

SPECIAL
ISSUE

500

GREAT-SOUNDING
COMPONENTS RECOMMENDED

stereophile

ONLINE AUTHORITY:
WWW.STEREOPHILE.COM

FOCAL'S NEW
UTOPIA
HEADPHONES
P.40



THE 2 HORSEPOWER AMP

POWERHOUSE HP2-D FROM SAE



DAVE
COBB:
THE MIND
BEHIND THE
MUSIC

EUROPEAN
SUPER SPEAKERS
FROM CRYSTAL
& DYNAUDIO

AWESOME AMERICAN
AMPLIFIERS
FROM BEL CANTO
& FIRST WATT

OCTOBER
2016

THE
MAGAZINE
NETWORK
TEN

JOHN ATKINSON

Crystal Cable Arabesque Minissimo Diamond

LOUDSPEAKER

I have been an advocate of small speakers since I began using BBC LS3/5a's in the late 1970s, continuing through Celestion SL6es in 1981, Celestion SL600s and SL700s in the late '80s, and B&W Silver Signatures in the mid-'90s. Yes, I do like accurate and extended bass reproduction—but you need a big speaker to be able to provide that, and, as the late Spencer Hughes, founder of Spendor, once remarked, “big speakers have big problems.” I don't see the point of extending a speaker's low-frequency performance if the result is compromised soundstaging and midrange reproduction. And there is also the intellectual elegance of a speaker that is no bigger than it need be.

I've known the Dutch engineer Edwin Rijnveld since the 1980s, when he founded the Siltech cable company. I was impressed by the expertise evident in both the Siltech SAGA two-chassis amplifier, reviewed by Michael Fremer in our October 2014 issue,¹ and in the expensive, glass-enclosure Arabesque speakers Edwin designed to be produced under the brand name Crystal Cable, run by his wife, Gabi. I was talking to the Rijnvelds at a dinner they organized last January, at the 2016 Consumer Electronics Show, to honor musician Graham Nash, who was attending the show on *Stereophile's* behalf.² When they suggested I review the newest Crystal Cable speaker, the stand-mounted Arabesque Minissimo Diamond (\$19,995/pair with stands), I didn't have to be asked twice.

The Arabesque Minissimo Diamond

The Diamond uses the same enclosure as the original Arabesque Minissimo: a small two-way speaker, introduced in 2014, that uses a unique thin-wall enclosure featuring, other than a flat front section for the drive-units, continuously

¹ See www.stereophile.com/content/siltech-saga-power-amplifier.

² See <http://tinyurl.com/h33y5h7>.



SPECIFICATIONS

Description Two-way, reflex-loaded, stand-mounted loudspeaker with integral stand. Drive-units: 1" (25mm) diamond-dome tweeter, 6.125" (155mm) laminated paper-cone woofer. Crossover frequency: 1.8kHz with first-order filters. Frequency response: 47Hz–50kHz,

–3dB (near wall). Sensitivity: 83.5dB/2.83V/m. Nominal impedance: 8 ohms (7 ohms minimum). Maximum SPL: 106dB. Recommended amplifier power: 50W solid-state, 80W “digital” (class-D), 30W tube (8 ohm tap). **Dimensions** 38" (965mm) H (on integral stands) by 10.5" (267mm) W by 9.75"

(248mm) D. Weight: 56 lbs (25.5kg), including stands.

Finish Metallic gloss paint.

Serial numbers of units reviewed 123 (both).

Price \$19,995/pair, including stands. Approximate number of dealers: 12. Warranty: Five years, parts & labor.

Manufacturer Crystal Cable, Nieuwe

Stationsstraat 10, 6811 KS Arnhem, The Netherlands. Tel: (31) 26-353-9045. Web: www.crystalcable.com. US distributor: Audio Plus Services, 156 Lawrence Paquette Industrial Drive, Champlain, NY 12919. Tel: (800) 663-9352. Web: www.audioplusservices.com.

curved side and rear walls. Viewed from above, the Minissimo's cabinet resembles a serifed font's comma lying on its side. The monocoque enclosure is milled from a single piece of aluminum-loaded polymer, with both the curvature and thickness of the walls optimized using Sweden's sophisticated COMSOL Multiphysics app. As there are no parallel surfaces other than the top and bottom panels, the cabinet shape minimizes the production of internal resonances; just as important, the absence of any sharply defined acoustic discontinuities around the drive-units eliminates disturbances and reflections of the radiated wavefronts.

