LAVARDIN IT INTEGRATED AMPLIFIER

Some say there is nothing new in the world of amplifier design. They've obviously not heard of what's happening with Class-D amplifiers. But until this Lavardin IT integrated amplifier landed on my doorstep for review, I had certainly never heard of French designer Gérard Perrot, or his theories about amplification, or that when discussing his theories on the internet he supposedly went under the mysterious name of 'Hephaestus'. I can only assume he assumed a pseudonym because at the time he developed the circuit used in the Lavardin IT he was working for the giant French electronics manufacturer Thompson (now Thales), which perhaps does not permit its employees to make public statements… and in Perrot's case not least because he was leader of the team at Thompson responsible for designing radar installations for the military!

Perrot identified a new kind of distortion, which he called 'memory distortion.' He posited that in any conductor: *'new electron flow is continuously affected by the pattern of the immediately preceding electron flow.'* Perrot claimed it was memory distortion that is the primary reason valve amplifiers sound so different to solid-state amplifiers, because in solid-state amplifiers, electrons travel through solids, whereas in valve amplifiers, they travel through vacuums.

Perrot is quoted as saying: '*Memory distortion is the property that is the dominant factor in causing solid-state amplifiers to sound shrill and mechanical. Tube technology allows electrons to travel through a vacuum which leaves no storage or memory effect, but solid-state amplifiers use silicon components which keep a trace of current flow that has gone through.*'

Perrot claimed to have developed a method of building solid-state amplifiers that did not exhibit memory distortion, with the result that, in his words: '*all the improvements that transistor technology brings, such as high output power, accuracy, very low harmonic distortion and extended and linear frequency response, can be added to the most alive and silky musical rendition of the best single-ended monotriode designs.*'

Unfortunately, Gérard Perrot is no longer with us to explain exactly how his solid-state amplifiers eliminate this memory effect, having died tragically in 2000, aged 50, as a result of his motorcycle being hit by a car, leaving his business partner, Jean Christophe Crozel, to run the company, which he does to this day.

There is very little information in print. I could only find a paper titled '*Measurement of a Neglected Circuit Characteristic*' that he delivered to the 100th Convention of the Audio Engineering Society and a US Patent (#5,635,874) for a '*Stable Distortion Amplifier for Audio Signals*' granted in 1997 which showed how to put his theories into reality. Neither of these give much away, and Lavardin not only keeps its circuit diagrams secret, but also prevents 'reverse engineering' by encapsulating the IT's critical circuitry in epoxy, as I will review further on in this review.

THE EQUIPMENT

Both Perrot and Crozel were adamant right from the outset of their project that their amplifiers would be built entirely in France. '*Our products are not built in Asia, nor are they merely "assembled" here in France,*' says Crozel. '*These are home-grown, made-in-France products. The electrical parts used come from all over the world, but most are made in the USA, in the EU and in Canada. Notable exceptions are the power transformers, which are made in Italy, and the Nais/Panasonic relays which are made in Japan. The circuit boards are fabricated in the south of Paris area, but all components are hand-selected by us, hand-inserted by us and then wave soldered in our own factory.*'

That factory is in the Loire Valley, near Tours, but the company's first factory was in Montoire, near the medieval castle of Lavardin, from which the company took the brand-name for its amplifiers. The company behind Lavardin is CEVL, which also manufactures Okki Nokki record cleaning machines, Lecontoure loudspeakers and the rather unfortunately-named 'K-Rak' equipment racks.

The front panel of the Lavardin IT is 10mm thick and made from black anodised aluminium. The chassis is made from 3mm thick black anodised aluminium. Also black anodised aluminium are the two 340mm-long heat sinks that run down either side, all of which contribute to the IT tipping the scales at 12 kilograms. The amplifier itself measures 135×430×340mm (HWD).

As you can see from the photograph on the opposite page, the front panel has only three controls: a silver aluminium source selector that switches between four line-level inputs, a black aluminium power on/off button, and a silver aluminium volume control. I personally found the silver knobs rather incongruous and would have preferred them to be black anodised, but that's a personal call. I'd make the same call about the four silver hex-headed screws that attach the front panel to the chassis. The knobs are not available in black anodised aluminium, despite information to the contrary on Lavardin's website.

