



Karan Acoustics

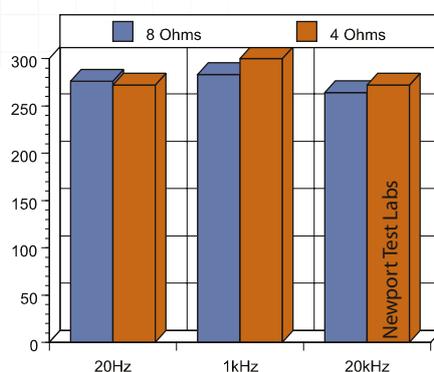
KA I 180 Mk2

INTEGRATED AMPLIFIER

If you're a follower of hi-fi forums, it's likely you will already have heard about this little-known Serbian brand, which takes its name from its founder, Milan Karan, who manufactures them in his home town of Novi Sad in the northern Serbian province of Vojvodina (about 70km north of Belgrade). Or, rather, he doesn't build the amplifiers himself, he employs a team of 6-8 workers who do that for him. It's all done by hand, so it's a slow process. In fact, this painstaking handcraftsmanship means it takes around three days to build a single KA I 180 Mk2.

THE EQUIPMENT

Just a glance at the front panel of the Karan KA I 180Mk2 will show that it's been designed as a true 'audiophile' amplifier, because there are no tone controls, no loudness contour buttons, no speaker selectors, no record output selectors... there's not even



Power Output: Single channel driven into 8-ohm and 4-ohm non-inductive loads at 20Hz, 1kHz and 20kHz. [KA I 180 Mk2]

a headphone socket or a power on/off switch. All you get are two large rotary knobs, the one on the left for input source selection, and the one on the right for volume. The amplifier is so 'audiophile' that these controls

aren't even labelled! Indeed, unless you switch the KA I 180Mk2 on, you can't even see a brand name, because the Karan name only becomes obvious when you switch the amplifier on, the result of which is that a red light back-illuminates the grey glass plate in the centre of the front panel, after which lettering becomes visible.

'But how do you switch the amplifier on if there's no power switch on the front panel?' I hear various readers ponder questioningly.

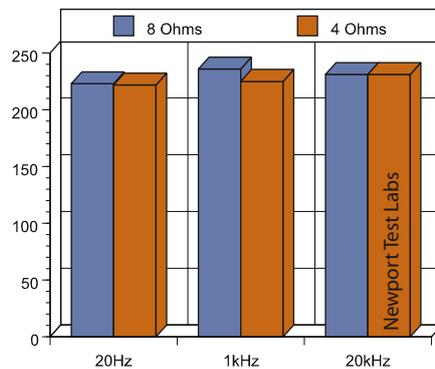
The answer to this question is that you do it via the single mains power switch on the rear panel. This means two things. The first is that if you want to be able to have easy access to this switch, you won't be able to put the KA I 180 Mk2 in a rack or cabinet unless you leave plenty of room above it so you can reach in and feel around for the switch. The second is that the Karan does not have a 'Standby' power mode, so it will always be 'ON' if you don't switch it off, drawing 35 watts continuously from your

mains power supply. This is apparently exactly as Milan Karan intended, because according to Radiance AudioVisual, Karan's Australian distributor, 'Karan designed the amplifiers to be 'always on' as this provides the best possible sonic performance. Milan believes that his amps need at least 48 hours of standby before they really sing.'

Once the Karan is switched on, not only do the words 'KARAN ACOUSTICS' become visible on the front panel, but also the name of the input source that's selected. There are only four of these: Line 1, Line 2, Line 3 and Balanced. As you've probably already guessed, the Line inputs are unbalanced (accessed via RCA sockets on the rear panel), while the balanced input is accessed via a standard three-pin XLR socket. The wiring for this is also standard (Pin 1/Ground, Pin 2/Negative, Pin 3/Positive). When you use the Source Selector to move through these four inputs, you will discover that the control's action is not continuous, in that once you have turned it to the right to click through the Line inputs to get to the balanced input, you'll have to click backwards again in order to select Line 1.

