Lamm ML2.2 monoblock power amplifier

By Art Dudley
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The challenge is biblical in character, if not in scope: A half year after railing, in these pages, against our industry's overabundance of products that cost more than $20,000, fate has given me such a thing to review.

In truth, it wasn't the fault of fate or even God, but of my own doing: Having reviewed the Lamm ML2.1 monophonic amplifier ($29,290/pair) in *Stereophile*'s October 2004 issue, and having been so impressed that I bought the review pair and kept them as my reference for a couple of years, I felt compelled to hear that amplifier's successor. My opportunity came with the announcement, last summer, of Lamm's ML2.2 monoblock ($37,290/pair); soon thereafter, a review pair was dispatched to my home via air freight. (It may seem extravagant to spend hundreds of dollars to get a pair of amps from Brooklyn to upstate New York, but designer Vladimir Lamm decries all but air when it comes to transporting his products, notwithstanding their robust crates; my Volkswagen and I made a tentative effort to collect them during a trip to the Borough at the Center of the Audio Universe, but fate and God intervened.)

Description
Like its forebears, the 18W Lamm ML2.2 is a single-ended-triode amplifier built around a somewhat unusual choice of power tube: the Russian 6C33C *indirectly* heated triode. You've probably heard the suggestion that Russian fighter jets can remain airborne in the wake of the electromagnetic pulse from a nuclear explosion, owing to their tubed control electronics; *this* is the tube in question. The 6C33C, originally developed as a voltage regulator, has a number of appealing qualities, including very low impedance, concomitantly low plate voltage, excellent durability during war and peace alike, and abundance. I think they also look nice.

Also like its forebears, each ML2.2 has two 6C33Cs: One is the output tube, operated with a B+ rail of just 175V, while the other reverts to type and assumes the role of output-section voltage regulator. That's rather noble, when you think about it.

The five remaining tubes in each ML2.2 are all small-signal devices, two of which—a 6AK5 sharp-cutoff pentode and a 5651 cold-cathode diode—work with the output-section regulator described above, and do not amplify the signal. The other three tubes—one 12AX7 and two 6N6P (also Russian, also plentiful)—are dual-triodes, used for voltage gain in a circuit derived from that of the Lamm ML3 ($139,490/pair), which endures as the company's flagship. The new input circuit is said to be one of the main differences between the ML2.1 and the ML2.2.

Another difference: As I described in a Follow-Up on the Lamm ML2.1 in the September 2005 issue, output-tube failures in that amplifier, though rare, were occasioned by the blowing of a 1.25 amp plate-current fuse. That doesn't sound like the worst thing in the world, except that the fuse was mounted internally, on a circuit board decorated with lightning bolts, exclamation points, and other outward signs of warning; to get at it, one had to unplug the amp, remove its tubes, turn the 81-lb chassis upside down, and remove a panel that's held in place with 18 machine bolts. For the ML2.2, that fuse and its holder have been relocated to the top panel, within easy reach. Nice.

The remaining refinements in the ML2.2, according to Vladimir Lamm: a new and reportedly better power transformer (the output transformer, custom-made to Vladimir Lamm's design, remains the same); five power-supply filter chokes instead of two; new circuitry that allows owners of Lamm preamplifiers to operate the ML2.2's power switch remotely; printed-circuit boards made of a higher-quality material; and upgrades of various parts.

Like its predecessor's, the ML2.2's chassis is cleanly designed and neatly and solidly built, giving an appearance that's serene, purposeful, and foursquare—but not at all exotic. The brushed-aluminum faceplate, which is anodized black, is appropriately thick but not excessively so, and the metalwork is clean, well finished, and very robust. Mounting bolts for various fasteners are integral to the inner surface of the chassis—there are no sad-looking globs of adhesive or silicone sealant inside this amp—and the wiring and soldering are as neat and precise as I've ever seen. This is a staggeringly well-built amplifier, but also one without the slightest concession to *luxury*.

Installation and setup

Buying a pair of Lamm ML2.2 amplifiers is not like bringing home a toaster oven, discarding the carton and instructions, and settling in for a long, easy life of open-face sandwiches: Enthusiast products just don't work that way. And as bullish as I am on high value and common sense, it's also the duty of the enthusiast press to say that, if you believe ever-more-expensive products should naturally be ever more easy to use, then neither the ML2.2 nor this review is for you.

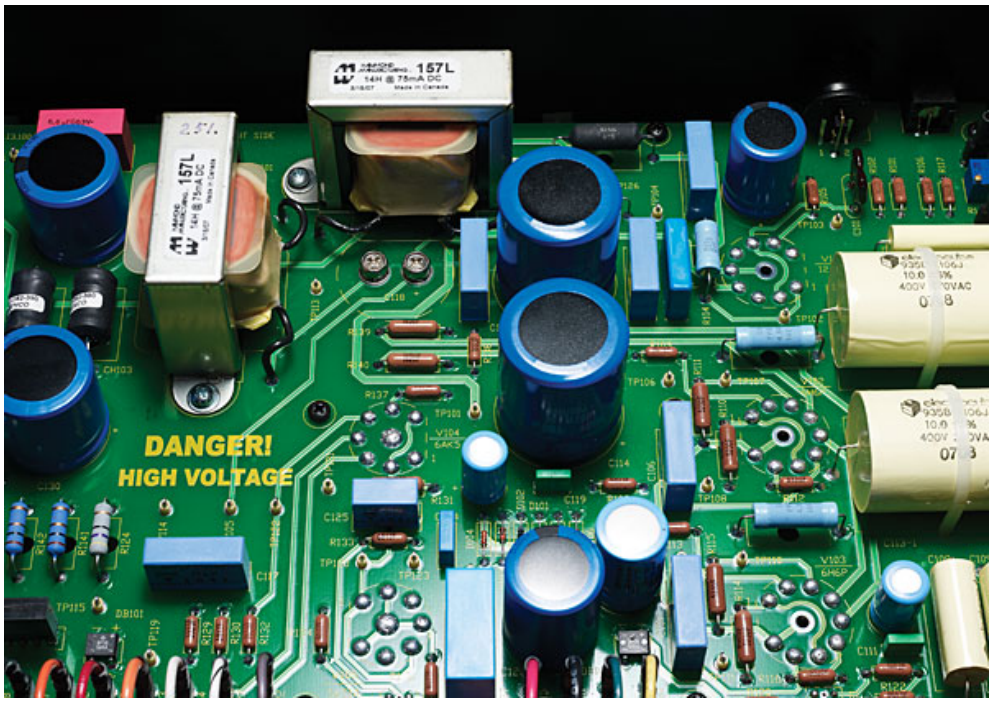
First of all, the Lamm ML2.2 is extraordinarily heavy: 107 lbs in its reliably sturdy and generously padded wooden crate—and that's just one channel. If you don't have a good dealer (or male children, or servants), you're faced with a considerable challenge just to get the amps into your house or apartment, out of their packaging, and onto whatever surface will support them.

