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Hi-Fi Choice

PASSION FOR SOUND

Issue No. **388**

September 2014

Active heroes

Dynaudio's Xeo 6 loudspeaker
champions hi-fi without wires

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PRODUCTS ON TEST:

AKG, Epos,
Monitor Audio,
Onkk, Philips
& Shure



GROUP TEST

Head start

Six high-class cans
hit the sweet spot

WIN!
ARCAM
BLUETOOTH
Seven DACs
to be won
p102

BEAUTIFUL SYSTEM

Linn's Exakt sounds
as good as it looks



Terrific tweaks
Four wallet-friendly upgrades to
help get the best from your system



Group test

HEADPHONES £300-£500

Head music

If you are serious about your listening, upmarket headphones represent a sweet spot for sound, as **Ed Selley** discovers

IN A PERFECT world, we wouldn't need headphones for use at home. We'd all have sufficient space, understanding, deaf or absent neighbours and fellow family members would share the same musical tastes, schedules and sleep patterns as us.

Sadly, this hi-fi utopia is a pipe dream, and while for the most part we can still largely enjoy our music via speakers, many will find themselves using headphones for a chunk of listening. How significant this chunk is will influence the amount of money you are prepared to spend on your hardware.

Here, we take a look at the choices on offer between £300 and £500. This is an important category for most headphone manufacturers where designs begin to switch to being oriented for home use rather than keeping one eye on connection to portable devices. This means that

bigger drivers can be used, along with larger and (hopefully) more comfortable earpads. The majority of the models here use the open-back principle, which can aid the sense of space to a performance – at the expense of making you the most unpopular person on your commute due to the increased noise leakage that results.

Mobile 'phones

At the same time, headphones at this price point are still sufficiently sensitive so that they can be driven by a tablet or smaller headphone amp without issue. All the designs here have a 3.5mm jack connection (albeit one as an adapter) and some have travel bags. On paper at least, these are flexible designs that should offer immersive home listening with just enough portability to make them useful for occasional use on the move. How does this work in practice? ▶

ON TEST



AKG Q701 £300 p27
Austrian manufacturer AKG's current flagship boasts design input from producer Quincy Jones and is made to be as happy in the studio as it is in the comfort of your listening room



Audio-Technica ATH-AD900X £315 p29
Part of a five-strong model range, the ATH-AD900X partners large 53mm drivers with open-back earpads and the company's trademark floating headband



Beyerdynamic T90 £500 p31
The most expensive headphone in the test is the second most costly model from Beyerdynamic's range, which utilises a unique 'Tesla' driver for improved efficiency. But how will it fare?



Final Audio Design Pandora Hope IV £400 p33
An unusual design from the Japanese company that makes use of a dynamic driver and an armature in each earpad as well as perhaps the strangest name in hi-fi



Sennheiser HD 650 £400 p35
Sennheiser's effort in this price category is the oldest model here, but with age comes experience and the HD 650 boasts a pretty impressive specification and has a loyal following



Shure SRH1840 £467 p37
Arguably more famous for its in-ear designs, Shure is now making a move into the super competitive world of headphones with the SRH1840 being its flagship open-back headphone offering

How we test

Hi-Fi Choice employs the most rigorous test and measurement regime in the business. Here's how we do it...

Unique group tests

This month's group test is supported by rigorous listening tests, backed up with objective lab testing

HEADPHONES GROUP TEST

REVIEWING HEADPHONES PROPERLY isn't easy, which is why few hi-fi magazines try. Anyone can don a pair of headphones, play some music and pronounce on their sound quality – but to back up the listening experience with empirical evidence you have to perform acoustic measurements. With headphones that requires costly specialist equipment, experience and custom-written processing software...

The most important item is an artificial ear that imitates the mechanical properties of the outer ear (pinna), so that any physical distortion caused by wearing the headphone is mimicked in the measurement. We then have to make sure

every time we perform a frequency response measurement the headphone is correctly sealed to the artificial ear, or low frequencies will be lost. We also have to take into account the fact that each time we remove, replace and re-measure a headphone, its response changes because it is positioned slightly differently.

We perform multiple measurements on each capsule to generate an averaged response – and use software to analyse where in the frequency range the largest differences occur. More software then adjusts the averaged responses to produce a corrected result that better represents what you actually hear.

RESULTS EXPLAINED

Sensitivity

+10

Capsule matching

+40

Bass extension

0

Impedance variation

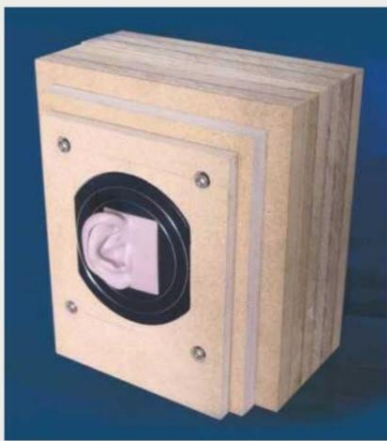
+50

Weight

+10

KEY: ■ Group average

■ % below average ■ % above average



SENSITIVITY

This determines how loud the music is at a given volume control setting. We measure the sound pressure level achieved on our artificial ear for an input of 1V rms at a frequency of 1kHz, averaged for the two channels.