The volume control on the right of the front panel has a smooth action and what appears to be a LED inset into it. However, no matter what I did, I couldn't get the LED to glow, so figured it was either not a LED at all, or it was not connected, or it was a LED and it was connected, but it didn't work. All this guesswork was entirely wrong. It turns out that what I thought was a LED is actually a cubic zirconia, which is intended to reflect light from within the room to allow easy identification of the rotational position of the control from any distance. The remote is motorised so that it can be operated via the supplied remote, but unlike most motorised volume controls, the version Karan uses 'feels' like an ordinary control when you turn it manually... in other words, it doesn't have the usual 'dead' feel of a motorised volume control, and there's also no control 'backlash' when you stop turning it. In fact the tactile 'feel' and feedback you get when operating the volume control is fantastic.

Speaking of the remote, it is very strange! Firstly, perhaps taking its design cues from Denmark, it's circular, rather than rectangular. Second, it has only two



Power Output: Both channels driven into 8-ohm and 4-ohm non-inductive loads at 20Hz, 1kHz and 20kHz. [KA I 180 Mk2]

buttons: Volume Up and Volume Down. In other words, you can't use it to select input source, nor is there a 'Mute' function, both of which would have been handy! It's powered by two AAA batteries and when I checked I was pleased to find that either Karan or its Australian distributor had fitted good-quality alkaline batteries, so you won't have to worry about them leaking and possibly damaging the remote.

All the connectors on the rear of the Karana KA I 180 Mk2 are gold-plated, and of extremely high manufacturing quality. In addition to the inputs and outputs I expected, there's also a record output (also via gold-plated RCA) so you can use it to send the selected input to a recording device, or to a distributed sound system, or for some other purpose.

Karan doesn't want you to remove the lid on its amplifiers, because there are dangerous voltages inside, yet the company realises that many people will be curious about a hand-made amplifier, so it has included in the Owners' Manual a very large photograph showing the inside of the amplifier with the caption: 'This is your amplifier inside please don't open.' However, I did 'lift the lid' on mine and was very impressed by absolutely everything I saw inside, from the quality of the individual electronic components Karan uses to the high standard of workmanship, right down to the layout of the tracks on the PCB boards. It truly is a work of art.

Although the huge toroidal transformer is branded Karan, Karan does not make them in-house, but

has them custom-made in Germany—a country that is apparently Karan's preferred source for most of the resistors, capacitors, diodes and other semi-conductors used in Karan products. (One exception to this is the use of two pairs of Japanese Sanken 2SC3264/2SA1295 epitaxial planar ring emitter output transistors per channel, arranged as differential pairs.) The resin-

KARAN ACOUSTICS KA I 180 MK2 INTEGRATED AMPLIFIER

Brand: Karan Acoustics
Model: KA I 180 Mk2
Category: Integrated Amplifier
RRP: \$11,000
Warranty: Five Years Transferable
Distributor: Radiance AudioVisual
Address: Unit 33. 5 Gladstone Street
 Castle Hill
 NSW 2154
 ☎ **(02) 9659 1117**
 ✉ **info@www.radianceav.com.au**
 🌐 **www.radianceav.com.au**

- High power
- Quiet backgrounds
- Superb build quality
- Line outputs
- Single-function remote
- Standby circuit

LAB REPORT

Readers interested in a full technical appraisal of the performance of the Karan K I 180 Mk2 should continue on and read the LABORATORY REPORT published on page 22. Readers should note that the results mentioned in the report, tabulated in performance charts and/or displayed using graphs and/or photographs should be construed as applying only to the specific sample tested.



Lab Report on page 22

encapsulated toroidal transformer has full dielectric insulation between primary and all secondary windings and is also encased in a non-magnetic shield... despite it being a toroidal design. The a.c. from this transformer is rectified to d.c. by a network of discrete BY550 high-surge capacity diodes (to make use of their low reverse current and low forward voltage drop) rather than a standard off-the-shelf bridge rectifier. The resulting d.c. rail is then smoothed by a total of eight 10,000µF 63VW electrolytic capacitors, each carrying Karan branding. Although I don't know which company makes the specific capacitors used in the Karan KA I 180 Mk2, based on past history I'd venture a guess that they're made for Karan by Roederstein.