At the rear of the amplifier are four pairs of gold-plated RCA terminals for the line inputs, a pair of gold-plated RCA record-out outputs, two pairs of gold-plated multi-way speaker terminals and an IEC 240V mains socket. Although serviceable and of good quality, the multi-way speaker terminals are fairly ordinary: I would have expected much better on an amplifier at this price.

Internally, the amplifier is spread across four different PCBs, all of which use through-hole components: left- and right-channel amplifier PCBs, a power supply PCB holding the smoothing capacitors and diode bridges, plus a PCB containing eight relays that are used to switch between inputs.

The amplifier boards are rather strangely laid-out, with rectangular holes cut in them for no apparent reason, plus some of the components on each board are completely encapsulated in epoxy—presumably to prevent industrial espionage but also making non-factory repair of the encapsulated components impossible, should it ever be required. Given this limitation, and the price of the amplifier, a lengthier warranty period than the two years currently offered would have seemed to be justified.

The left- and right-channel amplifier boards are identical, rather than mirror-imaged, and so one had to be positioned 'wrong way around' which puts the two power output transistors at the top of the heat sink for one channel, and at the bottom of it for the other. This PCB orientation also makes accessing the 2A protection fuse for the left channel much more difficult than accessing the fuse for the right channel. On my sample, the amplifier PCBs were installed poorly on their stand-off pins, such that they'd been forced into a curve, rather than sitting straight.

One possible explanation for the PCBs not being mirror-imaged is that Lavardin apparently does not use computerised layout programs to design its boards, they're all laid-out by hand, so creating a mirror-imaged PCB isn't simply a matter of pressing a button.

IN USE AND LISTENING SESSIONS

Despite the work that Lavardin says goes into making its knobs (the company says each one is machined from solid high-grade non-magnetic aluminium bar and undergoes six stages of machining, hand polishing and, confusingly, 'black anodisation') the silver aluminium volume control on my review sample had a slightly 'scratchy' feel, and did not rotate smoothly. Electrically-speaking, however, it worked perfectly.

The source selector knob felt nice under my fingers, but I was marginally disconcerted to find that the amplifier turned itself off whenever I switched inputs, only to turn itself back on about two seconds after I'd finished switching to the input I wanted. This action is accompanied by a clicking of relays and the red 'power-on' LED on the front panel extinguishing and then re-illuminating.

I first listened to the Lavardin IT without any source playing at all, just to hear how quiet the amplifier was, and was reassured to hear that even with the amplifier's volume control maxed-out the amplifier was completely silent… no circuit hiss, no mains hum, just beautiful silence. When I started playing music, I was simply stunned

The amplifier boards are rather strangely laid-out, with rectangular holes cut in them for no apparent reason, plus some of the components on each board are completely encapsulated in epoxy—presumably to prevent industrial espionage but also making non-factory repair of the encapsulated components impossible, should it ever be required. This PCB layout also makes it hard to access the 2A protection fuse for the left channel.