CAPSULE MATCHING

No two headphone capsules have the same frequency response, and any disparity can result in shifts in the stereo image. Response also varies according to the placement on the ear, so we perform 10 separate measurements on each capsule and average the results to determine their disparity from 40Hz to 10kHz.

BASS EXTENSION

Headphones, like loudspeakers, differ markedly in the depth of bass that they can deliver. We derive this figure by averaging the -6dB frequency ref 200Hz of both capsules and converting this to octave extension below 100Hz.

IMPEDANCE VARIATION

Most headphones have an input impedance that varies with frequency across the audible range, which modifies the frequency response according to the source impedance of the headphone outlet. This figure represents the source impedance required to produce a 1dB change in frequency response, 20Hz-20kHz.

WEIGHT

The weight of a pair of headphones isn't the only issue that determines its comfort, but it is certainly a key factor. We weigh the complete headset, including the connecting cable with a 1/4in jack plug (which often can involve the fitment of a supplied adaptor).

THE ARTIFICIAL EAR:

This eerie-looking item is the artificial ear we use for headphone testing. Key elements of the GRAS 43AG ear and cheek simulator are fitted within a laminated MDF block, which provides the means to mount the headphones on the artificial ear as on a real head.

REFERENCE SYSTEM

SOURCE

Lenovo T530 ThinkPad
Foobar audio player

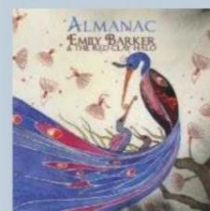
HEADPHONE AMPLIFIER

Chord Hugo

TEST MUSIC

EMILY BARKER AND THE RED CLAY HALO

Almanac
24/88.2 FLAC



KRAFTWERK

Minimum Maximum
24/88.2 FLAC



MAX RICHTER

Recomposed by Max Richter
24/96 FLAC



NIRVANA

Nevermind
24/96 FLAC



AKG

Q701 £300

The producer's producer, Quincy Jones, has a hand in this Austrian offering, but will it make the AKG sing?

DETAILS

PRODUCT
AKG Q701

ORIGIN
Austria

TYPE
Open-back, over-ear headphones

WEIGHT
235g

FEATURES
• 45mm Varimotion drivers
• Metal outer headband and automatically adjustable leather inner headband
• Detachable 3m cable

DISTRIBUTOR
Harman UK

TELEPHONE
01707 278113

WEBSITE
eu.akg.com

One of the brands that forms the Harman Group, AKG remains proud of its Austrian roots and the Q701 is emblazoned with a little 'Made in Austria' tag on each earpad. While the links to Vienna are strong, the company's US heritage is also on display too as the Q701 boasts design input from the one and only Quincy Jones.

The Q701 (the Q referencing Quincy) is built around a pair of 45mm 'Varimotion' drivers, which use a diaphragm of differing thickness across the surface area. These are placed in large circular earpads. They are described as a semi-open-back design, and when the substantial cloth pads are removed from the calculations, these are some of the thinnest housings in the test. This should not be taken to mean that the AKG feels flimsy, however. The build quality is well up to the standards of the group and feels substantial without leaving the Q701 feeling too heavy, which is always a clever touch.

The Q701 comes supplied with a 3m cord, which makes home use a breeze, although I can't pretend I'm completely sold on the lurid green colour of the jacket. The styling is an acquired taste with green stitching and a slightly tacky Quincy Jones motif on the headband, but it's a comfortable enough headphone to wear for long periods of time. The earpads completely cover the ear and although the pressure exerted on the side of the head is significant, it isn't so much they dig in. The use of a second inner band made of leather with a clever automatic size adjustment to keep them in place means they are among the best in test for moving about in, although they leak as much noise as you might expect from an open-back design, which probably rules them out for travel use.

Sound quality

The AKGs need a fair amount of input power to hit the test level due to the low sensitivity, but present no challenge for the Chord Hugo. The performance across the test material is largely positive too. The 'phones manage to sound airy and spacious with material and this adjusts well to the context of the music, be it giving the intimacy of Emily Barker enough space to sound convincing or capturing the vastness of the arena that Kraftwerk performs in.