It appears Karan has instituted a multi-disciplinarian approach to quality control because after each amplifier is built, it's tested by a one person, auditioned by yet another person, and then given a final check by yet another person, so by the time it gets to you, at least four different people will have signed off that the amplifier meets Karan's standards. (And when I say 'signed off' I mean this literally, because each person has to physically sign that they've made the specific check.) And speaking of standards, in addition to the internal components being state-of-the-art, from recognised audiophile manufacturers, the quality of the assembly is second to none, with outstandingly soldered joints, beautiful wire dressing, and superb component alignment. As for this being a 'Mk2' model, I am afraid that I never saw or heard the original Mk1, because Karan has only recently commenced distribution in Australia, but AV Guide's Alan Sircom, who had seen a Mk1 version, said of the differences in his review of the Mk2 version that: *'The rest of the specs are identical, as is much of the amplifier board layout and even the internal geography of the amp. It also has that unique—as in 'how does he do it?'—Class-A sound without Class-A inefficiency. The secret, apparently, is sliding bias, low current and treating the whole voltage rail like the base of a transistor. The one specification that has changed begins to give the game away. The new KA I-180 is 10kg heavier than its predecessor. What's*

changed? A bigger, potted toroidal transformer for starters. This necessitated a re-laying out of the centre power supply board... and that gave Milan Karan the perfect opportunity to revisit almost everything about the 180, changing and improving where necessary. It's a tribute to how good the initial design was that not a great deal ended up changing. Where the last few years have changed the face of the audio world is there's now even greater acceptance of the importance of audiophile-grade electronic components in products. In some places, this manifests itself as a burgeoning hot-rod community, whether home-grown or 'bodger built'. In others, it's the dealer or distributor making the changes for consumers. Here, the amp is upgraded at source. Look closely and you'll see audiophile-approved names like Vishay and WBT in place of the standard fare. This not only adds to the cost of the product, but seriously ups the performance, as we'll see.'

One other difference is that the Mk1 apparently did not have a remote control, so presumably also the volume control has changed, because there would be no point in fitting a motorised volume control to an amplifier that did not have a remote to operate it!

So far as dimensions and weight are concerned, the Karan measures

500×90×310mm (HWD) and weighs 18kg.

IN USE AND LISTENING SESSIONS

Depending on what brand and model of interconnects you use, you may experience a few cabling issues when installing the Karan KA I 180 Mk2. As you can see from the photograph of the Karan's rear panel, all the left-channel inputs and outputs are on the right side of the rear panel, and all the right-channel inputs and outputs are on the left side of the rear panel. (This sounds weird, but since we're looking at the panel from behind, the 'left' side of the rear panel is actually the 'right' side and *vice versa*.) What this means is that your signal cables cannot be a type where the two cables are physically joined together: you need to use signal cables where the left and right channel wires are completely separated. Also, the high-quality gold-plated speaker terminals have no insulating shroud, so that if you use bare-wire connections, rather than pins or spades, you will need to make very certain that no stray bits of wire come into contact with each other, or with the chassis.

You need also be made aware that because the Karan is a fully balanced design, the 'negative' speaker terminal is not at ground potential, so you should connect the terminals only to passive

loudspeakers, and never to electrostatic or other 'active' loudspeakers (or subwoofers) which have their negative terminal referenced to ground. Karan also warns in its manual (on page 6) that the amplifier is *'not recommended for loads less than 3Ω'* so you should take heed of this very specific recommendation also.

Karan warns that the amplifier can become quite hot, but I did not find this to be the case during the period I was using the amplifier. It certainly became overly warm, particularly after extended listening sessions at high volume levels, but every time I felt the casing and/or the heat sinks, I didn't think it became 'hot'. However, because I was constantly feeling the heatsinks to monitor the temperature, I certainly became aware of another danger—that the individual fins have extremely sharp edges...I hurt my fingers a couple of times. I certainly would not recommend putting the amplifier anywhere that someone walking past could catch their clothing on the heatsink fins! In terms of physical placement, I



was also gratified to find the amplifier had only three feet, rather than the usual four. This means that no matter how uneven the surface on which the amplifier is placed, it will never 'rock' or become unstable. Yes, it's only a small thing, but it shows that someone who cares about even the smallest design details has designed this amplifier.

The sound quality of the Karan also reveals that it's been designed by someone who really cares about sound, because it manages to combine the raw power of solid-state with the rich warmth of valves, so you get the best of both worlds: impressive dynamics and superb musicality. However, to an even greater extent what you hear from the Karan will depend largely on the speakers you choose, because in my sessions I found that the sonic 'signature' of the Karan changed subtly—and most noticeably in the bass—whenever I changed loudspeakers, so it's clear that the KA I 180 Mk2 and your speakers will form a symbiotic relationship. Certainly I found that with models that claimed nominal impedances of 4Ω, I was tending to write in my listening notes that the bass was 'full' and 'rich' and 'rounded', whereas when using exactly the same musical passages, but with the Karan connected to speakers that were rated at 8Ω, the descriptors I used to describe the bass changed to words such as 'tight', 'controlled' and 'great depth'. Interestingly, in both situations I was still noting down that the overall sound was 'warm' and the cryptic reminder to myself 'valve-like!' was written down multiple times across many pages.