to hear that it seemed to me not as though I was listening to a solid-state amplifier, but instead listening to a valve amplifier, but a valve amplifier that had no distortions whatsoever: not even that lush 'octave-like' rich second-harmonic sound that is prized so highly by valve aficionados… a collective that includes your reviewer. But in delivering this 'valve sound without distortion', the Lavardin IT did not fall into the usual solid-state trap of delivering the sound clinically. Instead the sound was just 'clean'… pure and miraculously smooth. When playing my all-time favourite recording of Beethoven's *Symphony No. 9 in D Minor*, (the CD version of Karajan's 1963 recording on DG), for example, the sound just flowed from the speakers as if it were gifted to my listening room by Beethoven and the Berlin Philharmonic. The delivery was absolutely effortless and the performances from the featured vocalists exceptional… as was the sound from the choir. I also felt the overall sound was more balanced from the Lavardin than I hear from all solid-state amplifiers… exactly the same balance of bass against midrange against treble that I hear when playing my own valve amplifier. But whereas my own valve amp does add subtle distortions (and it's these subtle distortions that I enjoy), the Lavardin IT added no distortion at all and definitely sounded the better for it. (Should you want this 1963 recording, it's now available only as part of a complete set of Beethoven Karajan symphonies, so if you want an alternative on a single disc—and a hi-res disc at that—go for Karajan's 1977 version, as re-mastered on SACD.) The Lavardin IT reproduced Beethoven's Ninth so naturalistically and generated such super-charged emotions in me that I was inspired to follow-up with another great choral symphony, Mahler's *Resurrection*, this time with Claudio Abbado and the Lucerne Festival Orchestra, but again on Deutsche Grammophon (DG4770582). Yet again the Lavardin's performance in re-creating this work simply sent chills down my spine. Particularly telling about this work is that when playing it, almost all amplifiers make you feel like you're simply being overwhelmed by a mass of noise, which is why this work sounds so good in live performance (these are few and far between and usually—at least for me—a long, long way away, but if one is on offer, go!), but such is the quality of the Lavardin's unique sound that I instead heard all Mahler's music ideas with crystal clarity, despite the interweaving nature of the parts. It's a belief of mine that if an amplifier can deliver the goods with symphonic works, it won't even raise a sweat with other musical genres, but this being a review that's likely to be read by people who don't listen to classical music at all I felt obliged to evaluate how the Lavardin IT handled other genres, and for the female vocalist category, what better test than the throaty contralto sound of Joan Armatrading, who's still a hugely under-rated talent despite an 18-album career and last year's world tour. I still return to my first copy of her self-titled album and most particularly the opener, *Down to Zero*, but also *Love and Affection*, both of which end up on every 'Best Of' Armatrading compilation (but, sadly, are badly remastered on all of them). On *Down to Zero*, the Lavardin IT showed its impeccable control of pace and timing, and just listen to the entry of B. J. Cole's pedal steel, then his continued contributions. Everything sounded insanely good… especially the Hammond organ on *Love and Affection*… and the 'funk' of this track is delivered with true 'bob' feel by the Lavardin IT.

To trial the sound of the piano (and introduce another genre) was just a matter of popping on Chris Cody's 'Not My Lover', the CD for which has been popping in and out of my player for months now. A combination of originals and re-works in jazz style (think Satie, Gainsbourg and Cole Porter) it purports to be Cody's reflection on his sojourn in Paris, but for mine it evokes memories of cool jazz in any city in the world. The highlight of this album is Cody's luminous piano playing—and, thanks to the Lavardin IT, the *sound* of that piano!—but Brendan Clarke's bass is another highlight, not just for the tone, but for the beautifully underplayed playing. And if you want to hear a superb tenor sax sound, it's here, courtesy of Karl Laskowski… and again courtesy of the Lavardin IT. Once again, the Lavardin just stays completely out of the way of the ebb and flow (and the occasional stab!) of the dialogue between the musicians in a way I have not experienced with any other amplifier, ever…

One proviso about the Lavardin IT is that it is by no means powerful. My personal experience after using it with several different pairs of speakers is that you'll have to listen at moderate playback levels—unless you're using very efficient loudspeakers—if you want to avoid clipping on peaks. On the plus side, the Lavardin IT brought out the absolute best in every single pair of speakers I trialled.