This space is underpinned by bass that is well defined and free of any sense of sluggishness although it isn't the deepest or most powerful on offer. It does integrate well with the other frequencies, though, and there is plenty of detail on display. As the complexity of pieces increases, the AKG loses touch with the very best in the group – the harpsichord in the Max Richter reworking of *Spring* is rather subdued and some of the crowd noise in Kraftwerk is hard to pick out. There is also a sense that the dense and slightly harsh Nirvana recording doesn't show the Q701 at its best. Kurt Cobain's vocals are not perfectly separated from the

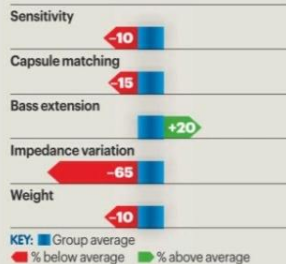


HEADPHONES GROUP TEST

ON TEST

AKG claims a sensitivity of 105dB SPL for 1V for the Q701, but we measured a little less than that: 103.1dB at 1kHz, averaged for the two capsules. This makes the AKG the lowest-sensitivity model in this group, less sensitive even than the high impedance Sennheiser. Impedance modulus varies from 60ohms to 92ohms over the audible frequency range (20Hz-20kHz) and so it takes a source resistance of only 27.3ohms to cause a 1dB alteration of frequency response. With the exception of the Final Audio Design, this is the lowest (ie worst) figure in the group. Capsule matching error was a little worse than average at ±8.1dB, 40Hz-10kHz, but bass extension was second best here at a fine 18Hz. Diffuse-field correction of the frequency response indicates a tonally neutral sound above 600Hz, but below that an excess in output amounting to about 4dB at 100Hz. **KH**

RESULTS AT A GLANCE



partnering instruments and the presentation is a little shallow.

The AKG does manage to get plenty right, though. With the more uptempo pieces and during more general listening it always manages to keep an energy and sense of life to the performance that makes it easy to listen to for long periods. Although it proves perfectly happy at the test level, it is worth pointing out that the Q701 starts to sound a touch hard and sibilant when pushed to higher volume levels than this. Overall though, given the solid build, competitive and falling asking price, this is a strong performance from a generally very likeable headphone. ▶

Hi-Fi Choice

OUR VERDICT

SOUND QUALITY



LIKE: Lively sound; solid build; price

VALUE FOR MONEY



DISLIKE: Can sound a little strident at high levels; looks not for all

BUILD QUALITY



WE SAY: A strong showing from one of the more affordable models, but there are some weaknesses to the performance

FEATURES



OVERALL



Audio-Technica ATH-AD900X £315

The looks are Spartan, but is beauty more than skin deep with one of the test's more wallet-friendly models?

DETAILS

PRODUCT
Audio-Technica
ATH-AD900X

ORIGIN
Japan/China

TYPE
Open-back, over-ear headphones

WEIGHT
265g

FEATURES
• 53mm drivers with CCAW voicecoil
• 3D Wing Support headband
• Fixed 3m cable

DISTRIBUTOR
Audio-Technica UK

TELEPHONE
0113 2771441

WEBSITE
audio-technica.com

Better known in hi-fi circles for its range of phono cartridges, Audio-Technica has been producing headphones for decades and has an extensive lineup. This is one of a five-strong family of open-back designs and sits in the middle of the range. Compared with the other models here, the ATH-AD900X is best described as 'functional'. The design is dominated by the large circular earpads that each mount a single 53mm driver – one of the largest in the test. These use an Audio-Technica trademark in the form of copper clad aluminium wire in the voice coils. The driver mounting is completely visible and is the only real colour on the otherwise exclusively black 'phone.

This is among the least expensive in the test, but this doesn't necessarily reflect in the overall construction. Everything feels solidly assembled without being unduly heavy or bulky and there are some useful touches to improve comfort and longevity like the point where the cable meets the

earpad being a rotating cuff to reduce stress. The 3m cord is fixed and as such is ideal for home use, but a little on the long side for moving around. The ATH-AD900X makes use of Audio-Technica's '3D wing support housing', which consists of two independently sprung pads that adjust to the head. In this instance I'm not completely convinced. The spring weighting seems a little low and this means that the headphone is mainly supported on the earpad. This being said, it is far from uncomfortable and is easy enough to wear for longer periods of time. Like the other open-back headphone designs, there is a fair amount of leakage, making it unsuitable for use out and about.

Sound quality

The Audio-Technica demonstrates better than average sensitivity and needs a little less output from the Chord Hugo to reach the test level. Having done so, it puts in a performance that is defined by some aspects that are consistent across all the test pieces. The most significant is that the Audio-Technica presents the sound very close to the ear, giving less sense of depth than the other models. This is not always a negative; it lends the Emily Barker track an intimacy that is extremely pleasant, but the larger scale of the Kraftwerk recording is not captured anything like as effectively.

