Micromega AS-400

WIFI CONNECTED D/A INTEGRATED AMPLIFIER

ART DUDLEY

Blind though I am to the allure of blind testing, I can appreciate some degree of review-sample anonymity: Distinctive products elicit distinctive responses, but a plain black box encourages us to leave our prejudices at the door. It asks of us a certain . . . *objectivity*.

So it was with the Micromega AS-400 digital source/integrated amplifier ($4495), the anonymity of which was compounded, in my case, by a generous helping of forgetfulness: I suppose I was told, ahead of time, that this was a class-D amplifier, but at some point in time before my first at-home audition I apparently killed the brain cells responsible for remembering that fact. So I was innocent of conscious prejudice when I listened to this elegant cipher of a box and wrote, in my notes: "Dynamic, dramatic, and almost relentlessly exciting with some recordings. Imbued pianos with almost too much dynamism for the room—too much being very good!—but lacked some 'purr' in the die-away. Basically fine and fun. Wish it had a little more color and spatial depth."

All enduringly true. And you could stop there if you wanted. But the thing is, there's a *lot* more to the Micromega AS-400 than just that.

DESCRIPTION Solid-state integrated amplifier with iTunes-ready WiFi receiver and D/A converter. Line-level analog inputs: 3 pairs RCA jacks (plus 3.5mm minijack for iPod analog out). Phono inputs: 1 moving-magnet. Digital codecs supported: AAC, AIFF, ALAC, MP3, WMA, WAV. Word length and sampling rates supported: up to 16-bit/44.1kHz (but see text). Line-level input sensitivity: 280mV. Line-level input impedance: 100k ohms. Phono input sensitivity: 18mV RMS. Phono input impedance: 47k ohms. Frequency response: 10Hz–50kHz, +0/–3dB. Signal/noise: 96dB, A-weighted. Amplifier output power: 400Wpc into 4 ohms (23dBW) with both channels driven. THD: <0.01%, 20Hz–20kHz, half-power. **DIMENSIONS** 17" (430mm) W by 3.7" (95mm) H by 14.4" (370mm) D. Weight: 28.6 lbs (13kg). **SERIAL NUMBER OF UNIT REVIEWED** 30201695-V3-000001. **PRICE** $4495. Approximate number of dealers: 9. **MANUFACTURER** Audis Micromega, 13-15 rue du 8 mai 1945, Parc d'activités de la haie Griselle, 94470 Boissy St-Léger, France. Tel: (33) 01-43-82-88-60. Fax: (33) 01-43-82-61-29. Web: www.micromega-hifi.com. US distributor: Audio Plus Services, 156 Lawrence Paquette Industrial Drive, Champlain, NY 12919. Tel: (800) 663-9352. Fax: (866) 656-0686. Web: www.audioplusservices.com.

Description

Rather like the Linn Majik DS-I before it, the Micromega AS-400 combines a solid-state preamplifier and power amplifier with a custom digital-to-analog converter, the latter tailored specifically to computer-music files (more on that in a moment). Also like the Linn, the AS-400 comes complete with its own phono preamp: a lovely trend, and one that would seem to allow the buyer to take advantage of both the new and the old in terms of cutting-edge music media.

Yet one could argue that the AS-400's real calling card is its implementation of

something that Micromega calls their AirStream module—essentially, an Apple AirPort Express WiFi receiver that has been reworked as a perfectionist audio component. Micromega uses three different feeds from an R-core transformer to supply its main module, master clock, and D/A analog section. The incoming digital stream is referenced to the AirStream's own custom-made timing clock, then fed to a 24-bit/192kHz Cirrus Logic CS4351 chip, supported with various perfectionist-quality parts. (The D/A in the AirPort Express is not used.) First seen in Micromega's WM-10 standalone digital source, the AirStream module is intended to allow the owner of an AirPort-equipped Apple Mac or similar computer to wirelessly stream his or her iTunes music files to a perfectionist playback system, thus making an end-run around the whole USB thing.