CONCLUSION

It's not powerful, it's not impressively large, it's not pretty, it's not particularly well-built, it has only four line level inputs, there is no phono stage, it isn't able to be remote-controlled and, if the Lavardin IT were merely the sum of these observations, its asking price would be impossible to justify. But one audition with your favourite track will instantly reveal to you that the Lavardin IT is far more than just the sum of its parts… it's an enigma, an amplifier that produces music that sounds so 'right' that you just know that all other amplifiers must be wrong. *Marc Leroy*

LAVARDIN IT INTEGRATED AMPLIFIER

Brand: Lavardin
Model: IT
Category: Integrated Amplifier
RRP: $10,500
Warranty: Two Years
Distributor: Audio Magic Pty Ltd
Address: 23/22 French Avenue
Northcote VIC 3070
T: (03) 9489 5122
E: info@audiomagic.com.au
W: www.audiomagic.com.au

Unique sound
Superb mids
Bass delivery

Power output
Price
Warranty

LABORATORY TEST REPORT

When *Newport Test Labs* started testing the Lavardin IT's power output, the lab techs quickly discovered this would not be possible using the standard design, because the 2-amp fuses on the internal PCBs blew whenever the amplifier approached rated power. After advice from Lavardin, the fuses were temporarily replaced with a larger, 3.15A fuses, even though Lavardin warned that these, too, '*may also blow during power measurements*.' When questioned about the use of the low-value fuse, the company said that it was chosen because this 2-amp rating: '*provides a real protection when playing music and has never made any problem to any customer for the past 19 years*.' The company was at pains to point out that if this fuse has to be replaced, it should be with a standard transparent glass fast-blow 2-amp fuse, stating specifically that '*neither ceramic nor esoteric high-end fuses should ever be used*.'

Once the higher-value fuses were fitted, the Lavardin IT's power output was able to be measured at three different frequencies and three different loads and you can see the surprising results of this testing in the power output table. I say 'surprising' because the results are exactly—and I mean 'exactly'—what I'd expect to see from a valve amplifier, not from a solid-state amplifier. As you can see, power output

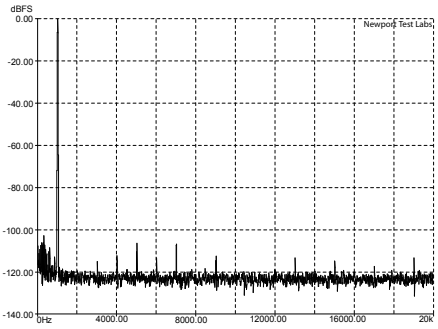


Figure 1. Total harmonic distortion (THD) at 1kHz at an output of 1-watt into an 8-ohm non-inductive load, referenced to 0dB. [Lavardin IT Integrated Amplifier]

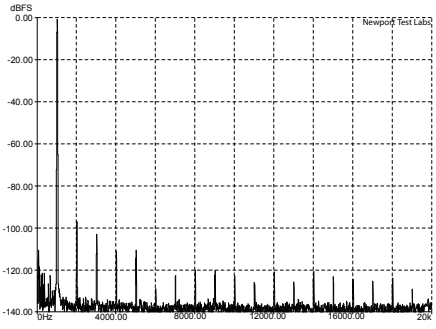


Figure 4. Total harmonic distortion (THD) at 1kHz at an output of 57-watts into a 4-ohm non-inductive load, referenced to 0dB. [Lavardin IT Integrated Amplifier]

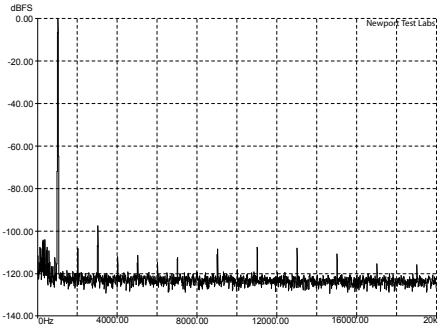


Figure 2. Total harmonic distortion (THD) at 1kHz at an output of 1-watt into a 4-ohm non-inductive load, referenced to 0dB. [Lavardin IT Integrated Amplifier]

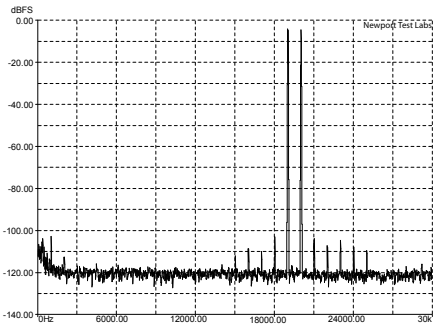


Figure 5. Intermodulation distortion (CCIF-IMD) using test signals at 19kHz and 20kHz, at an output of 1-watt into an 8-ohm non-inductive load, referenced to 0dB. [Lavardin IT Integrated Amplifier]

