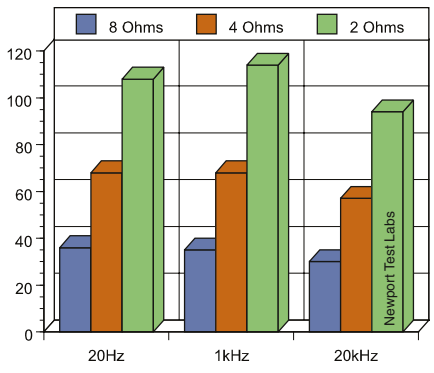
Musical Fidelity

AMS35i Integrated Amplifier

If the Australian Government has its way, this may be your last chance to buy an AMSS35i.

It's not that the pollies have it in for the AMS35i in particular, or even for Musical Fidelity in general. It's because all low-output, high-power consumption Class-A amplifiers are in the firing line of a new Labour government that has decreed that all hi-fi equipment sold in Australia after 2012 will have to draw less than 1-watt on standby. Having got that legislation through, the Government is now arguing for a total ban on all hi-fi amplifiers that are not suitably 'electrically efficient.'

On my reading of the proposed electrical efficiency regulations, this would completely rule out the sale of all Class-A integrated and power amplifiers, as well as quite a few ordinary Class-AB amplifiers. It would most certainly rule out the Musical Fidelity AMS35i, which not only does not have any standby circuitry at all, but will also pull a constant 330-watts of power from the mains whenever it's on—even if you're not using it.



Power Output: Single channel driven into 8-ohm, 4-ohm and 2-ohm non-inductive loads at 20Hz, 1kHz & 20kHz. [AMS35i]

Class-A Primer

In the past I've had a few problems explaining to readers what Class-A is—or perhaps, how it operates—firstly because it requires some technical knowledge on the part of readers, secondly because I didn't explain it too well, and thirdly because not everyone agreed with my definition! So let me try again…

First, to state the obvious, all hi-fi amplifiers take a very low-voltage electrical signal (from a CD player, etc) and 'boost' it from around 2 or 3 volts up to 20 or 30 volts, so that it's high enough to drive a loudspeaker. The way this is traditionally accomplished is by arranging a number of power output transistors inside the amplifier in a particular 'Class' configuration, where the various configurations are known as Class-A, Class-B, Class AB, Class-D, Class-G, Class-H and so on (but here we're only going to discuss the first three!).

To keep things simple for this example, let's imagine we're using just two output transistors and we're building a Class-B amplifier. To do this, we arrange the circuitry so that one transistor handles the top 'half' of each signal waveform or 'cycle' (that is, the bit from 0° to 180°) and the other transistor takes care of the bottom half of the cycle (the bit of the waveform from 180° to 360°). Because the waveform can only be in one place at a time, we'll only need one transistor at a time, so we'll only switch them on when we need them. So when one is 'on' the other will be 'off' and *vice versa*. The beauty of this Class-B arrangement of the two transistors is that because each transistor is only required to be on for 50% of the time (or cycle), and therefore delivers only half the total power, we can get away with using cheap, low-power, transistors. Also, because each transistor is dissipating less power, it won't get very hot, so we don't have to use as much heat-sinking—and heat-sinking is very expensive. Finally, because we only have to power one transistor at a time, we can share the power supply between the two transistors so it, too, can be much smaller.

However, the problem with the Class-B arrangement is that we are constantly switching the transistors on and off, and the audio signal is constantly being switched back and forth between the two transistors. This means that distortion and noise are both inevitable and unavoidable, since there will always be a 'gap' in the sound caused by the time it takes the transistor to switch itself on when the audio signal arrives at its input.

Since this is highly undesirable, we instead decide to arrange the two transistors in Class-A mode. We still use the same two transistors, and we still arrange them so that one handles the top half of the waveform, and the other the bottom half, but this time, instead of having them turn on and off according to whether they're doing anything or not, we instead leave both transistors on all the time. This neatly solves the problem of the transistors switching on and off (eliminating the gap) but means we have to use very high-power transistors, since they have to operate all the time. We also have to fit very large heat-sinks, be-

cause the transistors will get very hot because they're working all the time. Finally, we need a really large power supply because it has to do around twice the work compared to the Class-B arrangement.

