

## Lamm Industries M2.1 monoblock power amplifier

Paul Bolin, April 2003

How did Michael Jordan, talented as he was at the peak of his powers, *always* manage to impose his will on his teammates to push them to victory when it counted most? What made Sandy Koufax able to elevate his pitching to a superhuman level when the stakes were highest? A knowledgeable, hardcore sports fan can watch the performance of two players with nearly identical statistics and, after not too long, tell you which one is merely very good and which one is great. What makes a star are intangibles—those qualities you can't quantify or analyze, but can't help but recognize when you're in their presence.



The world of audio is analogous to the world of sports. With a few notable exceptions, the correlation between measured excellence and sonic distinction has been, at best, loose. The ultimate test, that which separates the great from the merely good, is the listening room. It's there, where the line between a thing done well and a thing done ill is infinitesimally thin, that a component's intangibles determine whether it falls short or ascends to the heights.

For nearly a decade, Vladimir Lamm has dedicated himself to creating audio equipment that meets his own demanding standards. Lamm's journey has not been easy; born and educated in the former Soviet Union, he homebrewed audio gear while working as a research scientist and, later, as the director of a factory that made consumer electronics. High-quality home audio equipment simply did not exist in the USSR, but since emigrating to the US, Lamm has more than made up for lost time—every piece of his equipment reviewed by *Stereophile* has landed in Class A of "Recommended Components." Were Lamm not the modest man he is, he could stake a strong claim to being the most honored and awarded audio designer of the last 10 years.

Lamm is a dedicated man of science—his equipment is built to mathematical and electrical models, not just to a preconceived notion of what music should sound like. Given his relentlessly objective methodology, it is all the more striking that every piece of Lamm gear that I have heard has what Jonathan Scull described in his review of Lamm's tubed M1.1 power amplifier back in the April 1995 *Stereophile* (Vol.18 No.4): an intangible that can only be called *soul*.

### Inner Beauty

Lamm Industries is probably the only company in the High End whose amplifiers' prices are in inverse relationship to their power output. At \$16,490/pair, the M2.1 monoblock amplifier is the company's least expensive (a relative term when dealing with Lamm components) and most powerful ([footnote 1](#)). The M2.1 is a hybrid design, and an unusual one. The amp's input stage is solid-state, with video buffers used for each signal phase driving a differential pair of JFETs, but then a "specially selected" military-grade 6922 (6DJ8) tube drives the six pairs of complementary MOSFET power transistors.

The M2.1 is specified to produce 200W into 4 or 8 ohms, and will tolerate loads as low as 1 ohm, which indicates a very stoutly engineered power supply. "While most class-AB amplifiers have [an] idle current ranging from a few tens to a few hundred milliamps," states Lamm's website, "the M2.1's idle current is 1.4 amps at 8 ohms and 2 amps at 4 ohms and below." A rear-panel locking switch changes the output stage bias and voltage rails to allow the M2.1 run in class-A up to 36W into 8 or 4 ohms. It runs in class-AB from that level up to the rated power limit.

Vladimir Lamm is a serious man who presents his products in an appropriately serious way, right down to the massive wooden crates in which the M2.1s were shipped and their superb, clearly written owner's manual. The latter includes a most comprehensive set of measurements and specifications, with graphs and documentation galore.

The M2.1's appearance is pure Louis Kahn: form follows function ([footnote 2](#)) There are no fripperies or fancy accoutrements; what you see—a largish, well-proportioned black box covered with heatsinks—is what you get. The front panel is featureless save for a red power LED, the engraved Lamm logo, and two beefy handles. The money is spent inside.

Popping the top shows the M2.1's interior to be immaculately built and well-organized, with one lonely-looking 6922 tube standing in the center of the large double-sided circuit board, with plated-through holes. (Vladimir has a horror of dry solder joints; the M2.1's components are soldered on both sides of the board.) A massive toroidal transformer lives under the circuit board, potted and isolated so that it contacts neither the transformer cover nor the amplifier's chassis, thus minimizing mechanical noise. As is Lamm's usual practice, that circuit board is filled with the finest parts: Dale metal-film resistors, PRC wire-wound resistors, Electrocube and Roederstein film capacitors, high-frequency switching-grade Cornell Dubilier capacitors, Bourns multiturn potentiometers, and other spendy goodies.

On the rear panel, heavy-duty gold-plated binding posts and gold-plated Neutrik XLR connectors permit balanced connections, with Esoteric Audio RCA jacks. Also featured on the rear are two additions I wish more manufacturers would provide: a second set of handles to make moving the amp much easier, and separate single-ended input jacks for standard and phase-inverting preamplifiers ([footnote 3](#)).

While the M2.1 is enormously solid, it's not so heavy that one person can't move it around with a minimum of grunts and groans. Multiple protection circuits guard against everything from transformer and heatsink overheating to shorts, line-voltage drops, and DC. For the home-theater set, remote turn-on is provided via 12V jacks. If there's another feature you might need, I can't imagine what it would be.

## The Soul in the Machine

Setup was short and sweet. I plunked the M2.1s down on shot-filled Grand Prix Audio Monaco amplifier stands and plugged them in with Acoustic Zen Gargantua II or Wireworld Silver Electra 3+ power cords. The only slack I cut them was to fire them up at least an hour before doing any serious listening. Nothing more needed to be done. The Lamms behaved perfectly over a period of some six months; about the only negative thing I have to say about living with them is that they run on the hot side of warm and can raise the room temperature to a tasty level.