Not only is the AirStream module in this new product said to be more advanced than those in Micromega's past, but computer-music technology in general has progressed in such a way that a new frontier is available to the prospective AS-400 owner: At the end of 2010, Apple released v.4.3 of their iPod operating system, which incorporates a new wireless-transmission protocol called AirPlay.[1] The long and short of it: One can now wirelessly stream full-resolution 16-bit/44.1kHz, iTunes-compatible music files from an iPod to a Micromega AS-400. Compare that with the Chordette Gem D/A converter (reviewed in the January 2011 issue), which uses Bluetooth wireless technology and a necessarily lossy codec to accomplish the same thing.

The Micromega's phono section deserves special mention: Its sensitivity is appropriate for moving-magnet cartridges, but moving-coil types will require additional gain (and, for most users, a load impedance considerably lower than the AS-400's MM-appropriate 47k ohms). For me, that's no hindrance, as I far prefer loading my MC cartridges with an outboard step-up transformer. Additionally, Micromega has engineered the AS-400 so that, when its phono inputs are selected, power to the AirStream module is interrupted, so that the latter's own power-supply feeds won't add noise to the delicate phono signal. Nice.

Finally, no discussion of the Micromega AS-400 would be complete without mentioning its amplifier output section, which is class-D—perhaps the most misunderstood of the classes, second only to the working poor. The *D* doesn't stand for *digital*—although there is, coincidentally, a digital-like concept behind this 60-year-old design: Its output devices are always switched either on or off. The resultant wave is shaped via pulse-width modulation (which is not nearly as digital as it sounds) in an effort to mimic the original signal.

All of the above is housed in a metal enclosure of average proportions and with an above-average level of finish.

1 A modern ailment: One can see just so many compound words with capitalized second syllables before UpChucking.

MEASUREMENTS

To perform the measurements on the Micromega AS-400, I mostly used *Stereophile*'s loan sample of the top-of-the-line Audio Precision SYS2722 system (see the January 2008 "As We See It" and www.ap.com); for some tests, I also used my vintage Audio Precision System One Dual Domain and the Miller Audio Research Jitter Analyzer. Before I did any testing of the Micromega AS-400 I ran it at one-third power into 8 ohms for an hour, which imposes the maximum heat stress on an amplifier with a class-AB output stage. As the AS-400 is a class-D design, one of the benefits of which is very high efficiency, I wasn't expecting the amplifier to be hot at the end of that time. However, the chassis was warm, particularly on the left-hand side, where the top cover measured 108.5°F.

The Micromega's MM-compatible phono input offered a maximum gain of 50.1dB at 1kHz, measured at the variable Preamp Out jacks, which is a little on the high side. However, it is fair to note that this includes the gain of the line-preamplifier section, estimated at 10.9dB. The unweighted, wideband signal/noise ratio ref. 5mV input at 1kHz with the input shorted was an excellent 71.2dB in the left channel and 72.7dB in the right. A-weighting improved these figures to 80 and 89dB, respectively. The phono input preserved absolute polarity (*ie*, was non-inverting), and the input impedance varied from 45k ohms at low and middle frequencies to 11k ohms at the top of the audioband. The RIAA-equalized response is shown in fig.1; there is a 0.2dB mismatch between the channels at some frequencies, and the RIAA correction suffers from a slight lack of midrange energy and a little too much treble energy. Though the errors are small in absolute terms, the frequency regions affected are wide enough for the change in response to be just audible. When Art Dudley described the sound of the phono section's top end as "light and detailed but not bright," this is what I would have expected from the measurement.

Channel separation via the phono input was excellent, as was distortion, which lay below 0.1% at typical recorded levels. However, the overload margin was not as large as I would have wished, being just 12dB at 20Hz, 9.2dB at 1kHz, and 7.5dB at 20kHz. High-output moving-magnet cartridges are best avoided.