The tweeter is made by SEAS. As its name implies, the Diamond edition replaces the original speaker's beryllium-dome tweeter with a 1" diamond-diaphragm dome developed in conjunction with Crystal Cable and using a silver voice-coil. The fragile dome is protected by a laser-cut, acoustically transparent grille. The 6" woofer, made by Scan-Speak to Crystal's specifications, remains unchanged, with a tri-lobed emblem pressed into the 4"-diameter, laminated-paper cone, though Crystal Cable now matches each pair's drive-units to within 0.3dB. The woofer is reflex-loaded by a downward-firing, 1"-diameter port in the speaker's base.

There are also significant improvements inside the Diamond Edition: monocrystal silver internal wiring, WBT NextGen silver biwire terminals, and a different crossover topology called Natural Science, claimed to maintain true

in-phase output from the drivers. The crossover filters use non-inductive silver-in-oil capacitors, 5" carbon resistors, and "multistranded, perfect-lay, hexagonal winding, air-core, vacuum-impregnated" inductors.

The speaker's enclosure is finished in automotive gloss paint and the two speakers of each pair are mirror-imaged. The speaker is permanently fixed to its stand, this comprising three damped, chromed tubes and a heavy base embossed with the enclosure's "comma" profile. Carpet-piercing spikes are provided; I used them.

Listening

The Arabesque Minissimo Diamond's manual suggests that placing the mirror-imaged speakers so that the larger curved sides—the commas' tails—face outward gives the deepest

soundstaging, so that's how I set them up. Reversing these positions is said to work better in wide rooms. The manual recommends a listening distance of 1 to 1.5

The Crystals reproduced a narrow central image with no splashing to the sides.

times the distance between the speakers; in my room, the tweeters were 78" distant from one another and 101" from my ears, with the speakers toed in to the listening position. The left and right speakers were 38" and 50" from their respective sidewalls, this asymmetry due to the right-hand side of my room having a raised section behind the speaker with two stairs leading up to the vestibule, which gives the right

MEASUREMENTS

I used DRA Labs' MLSSA system and a calibrated DPA 4006 microphone to measure the Arabesque Minissimo Diamond's frequency response in the farfield, and an Earthworks QTC-40 for the nearfield and in-room responses.

My estimate of the Minissimo Diamond's voltage sensitivity was 81dB/2.83V/m, which is both well below average and lower than the specified 83.5dB. This speaker needs a relatively powerful amplifier to play at satisfactory levels, but as it has a small-diameter woofer, its user will have to be careful not to overdrive it. However, as the solid trace in fig.1

reveals, it is a very easy load for the partnering amplifier to drive, with an impedance that remains above the specified 8 ohms for much of the audioband, and a minimum magnitude of 7.8 ohms at 177Hz. The electrical phase angle (fig.1, dotted trace) is generally benign; when it is extreme, at two instances in the bass, the magnitude is very high, ameliorating any drive difficulty.

There are no wrinkles in the impedance traces that would suggest the presence of cabinet-wall resonances, and the unusually shaped enclosure felt inert to a knuckle-rap test. How-

ever, I did find a couple of high Quality factor (Q) modes present at narrowly defined places on the enclosure's baffle and top and bottom panels, at 463, 485, and 560Hz.

Visible in the right-hand portion of fig.2 is the Minissimo Diamond's acoustic crossover on the tweeter axis. The woofer (blue trace) hands off to the tweeter (green) at the specified 1.8kHz. The tweeter's average level appears to be a couple of dB lower than that of the woofer, and while the crossover filter slopes appear gentle, the woofer's upper-frequency rolloff is clean. The apparent rise in the woofer's output in the upper bass will be due in part to the nearfield measurement technique, which assumes that the drive-unit is mounted in a baffle that extends to infinity in both planes. The sharply defined notch at 51Hz in the woofer's output indicates that this is the tuning frequency of the port that fires down from the speaker's base, and the port's response (red trace) peaks between 35 and 90Hz. The port's output rolls off smoothly, and though a peak can be seen at 520Hz, this is well down in level.