One thing that never changed was the sheer amount of power that was instantly available, no matter what speakers I used. This not only allowed me to increase the volume far beyond 'safe' listening levels, but meant that the dynamic realism of the sound was exceptional irrespective of the volume level. This overall impression was further enhanced by the contrast between the silky-smooth, ultra-quiet noise floors that meant you could, literally, hear a pin drop. What I also found impressive was that when listening, I always had the uncanny sense that I was at a live performance... or, if you like, that the performer (or in a small ensemble, performers...) was in my living room. This was partly because of the almost

holographic soundfield. At one point, I was enjoying a piano sonata when the pianist accidentally kicked one of the piano's pedals and the image was so real that the instant I heard the sound, I actually looked downwards, to where the pedal would have been, to double-check... even though I knew, of course, that there was nothing to be seen! Certainly, with solo performers and small ensembles, the sonic prowess of the Karan is sufficiently good that you can suspend reality... albeit for the duration of a track or three!

This means, of course, that if your speakers are up to it, the Karan can be brutally revealing with CDs that have been recorded poorly. If a vocalist wavers back and forth in front of a microphone, for example, I can guarantee you that the movement of the image will drive you crazy... it certainly did me! The same is true if you're listening to a close-miked acoustic guitarist who's making a fair bit of noise on the fretboard: the sound is so realistic that it's easy to be distracted from the main event, the music. You'll also

■ The sound is so perfect that Missy Higgins is with you in the room... and you can just feel her pain.

need to be a little careful with orchestral CDs that have been multi-miked, because I found these to sound a little cluttered and confused. When listening to a properly-miked orchestra, however, the timing and precision of the Karan is so good that it's as if you can hear every instrument individually, yet without losing the overarching orchestral presentation.

The arrival of the Karan KA I 180 Mk2 handily coincided with the arrival of my replacement copy of Missy Higgins' debut studio album (*The Sound of White*) so with the Karan's help I spent many, many very happy hours rediscovering this fabulous album... not to mention wondering where my original CD had got to. (For the record, *TSoW* is rated #86 in the book '100 Best Australian Albums' compiled by Toby Creswell, Craig Mathieson and John O'Donnell.) It's not just the music on this album either—though in the end, it is all about the music!—but I just love lots of the production and the incredible reality of the

sound on this album. Sometimes the sound is so perfect that Higgins is with you in the room, and you can just feel her pain. (At some other moments, though, I do think there is a little unwanted overproduction... did we really need the cello on *Any Day Now* for example?)

It's a great album for auditioning equipment, too: for the purity of the capture, and for the incredible way Higgins varies the tone and colour of her voice, sometimes almost bar by bar. When this album come out, I also couldn't quite believe the lyrics... and ten years down the track I am still amazed. Just take the opening stanza to 'Unbroken': *'Red handprint on the white of your cheek, pack your bags quiet while the lion sleeps. Watch your mother put her name on the line, next to the place where your father signed. And inevitably what you used to be succumbs to the pull of gravity and you will never, no you will never see with virgin eyes again...'* Phew! No wonder the album didn't chart so well in the US!

CONCLUSION

Designer Milan Karan obviously has a very clear idea of how he wants his amplifiers to sound...and perform... and a very focused personal vision as to how to go about achieving it, which is no doubt why he is building them by hand, using a solid-state output circuit topology that is rarely used in hi-fi amplifiers (though Dan D'Agostino used it when he was at Krell and it's still being used by Hans Ole Vitus at Vitus Audio in Denmark, to name just two famous users).

Select your loudspeakers carefully and the Karan KA I 180 Mk2 will reward you with a sound that combines the musicality of valves with the power of solid-state, presented in a beautifully executed electronic package. 

greg borrowman

SPECIAL NOTE: This review is slightly different from that which originally appeared in the magazine. Several factual corrections have been made to the text, email address and warranty details.