The M2.1 had every strength you might expect to find in the work of such an accomplished engineer designing to a very high price point. Their tonal balance was utterly even and neutral. My usual tools of bass torture from Kruder & Dorfmeister, Kraftwerk, and the soundtrack of *The Thin Red Line* didn't faze them in the least. Even the "Poem of Chinese Drums," from Burmester's *Demonstration CD No.3*, couldn't make them lose their cool. The bass was always rock-solid, right on pitch and bloomy, not boomy.

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Footnote 1: The M2.1's sibling, the 100Wpc pure class-A M1.1, costs \$17,290/pair; the 90Wpc ML1.1 push-pull triode monoblock costs \$22,690/pair; and the 18Wpc ML2, a single-ended-triode design, goes for a whopping \$29,290/pair.—**Paul Bolin**

Footnote 2: According to reader Allen Edelstein (hahax@rcn.com), it was not Lou Kahn who first said that "form follows function" but Frank Lloyd Wright. "For Kahn, form was more like mathematical topology where a donut and tea cup are topologically equivalent. Shape was the personification of the more abstract form," clarified Mr. Edelstein.—**John Atkinson**

Footnote 3: Owners of Conrad-Johnson amps, among others, will find this last feature a blessing.—**Paul Bolin**

The treble was smooth and extended—if perhaps not quite as extended as the Halcro dm58 monoblock's, it wasn't far short. The overtones of the strings of the Munich Bach Orchestra in Bach's Brandenburg Concertos 5 and 6 (LP, Archiv 2722 033-10) were rosiny yet naturally sweet—the Lamm added neither sugar nor astringency. Like its sibling, the triode-powered ML1, the M2.1 had just a hint of darkness, no more than a filmy scrim, at the top of the uppermost treble, but this did nothing to seriously impede their reproduction of the overtones of strings, cymbals, or piano. The Lamms presented no obstacles to hearing the size, shape, and unique sonic character of any concert hall, club, or studio.

As for midrange, the Lamm's ability to conjure the human voice was simply off the charts. Save for his fellow Irishman Van Morrison, there is no more emotionally honest or personally compelling singer in rock or folk music than the magnificent Christy Moore. His voice gets inside me as do few others, whether or not you agree with the political sentiments expressed in nearly everything he sings.

While he usually records in acoustic settings, Moore did some of his finest work back in the early and mid-1980s, with Moving Hearts. An unlikely mélange of electrified traditional Irish music, fusion, and rock, MH was a butt-kicking band whose eponymous debut LP (WEA K 58387, UK) just *smokes* from beginning to end. "Hiroshima Nagasaki Russian Roulette" is a one-song exhibition of all they did well: Moore spits out the bitter words with a contemptuous anger that would stop the most attitudinous punk rocker dead in his tracks. Behind him lies the richly layered backdrop of Donal Lunny's electric bouzouki, Declan Sinnott's stinging lead guitar, and the tough, fibrous Fender bass of Eoghan O'Neill. Toward the song's end, Sinnott engages in a high-speed game of cat-and-mouse harmony playing with Uilleann piper Davy Spillane and Keith Donald's soprano sax that is a wonder to hear. [*Amen!*—Ed.]

The Lamm laid all of this on the line with tremendous clarity and drive—every cutting word bitten off by Moore, the dizzying interplay between Spillane, Sinnott, and Donald, and the rock-solid rhythm section. In case you missed it the first time, Spillane, Donald, and Sinnott later repeat their effortless, simultaneous virtuosity on "McBride's," to equally impressive effect; through the Lamm, the infinitely subtle contrast in timbre between the pipes and the soprano sax was as clear as the difference between chalk and cheese. The deep mournfulness of Moore's voice in "Irish Ways and Irish Laws" came from somewhere as old as time, the words "I wonder will I live so long..." hanging in the room like a lost, lonely ghost.

Eva Cassidy's "Cheek to Cheek," from her *Live at Blues Alley* (CD, Blix Street 10046), glowed with life and love. As with Moore and every other singer I heard through the M2.1s, Cassidy's voice came from a *body*, not a singing head hanging ungrounded between the speakers. Only the best amps can materialize a whole person behind the voice, and the Lamms nailed it squarely.

Voices were not the only instruments with which the M2.1 excelled. Guitars had a resonance and presence that was Goosebump City. Mark Knopfler's slashing, biting Stratocaster on Dire Straits' "Tunnel of Love," from *Making Movies* (LP, Warner Bros. BSK 3480), was as tingly as his mellow, woody Dobro on "Romeo and Juliet." Most amplifiers will give you the Dobro's wooden body *or* its metal resonator. The M2.1 squarely hit both bullseyes. The rich warmth of the nylon-stringed guitars of Anthony Phillips and Enrique Berro Garcia on "Otto's Face," from *Antiques* (LP, PVC 8968), was as graceful and lifelike as recorded music can be. I recently stumbled on an elderly, rainbow-label British EMI pressing of *The Ballad Style of Stan Kenton* (LP, Capitol/EMI S1068), and it was a beauty through the Lamms. The thick, buttery moo of the trombones provided a plush, mellow backdrop for the bracingly upfront sax section, everything surrounded by a tangible cushion of air and space.