Class-A amplifiers are so big, heavy, hot, inefficient (and consequently, expensive) that few manufacturers build them. Even the ones that claim to be Class-A are usually what's called Class-AB amplifiers.

To build a Class-AB amplifier we use the same two transistors, and we switch them on and off just like we did for the standard Class-B mode, but instead of having each one conduct for half the cycle, we arrange an overlap, so that each one operates for, say, 60 per cent of the total waveform. This means that for 20 per cent of the waveform (at the points at which the audio signal crosses from one transistor to the other) both transistors will be on, so the amplifier will be operating in 'Class-A' for this period. The percentage of the time we leave both transistors switched on dictates how 'Class-A' our Class-AB amplifier really is. In practise, amplifier designers don't talk about percentages when discussing Class-AB operation, they instead say that their amplifier operates in Class-A for 'up to 10-watts output' or some such, (after which its output becomes pure Class B, which is what they don't tell you!).

Where the whole thing comes unstuck is that many hi-fi purists claim that the only amplifier design that can correctly be labelled 'Class-A' is one that never 'divides' the audio signal in any way such that different parts of it are handled by different transistors. Some go further and say only a single output device is permissible. The problem is that the 'purer' you become, the less power you're able to deliver. Since Musical Fidelity uses four output devices per channel, it's unlikely to satisfy the 'purest of the pure' as being a 'true' Class-A amplifier. For the record, I am one of the many who says that so long as all the output devices are all conducting through all 360 degrees, it's a true Class-A design.

The Equipment

I noticed a design failing in the AMS35i the minute I put it onto the top shelf of my equipment rack, because it crushed my fingers! For some reason, the four feet underneath the amp are so small that if your fingers are under the amp when you put it down, it'll crush them. And with an amplifier that weighs a shade less than 30 kilograms, that's not funny.

Two other traps lie in wait when it comes to those side-mounted heat sinks. In order to increase the surface area of each fin, so that each one dissipates more heat, Musical Fidelity has made them 'wavy.' The problem with this is that the cutting process used to create the wave shape makes the edges really sharp! This isn't a serious issue, but it is yet another reason you should never try to move the AMS35i without enlisting the aid of a second—preferably strong!—person.

> "I noticed a design failing in the AMS35i the minute I put it onto the top shelf of my equipment rack"

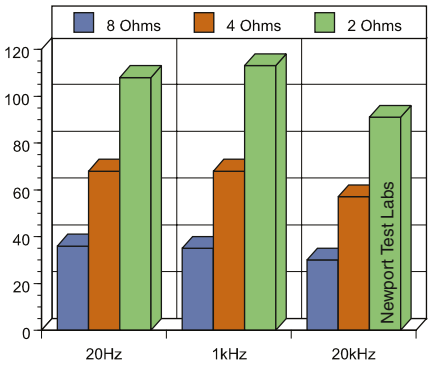
Speaking of strong, you may have to take up weight-lifting to maintain proper control over Musical Fidelity's remote. I don't know what it's made of, but it weighs half a kilo. (Yep, literally, 500-grams). It's lovely though, with cut-away edges so you can pick it up easily from a flat surface and a flat bottom, so you can stand it on end if you like. Even the controls are fun, because each of the metal buttons, when pressed, makes a sound like a miniature gamelan, so if you press several in quick succession, it sounds like a Javanese orchestra. The remote controls all the amplifier's functions—not that there's many to control—Volume, Muting and Input Selection (CD, Aux, Tuner, Tape, Balanced Input and Tape Monitor).

The front panel volume control is, of course, motor-actuated, but it's one of the best of its type I've seen. When you adjust it manually, the action is smooth and not, like many motor actuated controls, like dragging a spoon through honey. Even better, when you let the control go after moving it manually, there is no backlash at all. It stays where you stop it. When you're using the remote to adjust volume, the 'up' and 'down' actions are quick and precise. And, if you hit 'up' immediately followed by 'down', the control responds instantaneously. The muting logic isn't perfect, because although the mute circuit automatically demutes if you alter volume using the remote (as it should), it stays engaged if you turn the front panel control, whereas it should disengage. Incidentally, the calibrations on the volume control show that someone at Musical Fidelity is a Spinal Tap fan: they go up to 110!