CONTINUED FROM PAGE 18

TEST RESULTS

I was interested to see that Karan rates the power output of the KA I 180 Mk2 in the following way: ‘Pink noise RMS power: 180/300W into 8/4 ohms.’ It’s interesting because this is a measurement technique I have never heard of previously. It could be the industry standard for power measurement in Serbia. I presume that Karan uses some type of pink noise as the signal source (though as there are several quite different types of pink noise, it’s incorrect to simply state ‘pink noise’), connects a true RMS-reading voltmeter, then observes the pink noise on an oscilloscope whilst looking for signs of clipping! Nonetheless, it’s an interesting approach to measuring power output that I will look into myself, though I suspect it’s not without its issues, not least of which is the type of pink noise to be used.

Rather than try to replicate an unknown non-standard power measurement technique, *Newport Test Labs* used the world-standard amplifier power output measurement techniques recommended by the Europe’s International Electrotechnical Commission (IEC), as well as the USA’s Institute of High Fidelity (IHF), and Australia’s own Australian Standards Association (ASA), the results of which are tabulated in the accompanying table, and illustrated graphically in the form of bar-graphs in the main body of the review. Using this system, the KA I 180 Mk2 easily met its specification into 8Ω loads, returning test result figures of 223-watts (23.4dBw) per channel at 20Hz, 236-watts (23.7dBw) per



channel at 1kHz and 231-watts (23.6dBw) per channel at 20kHz.

However when driven into 4Ω loads, the Karan fell a little shy of specification, returning figures of 222-watts (23.4dBw) per channel at 20Hz, 225-watts per channel (23.5dBw) at 1kHz and 231-watts (23.6dBw) per channel at 20kHz. And when I say ‘a little shy’ I mean that, because the lowest power output figure it returned (at 20Hz) was only 1.3dB below specification, a difference so small it would not be audible, even under perfect listening conditions.

The Karan KA I 180 Mk2 has a very wide frequency response, extending from less

than 1Hz to 110kHz –1dB. Across the audio band, *Newport Test Labs* measured the Karan’s frequency response as 20Hz to 20kHz ±0.05dB when driving a standard non-inductive laboratory test resistor, which is self-evidently excellent! When driving a more demanding simulated speaker load (*Newport Test Labs* uses the same circuit as John Atkinson does at *Stereophile*), the frequency response was measured as being 20Hz to 20kHz ±0.75dB. This is still very flat indeed—the human ear would detect it as being perfectly flat, and again an excellent result, but indicative of a fairly high output impedance and resulting in a low damping factor, as you can see in the table. The variation in the trace that’s been graphed in Graph 5 (red trace) is due to the extreme vertical scale of the graph, where the very top of the graph is at +1.5dB and the bottom is at –1.5dB.

Channel separation was exceptional at very low frequencies (119dB at 20Hz), outstanding at midrange frequencies (87dB at 1kHz) and good at high frequencies (60dB at 20kHz). Channel balance was an excellent 0.24dB at 1kHz. Interchannel phase errors were also outstandingly low, with a best result of just 0.01° at 1kHz, spreading to 0.1° at 20Hz and 0.59° at 20kHz. This is not only outstandingly low from a technical viewpoint—it would be completely impossible to detect such errors with the human ear... particularly that 20kHz result, since few people can hear 20kHz at all, much less detect a phase error at that frequency!

Newport Test Labs’ graphs of the Karan’s output spectrum show the relatively high levels of distortion I would expect from a balanced output circuit topology that does not employ overall feedback, which is exactly the type of circuit Karan says is used inside the KA I 180 Mk2. At an output of one-watt, into either 8Ω or 4Ω loads, odd-order harmonic distortion components dominate—

Karan Acoustics KA I 180 Mk2 Int. Amplifier — Power Output

| Channel | Load (Ω) | 20Hz (watts) | 20Hz (dBW) | 1kHz (watts) | 1kHz (dBW) | 20kHz (watts) | 20kHz (dBW) |
|---------|----------|--------------|------------|--------------|------------|---------------|-------------|
| 1 | 8 Ω | 276 | 24.4 | 283 | 24.5 | 264 | 24.2 |
| 2 | 8 Ω | 223 | 23.4 | 236 | 23.7 | 231 | 23.6 |
| 1 | 4 Ω | 272 | 24.3 | 300 | 24.7 | 272 | 24.3 |
| 2 | 4 Ω | 222 | 23.4 | 225 | 23.5 | 231 | 23.6 |