Fig.3 shows the Crystal's response

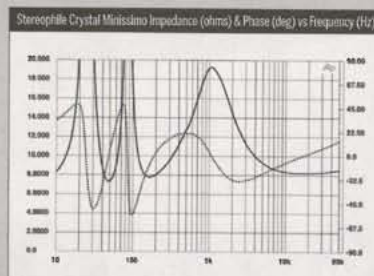


Fig.1 Crystal Minissimo Diamond, electrical impedance (solid) and phase (dashed) (5 ohms/vertical div.).

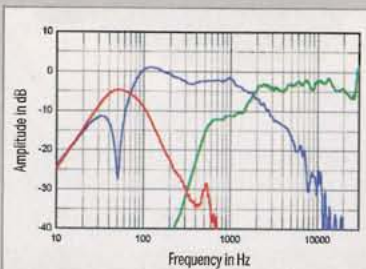


Fig.2 Crystal Minissimo Diamond, acoustic crossover on tweeter axis, corrected for microphone response, with nearfield responses of woofer (blue) and port (red), plotted in the ratios of their radiating diameters.

and left speakers different acoustic environments.

Crystal recommends a distance of at least 12" from the wall behind the speakers, with 24" being optimal. Unfortunately, this wasn't possible in my room, as my equipment racks stand against that wall. I experimented with various placements and ended with the woofer dustcaps 80" from the wall behind the speakers, which is close to where KEF's LS50s performed best in my room. Despite this, the low-frequency, $\frac{1}{3}$ -octave warble tones on *Editor's Choice* (CD, Stereophile STPH016-2) were still reproduced in good measure down to the 63Hz band, with the 50Hz and 40Hz tones

shelved down and the 25 and 20Hz tones inaudible. But the definition of bass instruments was excellent. The low-pitched drums and bass marimba notes in "I Say," from Happy Rhodes's *HR*⁵ (16/44.1 ALAC, Aural Gratification), had sufficient weight and were well differentiated, despite occupying the same pitch space. Charlie Haden's double bass in his solo in "Turnaround," from *Jim Hall/Charlie Haden* (CD, Impulse! B002176502), had an excellent combination of body tone and attack, though it sounded perhaps a bit too rich in the upper bass. And Pino Palladino's Fender bass in the slow blues "Out of My Mind," from the John Mayer Trio's *Where the Light Is: John Mayer Live in Los Angeles* (16/48 ALAC file ripped from DVD-V, Sony 8697-722727-9), sounded both impressively even and in full measure.

Bass guitar and double bass don't produce any energy below the midbass, so to test how much low bass was missing, I played a recording I'd made of Jonas Nordwall performing the *Toccata* of Widor's Organ Symphony 5, which has high levels of energy below 40Hz (24/88.2, AIFF file). The lowest notes were indeed missing in action, even though the woofers' excursions looked to be around 0.5" peak-peak. (The maximum linear excursion

The monocoque enclosure is milled from a single piece of aluminum-loaded polymer.

measurements, continued

averaged across a 30° horizontal window centered on the tweeter axis, spliced at 300Hz to the complex sum of the nearfield woofer and port responses. The response rolls off with the usual fourth-order slope below 80Hz to reach -6dB at the port tuning frequency, and again, the boost in the upper bass is mostly due to the nearfield measurement technique.

The tweeter's level is now 4-5dB below that of the speaker in the mid-range, which is due not only to the relative levels of the two drive-units seen in fig.2, but also to the tweeter's output becoming increasingly directional above 7kHz (fig.4). Below that fre-

quency, however, the Crystal speaker's dispersion is wide and even—which, all else being equal, correlates with stable, accurate stereo imaging. In the vertical plane (fig.5), the response doesn't change significantly for several degrees below the tweeter axis, which is 36" from the floor, but a suckout in the low treble does develop above the tweeter axis.