I tested the AirStream feature using Apple Lossless files played with iTunes on my Intel-based MacBook. Setting iTunes to stream audio to the AS-400 was as straightforward as AD described, and, as with the phono input, I assessed performance at the variable Preamp Outs. AirStream data were restricted to a 16-bit word length and sample rates of 48kHz and below. A full-scale digital signal at 1kHz clipped the AS-400's preamplifier at volume-control settings greater than "–7," at which setting the THD+noise was 0.1% and

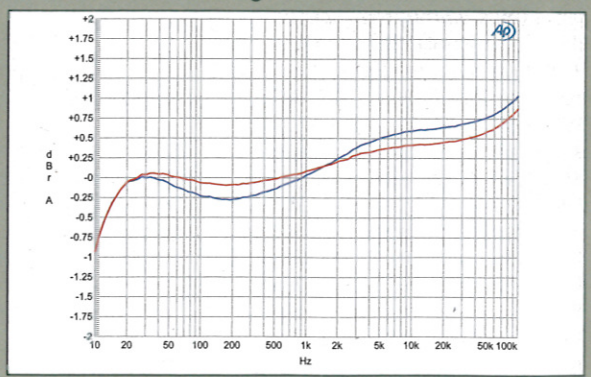

Fig.1 Micromega AS-400, MM input, RIAA response at 5mV (left channel blue, right red), measured at Preamp Out jacks (0.25dB/vertical div.).

Perfect is not too strong a word to describe the fit of the casework, the powder-coat finish is uncannily smooth, and the front panel is the very model of understated elegance. Above all other adjectives, the AS-400 looks *mature.*

Setup and installation

When I open the carton of a new review sample and see that it contains a software disc, the first words out of my mouth are usually "Oh, *shit.*" The Micromega came packaged with a set of discs, but I needn't have panicked: It turned out to be the software and documentation Apple supplies with every AirPort Express they sell; chances are, the AS-400 user will never have to break the seal on their packaging.

The setup procedure for the AS-400 was nonetheless more involved than that for a step-up transformer or a cable riser—more, even, than for most integrated amps, assuming they don't contain wireless music streamers of their own. But as someone who has, in recent months alone, worn on his sleeve a bilious disdain for needlessly difficult setup regimens, you can take my word: The Micromega AS-400 was relatively easy.

Here's how it went for me: At power-up, the AS-400's pilot light glowed blue and the word *AirStream* glowed red in six-point type on the digital readout. Approximately 65 seconds later, that word changed from red to blue, suggesting that the AirStream module was ready to go. And it was: When I clicked on my iMac's WiFi icon, in the upper-right portion of its display, I saw that Music was now an available network selection. I duly accepted it.

Then I launched iTunes and located the "choose which speakers to use" icon in the lower right-hand corner of the display: The symbol, which appears only when an appropriate WiFi network has been located, resembles a planaria worm wearing a box on his head. (Ironically, the icon appears right next to the one for iTunes' Genius function.) Clicking on it gave me the choice between my computer or something called WM20-330e85. I selected the latter, which is related to the Micromega's serial number, and that was that. Within 10 minutes of unpacking the AS-400, my iMac was wirelessly

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the output level was 3.26V; the output preserved absolute polarity. (The output level was the same using my iPhone 3G and AirPlay as the source.) The AirStream frequency response was perfectly flat to 20kHz, so I haven't shown it. Channel separation at 1kHz was a good 82dB, R–L, and 88dB, L–R. The separation was almost 20dB better in the bass, but 15dB worse above 10kHz.

The DAC's linearity error (not shown) was less than 1dB down to –107dBFS, and in the spectrum of a dithered 1kHz tone at –90dBFS (fig.2) the peak representing the tone just touched the –90dBFS line. The noise floor in this graph was a little higher than usual with 16-bit data, and there were some power-supply–related spuriae evident, though at low levels. Both observations were confirmed by FFT analysis (fig.3). However, the waveform of an undithered tone at exactly –90.31dBFS was perfectly symmetrical, with the three DC voltage levels described by the data clearly resolved (not shown.

Distortion via AirStream was higher at high signal levels than at low. This can be seen in fig.4, which compares the spectra of a full-scale 1kHz tone (red trace) with that of a 1kHz tone at –10dBFS (blue trace). (Both were measured at the preamp outputs with the volume control set to "–20," which is equivalent to a level of 730mV at the preamp outputs, in order to be sure that the distortion products are due to the digital decoder rather than the preamplifier circuit.) A regular series of harmonics can be seen with the 0dBFS tone, with the highest in level, the second harmonic, reaching –54dB (0.6%). At the lower recorded level, the distortion decreased dramatically, the second harmonic now lying at –80dB (0.0.01%). The picture was similar with intermodulation distortion, the 1kHz difference product from a full-scale mixture of 19 and 20kHz tones reaching –66dB (0.05%, not shown).