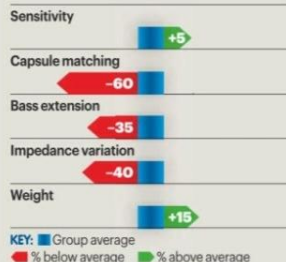
This slightly shallow presentation can mean that fine details are harder to pick out from the mix and the very dense Nirvana piece is slightly disjointed with little separation between voices and instruments. This is a shame because there is a tonal sweetness to the ATH-AD900X that makes it extremely easy to listen to and able to generate very high volume levels without sounding forced or strained. This sweetness doesn't come at the expense of tonal realism either, with vocals in particular sounding entirely believable and well defined. The performance is underpinned by bass that is detailed and well integrated

HEADPHONES GROUPTEST £300-£500

ON TEST

Audio-Technica claims a sensitivity of 100dB SPL for 1mW for the ATH-AD900X, which for its nominal impedance of 38ohms is equivalent to 114.2dB for 1V. Our measurements suggest this is conservative, our 1kHz figure being 117.8dB, making the AD900X the most sensitive model in the group bar the Final Audio Design. Measured impedance varied between 35.8ohms and 44.4ohms, 20Hz-20kHz, a smaller relative variation than the AKG's and so a higher 45.9ohms source resistance is required to change the frequency response by 1dB. Capsule matching error was worst in group at ±11.3dB, 40Hz-10kHz, suggesting that the AT's response is more dependent on ear shape. Bass extension was the poorest in the group at 39Hz and the diffuse-field-corrected frequency response suggests a mild upper-bass prominence and distinctly suppressed presence band. **KH**

RESULTS AT A GLANCE



with the rest of the frequency response, but doesn't necessarily demonstrate greater depth or impact that might be expected from a driver of the size used in the earpad.

As one of the least costly in this test, the ATH-AD900X is capable of some very pleasant performance traits and is able to keep the more expensive headphones on their toes. Perhaps more than any other model in this roundup, though, the Audio-Technica gives a presentation that is more obviously headphone based, and for anyone listening to larger scale pieces of music, the lack of depth in its presentation may prove a little too restrictive for some to truly enjoy ● ▶



Hi-Fi Choice

OUR VERDICT

SOUND QUALITY

★★★★☆

LIKE: Tonally sweet but believable sound; reasonable sensitivity; solid build

VALUE FOR MONEY

★★★★☆

DISLIKE: Presentation lacks depth and space; not very attractive

BUILD QUALITY

★★★★☆

FEATURES

★★★★☆

WE SAY: Some likeable traits, but constrained performance may be a problem

OVERALL

★★★★☆

Beyerdynamic

T90 £500

Does the most expensive model in the roundup do enough to justify the asking price?

DETAILS

PRODUCT
Beyerdynamic T90

ORIGIN
Germany

TYPE
Open-back, over-ear headphones

WEIGHT
425g

FEATURES

- 'Tesla' high magnetic field drivers
- Leather carry case
- Velvet microfiber earpads

DISTRIBUTOR
Polaraudio Ltd

TELEPHONE
01444 258258

WEBSITE
europe.
beyerdynamic.com

This headphone is among the second tier of Beyerdynamic's extensive range. It is an open-back design that is built around a pair of dynamic drivers utilising a feature Beyerdynamic describes as using 'Tesla' technology. This uses a very strong magnetic current to motivate the driver, which in turn is lighter – and hopefully more responsive.

While the drivers might be lighter, the T90 itself is the heaviest model in the roundup and this weight is compacted into a fairly small space as the earpads are some of the smaller models here. Having said that, they're still large enough to comfortably enclose the ear.

The construction is generally excellent with high-quality materials used throughout and a general impression that a considerable amount of attention has been lavished on their design. The end result is a handsome and fairly understated pair of headphones and something that is comfortable to wear for extended

periods of time with the weight being perfectly distributed across the head.

There are some minor black marks, though. The 3m cable is captive and makes do with a standard plastic moulding where it joins the earpad and there is further visible (and, therefore, vulnerable) cable between the housing and the headband. What Beyerdynamic takes with one hand it gives with the other, however, as the T90 is supplied with an excellent carry case. This is something you might actually make use of as, although the headphone is open backed, noise leakage is lower than some of the other models here and coupled with the smaller size, makes it a viable choice for use out and about as well as at home.

Sound quality

The T90 is among one of the less sensitive headphones in the test and requires more power from the Hugo to reach the test level. Having achieved this, though, it makes a strong case for itself from the outset. The word that keeps cropping up in the listening notes is "smooth", but this is rather deceptive and does the T90 something of a disservice. The presentation is extremely well controlled, which means that there is absolutely no trace of noise or harshness to it. The result is a headphone that manages to handle pretty much everything that you can throw at it.

As well as this control, it also has an exceptionally spacious presentation that allows for a completely convincing performance of even very sizeable recordings, while sounding suitably intimate with smaller ones. The way that the T90 handles the Kraftwerk piece in particular is comfortably the best in the group with a vast, detailed and completely immersive soundstage. The bass response is equally accomplished with plenty of power and authority to it. There is also a sense of excitement with the more up-tempo performances that makes this headphone a compelling listen.