Second, after installing 14 tubes in two mono amplifiers—every tube neatly packed and clearly marked for a single, specific socket—the user must check and, if necessary, adjust the plate voltage and plate current for each amp's output tubes. This requires a very small screwdriver—the adjustment pots are easily accessed via clearly marked openings in the top panel—and a very good digital multimeter. One of those two items is included with every ML2.2; as for the other, Lamm recommends the Fluke 87V.

Third, you must be willing and able to repeat those checks and adjustments, precisely and carefully, every now and then—partly because failure to do so would result in suboptimal performance, partly because failure to do so could result in premature

deterioration of the power tubes. According to the recommendations in Lamm's almost peerlessly thorough operating manual, every two years you will also want to replace the 6N6P tubes with matched pairs of same.

Except for the lifting, none of the above is at all difficult, and during the four months I spent with the ML2.2s, all of it went without a hitch. (I did not, of course, have to replace the 6N6Ps, or any other tubes.) When I first installed the Lamms, the plate-current and plate-voltage readings for one amplifier were spot on; the other needed only a slight nudge in the right direction. I rechecked and readjusted both amps twice during their stay here, and the readings never strayed more than slightly.



During their time in my system, the ML2.2s remained on the floor—I don't have an equipment support that can accommodate their size—within 2m of my Shindo Masseto preamplifier, whose output impedance is an accommodating 600 ohms. Like its predecessors, the ML2.2 allows the user to choose between RCA and XLR input jacks, the latter offered for the sake of convenience only (the Lamm is not a balanced design). Three separate pairs of chunky, gold-plated binding posts allow the user to select between output-transformer secondaries for 4, 8, and 16 ohms. I used only Auditorium 23 stranded-copper cables with gold-plated banana plugs, driving my Audio Note AN-E/SPe HE and Quad ESL loudspeakers, as well as a borrowed pair of DeVore Fidelity Orangutan O/96s and, just prior to their return to the manufacturer, a borrowed pair of Wilson Audio Sophia 2s. I used the ML2.2s' 8 ohm taps with the Audio Notes and the DeVores and both the 8 and 16 ohm taps in an effort to get the Quads to sound good with the Lamms (but see below).

Listening

Interestingly, while the reproduction of spatial effects on stereo recordings isn't high on my list of priorities, the ML2.2s' imaging prowess was among the first things I noticed. In that regard, these newest Lamms embodied the single-ended ideal: They floated solo instruments and voices between the speakers with the sort of psychedelic presence that seems the sole province of that output architecture. Spatially and in many other ways, the Lamms were engaging from the start.

More important, those sounds were musically convincing. While the sounds of instruments and voices had believable color, texture, and presence, and appeared to emanate from within a black absence of electronic noise, it was also apparent from the start that the Lamm allowed lines of notes to retain apparently all their natural flow and momentum. Although this might pass for faint praise in another context, the ML2.2 was the most listenable amplifier I've experienced.

In my 2004 review of the Lamm ML2.1, I described that amplifier's ability to scrape noise and distortion away from lines of notes, and get closer than ever to the real musical sounds underneath the artifacts. The ML2.2 did that and more: it unearthed music, and musical meanings, I'd simply never heard before. In the minutes before the start of "Conquistador," from Procol Harum's *Live in Concert with the Edmonton Symphony Orchestra* (LP, Chrysalis CHR 1004), when one normally hears only a gentle, nearly subconscious wash of orchestral tuning-up sounds, it was now impossible not to hear and appreciate the short scraps of melody being tossed around. Later, during the song itself, it was far easier than usual to hear when organist Chris Copping enters in the chorus: no mean feat regarding an instrument playing nothing-special chords under an 80-piece orchestra. And later still, during "Whaling Stories," I could hear the vibrato in the massed voices of the chorus. *Wow*.

The ML2.2 didn't just respect sonic colors and textures—it revered them, with greater saturation and depth than I recall from its predecessor. The new Lamm gave a compellingly rich, tactile account of the massed strings in Ferenc Fricsay's posthumously released recording of Tchaikovsky's Symphony 6, with the Berlin Radio Symphony Orchestra (LP, Deutsche Grammophon/Speakers Corner 138 135), and did much the same for the remarkable tone that Phil Lesh coaxes from his electric bass throughout the Grateful Dead's *American Beauty* (LP, Warner Bros./Mobile Fidelity Sound Lab MFSL 1-014). That quality, coupled with the Lamm's superb temporal performance, allowed me a greater-than-usual degree of appreciation for Lesh's superbly crafted lines.

While a direct comparison of the ML2.2 and ML2.1 wasn't possible, my memory of the ML2.1's sound suggested that the ML2.2's character differed from it only slightly: The new amp sounded a little more forward than the old, with a bit more *meat* to instrumental and vocal sounds in the treble range—which is to say that the ML2.2 was a little less airy-fairy and somewhat more substantive than the ML2.1. But a different sort of comparison comes down in favor of the earlier amp: While the ML2.1 sounded great with my Quad ESLs, the ML2.2 was notably less so. A few records sounded fine—Henry Grimes's bass solo in "All the Things You Are," from Sonny Rollins and Coleman Hawkins's *Sonny Meets Hawk!* (LP, RCA Living Stereo/Classic LSP-2712), was generously textured and had an especially nice sense of melodic flow—but Tony Rice's solo guitar in the title song of the Tony Rice Unit's *Manzanita* (LP, Rounder 0092) sounded distant, dull, and bereft of its usual supple twang, almost as if the guitar part were recorded out of phase from everything else in the mix. Similar examples of such midrange skewing piled up before I learned from Vladimir Lamm that the ML2.2 uses less feedback than the ML2.1—and feedback, as I've learned over the years, is something a tube amp needs in order to drive the ESLs' wiggy load. That's not a flaw, really; just the loss of a lucky pairing.

With the Audio Note and DeVore speakers back in the system, I did wish that the ML2.2 were a bit better at expressing musical touch and force. It was good enough in that regard: John Bonham's drumming in "Royal Orleans," from Led Zeppelin's *Presence* (LP, Swan Song/Classic SS 8416), sounded convincingly strong, and the drums, guitars, and piano in the starkly recorded title song of John Cale's *Fear* (LP, Island ILPS 9301) all had fine impact. But my similarly powered (20Wpc) Shindo Haut-Brion amplifier was better with both of these recordings, especially at expressing the force behind quieter sounds. The latter included the strange five-note figure the late B.J. Wilson plays on tabla in "Boredom," from Procol Harum's *A Salty Dog* (LP, A&M SP 4179), and the even subtler details throughout the remarkably explicit recording, by Ernest Ansermet and L'Orchestre de la Suisse Romande, of Ravel's *L'Enfant et les Sortilèges* (LP, Decca/Speakers Corner SXL 2212), where the Shindo amp even gave a sense of the force behind the singer's rolled Rs—an effect the Lamm didn't put across as well.