After the basics have been gotten right, it is careful attention to the little things that elevates the solidly workmanlike to the truly artisanal. Consider Bruno Walter's incomparable turn with Beethoven's Symphony 6, "Pastoral" (SACD, Sony Classical SS 6012). Walter was one of the last representatives of a conducting tradition that, sadly, is no more. The Lamms delivered the most subtle and important elements of that style—the gentlest of dynamic variances, the delicate shiftings of light and shade, of texture and balance—that made this *Walter's* Beethoven, not von Karajan's, Solti's, or Joe Schmo's. The Lamm authoritatively delivered Walter's disciplined but *gemütlich* humanism in his approach to this music, his firm yet gentle control of every detail of the score. Those lovingly traced low-level details present in the music's inner voices were cleanly and easily traversed, but the *Sturm und Drang* of the thunderstorm had a rafter-rattling power that was just as lucid and transparent as the second movement's birdcalls.

The Lamms were every bit as capable with electric and electronic instruments as with a full orchestra. Enigma's "Mea Culpa" (German CD single, Virgin DINS 104) is a pure exercise in moods and atmospheres. Like a great film director, the Lamms were so good at setting the stage that all the technique that goes into creating a believable scenario was forgotten. The enticing, vaguely menacing female voice drew me in to Michel Cretu's three-dimensional sound sculpture of the "Fading Shades" mix, weaving a spell of ominous Gothic gloom. On the

more upbeat "Orthodox Mix," synthesizer twinkles fizzed over, around, and between the speakers in a 3-D display like a firefly ballet at twilight. The densely alien soundscapes of Future Sound of London's *Lifeforms* (Dutch CD, EBV/Virgin CDV 2722) were defined by the underlying organic quality that makes FSOL unique in electronic music.

Dynamics were consistently lifelike, from the depths to the lower treble. The huge booms from the taiko drum and bass drum in "Journey to the Line," from *The Thin Red Line*, had tremendous power and focus and remained where they belonged: deep in the soundstage. The burst of synth noise that leaps from burbling near-silence in "Among Myselfs," from *Lifeforms*, was enough to scare me out of the room with its sheer violence and suddenness. In the uppermost treble there was a barely-there sense of not exactly compression, but a reticence noticeable only in contrast to the amp's continuous performance across the rest of the spectrum. This, I suspect, is the residuum of that equally faint tint of timbral darkness in the same range. In spite of this, the Lamm's treble dynamics were very good indeed.

Soundstaging was, as is the case with today's best components, entirely a matter of what was encoded in the grooves or pits. Those drums on "Journey to the Line" were waaaaay back in a soundfield that was precisely and naturally drawn. All sections of the orchestra had just the right amount of room to breathe on the "Pastoral," and on the Eva Cassidy disc I could feel each musician positioned around her, grounded with authority and a wholly convincing sense of place and space.

The Lamms also caught how instruments and singers project sound into space with uncommon accuracy. Whether it was the soundboard of a grand piano, a nylon-string acoustic guitar, or a saxophone, each retained its special projection characteristics. There was no homogenization, flattening, or "dumbing down" of the unique timbral and spatial characteristics of any recording.

The Lamms were masterful at maximizing the differences between LPs or CDs, giving each what is truly its own, making perfect musical sense out of whatever music flowed through them. And when the recording was so awful as to make this impossible, they told the unvarnished truth about that, too—but that's an issue of software, not hardware.

Several months' worth of listening to the M2.1s led to one conclusion: They are among the very few amplifiers that are not just impressive, but *convincing* in their musical presentation. While they did all of the "audio stuff" superbly, that was not their apparent *raison d'être*. To hear the Lamms was to realize that they are a labor of love for their designer, and that I could hear Vladimir Lamm's commitment in every last note that passed through them.

## **Battle of the Titans**

Given what I've just said about the Lamm M2.1 and what I wrote about the Halcro dm58 monoblock in the October 2002 issue (every word of which I stand by), it behooved me to compare the two amplifiers head to head.

The Halcro remains more like something transported from Krypton, Superman's technologically hyper-advanced home world, than a conventional piece of audio equipment. The Lamms were, in a subtle but recognizable way, more approachable and spiritual in their presentation. Describe it as yin vs yang, Apollonian vs Dionysian, Platonic ideal vs Aristotelian reality—that was the difference between the two electronic giants. They were the two sides of a cosmic coin. I could not conclude that the Lamm's ultimate resolution and noise floor were quite the equal of the Halcro's, but no other amp's are, either. But, but...the M2.1's ability (shared with its sibling ML1) to consistently infuse a genuinely human presence into recorded music placed it on a peak barely less approachable than the solitary Everest on which dwells the Halcro dm58.

The dm58 and the M2.1 are two of the best high-powered—no, two of the very finest amplifiers of *any* kind to be found. Nor are they interchangeable—each has a distinct personality. If the Halcro is imbued with magic (defined as science of a higher order), the Lamm possesses an intangible of its own—call it soul, humanity, a techno-alchemical simulacrum of the life-essence itself. The Halcro first awes, then compels. The Lamm first compels, then awes. You pays yer money and makes yer choice.