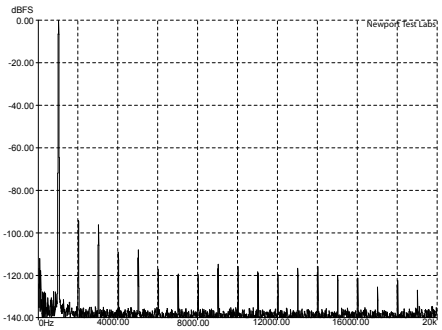


Figure 3. Total harmonic distortion (THD) at 1kHz at an output of 52-watts into an 8-ohm non-inductive load, referenced to 0dB. [Lavardin IT Integrated Amplifier]

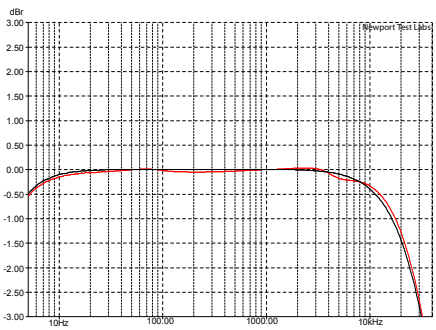


Figure 6. Frequency response of line input at an output of 1-watt into an 8-ohm non-inductive load (black trace) and into a combination resistive/inductive/capacitive load representative of a typical two-way loudspeaker system (red trace). [Lavardin IT Integrated Amplifier]

essentially remained the same irrespective of the load impedance, so the power output into 2Ω loads was almost identical to that into 8Ω loads. Another peculiarity was that the power output at high frequencies when driving 8Ω loads was less than half the unit's rated power, so the amplifier was only able to deliver 22-watts at 20kHz into 8Ω loads, whereas at 1kHz it was able to deliver 52-watts per channel into 8Ω with only one channel driven, and 46-watts per channel into 8Ω with both channels driven. This, too, is very valve-like behaviour. When *Newport Test Labs* examined the both-channels-driven into 8Ω high-frequency behaviour of the Lavardin IT more closely, the lab discovered that it will deliver 45-watts at all frequencies from 1kHz up to 10kHz, after which output power drops with increasing frequency, to 37-watts at 15kHz and then to 22-watts at 20kHz, as shown on the accompanying table.

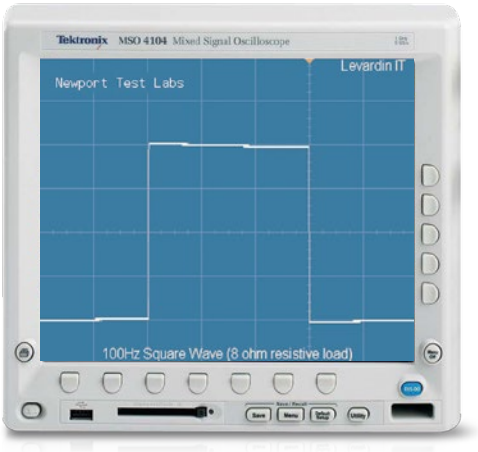
When driving 4Ω loads the amplifier was able to deliver almost the same power output at 20kHz (45-watts) as it could at 1kHz (52-watts), while when driving 2Ω loads, it delivered slightly more power at 20kHz (50-watts) than it could at 1kHz, where it was only able to deliver 47-watts per channel.