Despite there being no standby mode, the amplifier will 'remember' the input you were using when you switch it off, and re-instate it when the amplifier is switched back on. The two exceptions are the Mute circuit and the Tape Monitor circuit, both of which revert to 'Off.' A minor gripe is that if you cause the protection circuit to trigger (by short-circuiting the output terminals, for example) the amp's output stage shuts down, but the rest of the amp stays on and gives no indication anything's amiss (other than there being no sound, of course!). Memo to MF: It would be nicer if the power LED could flash, or something…

In Use and Listening

It was hot, hot, hot! No, I'm not talking about the sound, I'm talking about the temperature of the amplifier's casing.



Power Output: Both channels driven into 8-ohm, 4-ohm and 2-ohm non-inductive loads at 20Hz, 1kHz and 20kHz. [AMS35i]

- Stunning sound
- Fabulous performance
- Lowest-ever IMD!

- Runs very hot
- Low-powered
- Not for greenies!

Musical Fidelity AMS35i Integrated Amplifier

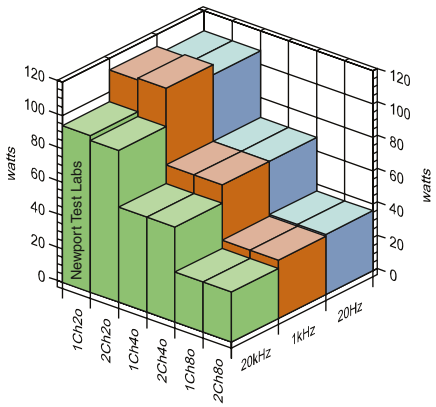
Brand: Musical Fidelity
Model: AMS35i
Category: Integrated Amplifier
RRP: $13,995
Warranty: Two Years
Distributor: Audio Marketing Pty Ltd
Address: Unit 14L. 175 Lower Gibbes Street, Chatswood, NSW 2067
T: (02) 9882 3877
F: (02) 9882 3944
E: info@audiomarketing.com.au
W: www.audiomarketing.com.au

Musical Fidelity's AMS35i gets hot… seriously hot. So hot that I could easily have made my point (and my breakfast) by cooking an egg on the solid parts on top of the amplifier if I hadn't been so worried about the possibility of some egg running down inside the amplifier. How would I have explained that to the guys at Audio Marketing? In fact, after only an hour of listening, the top surface was so hot that although I could touch it with a finger, I couldn't leave my hand on it. The good news was that once the amplifier reached its 'operating temperature', that temperature was then not further affected by how I used the amplifier. I played loud music, soft music, and sometimes nothing at all, and the casing temperature appeared to remain constant.

Needless to say, I didn't have to wait very long after I switched the amplifier on for all the components to have stabilised at normal operating temperature. In fact, this could actually be an advantage, because whereas with some amplifiers you seem to have to wait eons before they come up to temperature, tempting you to leave them on permanently to avoid any delays to your musical enjoyment, the AMS35i heats up so fast that I'd be perfectly happy to leave it off when I wasn't actually using it. Indeed I think I'd switch it off even if I planned on using it only a few hours later…

Which means, of course, that you'll quickly find out that the sound is good. Very good. Very, very, good! I don't know exactly what it is about Class-A sound that makes it so impressive, but you'll hear the difference straight away, no matter what style of music you prefer, what source you prefer, or what loudspeakers you use. The sound has a particular clarity that defies description, because it's not a lack of distortion that's causing the clarity (though there certainly is a complete lack of audible distortion), but just that there's an increase in clarity. For me, I found that the clarity didn't so much manifest itself aurally, as mentally. Instead of thinking to myself: 'that violin sounds exactly as it should', I was thinking: 'that note is just perfectly placed.' In other words, I began to appreciate the music more than the performance.