You won't get any guff from me however you decide, only hearty congratulations that you have the cash and good taste to make such beauty and wonderfulness integral and permanent parts of your life. That I've been fortunate enough to live with both of these masterpieces back to back makes me realize how lucky I am to be an audio reviewer.

## Finale

There's an oft-told story about a fellow who approached Louis Armstrong and asked the great man, "What is jazz?" Pops smiled, laughed, and said, "If you don't know, I can't tell you."

So it was with the Lamm M2.1 monoblocks. Words like "convincing," "human," and "soulful" pepper this review and my listening notes, but it all comes down to one thing: the Lamms made me *believe* in the music I was hearing. Koufax and Jordan would recognize one of their own. What makes the Lamms so special is ephemeral, beyond being pinned down by mere words, but it can't be missed by anyone who loves music delivered with heart and soul. Doesn't that include just about all of us?—**Paul Bolin**

### Sidebar 1: Specifications

**Description:** Monoblock power amplifier with a solid-state input stage, tube driver stage, and MOSFET output stage; switch-selectable output-stage biasing to maintain optimal performance into loads between 1 and 16 ohms; and remote-control power on/off. Tube complement: one 6922/6DJ8. Rated output power: 200W minimum into 8 ohms (23dBW), High impedance setting, continuous sinewave drive, 20Hz-20kHz, with <0.3% THD at rated line voltage, (36W in class-A); 200W into 4 ohms (20dBW), same conditions (36W in class-A); 400W into 2 ohms (20dBW), Low impedance setting, with <1% THD (18W in class-A); 600W into 1 ohm (18.75dBW, 9W in class-A). Frequency response: 4Hz-150kHz, +0, -3dB (1-200W into 8 ohms). Voltage gain: 31.8db ±0.2dB. Input sensitivity: 1.026V RMS ±2% for 200W into 8 ohms, High impedance setting; 725mV RMS ±2% for 200W into 4 ohms, Low impedance setting. Input impedance: 41k ohms shunted by 470pF. Output impedance: typically 0.2 ohm, 20Hz-20kHz. Slew rate: voltage out = 113.14V peak-peak of squarewave signal into 8 ohms, 40V/μs. IM distortion (60Hz:7kHz 4:1) SMPTE: <0.5%, 1-200W into 8 ohms at rated line voltage; <0.5%, 1-200W into 4 ohms at rated line voltage. Typical power consumption: 220W at idle, 350W at rated output at 8 (4) ohms.

**Dimensions:** 17" (432mm) W by 8.25" (210mm) H by 19.5" (495mm) D; add 2.8125" (72mm) D for front and rear handles. Weights: 65 lbs (30.16kg) net, 92 lbs (41.77kg) shipping.

**Serial numbers of units reviewed:** A10233, A10244, listening; A10189, A10190, measuring.

**Price:** \$16,490/pair. Approximate number of dealers: 12.

**Manufacturer:** Lamm Industries Inc., 2621 E. 24th St., Brooklyn, NY 11235. Tel: (718) 368-0181. Fax: (718) 368-0140. Web: <http://www.lammindustries.com/>.

### Sidebar 2: Associated Equipment

**Analog sources:** SOTA Cosmos, Clearaudio Champion Level 2 turntables; Graham 2.2, Clearaudio Unify tonearms; Dynavector XV-1, XV-1S, Benz L2, Grado Statement Reference phono cartridges.

**Digital sources:** Classé Omega CD/SACD and Ayre D-X1 CD/DVD players.

**Preamplification:** Manley Steelhead, Boulder 2080 phono stages; Jeff Rowland Design Group Synergy Ili, Ayre K-1x line stages.

**Power amplifiers:** Halcro dm58 monoblocks.

**Loudspeakers:** Calix Phoenix Grand Signature, EgglestonWorks Andra II.

**Cables:** Interconnect: Acoustic Zen Silver Reference, Nordost Valhalla, Cardas Golden Reference. Speaker: Acoustic Zen Satori Shotgun; Nordost Valhalla, SPM. AC: Acoustic Zen Gargantua, Gargantua II; Wireworld Silver Electra 3+; Nordost El Dorado.

**Accessories:** Custom Power Cord Company Top Gun Super Power Block, Monster Power HTPS 7000 Signature power conditioners; Grand Prix Audio Monaco Modular, Ultra Resolution Technologies Bedrock equipment stands; Ganymede, Shun Mook Iso-Qube, Nordost Ti Pulsar Point isolation footers; Caig ProGold contact cleaner; Ayre/Cardas IBE system-enhancement disc.—**Paul Bolin**

### Sidebar 3: Measurements

Before I performed any measurements, I ran the Lamm M2.1 monoblock at one-third power into 8 ohms for an hour, with its output stage set to its High impedance parameters. Although the amplifier runs hot, I could keep my hands on the heatsinks at the end of that period, which implies a temperature below 60 degrees C. As an amplifier with a class-A output stage runs hottest when it isn't under load and coolest at maximum power, the Lamm's output MOSFETs do appear to have a significant level of class-A operation—36W into 8 ohms, according to the specification.