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

Karan Acoustics KA I 180 Mk2 Integrated Amplifier — Test Results

| Test | Measured Result | Units/Comment |
|-------------------------------------|---------------------|-----------------------------------|
| Frequency Response @ 1 watt o/p | < 1Hz – 110kHz | –1dB |
| Channel Separation (dB) | 119dB / 87dB / 60dB | (20Hz / 1kHz / 20kHz) |
| Channel Balance | 0.24 | dB @ 1kHz |
| Interchannel Phase | 0.1 / 0.01 / 0.59 | degrees (20Hz / 1kHz / 20kHz) |
| THD+N | 0.61% / 0.12% | @ 1-watt / @ rated output |
| Signal-to-Noise (unwghted/wgghted) | 82dB / 94dB | dB referred to 1-watt output |
| Signal-to-Noise (unwghted/wgghted) | 95dB / 102dB | dB referred to rated output |
| Input Sensitivity (CD Input) | 120mV / 1.63mV | (1-watt / rated output) |
| Output Impedance | 1.3Ω | @80Hz |
| Damping Factor | 6.15 | @1kHz |
| Power Consumption | N/A / 35 | watts (Standby / On) |
| Power Consumption | 102 / 1,037 | watts at 1-watt / at rated output |
| Mains Voltage Variation during Test | 241 – 255 | Minimum – Maximum |

again as I'd expect—with the third harmonic sitting at around -40dB (1.0%), the fifth at -50dB (0.31%), the seventh at -60dB (0.1%), and the ninth at -70dB (0.03%). Higher-order harmonic components extend right out to 20kHz. There's an even-order (second) harmonic at -80dB (0.01%) and a fourth at -110dB (0.0003%), with the other even-order distortion components being more than 115dB down (0.0001%). Despite this, the summed THD+N was still relatively low, at 0.61%, which is 'way below the 3.0% figure that's deemed to be 'audible' by psychoacousticians, and also significantly lower distortion than from most valve amplifiers.

Output distortion levels are lower at rated output—again as I'd expect given the circuit topology—though performance is now clearly better into 8Ω loads than it is



into 4Ω loads. In the case of the 8Ω result, the third harmonic is down at -60dB (0.1%), the fifth at -63dB (0.07%), the seventh at -70dB (0.03%), and the ninth at -72dB (0.02%), with further odd-order harmonic

components right out to 20kHz. The 'spikes' clustered around the fundamental and the individual harmonics are signs that the power supply is under considerable stress at these output levels—not surprising since the Karan needed to consume more than a kilowatt from the 240V mains supply for the amplifier to be able to deliver such high power output levels. If you look at the power consumption figures you can see that the Karan KA I 180 Mk2 is fairly power-hungry no matter how you're using it, and as it has no standby mode you should probably switch it off whenever you're not using it.

The graph of CCIF-IMD (at an output level of one watt) shows high levels of ordinary harmonic distortion, as you'd expect given the results in Graphs 1–4, but interestingly, there's very little regenerated signal down at 1kHz, with the signal at this

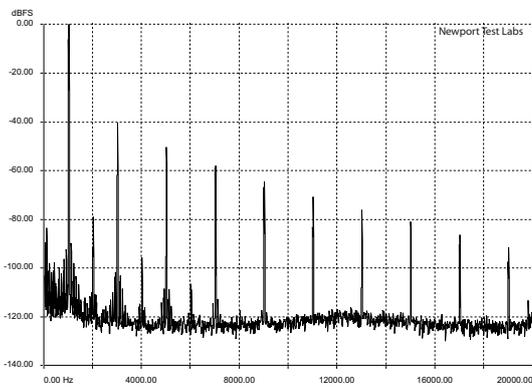
level nearly 90dB down.

This is completely unlike valve amplifiers, which have high levels of regenerated 1kHz signal.