In fact this happened so regularly when I was listening to the AMS35i that I began to ponder on the relationship between music and performance. It's obvious that without the music, there could be no performance but is the converse true? Can there be music without performance? It's a fact that all the greatest composers hear music in their heads and simply write down what they hear. But what if they'd been born deaf? Would they still have heard music? Would they still have become composers? It seems as though I am digressing, and perhaps I am, but the fact is that when listening to the AMS35i I discovered I was having a far more complete musical experience than I usually do when auditioning equipment, one that went far beyond the sound quality, the music, and even the performance. Welcome to the wonderful world of Class-A!



Power Output: Single and both channels driven into 8-ohm, 4-ohm and 2-ohm non-inductive loads at 20Hz, 1kHz and 20kHz. [AMS35i]

In the light of the above, it seems almost churlish to try to 'dissemble' the individual parts of this performance into 'bass', 'midrange', 'staging' and so on, but, just for the record, let's take the tour anyway. The deep bass was delicately etched, but in providing this high level of detail, it never lost any sense of pace, nor any of the driving fullness of sound that is essential to propel a performance forward to create an exciting live feel.

Speaker choice will, however, be very important in determining maximum volume levels in your listening room when using Musical Fidelity's AMS35i because I found that when using inefficient (86dBSPL or less) speakers in a large room, I was easily able to clip the output stages before reaching listening levels that I personally would regard as being 'loud.' The AMS35i is certainly powerful for a Class-A amplifier, but it is not overly powerful in the grand scheme of things. If you have only a smallish room… or you have a larger one but mostly listen at low-to-average sound pressure levels, I'd still recommend using speakers rated at around 88–90dBSPL for state-of-the-art results. And if you want really serious volume levels, particularly in larger rooms, I'd be looking at speakers with efficiencies of 90dBSPL+ in order to extract the maximum dynamic range potential from your system.

The sound was superbly pure and accurate over the midrange, with a juicy, liquid sound that was as far removed from a dry presentation as you can imagine, yet still—somewhat perplexingly—not at all forward. The sound was incredibly life-like without sounding larger than life, yet this liveness did not blur over any of the finer details.

Detailing extended up far beyond audibility, but with this top-end extension came an almost surreal smoothness to the higher frequencies, yet not so smooth that it approached the point of being glassy.

The stereo staging of the AMS35i was marvellous, so that not only was the left/right imaging precise and razor-sharp, the depth and height of the images were also tangible. No doubt this was helped in great measure by the dual-mono nature of the AMS35i's design, but I couldn't help wondering if the Class-A design played a part here too.

Conclusion

The Musical Fidelity AMS35i is very big, very heavy, very hot, and very expensive…but it sounds absolutely glorious and, thanks to its Class-A design, completely different to the great majority of amplifiers that are currently available, irrespective of their price or their power output capability (or the name on the front panel). The only pity is that here in Australia at least, Class-A amplifiers could be an endangered species, soon outlawed from sale.

So, to re-iterate what I said at the beginning, this could very well be your last chance to own one! ***greg borrowman***

LAB REPORT

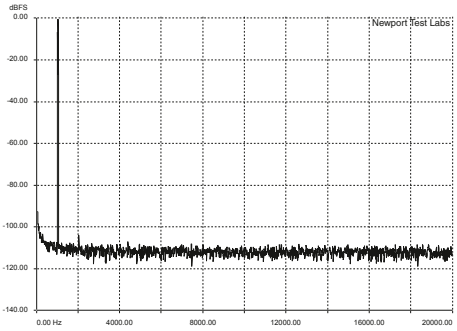
Readers interested in a full technical appraisal of the performance of the Musical Fidelity AMS35i Integrated Amplifier should continue on and read the LABORATORY REPORT published on the following pages. Readers should note that the results mentioned in the report, tabulated in performance charts and/or displayed using graphs and/or photographs should be construed as applying only to the specific sample tested.