The M2.1's unbalanced input impedance was a fairly high 38k ohms and the balanced figure twice that, as expected. The amplifier didn't invert absolute signal polarity through the top RCA jack or the XLR jack, but it did invert polarity through the bottom RCA jack, again as expected. (The unconnected jack has to be shorted to ground with the supplied jumper for unbalanced operation.) The voltage gain at 1kHz was significantly higher than usual, at 31.75dB into 8 ohms (balanced input, both output-stage settings). The unbalanced figure was very

slightly lower, at 31.6dB. It takes less than 2V to drive the amplifier into clipping, meaning that it will be well suited for use with a passive control unit.

At 0.22 ohm, the output impedance was a little higher than is usually found with a solid-state design, presumably, like the high gain, due to the absence of loop negative feedback. This figure was identical with both output-stage settings, and was typical of the M2.1's performance in the midrange and below; though it rose to 0.26 ohm at 20kHz, the difference is not significant. However, the interaction between the amplifier's source impedance and the speaker load will result in response changes that are larger than with a low-impedance amplifier like the Parasound JC-1, which Michael Fremer reviewed in February.

This can be seen in fig.1, which shows the M2.1's frequency response plotted with it driving the magazine's standard simulated speaker load, as well as the responses into 8, 4, and 2 ohms. At +0.15d, -0.25dB, the response changes into the simulated speaker are still small in absolute terms, but might be just audible. The infrasonic response is restricted by an inter-stage coupling capacitor, but this does not affect audio frequencies. The ultrasonic response rolls off by 3dB at 156kHz, regardless of output-stage setting or input conditions. Correlating with that extended bandwidth, the M2.1's reproduction of a small-signal 10kHz squarewave (fig.2) was excellent, with short leading-edge risetimes and no sign of overshoot or ringing.

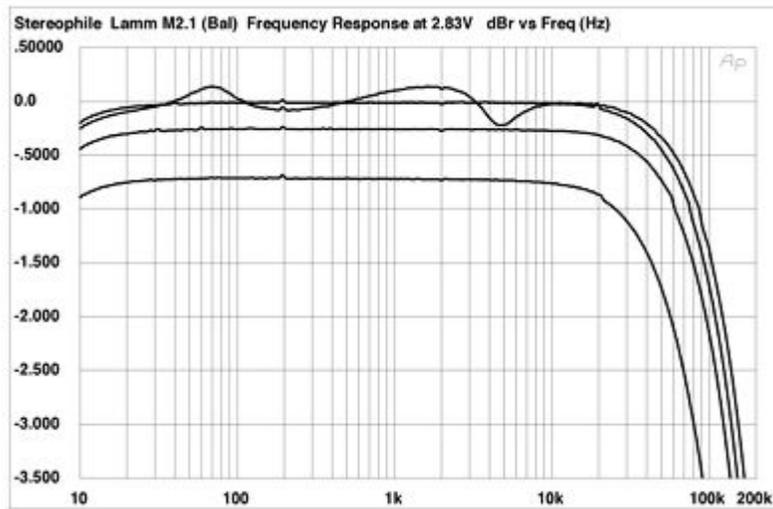


Fig.1 Lamm M1.2, balanced, frequency response at (from top to bottom at 2kHz): 2.83V into dummy loudspeaker load, 1W into 8 ohms, 2W into 4 ohms, 4W into 2 ohms (0.5dB/vertical div.).

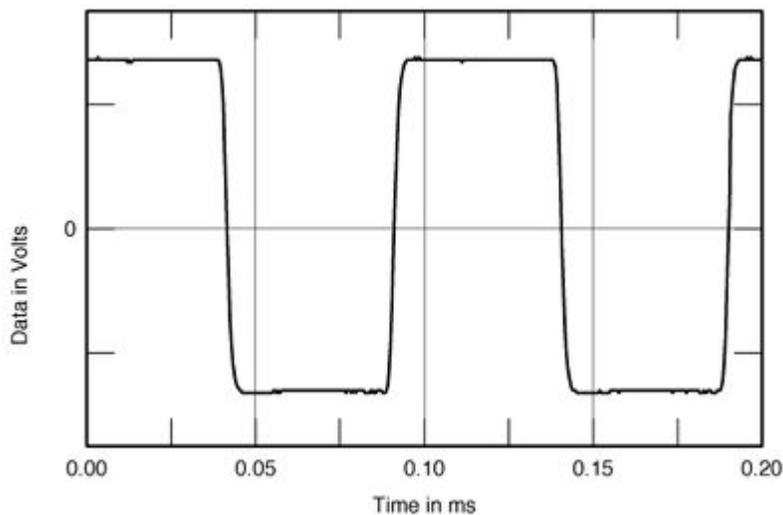


Fig.2 Lamm M1.2, small-signal 10kHz squarewave into 8 ohms.

The Lamm's unweighted, wideband signal/noise ratio was good, at 68.7dB ref. 1W into 8 ohms. The A-weighted figure was 10dB better, due to the elimination of some power-supply spurious at 120Hz. (In this respect, the M2.1

does seem a bit sensitive to system grounding.) The amplifier's distortion level depended on the load impedance.

Fig.3, taken at a moderately high level to lift the true distortion out of the noise floor, shows a small increase in THD when the load impedance is halved from 8 ohms to 4 ohms, but then a much larger increase into 2 ohms. A small rise in THD above the audioband is also evident. This graph was taken with the High impedance output-stage setting. The picture was not significantly different into 2 ohms with the Low impedance setting, though the 4 ohm THD was then as low as it was into 8 ohms.