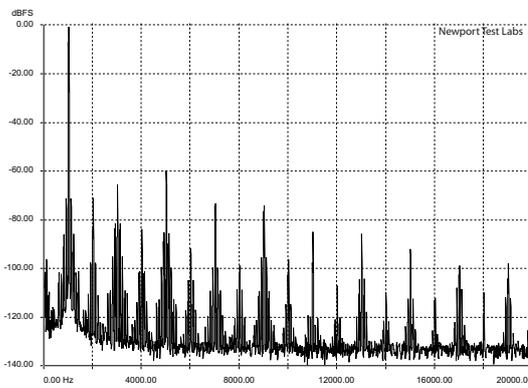
Signal-to-noise ratios were excellent, with the KA I 180 Mk2 returning best measured results of 95dB (unweighted) and 102dB (A-weighted) referred to rated output. S/N ratios referred to one-watt (which are the ones you'd use to compare with the results gained by other amplifiers) were also good, with Newport Test Labs measuring S/N at 82dB (unweighted) and 94dB (A-weighted) respectively.

Mains power consumption was very high, with the Karan needing to consume more than 100-watts from the 240V mains to deliver just one watt to the loudspeakers, and more than one thousand watts (1kW!) to deliver its rated output at 8Ω (180-watts). Because of this, I'd suggest considering installing a dedicated power-point exclusively for use by the KA I 180 Mk2 in order to ensure you can extract the best performance from this powerful, extremely wide-band amplifier.

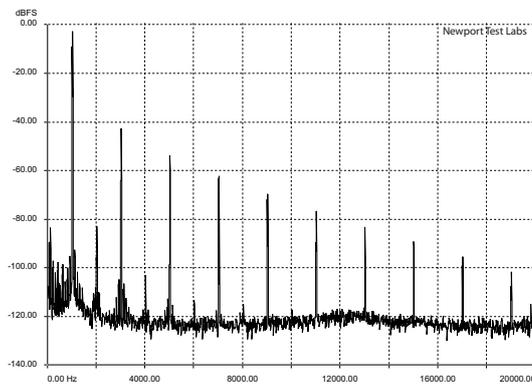
Steve Holding



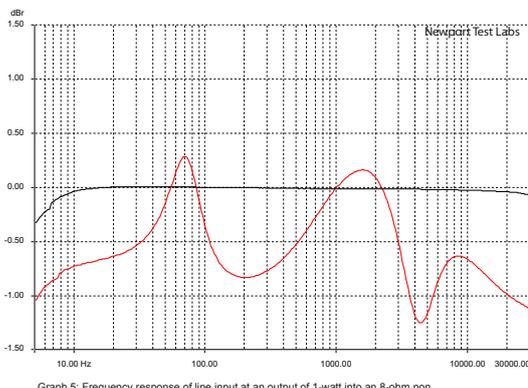
Graph 1: Total harmonic distortion (THD) at 1kHz at an output of 1-watt into an 8-ohm non-inductive load, referenced to 0dB.



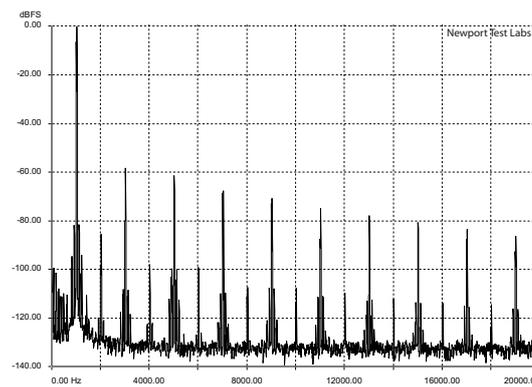
Graph 4: Total harmonic distortion (THD) at 1kHz at rated output (300 watts) into a 4-ohm non-inductive load, referenced to 0dB.



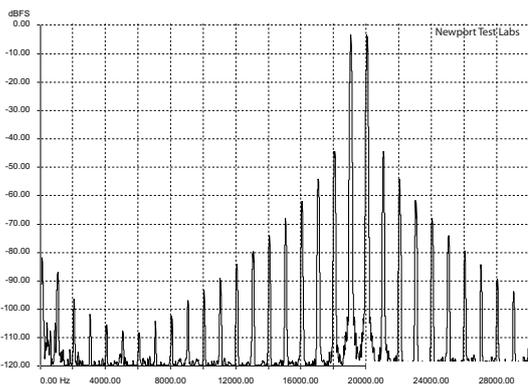
Graph 2: Total harmonic distortion (THD) at 1kHz at an output of 1-watt into a 4-ohm non-inductive load, referenced to 0dB.



Graph 5: 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).



Graph 3: Total harmonic distortion (THD) at 1kHz at rated output (180 watts) into an 8-ohm non-inductive load, referenced to 0dB.



Graph 6: 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.