Conclusions

Because enthusiast products and appliances are held to different standards of ease of use, their values must be judged rather differently. It isn't fair to expect that the Lamm ML2.2 would offer 100 times better sound than a second-hand Adcom amp—or, for that matter, 28% better sound than a Lamm ML2.1—if only because, in any endeavor, perfectionism's gains are small.

That doesn't mean the ML2.2 should get a pass on this front: As I wrote in that 2004 review of the ML2.1, "It's my professional responsibility to tell you that I just plain don't see anywhere near $15,000 worth of parts inside one of these chassis, no matter how much the trannies cost. Are they that difficult and time-consuming to build? Maybe."

Although the quality and thus the presumed expense of the parts, materials, and workmanship in the Lamm ML2.2 are all beyond question, one must face the fact that to buy an expensive product such as this is to pay a premium for the designer's original ideas,

much as one pays to own a book or a print or a recording of music. Vladimir Lamm, whose groundwork in engineering and the perception of sound has occupied him for nearly 50 years—and whose Lamm Industries celebrates its 20th anniversary this year—has created an amp that offers not only unparalleled performance in many regards, but combinations of musical qualities available in no other product I know of. While only the prospective buyer can judge the value of the ML2.2, I suspect that most people with both the means and a thirst for the capabilities described above would have little trouble pulling the trigger.

Apart from costing more than the average person can spend, the Lamm ML2.2 is a failure in only one regard: It is completely useless for background music. Every note it played in my home became unignorable. An extraordinary product, and one that all of you should endeavor to hear.

Specifications

Description: Tubed monoblock power amplifier. Tube complement: two 6C33C, two 6N6P, one 6AK5, one 5651, one 12AX7. Output power: 18W into 4, 8, or 16 ohms at 0.7% THD (9.55, 12.55, 15.55dBW, respectively). Frequency response: 20Hz–20kHz at 18Wpc, –0.3dB. Input impedance: 41k ohms. Input sensitivity: 0.85V. Slew rate (48V peak–peak): 15V/µs. Signal/noise ratio, ref. 4V RMS into 16 ohms: typically 90dB A-weighted.
Dimensions: 16" (445mm) W by 8.25" (210mm) H by 20.375" (520mm) D. Weight: 81 lbs (36.8kg).
Serial numbers of units reviewed: B10253, B10254.
Price: $37,290/pair. Approximate number of dealers: 10.
Manufacturer: Lamm Industries, Inc., 2621 E. 24th Street, Brooklyn, NY 11235. Tel: (718) 368-0181. Fax: (718) 368-0140. Web: www.lammindustries.com.

Associated Equipment

Analog Sources: Garrard 301, Thorens TD 124 turntables; EMT 997, Artemis Lab TA-1 tonearms; Ortofon SPU, EMT TSD 15 70th Anniversary pickup heads; Miyabi 47 cartridge.
Digital Sources: AudioQuest DragonFly USB DAC; Apple iMac G5 computer running Apple iTunes v.11.0, Decibel v.1.0.2 playback softwares; Sony SCD-777ES SACD/CD player.
Preamplification: Auditorium 23 Standard (SPU version), Silvercore One-to-Ten, Hommage T2 step-up transformers; Shindo Masseto preamplifier.
Power Amplifiers: Shindo Corton-Charlemagne, Shindo Haut-Brion, Fi 421A.
Loudspeakers: Audio Note AN-E/SPe HE, Quad ESL, Wilson Audio Specialties Sophia 2, DeVore Fidelity Orangutan O/96.
Cables: USB: AudioQuest Carbon, Nordost Blue Heaven. Interconnect: Audio Note AN-Vx, Shindo Silver. Speaker: Auditorium 23. AC: manufacturer's own.
Accessories: Box Furniture Company D3S rack (source, amplification components); Keith Monks record-cleaning machine; Peter W. Belt Cream Electret.—**Art Dudley**

Measurements

To measure one of the Lamm ML2.2 amplifiers (serial no.B10254), I used *Stereophile*'s loan sample of the top-of-the-line Audio Precision SYS2722 system (see www.ap.com and the January 2008 "As We See It"). Before performing any measurements, I ran the amplifier with a 1kHz tone at 1W into 8 ohms for an hour, then turned off the signal generator and adjusted the output-stage plate voltage and current, following the detailed instructions in the manual and using the recommended Fluke 87 meter. Lamm recommends that the wall voltage be 120V for this procedure; unfortunately, the voltage in my quiet suburban neighborhood remained higher than that, at 124.4V. After adjustment, the plate voltage for the measurements was 174.4V DC and the plate current voltage was 0.305V, both figures within the recommended ranges.

The signal from all three output transformer taps was non-inverting. The input impedance was 42k ohms at 20Hz, dropping slightly to 37k ohms at 1kHz, then again to 22k ohms at 20kHz. The voltage gain depended on the tap. It was 20dB from the 4 ohm tap, 22.7dB from the 8 ohm tap, and 25.1dB from the 16 ohm tap, all of these lower than usual for a power amplifier. The output impedance also depended on the transformer tap used. From the 4 ohm tap, the impedance was a low 0.38 ohm at low and middle frequencies, rising to 0.5 ohm at 20kHz. As expected it was higher from the 8 ohm tap, at 0.7 ohm at 20Hz and 1kHz, and 0.8 ohm at 20kHz, and higher still from the 16 ohm tap: 1.35 ohms at all audio frequencies.

These figures are all commendably low for a tube design with a single-ended output stage. As a result, the variation in the ML2.2's frequency response due to the Ohm's Law interaction between the source impedance and the manner in which the impedance of our standard simulated loudspeaker changes with frequency was relatively small. Even from the 16 ohm tap (fig.1, gray trace), the variation was only ±0.9dB, while from the 4 ohm tap (fig.2, gray trace) it was just ±0.3dB. The graphs also reveal that the ML2.2 has a very wide small-signal bandwidth, with the output into 16 ohms from all output taps being flat to below 20Hz and to the top of the

audioband, and –3dB above 100kHz. As a result, the ML2.2's reproduction of a 10kHz squarewave (fig.3) featured very short risetimes, though a small amount of overshoot and ultrasonic ringing can be seen on the leading edges.