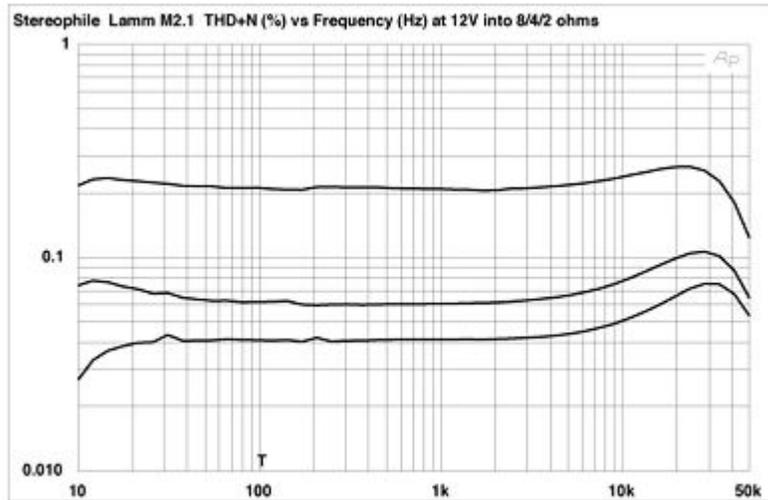


Fig.3 Lamm M1.2, balanced, High impedance setting, THD+N (%) vs frequency (from bottom to top at 4kHz): 12V into 8 ohms, 4 ohms, 2 ohms.

At low output powers, such as 1W into 8 ohms, the distortion was low in level, with the second harmonic dominant, at -81.3dB (0.009%), and all other harmonics below -100dB. But as the output power increased, the third harmonic increasingly became apparent (fig.4). The balance between the second and third harmonics at high powers appeared to depend on the output stage setting. Figs. 5 and 6 were taken at the identical power—175W into 4 ohms—but with the output stage set to Low and High impedance, respectively. The odd harmonics are less dominant in the latter condition, though the former has slightly less THD overall.

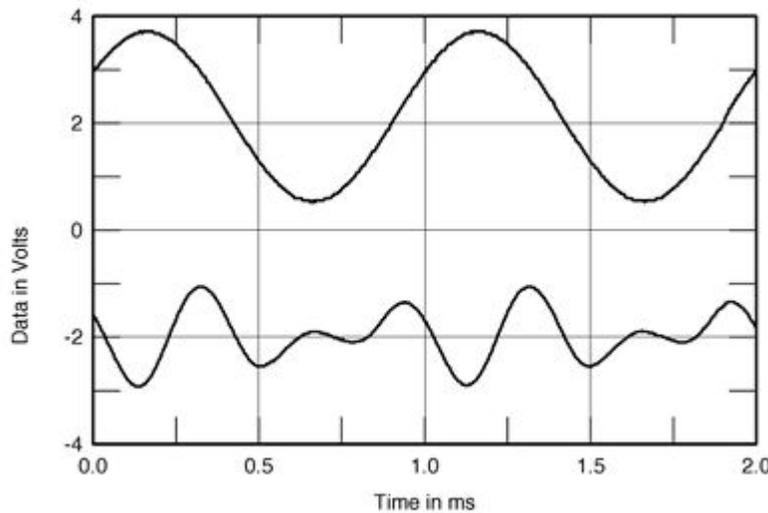


Fig.4 Lamm M1.2, balanced, High impedance setting, 1kHz waveform at 187W into 8 ohms (top), 0.16% THD+N; distortion and noise waveform with fundamental notched out (bottom, not to scale).

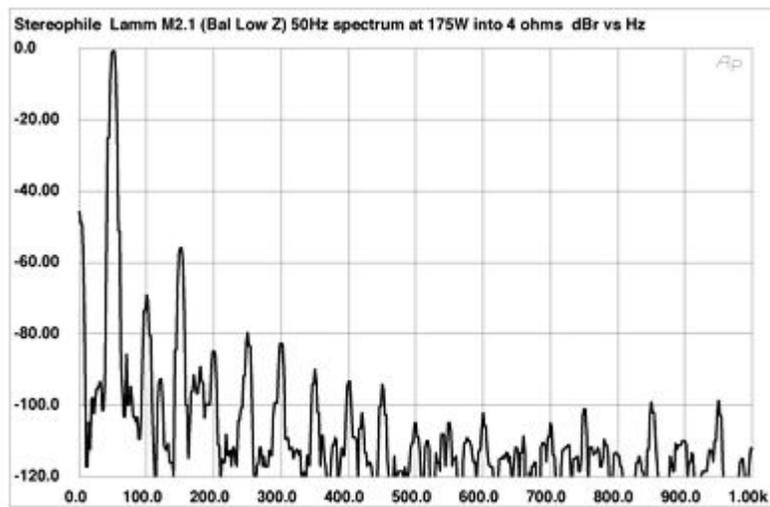


Fig.5 Lamm M1.2, balanced, Low impedance setting, spectrum of 50Hz sinewave, DC-1kHz, at 175W into 4 ohms (linear frequency scale).