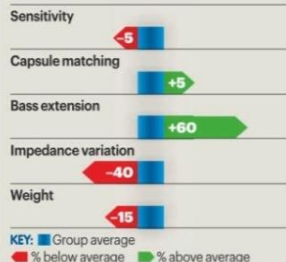


HEADPHONES £300-£500 GROUPTEST

ON TEST

Beyerdynamic claims a sensitivity of 102dB for 1mW at 500Hz for the T90, equivalent to 108dB for 1V input across the nominal 250ohm impedance. We measured a figure a little less than this – 106.3dB, averaged for the two capsules – at 1kHz, a low figure but to be expected given the T90's high impedance. This varied from a minimum of 240ohms to a maximum of 730ohms, 20Hz-20kHz, which means that a source resistance of 45.8ohms will result in a change in frequency response of 1dB, a surprisingly low figure for a high-impedance headphone. Capsule matching error was mid-pack at ± 7.0 dB, but bass extension was best in group at an impressive 10Hz. The diffuse-field-corrected frequency response, though, suggests an element of 'boom and tizz' to the T90's tonal balance, with a broad low frequency hump of over 6dB at 100Hz and a treble peak of almost 7dB at 6kHz. **KH**

RESULTS AT A GLANCE



None of this comes at the expense of a believable and accurate tonal presentation, though. The Max Richter piece is presented with absolute conviction and every instrument has the space it needs and a tangibly real weight and decay to the strings. This is equally apparent with the Nirvana track and it does a better job than any of the other headphones in the test at opening out dense and aggressive recordings. The Beyerdynamic isn't cheap, but the consistent ability it shows across all genres and recording qualities is a class apart, and combined with the solid build and high comfort levels, you have a winning package. ▶

Hi-Fi Choice

OUR VERDICT

SOUND QUALITY
★★★★★
VALUE FOR MONEY
★★★★★
BUILD QUALITY
★★★★★
FEATURES
★★★★★

LIKE: Superbly enjoyable sound; solid build; high comfort

DISLIKE: Not cheap; rather heavy; slightly insensitive

WE SAY: Not without some minor foibles, but this is a superbly accomplished headphone

OVERALL



Final Audio Design Pandora Hope IV £400



Can the high-end Japanese brand come up with a performance to match the rather exotic monicker?

DETAILS

PRODUCT

Final Audio Design
Pandora Hope IV

ORIGIN

Japan

TYPE

Closed-back, over-ear headphones

WEIGHT

410g

FEATURES

- Balanced Air Movement' design
- Hybrid dynamic driver and armature driver arrangement
- ABS Plastic chassis

DISTRIBUTOR

KS Distribution

TELEPHONE

01903 768919

WEBSITE

final-audio-design.com

One of the more elusive Japanese brands, Final Audio Design has come up with some unashamedly high-end equipment, but recently has focussed exclusively on headphones and earphones – many of which are still very exclusive products. The splendidly titled Pandora Hope IV is the cheaper of two over-ear designs (the other being the Pandora Hope VI) and is the only model in the test that isn't open back. Its type is a little harder to quantify as the Final is listed as a closed-back design, but one that uses something called Balanced Air Movement to improve air flow. The result is that it leaks pretty much the same levels of noise as the other models in the test, suggesting that sound is escaping from somewhere. Internally this headphone is also a deviation from the rest of the test. A pair of 50mm drivers are used for the bass and midrange, but these are joined by a balanced armature for the treble, which is mounted in front of the main driver. This doesn't affect

the overall dimensions of the Final, which is one of the smaller designs in the group. The styling is pretty bold too. The Hope IV isn't quite as Dan Dare as the bigger Hope VI, but it is still probably the most interesting design here. It is comfortable too, with the weight being well distributed across the head and the pads exerting enough traction to keep the Final in place without digging in.

The news isn't entirely good, though. It is supplied with a 1.5m cord, which is realistically a little too short for home use, and thanks to the unique locking connectors on the headphone end, isn't something that is easily replaced.

Sound quality

The Pandora Hope IV is comfortably the most sensitive headphone in the test and requires less power than any of the others to reach the test level. Having done so, the overall presentation is distinctive, but generally likeable. The dedicated armature for treble does make its presence felt with a well-lit and detailed top end that manages to avoid tipping over into outright brightness with most material – even with high volume levels. This is in turn underpinned with deep and usefully powerful bass that is pleasingly energetic.

The Emily Barker recording sounds pleasantly lively, but Kraftwerk is where this energy really makes itself felt and the Final has a liveliness that is consistently engaging.

The Pandora Hope IV has to give ground to the best in the group in terms of the midrange between these two frequency extremes, however. Like the rest of the performance, it is smooth and usually civilised, but there is a loss of fine detail in this area that means that it never really extracts the information from the Max Richter piece that some of the other models manage to find. This is coupled with a reduction in the sense of scale in pieces that depend on the midband being opened out and presented with a greater sense of

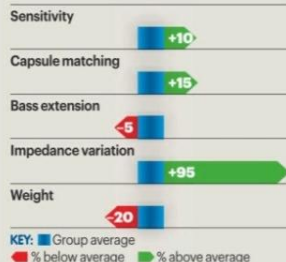


HEADPHONES GROUP TEST £300-£500

ON TEST

The Pandora Hope IV is a bit unusual in terms of its measurements. It has a nominal impedance of just 8ohms – something you might expect of a loudspeaker, but not a headphone. One positive outcome is that the Pandora Hope has the highest sensitivity of the group at 123.1dB SPL for 1V input at 1kHz, but exploiting this will require that the source has sufficient current capability. It will also have to have very low output resistance because impedance varies from a minimum of 8.8ohms to a maximum of 16.6ohms – a 2:1 ratio that means a mere 2.7ohms source resistance will introduce a frequency response modification of 1dB. Capsule matching error was better than the group average, though, at ± 6.0 dB, and 25Hz bass extension is about par too. But the diffuse-field-corrected frequency response looks very ragged, with an upper-bass peak of about 8dB. **KH**

RESULTS AT A GLANCE



space. On tracks like the Nirvana recording, this is far less important than the Final's sheer drive and energy and the Pandora makes a commendable effort at making sense of the dense and abrasive recording.