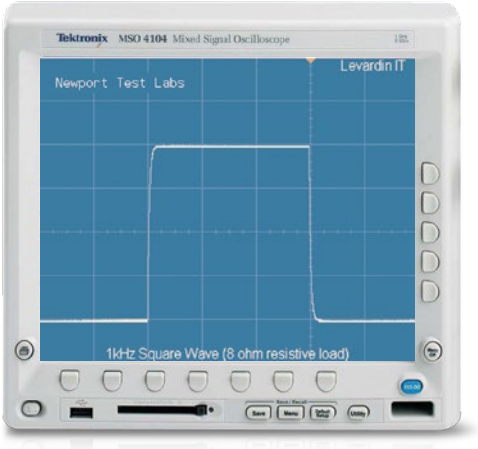
I can't explain these results, because they make it appear like the Lavardin is not working like a standard voltage-source amplifier, but somewhat akin to a unity-coupled design.

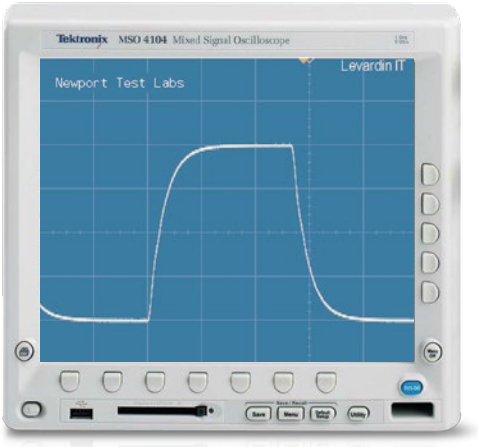
Looking at the distortion spectrograms, I can say that harmonic distortion is very low, and at an output of 1-watt into 8Ω, at least, is completely atypical of distortion spectra I've seen from any other amplifier when driven into the same load at the same output. What's unique is that there's no second harmonic distortion at all, and almost no third harmonic distortion either. The two obvious distortion components are the fifth and seventh harmonics, each at around at –95dB (0.0017%). All other harmonic distortion components are more than 110dB down (0.0003%). Driven into a 4Ω load at one watt, distortion is still low, but the distribution of the distortion components is more typical, with a second harmonic at –110dB (0.0003%), a third at –97dB (0.0014%) and all other harmonics at around—or more than—110dB down (0.0003%).

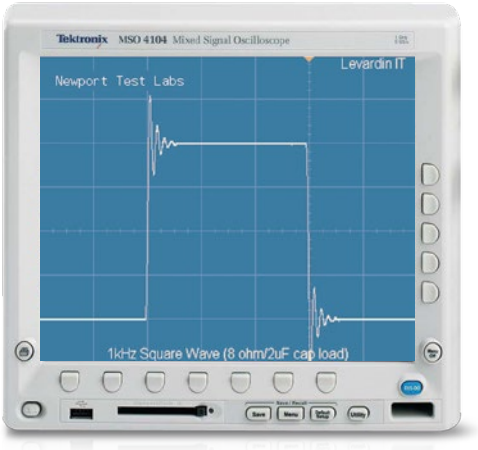
When the Lavardin IT is delivering 52-watts into 8Ω it exhibits a more familiar distribution of harmonic distortion components, with a dominant second-harmonic component at –95dB (0.0017%), a third harmonic at –98dB (0.0012%), and fourth and fifth harmonics both at –110dB (0.0003%), after which all higher-order harmonics are hovering around –120dB (0.0001%). At 57-watts into 4Ω (Graph 4) distribution of distortion components is similar to that into the 8Ω load, but distortion has actually reduced a little in level compared to the 8Ω result. That said, overall distortion at these output levels is still very, very low, with *Newport Test Labs* recording an overall THD+N figure of just 0.001%, 'way below the threshold of audibility.

Intermodulation distortion (Graph 5) of the Lavardin IT was also exceedingly low. Either side of the two test tones at 19kHz and 20kHz (1:1) used for this test, you can see the adjacent unwanted sidebands are both close to 105dB (0.0005%) down, and the other sidebands around 105–110dB down. Significantly, the unwanted regenerated difference frequency (at 1kHz) is around 102dB down (0.0007%).