Laboratory Test Report

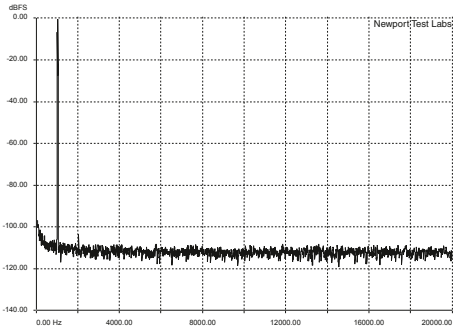
Newport Test Labs' tabulated figures show that the AMS35i only just managed to deliver 35-watts of power with both channels driven into 8Ω loads at 1kHz, and managed only 30-watts per channel at 20kHz when driving the same load. This means that under Australian legislation, which requires amplifiers to meet their claimed rated power output at all frequencies between 20Hz and 20kHz, the AMS35i should be rated at 30-watts per channel. In real terms, this isn't a large difference (just 0.7dB, as you can see from the dBW columns in the tabulated figures) but if you're going by the book… The amplifier puts out 35-watts at 20Hz, which indicates that the power supply is more than up to the task, because I would have expected power output to sag a little at such a low frequency, particularly when both channels were being driven.

The Musical Fidelity AMS35i didn't quite achieve a doubling of power output when the load impedance was halved (the theoretical ideal) but it certainly came within a whisker, delivering 68-watts per channel at 1kHz and 20Hz, irrespective of whether one or two channels were driven. It also came close at 20kHz, returning 57-watts per channel when one or both channels were driven into 4Ω.

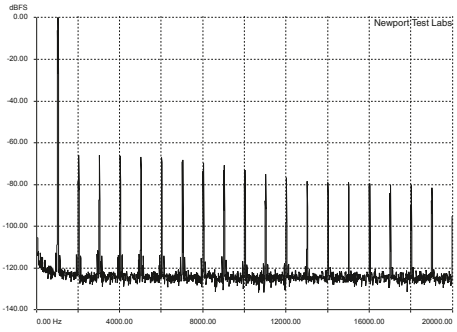
Where the AMS35i absolutely excelled was with its performance into 2Ω loads (for which it's not actually rated), where it returned a power output of 113-watts per channel, both channels driven, using a 1kHz test signal. Power output stayed above 100-watts per channel down at 20Hz too. It was only up at 20kHz that power output dropped to just above 90-watts per channel. This is exceptional performance for a Class-A amplifier and sets the AMS35i apart amongst Class-A designs, because most manufacturers build in protection circuits to prevent you trying to drive 2Ω loads. It's a measure of Musical Fidelity's confidence in its circuit and the quality of the components it uses that it will deliver such high power levels at such low load impedances.



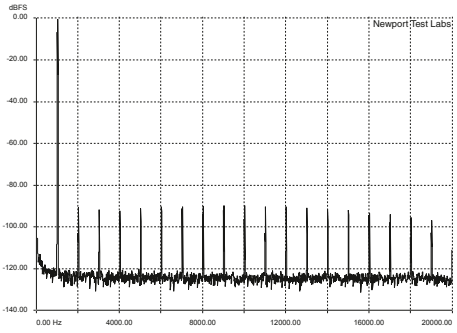
Graph 1: Total harmonic distortion (THD) at 1kHz referenced to 1-watt across an 8-ohm non-inductive load. [Musical Fidelity AMS35i Integrated Amplifier]



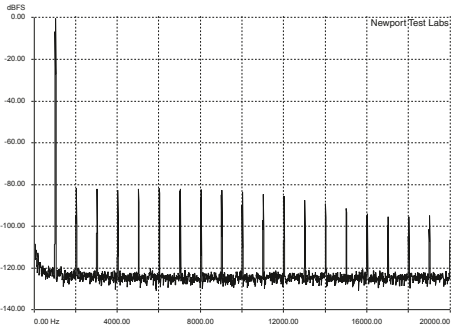
Graph 2: Total harmonic distortion (THD) at 1kHz referenced to 1-watt across a 4-ohm non-inductive load. [Musical Fidelity AMS35i Class-A Integrated Amplifier]



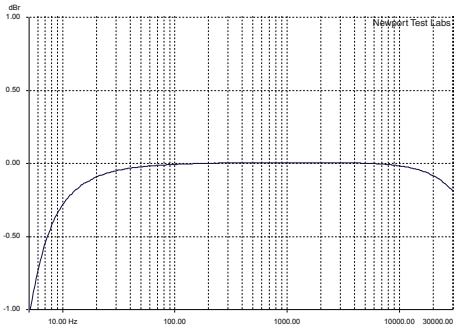
Graph 3: Total harmonic distortion (THD) at 1kHz referenced to rated output (35 watts) across an 8-ohm non-inductive load. [Musical Fidelity AMS35i Class-A Integrated Amplifier]