As one of the mid-priced models in the test and one of the better (in an admittedly generally unsuitable field) models for use on the move, the Final makes a commendable degree of sense and the useful sensitivity makes it an unfussy partner.

As a home headphone, the decidedly short cord combined with a slight lack of finesse ultimately deny it the top spot, but this is still more than just a classy name ●

Hi-Fi Choice

OUR VERDICT

SOUND QUALITY

★★★★★

LIKE: Energetic performance; sensitive and comfortable

VALUE FOR MONEY

★★★★★

DISLIKE: Slightly recessed midrange; short cord; looks are a matter of taste

BUILD QUALITY

★★★★★

FEATURES

★★★★★

WE SAY: An unusual 'phone that produces a likeable sound

OVERALL

★★★★★

Sennheiser

HD 650 £400

Having won more than its fair share of headphone roundups, can the old pro come up with the goods?

DETAILS

PRODUCT
Sennheiser HD 650

ORIGIN
Germany/Ireland

TYPE
Open-back, over-ear headphones

WEIGHT
260g

FEATURES
• Handpicked pair matched drivers
• Magnets chosen to reduce intermodal distortion
• Lightweight voicecoils for improved transient response

DISTRIBUTOR
Sennheiser UK

TELEPHONE
0203 0144 152

WEBSITE
sennheiser.co.uk

Of all the models here, the Sennheiser has been around the longest and has been something of a mainstay at this price point. The HD 650 is an open-back design that is built around a pair of dynamic drivers of an undisclosed size. While no exact figure has been quoted for them, Sennheiser is at pains to point out that it takes exceptional care in pair matching the drivers and performance is further boosted by optimised magnets and a specialised damping element that's been applied to the entire diaphragm.

So far so good, but the chassis that Sennheiser has wrapped these drivers in is not without some design foibles that may or may not infuriate. The earpads are the largest in the test and the result is that even as a full-sized adult, I find that the pad actually rests partly on the hinge of my jaw, which is not conducive to a comfortable fit. Sennheiser then proceeds to apply an extremely high level of compression to the headband that means that the

force applied by the earpads is very high. When this is combined with padding that looks similar to the other headphones here, but doesn't offer much 'give', you have the least comfortable offering in the test.

The overall build is of a very high standard, however. Everything feels very solid despite the impressively low weight and the titanium finish is attractive. The 3m cord is detachable to reduce strain and make packing easier. This cord is the only one in the test fitted with a fixed 6.35mm jack, although a 3.5mm adapter is supplied. Given that it leaks a tremendous amount of noise through the open-back earpads, it would probably not be the most appropriate choice for use on the move.

Sound quality

The HD 650 requires a reasonable amount of power to reach the test level and having done so, demonstrates a number of likeable traits interspersed with some less desirable ones. There is plenty of power and authority to the presentation and there is a pleasing amount of fine detail too. Barker's vocals are well handled and it manages to emphasise the considerable amount of different percussion used in support. There is plenty of energy to the performance too. Kraftwerk is given a potency that is tremendously entertaining and effective at capturing the flavour of the live performance.

At the same time, some of the same limitations that affect the Audio-Technica are on show here. The performance never has much sense of depth and space to it with everything presented in a shallow fashion in front of the ear, which can rob pieces that need more room to sound believable. This is partnered with a midrange that can feel rather thick and slow at some points. While this same thickness can be useful with vocals and in particular at adding a welcome touch of civility to the Nirvana recording, it leaves the orchestra of Richter sounding a little

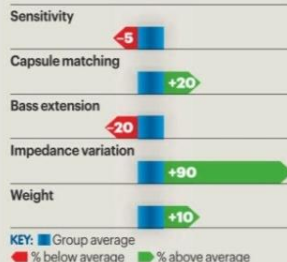


HEADPHONES GROUPTEST

ON TEST

Sennheiser claims a sensitivity for the HD 650 of 103dB SPL, but specifies no input. It seems that 1V may be the missing value as we measured 106.4dB sensitivity at 1kHz for this input. This is the second-lowest in the group but is explained by the HD 650's high impedance, nominally 300ohms. Over the audible frequency range we measured a minimum of 307ohms and a maximum of 433ohms, which makes the Sennheiser unusually insensitive to source resistance: it would take 183.2ohms in series to produce a 1dB change in frequency response. Capsule matching was better than the group average at ± 5.9 dB whereas bass extension was slightly worse than average at 31Hz. The diffuse-field-corrected frequency response indicates that the HD 650's perceived tonal balance will be on the warm side, with mildly elevated upper bass (+3dB) and a slight shortfall in presence band output. **KH**

RESULTS AT A GLANCE



lead and lacking the wonderfully open presentation of rivals like the Beyerdynamic and Shure. It is also worth noting that while the HD 650 is civilised at the test level, it's already showing a touch of harshness during dynamic peaks and further increases to volume lead to it becoming rather hard and brittle.