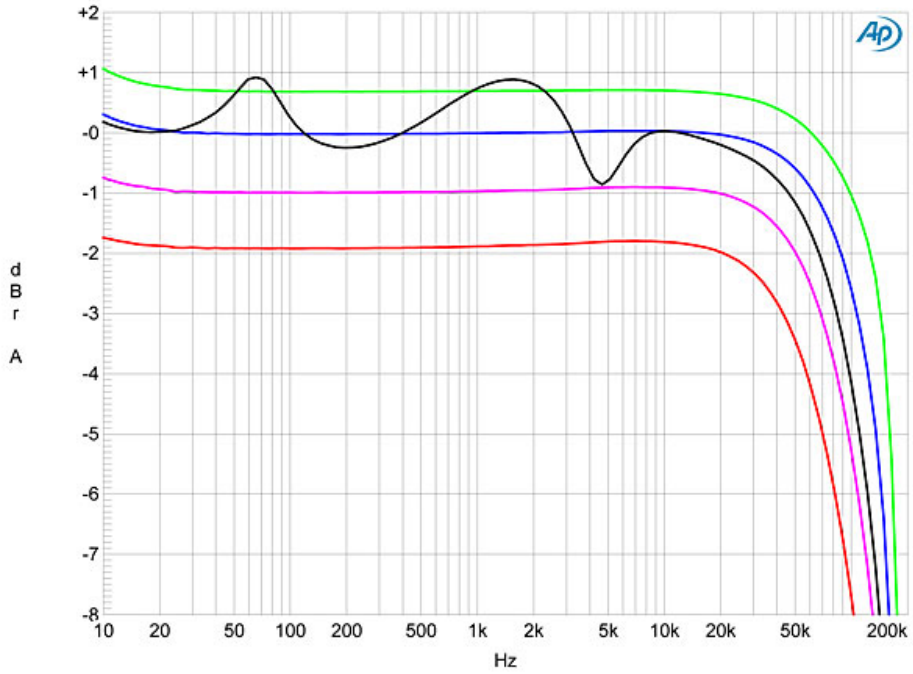


Fig.1 Lamm ML2.2, 16 ohm tap, frequency response at 2.83V into: simulated loudspeaker load (gray), 16 ohms (green), 8 ohms (blue), 4 ohms (magenta), 2 ohms (red) (0.25dB/vertical div.).

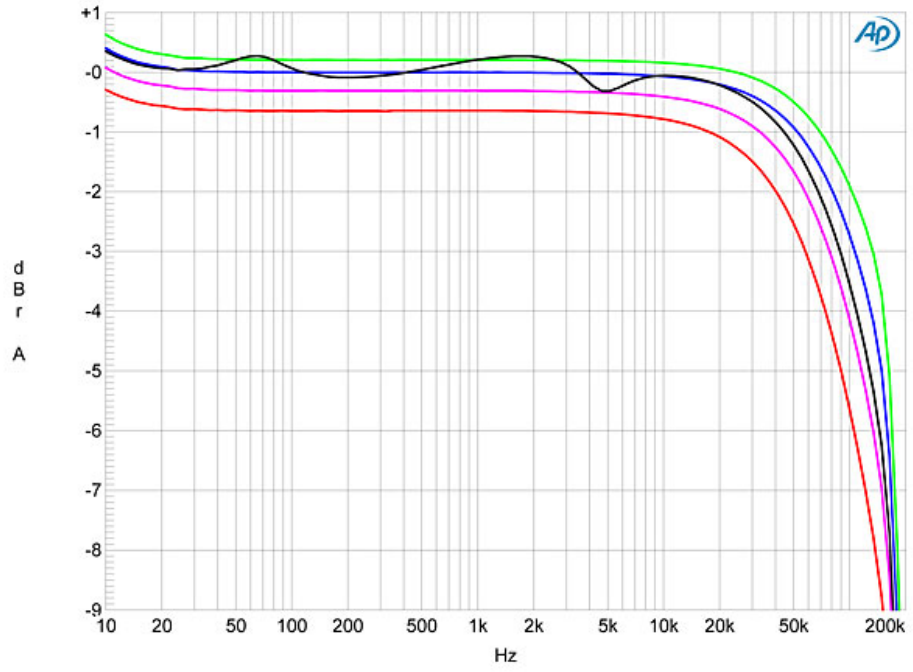


Fig.2 Lamm ML2.2, 4 ohm tap, frequency response at 2.83V into: simulated loudspeaker load (gray), 16 ohms (green), 8 ohms (blue), 4 ohms (magenta), 2 ohms (red) (0.25dB/vertical div.).

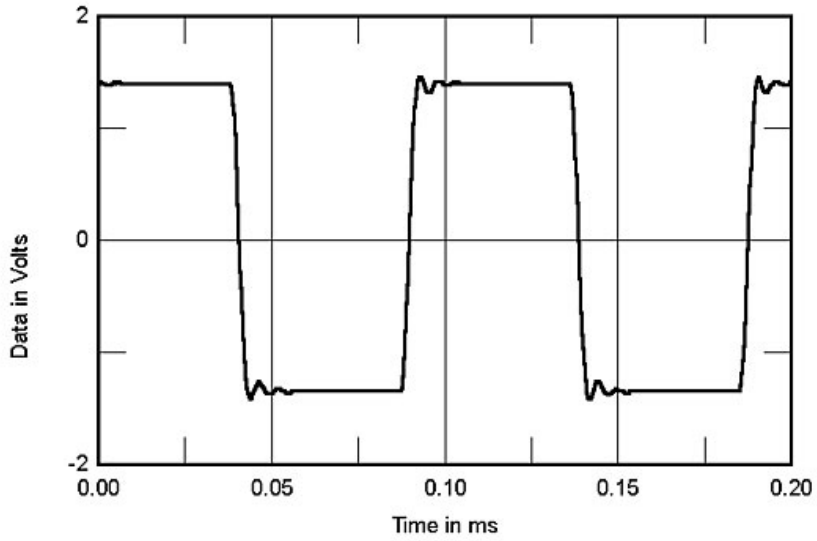


Fig.3 Lamm ML2.2, 4 ohm tap, small-signal 10kHz squarewave into 8 ohms.

I measure an amplifier's signal/noise ratio (SNR) with the input shorted. The ML2.2's SNR varied with the output tap chosen, in general decreasing by the amount of extra voltage gain available. The wideband, unweighted ratio, ref. 2.83V into 8 ohms, was 77.3dB from the 16 ohm tap, 79.5dB from the 8 ohm tap, and 82.1dB from the 4 ohm tap. These ratios all improved by 9dB when A-weighted, and, as can be seen in fig.4, the noise primarily comprises components at 60Hz and its even and odd harmonics, the last due to magnetic interference from the AC transformer. Overall, however, these spuriae are all relatively low in level for a tube design.