Over the years, I have found that a speaker's spatially averaged response, which integrates the speakers' direct sound with the in-room energy generated by the speakers, correlates relatively well with its perceived balance. I average 20 $\frac{1}{6}$ -octave-smoothed spectra, individually taken for the left

and right speakers using SMUGSoftware's FuzzMeasure 3.0 program and a 96kHz sample rate, in a rectangular grid 36" wide by 18" high and centered on the positions of my ears. This mostly eliminates the room acoustic's effects, and in fig.6 I have overlaid the Crystal's response (red trace) with that of the similarly sized KEF LS50 (blue) so that their mid-high-treble outputs are similar in level. The Dutch speaker thus appears to produce too much upper-midrange energy compared with the British speaker; if the music being played allows the listener's ears to latch on to the treble output as its reference, the Minissimo Diamond will sound a little midrange-dominant. But if the music

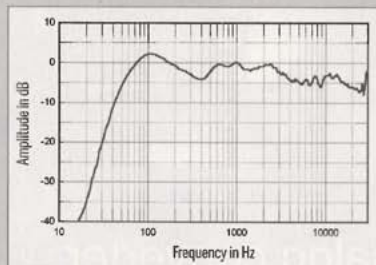


Fig.3 Crystal Minissimo Diamond, anechoic response on tweeter axis at 50°, averaged across 30° horizontal window and corrected for microphone response, with complex sum of nearfield woofer and port responses plotted below 300Hz.

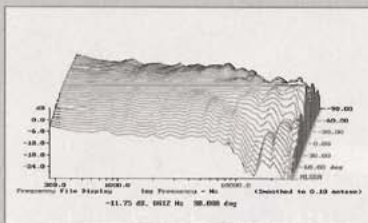


Fig.4 Crystal Minissimo Diamond, lateral response family at 50°, normalized to response on tweeter axis, from back to front: differences in response 90-5° off axis on large curved side, reference response, differences in response 5-90° off axis on small curved side.

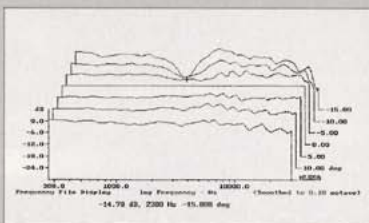


Fig.5 Crystal Minissimo Diamond, vertical response family at 50°, normalized to response on tweeter axis, from back to front: differences in response 15-5° above axis, reference response, differences in response 5-15° below axis.

is 0.75"). More significant, the Minissimo Diamonds opened a deep, well-defined, transparent window on the acoustic of the First United Methodist Church of Portland, Oregon.

The Crystal speaker's excellent imaging and clarity were a consistent factor throughout my auditioning. The half-step-spaced tonebursts on *Editor's Choice* spoke very cleanly, with no discontinuity between the ranges handled by the woofer and tweeter. Though the woodwind countermelodies in Rachmaninoff's *Vocalise*, with Iván Fisher conducting the Budapest Festival Orchestra (DSD64 file, Channel Classics), were set well back in the soundstage, they were readily audible without any feeling that they were being spotlighted. When I listened to the dual-mono pink-noise track from *Editor's Choice*, the Crystals reproduced a narrow central image with no splashing to the sides, and the image of my Fender bass in this CD's "Channel Phasing" track was locked firmly in space.

When it came to tonal quality, getting a handle on the Minissimo Diamonds was less straightforward. Pink noise revealed a slightly midrange-forward balance, though the treble was smooth and free from coloration. This was with my ears level with the tweeters, which are 36" from the floor. The balance didn't change significantly as I raised my head a few inches, but a hollow quality became evident when I stood up. Both the John Mayer track and Rachmaninoff's *Vocalise* sounded a tad mellow, particularly with the sweet-sounding First Watt J2 amplifier, reviewed by Herb Reichert elsewhere in this issue. By contrast, the top octaves of the cymbals in "A Cockeyed Optimist," from the Fred Hersch Trio's *Sunday Night at the Vanguard* (CD,

Palmetto PM2183),³ didn't sound rolled off, whereas the midrange of the piano was a little too prominent.