Jitter via the AirStream feed was moderately high, and estimated by the Miller Analyzer software to be 887

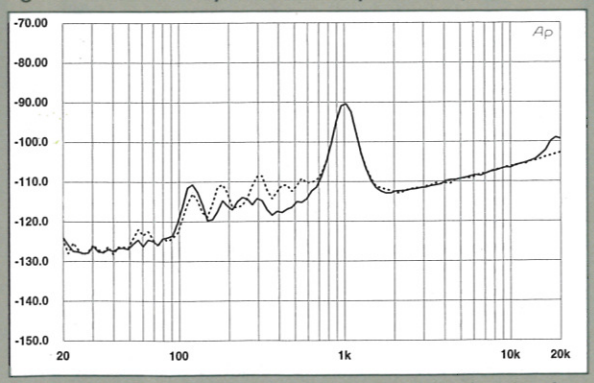

Fig.2 Micromega AS-400, ⅓-octave spectrum with noise and spuriae of dithered 1kHz tone at –90dBFS with 16-bit AirStream data (right channel dashed).

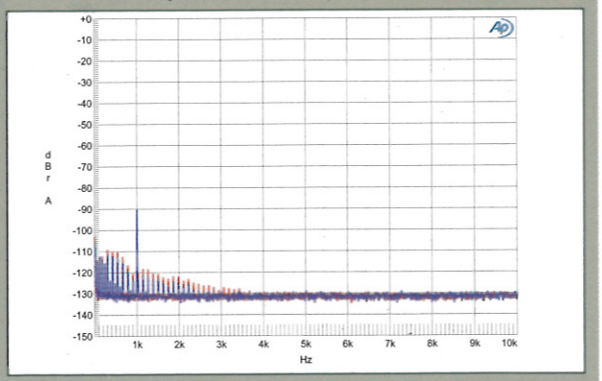

Fig.3 Micromega AS-400, FFT-derived spectrum with noise and spuriae of dithered 1kHz tone at –90dBFS with 16-bit AirStream data (left channel blue, right red).

streaming music to it. Contrast that with every other wireless digital source that's come my way . . .

I wanted to try streaming music files from three software alternatives to iTunes that arrived at more or less the same time as the Micromega AS-400: Pure Music, Decibel, and Amarra (see my "Listening" column on p.39). Because the Micromega AirStream module is optimized for iTunes, that wasn't possible without jumping through one more hoop: downloading and installing a $25 utility called AirFoil, from Rogue Amoeba Software.[2] Once AirFoil is in place, virtually any music file can be streamed to an AirPort Express base station, including the FLAC codec, which iTunes doesn't otherwise support.

If anything, getting my iPod Touch to stream music files to the AS-400 was even easier: I chose WiFi from the Settings page of my iPod (which I'd already updated with OS 4.3), selected Music, and there it was: When I went to play music, I saw that the behatted planaria had appeared to the right of the Skip Forward symbol. As long as my iMac wasn't trying to hog the same airwaves, everything was cool.

A final, miscellaneous setup note: The AS-400 ran warm but not scary-hot. Still, I was a surprised that it didn't run cooler, given that class-D output sections tend toward the very efficient.

Listening

It seemed to me that the whole of the Micromega AS-400—the sound of its preamp and power amp taken together—was designed to accommodate and complement the built-in digital source that is its raison d'être. That's wise: Although $4495 is no longer regarded as a terribly high price for a traditional (sourceless) integrated amplifier, there's no reason to buy something like that unless something like that is what you want.

And that something struck me as a hell of a lot of fun to listen to and to use. The first time I fired up my iPod Touch with the AS-400, I was not only impressed: I was surprised. That first number was "Afro Blue," from Phillips, Grier & Flinner's *Looking Back* (from CD, Compass 4342): a jazzy acoustic instrumental that opens with a string-bass improvisation by Todd Phillips. The instruments had most of the sound they should have, lacking only a little color. The ensemble had the scale and presence they should have. And the record had the fun it should have. I was pretty much sold.