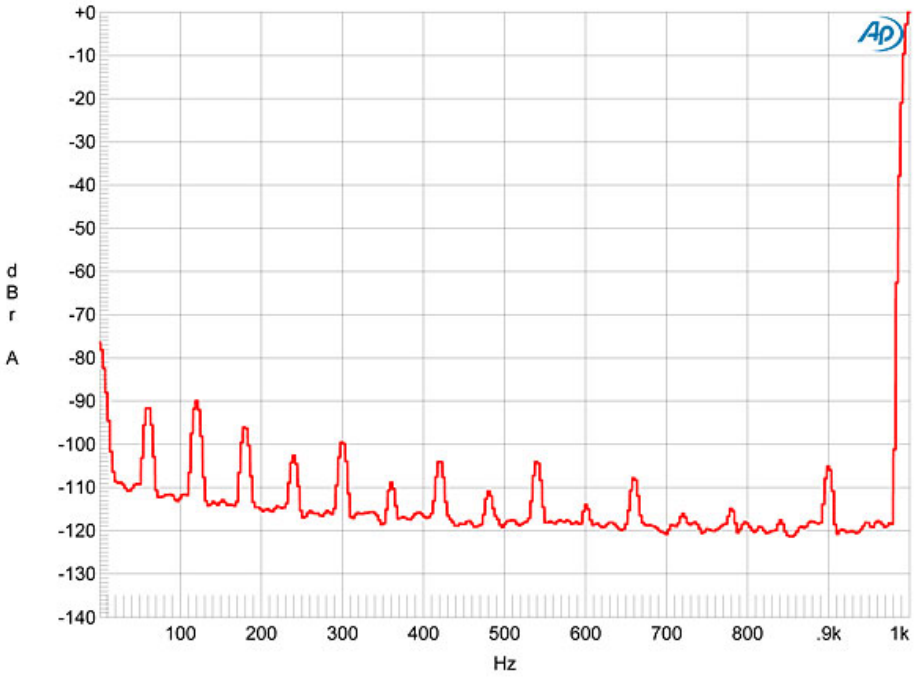


Fig.4 Lamm ML2.2, 4 ohm tap, spectrum of 1kHz sinewave, DC–1kHz, at 1W into 8 ohms (linear frequency scale).

Figs. 5, 6, and 7 were all taken from the 8 ohm output transformer tap, and show how the THD+noise percentage in the amplifier's output changes with output power into, respectively, half the nominal tap value, when the load is the same as the tap value, and into twice the tap value. The curves from the other two taps were very similar, so I haven't shown them. The ML2.2 more than meets its specified output power of 18W into a matched load (12.55dBW) at 3% THD, offering 20W into 8 ohms from its 8 ohm tap (13dBW, fig.6), and around 15W into 4 ohms (9dBW, fig.5) and 16 ohms (14.8dBW, fig.7). (In part, this extra power will be due to

the fact that I was measuring with a wall AC voltage of 124.4V instead of 120V.) The 1% THD powers are much less, of course, due to the fact that the single-ended output-stage topology and a small degree of global negative feedback lead to a steadily rising amount of distortion as the power increases.

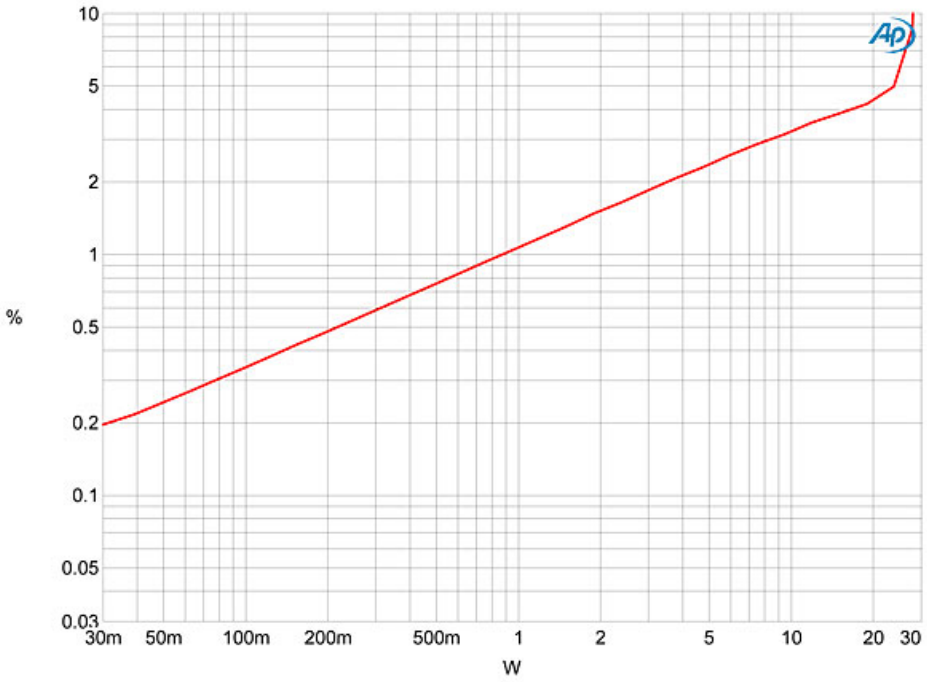


Fig.5 Lamm ML2.2, 8 ohm tap, distortion (%) *vs* 1kHz continuous output power into 4 ohms.