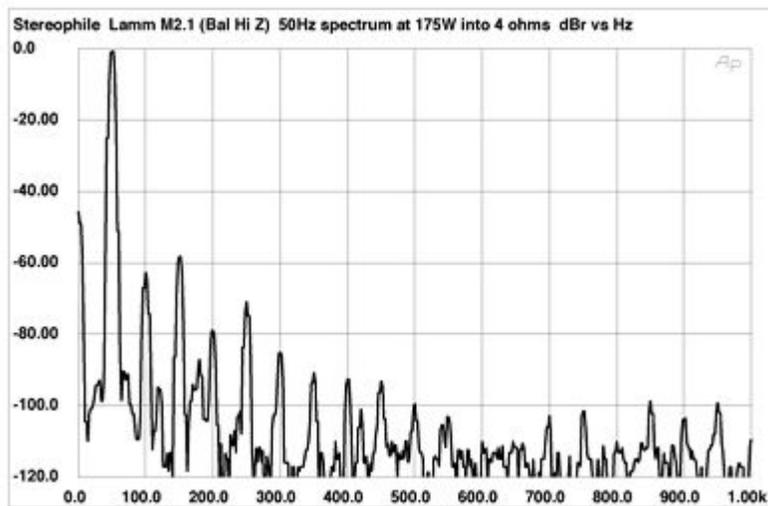


Fig.6 Lamm M1.2, balanced, High impedance setting, spectrum of 50Hz sinewave, DC-1kHz, at 175W into 4 ohms (linear frequency scale).

The 120Hz component I mentioned earlier can be seen in these two graphs, though it is fair to point out that this component is better than 90dB down from the signal level. There was no significant change in the harmonic spectrum between balanced and unbalanced drive, suggesting that what governs the amplifier's distortion signature is the behavior of the subsequent single-ended driver and output stages, not the input buffers and differential pair.

Correlating with the small increase in THD seen at high frequencies in fig.3, the M2.1's intermodulation behavior with the demanding 1:1 mix of 19kHz and 20kHz tones was good rather than excellent, as can be seen in fig.7, which was taken just below visible waveform clipping on the oscilloscope with the low-impedance output setting. Nevertheless, the 1kHz difference component is still 70dB down from the peak level (0.03%), which is good.

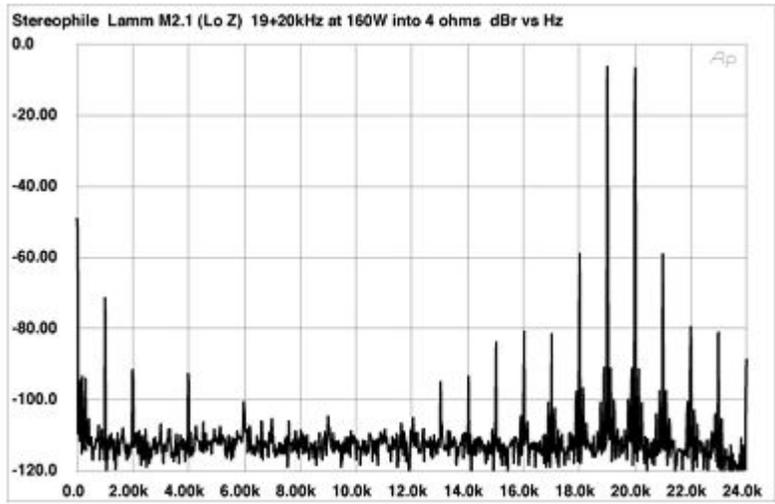


Fig.7 Lamm M1.2, balanced, Low impedance setting, HF intermodulation spectrum, DC-24kHz, 19+20kHz at 160W into 4 ohms (linear frequency scale).

The M2.1's maximum output power depends, of course, on whether the output stage has had the voltage rails and bias current optimized for low or high impedances. Fig.8 shows the M2.1's High-impedance behavior with continuous drive. At the clipping point, defined as 1% THD, the Lamm comfortably exceeded its specification, though it is fair to note that the AC wall voltage in my lab was a rather high 124V for these tests. It delivered 297W into 8 ohms (24.75dBW), 500W into 4 ohms (24dBW), and 780W into 2 ohms (22.9dBW), even though Lamm Industries is adamant that the M2.1 should not be used to drive such low loads when it is set for high impedances. Optimally set for low impedances (fig.9), the amp delivered 190W into 8 ohms (22.8dBW), 305W into 4 ohms (21.8dBW), and 510W into 2 ohms (21.1dBW).

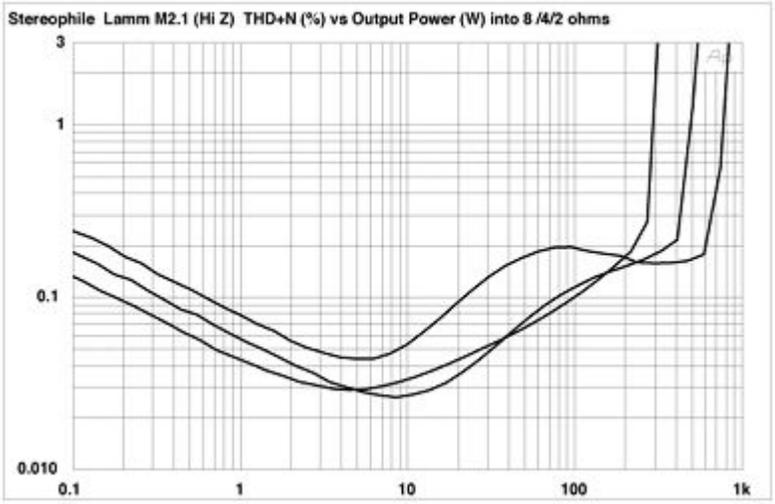


Fig.8 Lamm M1.2, balanced, High impedance setting, distortion (%) vs 1kHz continuous output power into (from bottom to top at 1W): 8 ohms, 4 ohms, 2 ohms.