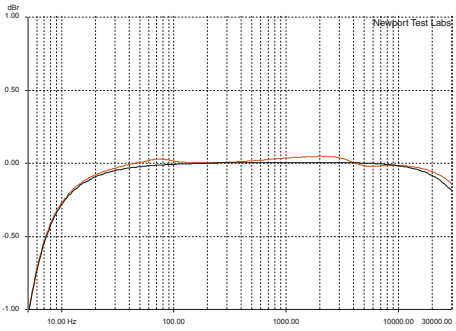
Graph 4: Total harmonic distortion (THD) at 1kHz referenced to 30-watts across an 8-ohm non-inductive load. [Musical Fidelity AMS35i Class-A Integrated Amplifier]



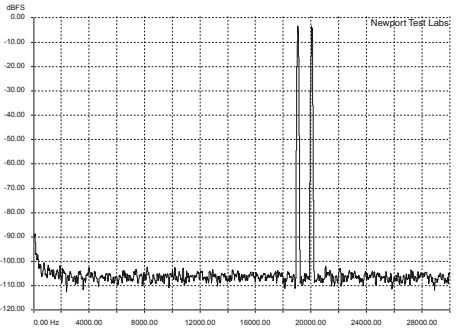
Graph 5: Total harmonic distortion (THD) at 1kHz referenced to 60-watts across a 4-ohm non-inductive load. [Musical Fidelity AMS35i Class-A Integrated Amplifier]



Graph 6: Frequency response of line input referenced to 1-watt output (at 0dB) across an 8-ohm non-inductive load. [Musical Fidelity AMS35i Class-A Integrated Amplifier]



Graph 7: Frequency response of line input referenced to a 1-watt output (at 0dB) across an 4-ohm non-inductive load (Black Trace) and across a combination resistive/inductive/capacitive load representative of a typical two-way loudspeaker system (Red Trace). [Musical Fidelity AMS35i]



Graph 8: Intermodulation distortion (CCIF-IMD) using test signals at 19kHz and 20kHz, referenced to a 1-watt output (at 0dB) across an 8-ohm non-inductive load. [Musical Fidelity AMS35i]

Distortion at an output of 1-watt was very low into both 8Ω and 4Ω loads. You can see this on the *Graph 1* (8Ω) and *Graph 2* (4Ω) spectrograms. There is only a single second harmonic distortion component in the output spectrum, at a level of –104dB, which is equivalent to 0.0006% THD. Note also that the level remains constant irrespective of loading, which means the amplifier will sound the same no matter what speakers you connect, and will also sound the same across the spectrum as the impedance of the speakers it's driving changes (as it inevitably will, in at least 90 per cent of cases).

Graph 3 shows the distortion generated by

the AMS35i when the amplifier is operating at 35-watts per channel, its 'rated' output (see earlier discussion). This level of distortion seemed a little high (around 0.3%) and I suspected the amplifier was right on the edge of clipping, so I asked for the test to be re-run at an output of 30-watts, which would be its power output rating under Australian standards. This result is shown in *Graph 4*, and you can see that although there is a veritable spray of odd and even harmonic distortion components right across the audio spectrum, all are more than 90dB down, or less than 0.003% THD. I suspect that the reason for this result is that Musical Fidelity is taking advantage of the Class-A operation to keep open loop gain very low and using very little feedback. Because of this lack of feedback, stability and phase should be excellent over the audio frequencies. You can see from *Graph 4* that the levels of distortion increase slightly when the AMS35i is delivering 60-watts into a 4Ω load, but the relative levels of the harmonic distortion components are fairly similar (except at very high frequencies) so once again, the 'sound' of the amplifier will remain uniform irrespective of frequency or loading. [I should add that when I said that distortion was 'a little high at 0.3%' at rated output, I was talking with regard to solid-state amplifiers. Most valve amplifier manufacturers would be very pleased if they could achieve 0.3% distortion ratings at any power level!]