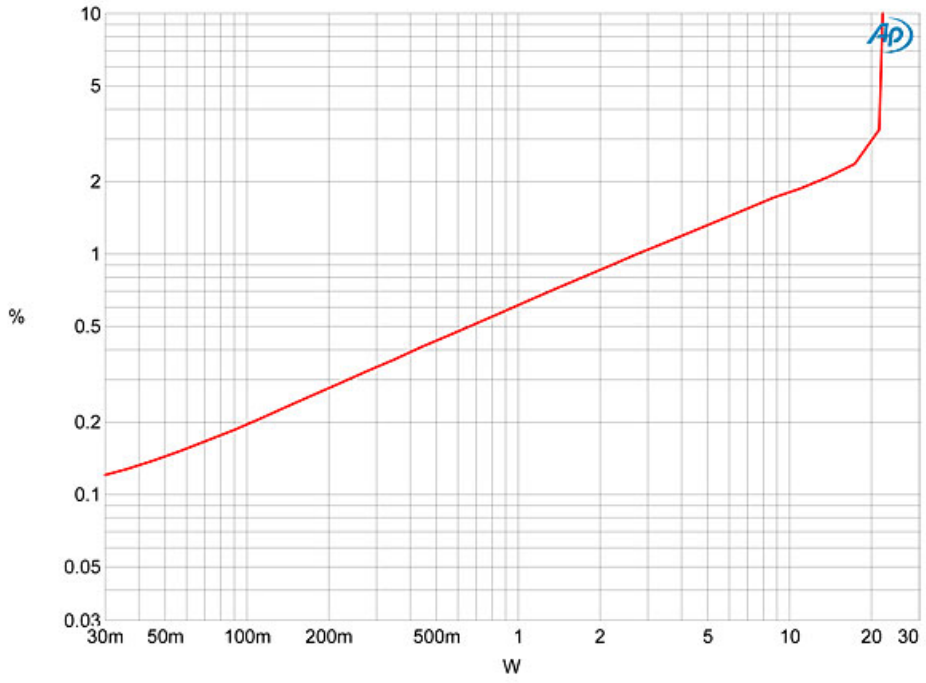


Fig.6 Lamm ML2.2, 8 ohm tap, distortion (%) *vs* 1kHz continuous output power into 8 ohms.

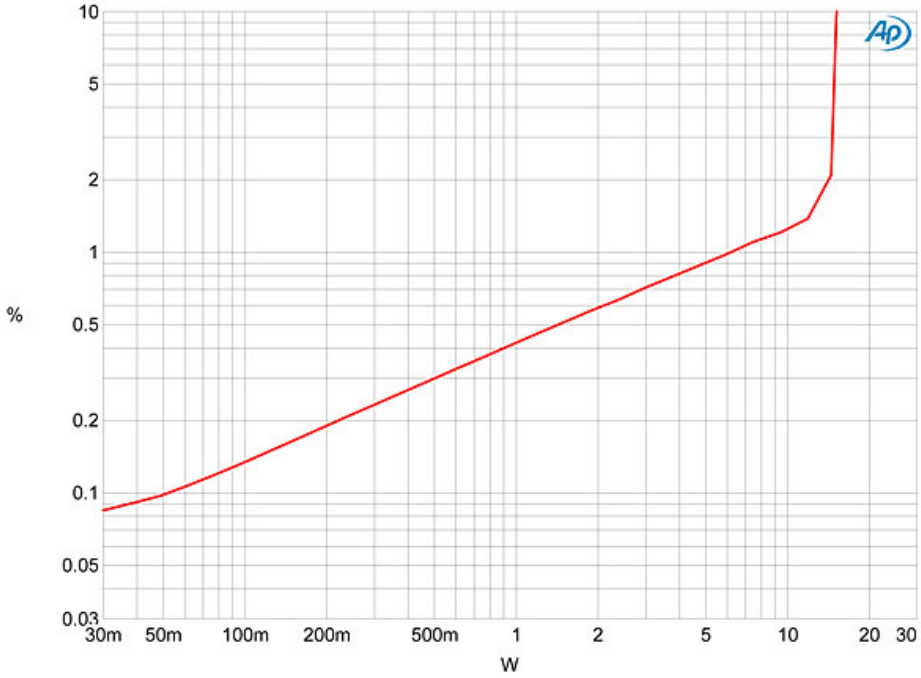


Fig.7 Lamm ML2.2, 8 ohm tap, distortion (%) *vs* 1kHz continuous output power into 16 ohms.

Fig.8, taken from the 4 ohm tap, shows that the THD doesn't change significantly with increasing frequency, though it does increase alarmingly as the load impedance halves. (The 8 and 16 ohm taps, figs.9 & 10, respectively, gave similar pictures, but the additional gain from these taps is accompanied by increasingly high levels of distortion overall.) That THD doesn't increase significantly at very low frequencies is a testament to the quality of the output transformer. Fortunately, the distortion is almost pure second harmonic (fig.11), which tends to be subjectively benign. Even at low frequencies, where the output transformer's core might start to saturate, the third harmonic is very much lower than the second (fig.12), which again suggests that the ML2.2's output transformer is quite special.

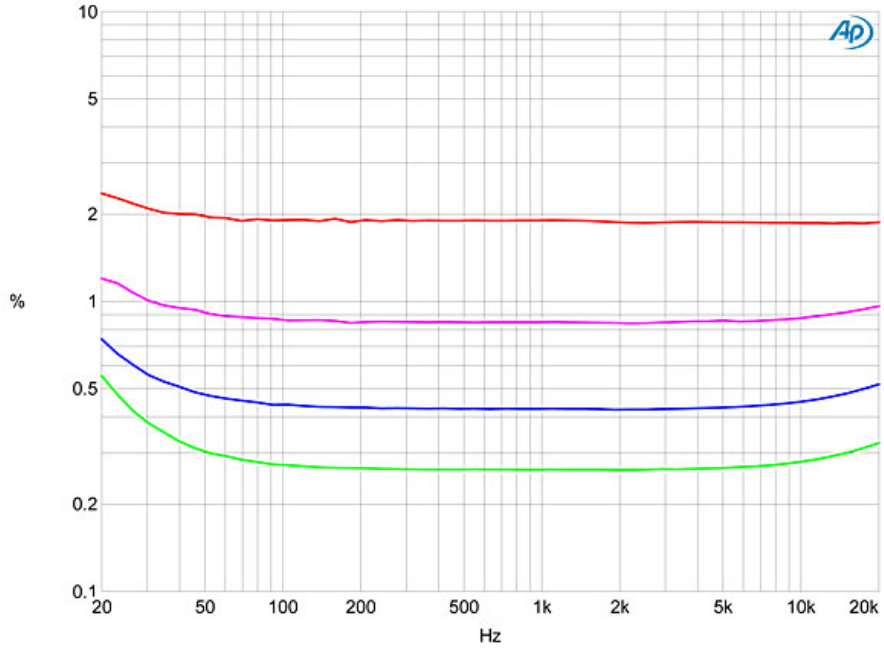


Fig.8 Lamm ML2.2, 4 ohm tap, THD+N (%) *vs* frequency at 2.83V into: 16 ohms (green), 8 ohms (blue), 4 ohms (magenta), 2 ohms (red).