Then I switched to the same music file, streamed from my iMac, and heard even better sound: slightly clearer, and with a more natural sense of flow. In fact, as the days progressed, there continued to be audible differences between the sounds of music files streamed from my iMac and (presumably) identical files streamed from my iPod—but those differences were often slight and hard to pin down, seeming almost to vary from

2 I'm sick of NerdNames, too. Ogg Vorbis could be the best-sounding lossy format on Earth and I'd still loathe it. And don't get me *started* on that stupid band that dresses like eyeballs.

measurements, *continued*

picoseconds p–p, left, and 911ps p–p, right. As shown by the spectrum (fig.5), the main sidebands lay at the power-supply–related frequencies of ±120, ±180, and ±240Hz, but what can also be seen in this graph is a significant widening of the base of the peak that represents the high-level 11.025kHz tone. This suggests the presence of fairly high levels of random low-frequency jitter that are not included in the Miller Analyzer's estimated figure.

Turning to the Micromega AS-400's line-level analog inputs, these preserved absolute polarity at both the preamp and speaker outputs, and offered an input impedance of 24k ohms across the band. This is lower than the specified 100k ohms, but should have no practical consequences. The maximum gain from the preamp section was 10.9dB. Driving the amplifier section directly gave a voltage gain of 32.3dB into 8 ohms, meaning that the maximum gain for the AS-400 assessed as an integrated amplifier was 43.2dB. The subwoofer output, which appears to be available from just the lower of the two RCA jacks labeled "Sub," rolled off by 0.8dB at 200Hz, 5dB at 300Hz, which is a lower crossover point than the –3dB at 400Hz pont that is specified.

The source impedance for the preamp outputs was a low 100 ohms at all frequencies. The input impedance for the AS-400's power amplifier input was 45k ohms. The source impedance for the speaker outputs was a low 0.07 ohm at 20Hz and 1kHz, rising inconsequentially to 0.1 ohm at 20kHz. As a result, the variation in response with our standard simulated loudspeaker was minimal (fig.6, gray trace). While the Micromega's preamplifier-section response was flat to 200kHz, the response at the speaker outputs rolled off above 10kHz, reaching –0.5dB at 20kHz and –3dB at 50kHz, which slightly reduced the risetimes of

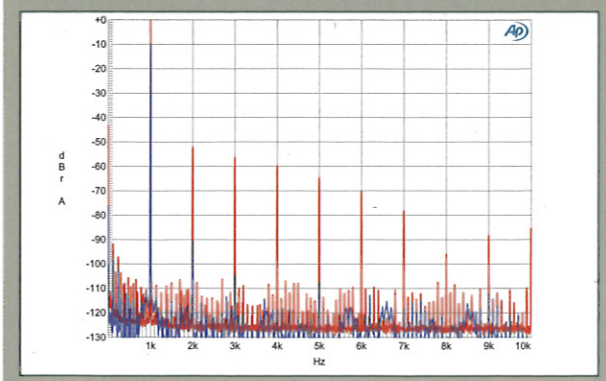

Fig.4 Micromega AS-400, FFT-derived spectrum with noise and spuriae of dithered 1kHz tone at 0dBFS (right channel red) and at –10dBFS (right blue) with 16-bit AirStream data, measured at Preamp Out jacks with volume control set to "–20."

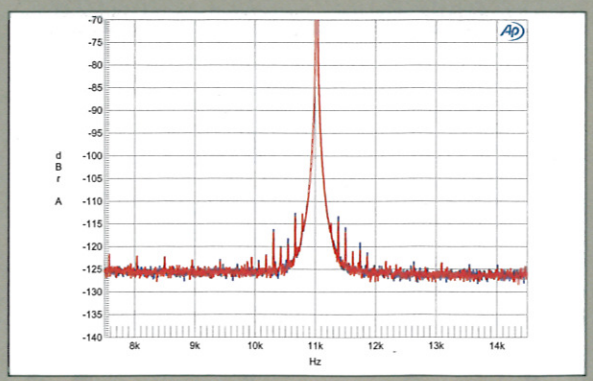

Fig.5 Micromega AS-400, high-resolution jitter spectrum of analog output signal, 11.025kHz at –6dBFS, sampled at 44.1kHz with LSB toggled at 229Hz, 16-bit AirStream data. Center frequency of trace, 11.025kHz; frequency range, ±3.5kHz (left channel blue, right red).

one selection to another. (I used only 44.1kHz AIFF files for these comparisons.) Even after compensating for the different output levels of the two devices, music streamed to the Micromega from the iMac generally had greater scale and more apparent channel separation. Music streamed from the iPod tended to be sonically a bit grayer and musically a bit fussier, with less certain momentum and flow. But the latter wasn't nearly enough to impede my enjoyment or ability to respond to the music. I recall in particular one dark, rainy morning in early April when I streamed the Byrds' "Here Without You" from my iPod to the AS-400, and the sound and music were utterly enchanting.