The frequency response of the Musical Fidelity AMS35i was measured by *Newport Test Labs* at 4.5Hz to 58kHz ±0.5dB, and 2.4Hz to 118kHz –3dB, which is so much better than the specification Musical Fidelity claims for it (10Hz to 50kHz –0.1dB) that I wondered why Musical Fidelity was being so shy. The response across the audio band is shown in *Graph 6*, and you can see that the frequency response is just 0.05dB down at 20Hz and 20kHz. More impressively, the AMS35i showed that its frequency response barely changes when driving a 'real' loudspeaker (though in this case what's shown is the result into a resistive/inductive/capacitive load that is representative of a typical two-way loudspeaker). (*Graph 7*) The tiny differences around 90Hz, 2kHz and above 20kHz amount to mere fractions of a decibel. This superlative performance led me to think the AMS35i would have a fairly low impedance, which turned out to be true (0.0432Ω) and thus a very high damping factor. The high damping factor (185) in turn means the Musical Fidelity will be able to maintain excellent control over your bass drivers.

However, the real *coup de grâce* came at the end, when I saw *Graph 8*, which shows intermodulation distortion—specifically, CCIF-IMD. If you ever needed any proof of the superiority of the Class-A design you can stop right here, because this is the best result I have ever seen. In fact, so far as results go, it's perfect. Perfect! The two signals that are visible above the noise floor are the test signals. Every other amplifier that *Newport Test Labs* has ever tested—ever— has resulted in graphs that returned high-frequency sidebands at 17kHz, 18kHz, 21kHz and 22kHz (at varying levels, depending on the amp tested), and a regenerated 1kHz signal (again varying in level depending on the amplifier being tested). This is a truly amazing result for the AMS35i. When I thought about this, I remembered that because Class-A amps do not require any frequency compensation, open loop gain remains steady over the audio band, which results in superior transient response and therefore dramatically reduced Transient Intermodulation Distortion (TID). However, I would not have imagined it could have such a dramatic effect on 'ordinary' steady-state intermodulation distortion. My personal feeling is that if you're looking for a technical reason why Class-A sounds superior, this would be where I'd start!

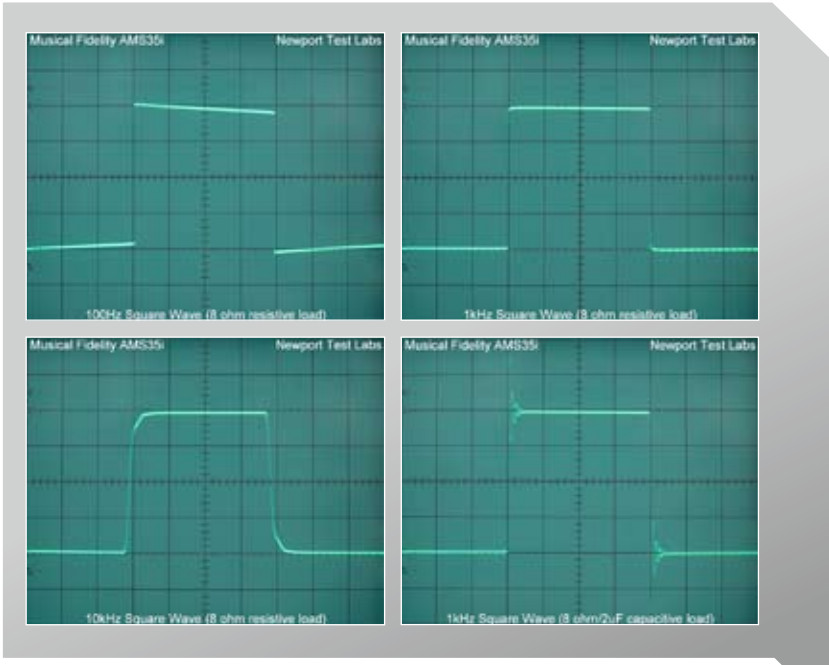
The A-weighted signal-to noise ratio came in exactly on specification at 96dB referenced to rated output, which is not particularly impressive until you remember that it's coming in off a low reference of only 35-watts. You can see from the distortion spectrograms that most of the noise the weighting is removing is low-frequency, with the noise floor across the audio band coming in

> "If you ever needed any proof of the superiority of the Class-A design you can stop right here, because this is the best result I have ever seen. In fact, so far as results go, it's perfect."