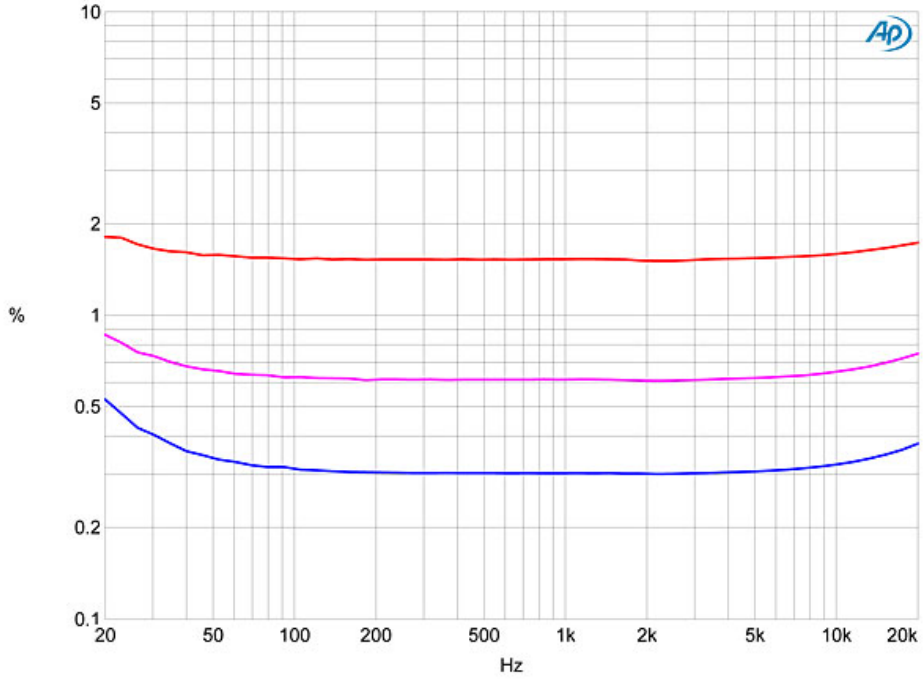


Fig.9 Lamm ML2.2, 8 ohm tap, THD+N (%) *vs* frequency at 2.83V into: 16 ohms (blue), 8 ohms (magenta), 4 ohms (red).

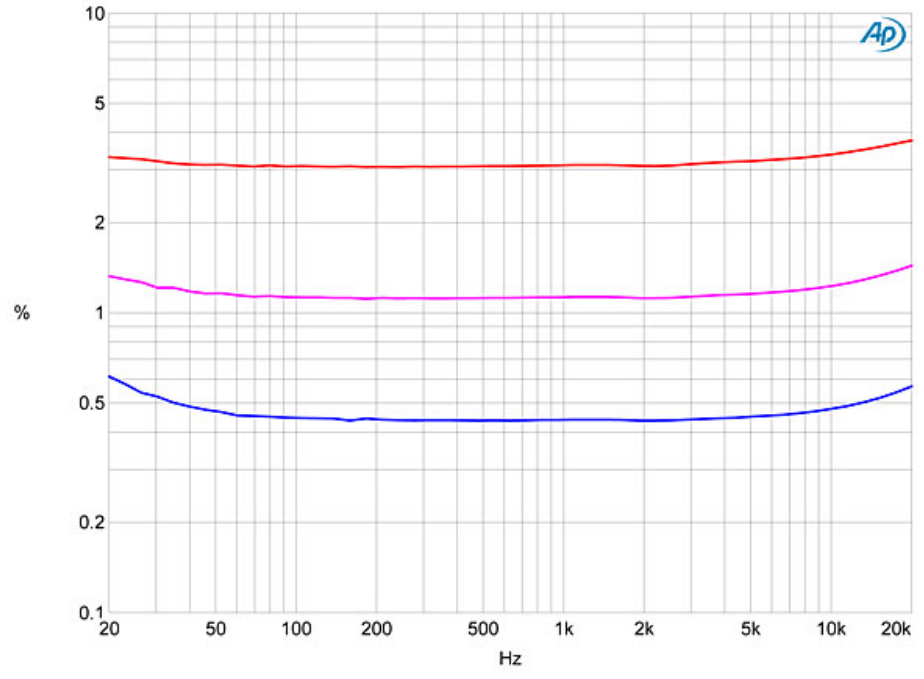


Fig.10 Lamm ML2.2, 16 ohm tap, THD+N (%) *vs* frequency at 2.83V into: 16 ohms (blue), 8 ohms (magenta), 4 ohms (red).

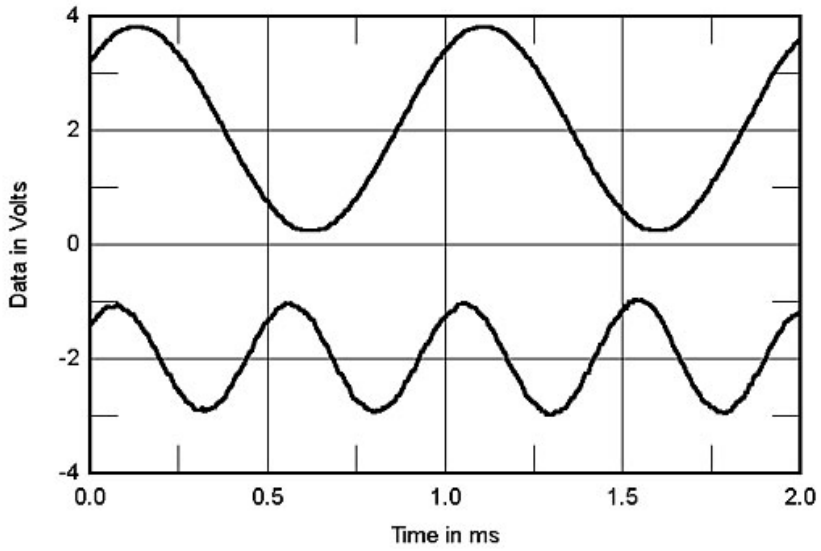


Fig.11 Lamm ML2.2, 4 ohm tap, 1kHz waveform at 1V into 8 ohms, 0.154% THD+N (top); distortion and noise waveform with fundamental notched out (bottom, not to scale).