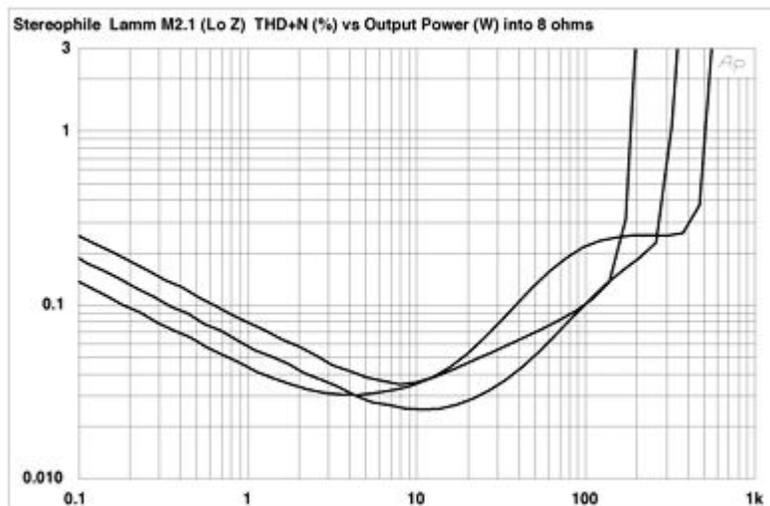


Fig.9 Lamm M1.2, balanced, Low impedance setting, distortion (%) vs 1kHz continuous output power into (from bottom to top at 1W): 8 ohms, 4 ohms, 2 ohms.

On the face of it, even with its output stage optimized for high impedances, the Lamm amplifier gives out more clipping power into low impedances than when it is set for low impedances. But if you look at how the distortion percentage into 2 ohms changes with increasing power in these two graphs, you can see that with the amplifier set to Low impedance, it offers better linearity over a wider range of powers into 2 ohms than when it is set to High impedance. This can also be seen in fig.10, which plots the summed level of the distortion harmonics against power with a low-duty-cycle 1kHz toneburst (10 cycles on, 400 cycles off). Interestingly, the clipping powers with toneburst drive vary between just 0.1dB and 0.3dB greater than with continuous drive, the small difference indicating excellent power-supply regulation.

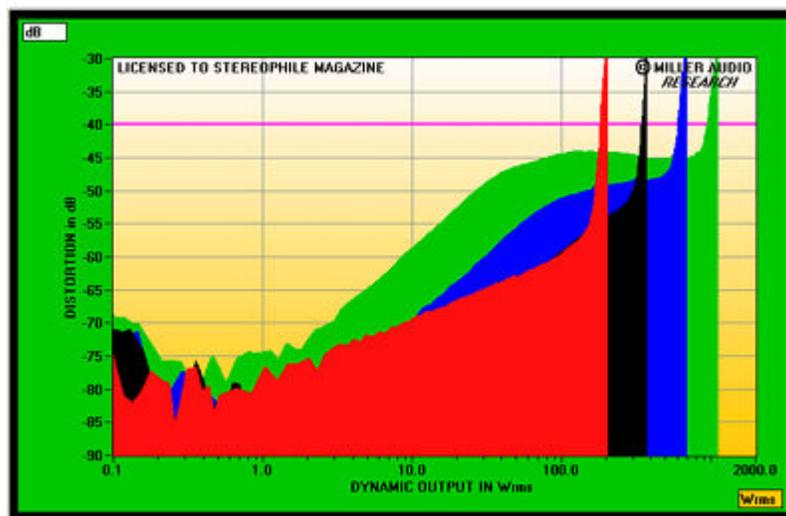


Fig.10 Lamm M1.2, unbalanced, Low impedance setting, distortion (%) vs 1kHz burst output power into: 8 ohms (red trace), 4 ohms (black), 2 ohms (blue), 1 ohm (green).

The Lamm M2.1's measurements reveal no significant weaknesses and imply a well-engineered design. It also appeared to be very rugged. When I drove over to Lamm, a near neighbor, to pick up a pair of amplifiers to measure—this making better logistical sense than shipping Paul Bolin's pair to Brooklyn from Minnesota and back again for him to finish the review—Vladimir was casually clipping one of the amps on his test bench with a 1kHz tone into 8 ohms, and leaving it running while we talked about the design. When I expressed some concern—I always leave the clipping tests to the end of my measurement program because that's when amplifiers break—Vladimir reached over and momentarily shorted the M2.1's output to ground. There was an impressive blue spark, but the amplifier safely turned itself off. Its red front-panel LED flashed away for 14 seconds, after which it turned back on and continued to drive full power into the load.

The M2.1 may be an expensive amplifier, but, in addition to fine sound quality, you also get a bombproof design that should deliver that sound for many years.—**John Atkinson**

