved. This powerful, sensitive three-way speaker presented a relatively tolerant amplifier loading, albeit a 4 ohm one. It's skillfully matched to the floor boundary and should deliver seamless, fast, neutral, and uniform sound energy from below 35Hz to above 18kHz. It took big power inputs gracefully, while providing unusually low levels of distortion over the entire bandpass—something that I heard as greater purity and more consistent tonality.

Soundstage width was narrower than some, and the Caldera could sound a tad controlled and polite; but it had stable, holographic image focus, with excellent perspectives and depth. High transparen-

System Context

No reasonable person could complain about the galaxy of supporting equipment assembled for this review. Prime mover was the Krell FPB 600 power amplifier directly coupled to the Krell KPS-20i/i integrated CD player. A pair of Conrad-Johnson Premier 8A tube monoblocks proved equal to the task of driving the Caldera (though lesser tubed devices did not). Other amplifier alternatives included the Classé CA-200 and Krell FPB 300. Preamplification included the Meridian 518 for pure digital-domain level control, plus the amazing C-J ART and a Premier Fourteen/Fifteen combination. Boulder's 2010 ably covered the all-balanced signal domain, supported by the universal-input Audio Research LS15. Analog sources comprised a Linn LP/Lingo/Naim/ARO/van den Hul Grasshopper IV GLA and a Meridian 200-series FM tuner.

Cables included a mix of van den Hul carbon The First (SE) and The Second (pure balanced) plus Siltech Silver speaker cables, the latter used for the mid and treble wiring together with van den Hul Revelation for the bass, this proving to be a potent combination.

—Martin Colloms

cy was allied to fine low-level resolution over the entire frequency range. The Caldera offered a velvet uniformity, an innate honesty with high dynamic resolution, and good pace and rhythm.

I can confidently recommend the Caldera for inclusion in the Class A (so-called "limited bass") loudspeaker category in *Stereophile's* "Recommended Components."

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Audio Physic loudspeaker placement

It's worth briefly noting Audio Physic's favored technique for speaker (and listener) placement. The listener is directed to a seat close to the back wall, essentially close-coupled to the wall boundary. This gives the listener something of a 2- π infinite-baffle characteristic, removing the major low-frequency room effects from the sphere of perception. The speaker itself then might not need to rely on room-boundary gain to

achieve a naturally balanced frequency response. In fact, Audio Physic recommends that the speakers be placed well into the room, as close to the anechoic condition as the room will allow. If the speakers are of sufficient quality, they will, when freed from local reflections, sound rather less room-dependent and have less coloration, coupled with superior image, focus, and depth. Some variation in the midrange timbre may be

experienced according to the precise spacing achieved between head and wall and the listening position.

It's well worth trying out. In some difficult rooms this has proved to be the only effective way of achieving control of sound quality. I tried both this and a conventional placement process with the Caldera with similar success. This suggests that the Caldera is not unduly room-critical.

—Martin Colloms