The HD 650 does a great deal right – the design has clearly been thought through and the solid build combined with light weight is welcome. The limitations to comfort and the lack of absolute clarity and depth compared to rivals deny it the honours this time despite the liveliness it can bring to many types of music. ▶

Hi-Fi Choice

OUR VERDICT

SOUND QUALITY
★★★★★ **LIKE:** Powerful and lively sound; excellent build; light weight

VALUE FOR MONEY
★★★★★ **DISLIKE:** Not very comfortable; can sound a little thick and lacking in depth

BUILD QUALITY
★★★★★ **WE SAY:** Well thought out, but some foibles make long-term listening less enjoyable

FEATURES
★★★★★

OVERALL



Shure SRH1840 £467

Can Shure translate its enormous success in the high-end earphone domain to the world of headphones?

DETAILS

PRODUCT
Shure SRH1840

ORIGIN
USA/China

TYPE
Open-back, over-ear headphones

WEIGHT
268g

FEATURES
• Pair matched drivers
• Lightweight metal chassis
• Zip bag with replacement earpads supplied

DISTRIBUTOR
Shure UK

TELEPHONE
01992 703058

WEBSITE
shure.co.uk

This is one of the more recent arrivals in the test and marks something of a departure for Shure, which is better known as a manufacturer of high-end earphones. The SRH1840 is the flagship of the increasingly large range. The open-back design is built around a pair of 40mm neodymium drivers that, like the Sennheiser HD 650 are pair matched by hand. Indeed, the Shure and the Sennheiser have more than a little in common with each other visually and the American offering also makes use of oval earpads.

Put it on your head, though, and the differences between the two designs become rather more apparent in favour of the Shure. It might be a similar shape and 8g heavier than the HD 650, but the SRH1840 is vastly more comfortable – indeed it's one of the most comfortable headphones I've worn full stop. The weight distribution, spring loading and the resistance of the earpads combine to give the most unobtrusive and

comfortable fit of the test, providing an elegant lesson in ergonomics.

This comfort is backed up with excellent and well thought out ancillaries. It is supplied with a hard shell carry bag and replacement pads as standard and should anything unpleasant happen to those, replacements are available directly from the Shure website as is another example of the 2.1m detachable cable. The build quality is excellent too – there's nothing showy about any aspect of the headphone and I'd hesitate to call it pretty – but everything has been assembled with a view to it lasting a long time and being easy to sort out and repair if it does go wrong. As an open-back design, it leaks a lot of noise but given that Shure has the closed-back SRH1540 at the same price, there is a more suitable portable option.

Sound quality

The Shure is not especially sensitive, but doesn't place any undue demands on the Chord Hugo to reach the test level. Once there, it demonstrates generally excellent performance. There is an impressive balance of realism and excitement. Detail retrieval is among the very finest in the test and even extremely subtle nuances can be picked out of the performance. Everything sounds convincing and well proportioned, but there is a sense of life and excitement that makes Emily Barker enjoyable rather than simply a reference exercise.

The sense of space that the Shure generates is also truly exceptional. The large scale Kraftwerk and Richter recordings are given all the space they need and when you combine this with the very high levels of comfort, you have a headphone that can really perform in a way that allows you to forget that you are wearing it. This effortless presentation is underpinned by bass that while not as seismic as the Beyerdynamic or AKG, is detailed, clear and seamlessly integrated with the upper registers. The SRH1840 is also able to be driven to high levels

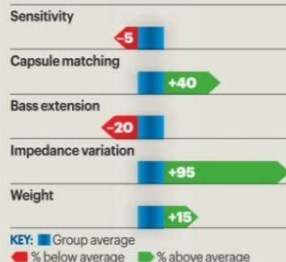


HEADPHONES **GROUPTEST**
£300-£500

ON TEST

Shure claims 96dB SPL sensitivity for 1mW input for the SRH1840, equivalent to 107.9dB for TV across its nominal impedance of 65ohms. Our measured figure matches very closely with this, the capsule average being 108.6dB at 1kHz. This is quite a low figure but is partly explained by that impedance, which is higher than for many modern medium-impedance headphones. We measured an impedance range of 62.0ohms to 73.2ohms across the audible range, which makes the Shure almost as insensitive to source resistance as the high-impedance Sennheiser: 152.4ohms in series would be needed to introduce a frequency response modification of 1dB. Capsule matching was tightest of the group at ± 4.2 dB, but bass extension was a little poorer than average at 32Hz. The diffuse-field-corrected frequency response was easily the flattest here, suggesting a neutral tonal balance. **KH**

RESULTS AT A GLANCE



without displaying any signs of hardening up or aggression.