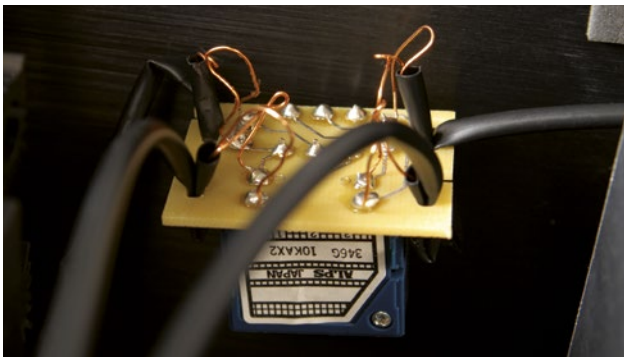
Lavardin IT Integrated Amplifier – Test Results – Power Output

Channel	Load (Ω)	20Hz (watts)	20Hz (dBW)	1kHz (watts)	1kHz (dBW)	20kHz (watts)	20kHz (dBW)
1	8 Ω	50	16.9	52	17.1	22	13.4
2	8 Ω	44	16.4	46	16.6	22	13.4
1	4 Ω	54	17.3	57	17.5	45	16.5
2	4 Ω	51	17.0	52	17.1	45	16.5
1	2 Ω	47	16.7	50	16.9	60	17.7
2	2 Ω	40	16.0	47	16.7	50	16.9

Note: Figures in the dBW column represent output level in decibels referred to one watt output.

Lavardin IT Integrated Amplifier – Laboratory Test Results

Test	Measured Result	Units/Comment
Frequency Response @ 1 watt o/p	4Hz – 19kHz	–1dB
Frequency Response @ 1 watt o/p	2Hz – 33kHz	–3dB
Channel Separation (dB)	119dB / 97dB / 72dB	(20Hz / 1kHz / 20kHz)
Channel Balance (Direct/Tone)	0.01	dB @ 1kHz
Interchannel Phase (Direct)	0.01 / 0.02 / 0.03	degrees (20Hz / 1kHz / 20kHz)
THD+N	0.007% / 0.001%	@ 1-watt / @ rated output
Signal-to-Noise (unwghted/wghted)	80dB / 85dB	dB referred to 1-watt output
Signal-to-Noise (unwghted/wghted)	96dB / 101dB	dB referred to rated output
Input Sensitivity	52mV / 385mV	(1-watt / rated output)
Output Impedance	0.09Ω	at 1kHz
Damping Factor	88	@1kHz
Power Consumption	n/a / 27.89	watts (Standby / On)
Power Consumption	40.79 / 182.57	watts at 1-watt / at rated output
Mains Voltage Variation during Test	240 – 248	Minimum – Maximum



The frequency response of the Lavardin IT, as measured by *Newport Test Labs*, was certainly flat across the audio band, both when driving a standard non-inductive 8Ω resistor (black trace) and when driving a load that simulates that of a two-way bass reflex loudspeaker (red trace), but the response rolls off quite quickly at high frequencies, so it's 1dB down at 19kHz when using the simulated speaker load, and 1dB down at 18kHz when using the 8Ω laboratory test load. Both traces are 3dB down at 33kHz. At low frequencies, the frequency response of the Lavardin IT was around 1dB down at 4Hz and 3dB down at 2Hz.

Channel separation was excellent, with *Newport Test Labs* measuring it as being 119dB at 16Hz, 97dB at 1kHz and 72dB at 20kHz. All are good results. Interchannel phase errors were also exceptionally low.

The signal-to-noise figures measured by *Newport Test Labs* were also excellent. Referenced to a 1-watt output, the lab measured the signal-to-noise ratio of the Lavardin IT at 85dB A-weighted, improving to 101dB A-weighted when referenced to rated output. However, most of the noise was outside the audio band, as you can see from the noise floors on Graphs 1–5, which are at around –120dB when referenced to 1-watt and down at –140dB when referenced to 50-watts. Most of the low-frequency noise is mains-related, as you can see from the left hand side of each graph.