Musical Fidelity AMS35i Class-A Integrated Amplifier - Test Results		
Test	**Measured Result**	**Units/Comment**
Frequency Response @ 1 watt	4.5Hz–58kHz	–1dB
Frequency Response @ 1 watt	2.4Hz–118kHz	–3dB
Channel Separation	103dB/112dB/84dB	(20Hz/1kHz/20kHz)
Channel Balance	0.03dB	@ 1kHz
THD+N	0.01% / 0.01%	1 watt/rated o/p
S/N Ratio (unweighted/weighted)	76dB/82dB	dB re 1 watt output
S/N Ratio (unweighted/weighted)	91dB/96dB	dB re rated output
Input Sensitivity (CD input)	20mV/116mV	(1 watt/rated o/p)
DC Offset	000	mV
Output Impedance	0.0432Ω	OC = 2.85V
Damping Factor	185	@ 1kHz
Power Consumption	N/A / 407 watts	Standby/On
Power Consumption	407 watts / 414 watts	1-watt/Rated op
Mains Voltage Variation	233–260 volts	Min–Max

Musical Fidelity AMS35i Class-A Integrated Amplifier - Power Output							
Channel	Load (Ω)	20Hz (watts)	20Hz (dBW)	1kHz (watts)	1kHz (dBW)	20kHz (watts)	20kHz (dBW)
1	8Ω	35	15.4	35	15.4	30	14.7
2	8Ω	35	15.4	35	15.4	30	14.7
1	4Ω	68	18.3	68	18.3	57	17.5
2	4Ω	68	18.3	68	18.3	57	17.5
1	2Ω	108	20.3	114	20.6	94	19.7
2	2Ω	108	20.3	113	20.5	91	19.7

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



"The 10kHz result is also very good, indicating a fast rise time and an extended h.f. response, again with zero phase shift."

at around –110dB below 1-watt, which is more than ample. Input sensitivity was fairly high, with the amp requiring just 20mV at the unbalanced inputs to deliver 1-watt at the output terminals, and 116mV to deliver rated output. This equates to gain of 43dB. For some reason, checks on the balanced inputs weren't done, but I'd expect them to be double the unbalanced results. Still good.

The 100Hz square wave shows a slight tilt, indicating that the AMS35i's response does not extend down to d.c., just as the frequency response tests confirmed. However, there's absolutely no 'bending' visible, which means no low-frequency phase shift, which is excellent. The 1kHz wave is near-perfect, as if it came straight from the signal generator. If I were to be picky, there's evidence of very slight thickening at the top of the leading edge, but it's an excellent result nonetheless. The 10kHz result is also very good, indicating a fast rise time and an extended h.f. response, again with zero phase shift. The slightly dish in the trace at the top of the leading edge where normally I'd expect a mild rounding lead me to suspect some slight frequency variations at extremely high frequencies (>100kHz)—too high to have any audible effect. The final square wave in the series shows that the AMS35i is beautifully behaved when driving a highly capacitative load, with only a mild overshoot and some quickly damped ringing. There is no doubt in my mind that this amplifier will be completely and unconditionally stable, even with the most difficult loudspeaker loads.

You don't need me to interpret the mains power consumption figures for you. They show that the Musical Fidelity AMS35i pulls over 400-watts from your mains power supply even when it's doing nothing at all. And when it's going flat-out, it pulls 414-watts. When you think that most of this power is being converted into heat (in fact it's being converted into heat twice as efficiently as with any other type of amplifier) you can see why the AMS35i gets so hot. To think: when I was just a lad, the bar radiator I used to keep my feet warm when I was studying at night only pulled a little more power from the mains than this amp! I noted that Musical Fidelity says the amplifier pulls only 330-watts, so it appears this was at least one specification they under-rated!

Steve Holding