Driven by whichever music-file source, the sound of the Micromega AirStream module didn't match that of the best (Ayre and Wavelength) USB D/A converters I've heard so far, nor that of the Linn Majik DS-I at its own best (with hi-rez files). Those alternatives all made music sound a little more present and colorful than did the AS-400: a little more flesh and blood. But it wasn't far enough from the mark to disappoint, especially in light of both the AS-400's price and its viability as a one-box, just-add-speakers solution.

Auditioned as an integrated amplifier, and setting aside for a moment its digital source capabilities, the AS-400 was enjoyable but not entirely to my taste, especially with line-level sources. On the plus side, the AS-400's ability to retrieve extremely subtle detail was nothing short of astounding. Drummer B.J. Wilson's very soft floor-tom roll near the beginning of Procol Harum's "Strangers in Space," from the recently reissued *Something Magic* (CD, Salvo CD029), was *uncovered* as never before, each little tap having its own distinct sound. And throughout Levon Helm's *Dirt Farmer* (CD, Vanguard 79844-2), the amp uncovered nuances in the performances that were otherwise lost to me—the fluttery background voices in "Calvary" were especially delightful. On the down side, the Micromega amp was spatially a bit flat—except for the most prominent lead vocals and solo instruments, few sounds stood proud of the mix—with insufficient timbral color compared with my reference amps, and a very slight trace of artificial texture in the trebles.

But the Micromega's phono section sounded like more than just an afterthought: Isolated from the rest of the AS-400 and driven with the Hommage T1 and Silvercore One-to-Ten transformers, it was slightly leaner than the phono section of my Shindo Masseto, but not at all shamed by the comparison. In phono mode the Micromega's top end was light and detailed but not bright, though it jelled better with the meaty Ortofon SPU pickup heads than with any of the alternatives on hand. A great new 45rpm reissue of Rachmaninoff's *Symphonic Dances*, with Donald Johanos conducting the Dallas Symphony Orchestra (45rpm LP, Turnabout/Analogue Productions AAPC 34145-45), had tremendous drama, scale, and sheer *whomp*

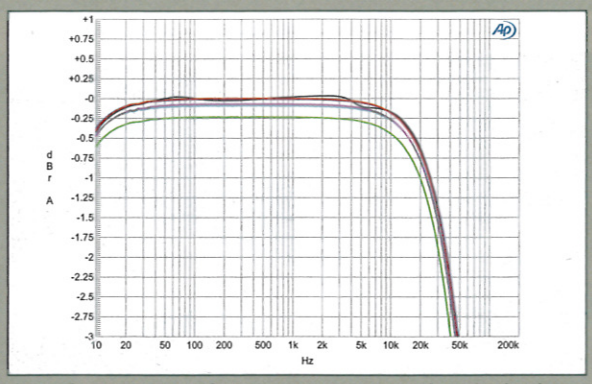

Fig.6 Micromega AS-400, frequency response at 2.83V into: simulated loudspeaker load (gray), 8 ohms (left channel blue, right red), 4 ohms (left cyan, right magenta), 2 ohms (green). (0.25dB/vertical div.)

a 10kHz squarewave (fig.7). This graph reveals that some ultrasonic noise is being produced by the class-D output stage; with no audio signal present, this noise measured 230mV with a center frequency of 480kHz. I used Audio Precision's AUX-0025 low-pass passive filter for all subsequent measurements to avoid the possibility of this noise driving the analyzer's input stage into slew-rate limiting.