The Achilles' heel appears with the Nirvana recording, hi-res or otherwise, which isn't flattered by the accuracy and detail that the SRH1840 can extract. *Come As You Are* is presented as a dense and confused mass of voices and instruments largely because it is. Shure hasn't completely set aside its pro audio heritage, which means the more forgiving Beyerdynamic is the better all rounder. It is hard to ignore the SRH1840's ability to disappear with some material and depending on your listening preferences, this is a must audition and a mighty fine effort. ▶

Hi-Fi Choice

OUR VERDICT

SOUND QUALITY
★★★★★
VALUE FOR MONEY
★★★★★
BUILD QUALITY
★★★★★
FEATURES
★★★★★

LIKE: Accurate, detailed and extremely involving sound; excellent build
DISLIKE: Merciless with poorer recordings
WE SAY: An excellent headphone that has much to offer listeners of better quality recordings

OVERALL



Group test verdict

He's had his head nodding to the beat with this month's cans and now it's over to **Ed Selley** to find out which headphones get his nod of approval

NONE OF THE headphones here are free of merit, but Audio-Technica's ATH-AD900X is perhaps the most restricted. The tonality is good and it is well priced, but the shallow sound, average comfort and rather Spartan appearance count against it. The AKG Q701 and Sennheiser HD 650 are both headphones that manage to excel in some areas, but fail to deliver in others. Both are well built and capable of delivering a powerful and lively sound, but the AKG doesn't always handle more complex pieces with the assurance it needs to and also lacks a little depth. The

Sennheiser is better able to handle poorer recordings, but also sounds a little constrained. More significantly, the discomfort is a real impediment to long-term enjoyment and I'd urge you to try before you buy.

The Final Hope Pandora IV hovers on the boundary between unusual and outright weird. The strange looks, odd driver arrangement and curious measurements all require a little caution, but the end result is a very enjoyable listen. The forgiving nature with poorer recordings is also welcome. Only the slightly recessed and congested midrange and the

annoyingly short cord prevent this Japanese curiosity from climbing further up the rankings.

The Shure SRH1840 is the other reason why the Final is denied a higher placing. This is a genuinely excellent headphone and an object lesson in comfort and ergonomics. The build quality is fantastic and the quality of the ancillaries is also absolutely superb. This is then topped off with an accurate and consistently entertaining performance and only a slightly ruthless nature with less perfect material robs it of top spot.



WINNER

The Beyerdynamic T90 delivers the best all-round performance. It keeps pace with the Shure in all regards, but with less perfect material manages to keep all of its excellent attributes. When you consider the build, comfort and ancillaries it's a worthy winner.



Make/model **AKG**
Q701



Audio-Technica
ATH-AD900X



Beyerdynamic
T90



Final Audio Design
Pandora Hope IV



Sennheiser
HD 650



Shure
SRH1840

	AKG Q701	Audio-Technica ATH-AD900X	Beyerdynamic T90	Final Audio Design Pandora Hope IV	Sennheiser HD 650	Shure SRH1840
Price	£300	£315	£500	£400	£400	£467
Sound	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Value	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Build	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Features	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
Overall	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★	★★★★★
	A strong showing from an affordable model, but there are weaknesses	Some likeable traits, but the constrained performance is a bit of a problem	Not without some foibles, but this is a really accomplished headphone	A rather unusual headphone that produces a likeable sound	Well thought out, but some foibles make long-term listening less enjoyable	An excellent headphone that excels with better quality recordings

Key features

	AKG Q701	Audio-Technica ATH-AD900X	Beyerdynamic T90	Final Audio Design Pandora Hope IV	Sennheiser HD 650	Shure SRH1840
Open-back	Yes	Yes	Yes	No	Yes	Yes
Closed-back	No	No	No	Yes	No	No
Carry case	No	No	Yes	No	No	Yes
6.35mm adaptor	Yes	Yes	Yes	Yes	No	Yes
Detachable cable	Yes	No	No	Yes	Yes	Yes

TRY WITH THESE

HEADPHONE AMP: Musical Fidelity M1 HPA P £500

The original M1 HPA was a peerless headphone amplifier with the insight and authority to work well with a range of headphones and the updated HPA P should prove an equally talented partner for any of the designs here. **HFC 365**



PORTABLE SOURCE: Astell & Kern AK240 £2,200

The ultimate portable player needs some talented cans to get the best out of it and the bewildering variety of formats that it supports. It has the power to work with the least sensitive designs here for a fine portable audio system. **HFC 387**



HEADPHONE AMP/DAC: Chord Hugo £1,400

The Chord was used to run the test and this amazingly talented half a hi-fi in a tiny, beautifully finished box would be a fine partner for any of these designs with enough power on tap to drive any of them to any level you see fit. **HFC 386**