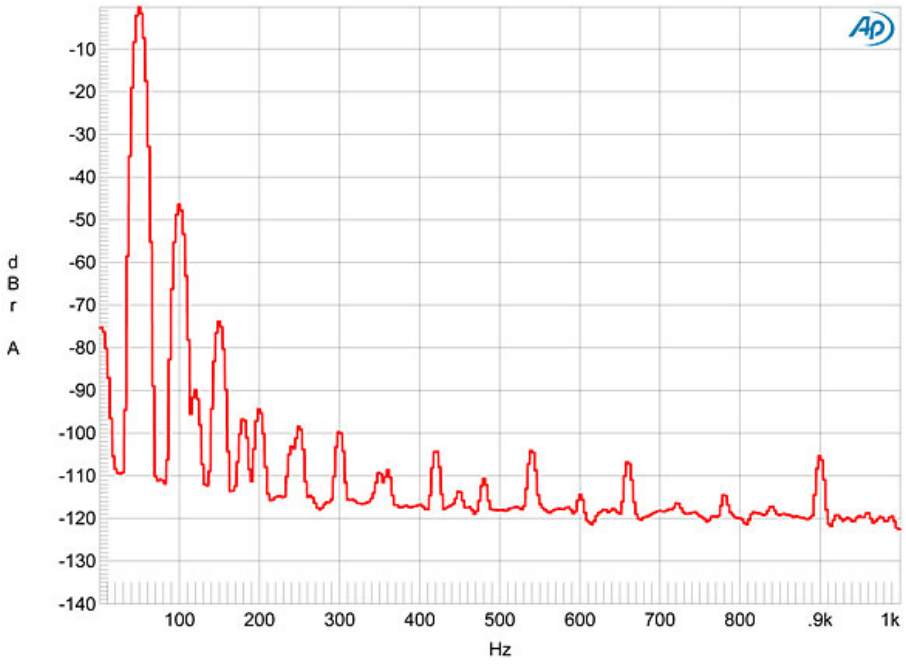


Fig.12 Lamm ML2.2, 4 ohm tap, spectrum of 50Hz sinewave, DC–10kHz, at 1W into 8 ohms (linear frequency scale).

The ML2.2 offers fairly low levels of second-harmonic distortion at powers below a few hundred milliwatts, which will be the power levels asked for by AD's sensitive loudspeakers. Whether or not second-harmonic distortion is subjectively innocuous will depend on whether or not the amplifier also develops high levels of intermodulation distortion. As its circuit's nonlinearity doesn't increase as the frequency increases, the ML2.2 scores relatively well here. Fig.13 shows the spectrum of the amplifier's output as it reproduced from its 4 ohm tap an equal mix of 19 and 20kHz tones with a peak output of 1W into 8 ohms. While the 1kHz second-order or difference component lies at –54dB (0.2%), any higher-order intermodulation components all lie below –80dB (0.01%). Even when the power was increased to just below clipping into 8 ohms (fig.14), the higher-order spuriae still lie at –70dB (0.03%), though the difference component has risen to –44dB (0.6%).

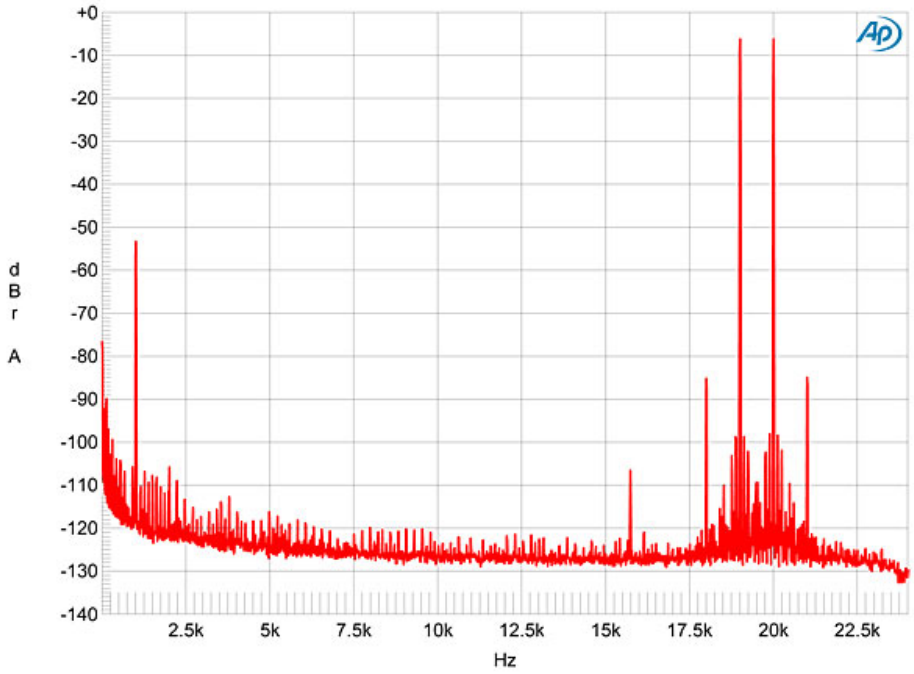


Fig.13 Lamm ML2.2, 4 ohm tap, HF intermodulation spectrum, DC–24kHz, 19+20kHz at 1W peak into 8 ohms (linear frequency scale).

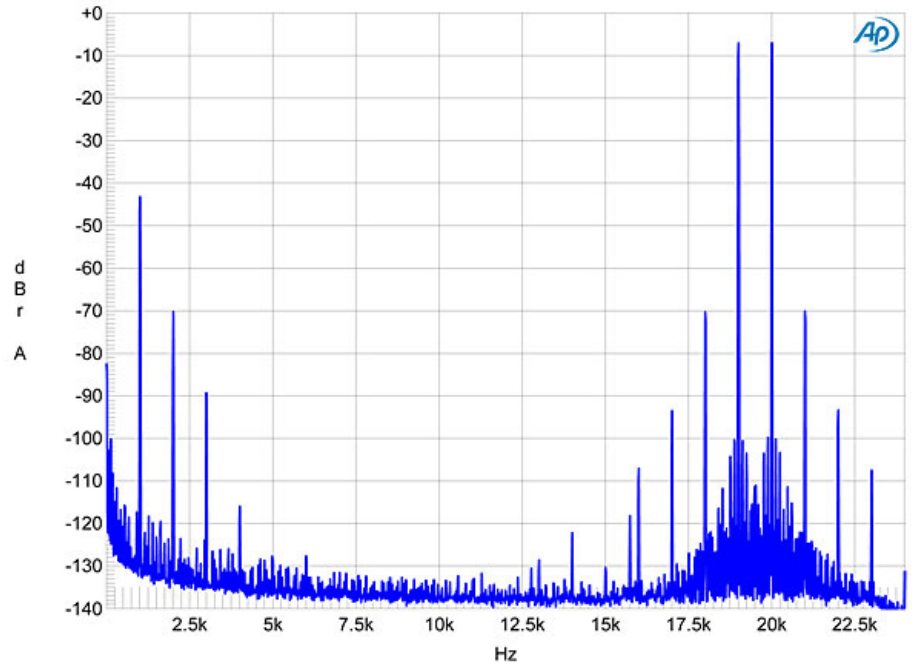


Fig.14 Lamm ML2.2, 4 ohm tap, HF intermodulation spectrum, DC–24kHz, 19+20kHz at 15W peak into 8 ohms (linear frequency scale).

Whenever I measure one of Vladimir Lamm's amplifiers, I am always impressed by the quality of the engineering. Yes, the ML2.2 has a bent transfer function, which means that it produces higher-than-usual levels of second-harmonic distortion—but this is *not* accompanied by high levels of high-order intermodulation. And you have that low output impedance and very wide bandwidth!—**John Atkinson**