I was surprised that *Newport Test Labs* measured the Lavardin's output impedance as being 0.09Ω (at 1kHz), not because of this isn't a good figure, resulting in a damping factor that's high enough to guarantee control over any loudspeaker you connect to it, but because I was expecting it to be much higher, not least because Lavardin itself says that it's 8Ω in its specifications. If it *had* been 8Ω, I would have taken a guess at at least one of the secrets of this amplifier's design, but because it was measured at only 0.09Ω, I am still left in the dark.

Square wave performance was good, but does show the bandwidth limitations of the design quite dramatically, even on the 100Hz square wave, where the tilt in the top shows the low-frequency restriction, and there's even a little rounding at the top of the leading edge showing the high-frequency limitation. On the plus side, no phase shifting is evident at low frequencies. The 1kHz square wave is rounded but otherwise fine, while the 10kHz square wave is so rounded it's beginning to look like a triangular wave. When loaded with a highly capacitive load, the Lavardin's performance was highly unusual. There is some ringing, which is to be expected, and it's nicely restricted and nicely controlled, but it seems to be somewhat elongated, which is certainly atypical: not the same as you'd get from either a solid-state or a valve amplifier.

As you've no doubt already grasped, the Lavardin IT returned a set of seemingly contradictory results during *Newport Test Labs'* tests. Its power output is lower than specified almost across the board, and it sags inexplicably at high frequencies into 8Ω loads, but not into 4Ω and 2Ω loads. Distortion is exceptionally low (both THD and IMD), and the signal-to-noise ratios are high. And although the frequency response rolls off earlier than is usual for a solid-state amplifier, it starts rolling off at such a high frequency, and so gradually, that it would not be perceptible as a 'roll-off' *per se*.

The Lavardin IT's performance on *Newport Test Lab*'s bench was so unusual that I can only guess that when he designed the Lavardin IT, designer Gérard Perrot deliberately set out to build an amplifier with the frequency response of a classic British solid-state Class-AB amplifier from the 80s, the super-low distortion of modern Class-D amplifier, and the output-stage characteristics of a single-ended triode valve amplifier. If this was indeed his intention, he certainly succeeded!

Steve Holding

SUBSCRIBE AND SAVE!

AVHUB TECH, TESTS & TECHNIQUES SUBSCRIBE ONLINE

Yes, you can read some of our reviews in full on AVHub.com.au. You can now swipe your way through every page of *Australian Hi-Fi* on your iPad or Android tablet, (or computer) using our snazzy Digital Issues. But there's nothing like the proper print edition, landing in your letterbox sealed in shiny cellophane, ready for you to read at your leisure, at full size, in the order we intended, in the bath, if you like.

Get every issue of *Australian Hi-Fi* the way it should be.

Subscribe online, anytime @ **mymagazines.com.au**

YES! PLEASE SEND ME A SUBSCRIPTION TO AUSTRALIAN HI-FI

☐ 14 ISSUES (2 YEARS) $109
☐ 7 ISSUES (1 YEAR) $59
INCLUDES HOME CINEMA & HI-FI LIVING SPECIAL EACH YEAR

SAVE OVER $30
SAVE OVER 15%

◯ New Subscription **or** ◯ Extend Subscription **or** ◯ Gift Subscription

◯ Mr ◯ Mrs ◯ Miss ◯ Ms

Your Name _____

Your Address _____

_____ Postcode _____

Daytime Phone ( ) _____

E-mail _____

Please provide phone or email in case of delivery issues

IF A GIFT SUBSCRIPTION ◯ Mr ◯ Mrs ◯ Miss ◯ Ms

Recipient's Name _____

Recipient's Address _____

_____ Postcode _____

Daytime Phone ( ) _____

E-mail _____

MYMAGAZINES.COM.AU

SYDNEY (02) 9901 6111
TOLLFREE 1300 361 146

SUBSCRIPTIONS
PO BOX 3355
ST LEONARDS NSW 1590

PAYMENT DETAILS

I enclose a cheque/money order for $ _____

payable to Next Media Pty Ltd **OR** Charge my credit card:

◯ Mastercard ◯ Visa ◯ American Express

Name on Card _____

Expiry Date ____/____ CVV: _____

Cardholder's Signature _____