The midrange of Robert Silverman's Steinway in his performance of Beethoven's *Diabelli Variations* (16/44.1 ALAC file, Stereophile STPH017-2) was also a little forward, but this recording sounded surprisingly dynamic. In the fugue of Variation 32, when Silverman pounds out the theme with his left hand, the Minissimo Diamonds sounded larger than they are. This was with the Pass Labs monoblocks; but with the First Watt J2's low 20dB gain and the Crystals' low sensitivity, I could get only just enough loudness, the peaks measuring around 93dB (Studio Six SPL meter app set to C-weighting and Fast). The speakers ran out of steam with the First Watt with the John Mayer track and with September's "Recording of the Month," Van Morrison's... *It's Too Late to Stop Now... Volumes II, III, IV & DVD* (CD, Exile/Columbia/Legacy 8887513474). If these speakers are to sing, they need more than 25Wpc.

Summing Up

At a hair less than \$20,000/pair, Crystal Cable's Arabesque Minissimo Diamond is very expensive for a small two-way loudspeaker. However, it looks drop-dead gorgeous, sounds superb when matched with an appropriate amplifier, and though the low bass is absent, it has a more convincing low-frequency balance than you'd expect. If your pockets are sufficiently deep, give it a listen. ■

3 See www.stereophile.com/content/great-piano-trios-fred-hersch-and-brad-mehldau.

measurements, continued

makes the listener take the midrange as being correct in level, the upper octaves will then sound too mellow.

In the bass, neither the Crystal nor the KEF have much output apparent below 50Hz, even with the help of the lowest mode in my room, around 32Hz. But the higher-Q tuning of the Minissimo's woofer results in a little too much upper-bass energy in-room compared with the LS50.

One thing I noted while doing these in-room measurements was that while the two Minissimo Diamonds matched very well in the midrange and treble, the left speaker, featured in figs. 2 and

3, had more energy apparent between 25 and 30kHz than the right. It's fair to note that this would have had no effect on my auditioning, as my hearing sensitivity dies above 15kHz.

Turning to the time domain, the Minissimo Diamond's step response on the tweeter axis (fig.7) reveals that while the woofer is connected in positive acoustic polarity, the tweeter's polarity is inverted. However, of greater importance is the fact that the decay of the tweeter's step (the sharp down/up spike at 3.75ms) blends smoothly with the start of the woofer's step. While the Crystal speaker's output isn't

time-coincident—possible with a first-order crossover only if the baffle tilts back to align the drive-units' acoustic centers—it is time-coherent. Finally, the Minissimo Diamond's cumulative spectral-decay or waterfall plot (fig.8) is impressively clean, suggesting that the diamond-diaphragm tweeter's first breakup mode doesn't occur until 30kHz or so.

In many respects, Crystal Cable's Arabesque Minissimo Diamond offers respectable measured performance. But its deliberately tailored treble response is going to make judgments of the speaker's sound quality dependent on the music being played, as I found in my auditioning. —John Atkinson

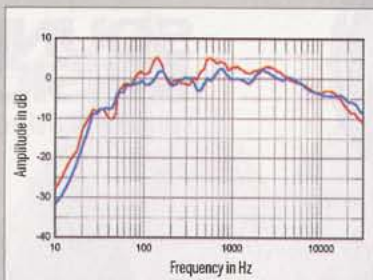


Fig.6 Crystal Minissimo Diamond, spatially averaged, 1/3-octave response in JA's listening room (red); and of KEF LS50 (blue).

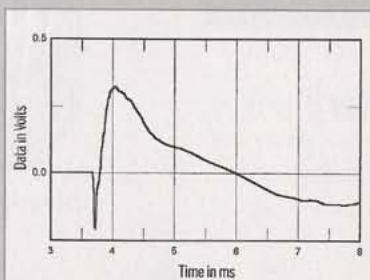


Fig.7 Crystal Minissimo Diamond, step response on tweeter axis at 50" (5ms time window, 30kHz bandwidth).

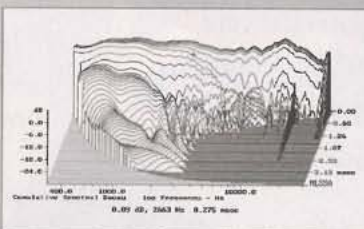


Fig.8 Crystal Minissimo Diamond, cumulative spectral-decay plot on tweeter axis at 50" (0.15ms risetime).