Channel separation for the amplifier as a whole was good, at better than 90dB below 20kHz and still 70dB at 20kHz. Fig.8 shows how the THD+N percentage in the AS-400's output changed with output power. The specified maximum power is 400W into 4 ohms with both channels driven (23dBW); the amplifier actually delivered 190Wpc into 8 ohms (22.8dBW) at clipping (defined as 1% THD+N), 325Wpc into 4 ohms (22.1dBW), and 460W into 2 ohms with one channel driven (20.6dBW). With some class-D amplifiers, the distortion rises with

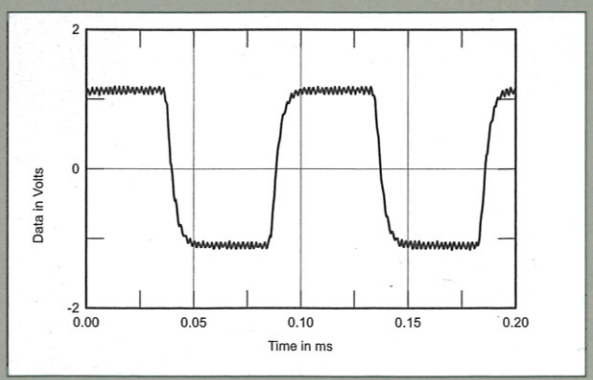

Fig.7 Micromega AS-400, small-signal 10kHz squarewave into 8 ohms.

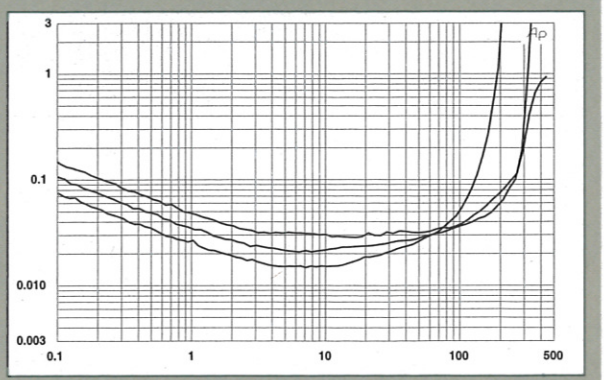

Fig.8 Micromega AS-400, distortion (%) *vs* 1kHz continuous output power into (from bottom to top at 10W): 8, 4, 2 ohms.

through the Micromega, with convincingly good bite in the loudest brass passages. Mono LPs and 78s had good *chunk*, too, although the Shindo's phono section was less perturbed by the noise on some worn-out discs.

Considered as an integrated amplifier, the Micromega AS-400 sounded best by far with the less sensitive Wilson and Snell loudspeakers, especially in my largest listening space. It's apparently more at ease at a gallop than a stroll.

Conclusions

The AS-400 didn't reach state-of-the-art heights in my system, as either an amp or a digital source—yet it was consistently engaging, musically and sonically. And the performance of its wireless digital source was so surprisingly good that I couldn't help thinking that a maxed-out, standalone AirStream unit might be just the cat to scare the USB pigeons . . .

Even as it stands, the Micromega AS-400 strikes me as a virtually perfect choice for the audio perfectionist who shares space with other listeners—and multiple iPods and/or iMacs. Correct me if I'm wrong, but I don't think anyone else offers this combination of qualities—high output power, a nice preamp with adjustable balance and a healthy number of analog inputs, a phono stage, and instant, out-of-the-box wireless compatibility with the world's most popular music-playback software—for any price, let alone one that seems so reasonable for the design and workmanship on tap. The AS-400 is a unique, and uniquely recommendable, piece of gear.

ASSOCIATED EQUIPMENT

ANALOG SOURCES Garrard 301, Thorens TD 124, Linn LP12 turntables; EMT 997, Rega RB300, Schick tonearms; Shindo SPU, EMT TSD 15, Ortofon SPU & 90th Anniversary SPU cartridges.
DIGITAL SOURCES Wavelength Cosecant, Furutech GT40, Ayre Acoustics QB-9 USB D/A converters; Apple iMac G5 computer running Apple iTunes V.10.1 & Decibel V.1.0.2 playback software; Sony SCD-777 SACD/CD player.
PREAMPLIFICATION Auditorium 23 Standard/SPU & Hommage T1, Silvercore One-to-Ten step-up transformers; Shindo Masseto preamplifier.
POWER AMPLIFIERS Shindo Corton-Charlemagne monoblocks.
LOUDSPEAKERS Audio Note AN-E/SPe HE, Wilson Audio Sophia 2, Snell Type A-II.
CABLES USB: Nordost Blue Heaven. Interconnect: Audio Note AN-Vx, Shindo Silver, Nordost Blue Heaven. Speaker: Auditorium 23.
ACCESSORIES Box Furniture Company D3S rack under source & amplification components; Keith Monks record-cleaning machine; OMA slate plinth for Thorens TD 124.

—Art Dudley

measurements, *continued*

frequency. However, the AS-400's THD remained commendably constant with frequency (fig.9).

The spectral content of the distortion varied with signal level. At low powers, it was heavily second-harmonic in nature (fig.10). At high powers, the third harmonic rose above the second, and higher-order harmonics appeared (fig.11). The Micromega AS-400 did well on the high-frequency intermodulation test, both the 1kHz difference tone and the higher-order products at 18 and 21kHz resulting from an equal mix of 19 and 20kHz tones, appearing at –80dB (0.01%), or just below visible waveform clipping on an oscilloscope (not shown).

Micromega's AS-400 measured well in most respects, especially considering that it has a class-D output stage. The AirStream feature was easy to use, though I was a little bothered by a higher level of distortion at high signal levels than I'd expected to see.

—John Atkinson

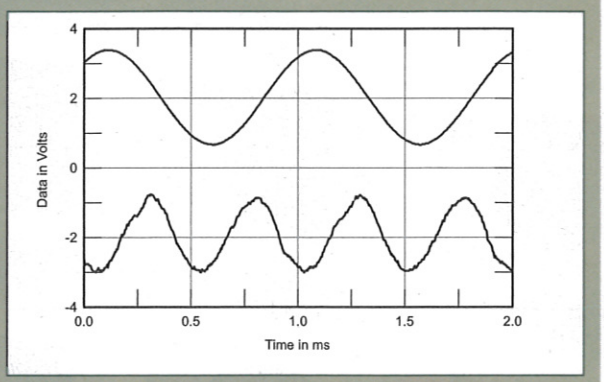

Fig.10 Micromega AS-400, 1kHz waveform at 10W into 4 ohms (top), 0.02% THD+N; distortion and noise waveform with fundamental notched out (bottom, not to scale).

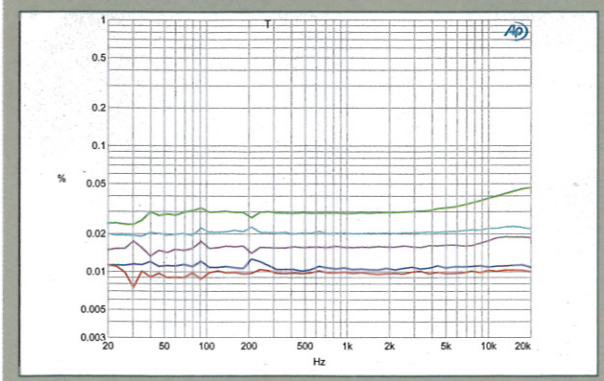

Fig.9 Micromega AS-400, distortion (%) *vs* frequency at 6.4V into 8 ohms (left channel blue, right red), 4 ohms (left cyan, right magenta), 2 ohms (green).

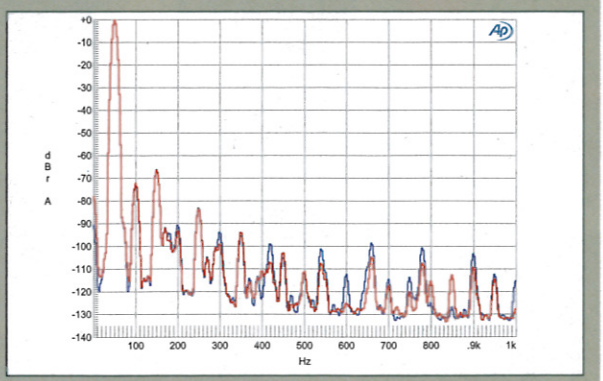

Fig.11 Micromega AS-400, spectrum of 50Hz sinewave, DC–1kHz, at 102W into 8 ohms (left channel blue, right red; linear frequency scale).