Tannoy Eyris DC1

Bookshelf Loudspeakers

The 'Dual Concentric' loudspeaker is a thing of beauty. It's also a thing of great cost. Look at a cut-away diagram of one of Tannoy's dual concentric drivers and you'll appreciate why they're so difficult to manufacture. So difficult indeed, that it's hardly surprising that Tannoy has ended up being based in Scotland, a country with a proud history of engineering excellence, and where it builds its drivers and cabinets.

Indeed Tannoy's original design of its dual concentric, developed in 1946 (but released two years later) was so difficult to manufacture that a new version was eventually developed, and it's that newer version that is used in the Eyris DC1. The newer design—along with the development of new materials—also permitted some miniaturisation of parts (previously impossible) which is one reason the Eyris DC1's bass/midrange driver now has a diameter of just 175mm, so it's a true 'bookshelf' model.

The Equipment

If you've looked closely at the photograph of the Eyris, you'll probably be wondering why there's an 'extra' tweeter positioned right at the top of the cabinet. What you're looking at is not a tweeter but Tannoy's latest supertweeter, which has a 25mm diameter dome made of titanium that's only 25 microns thick. This means that while you can look, you can't touch! As Tannoy says in its manual '*It is essential that the SuperTweeter diaphragms are not touched: any damage will destroy performance and require specialist repair by your Tannoy dealer. Any such damage will not be covered under warranty.*'

Tannoy makes certain you can't touch the diaphragm accidentally by providing a tough metal grille to sit over the supertweeter. This grille is held in place by a magnetic field, so it's easy to remove and replace... though you have to keep a tight grip on the grille to make sure it doesn't accidentally get 'pulled' onto the dome, rather than the dome surround. Why would you be removing and replacing the grille? Again, in the words of Tannoy's manual: '*For ultimate fidelity the enthusiast will appreciate the slight improvement in clarity and detail that is achieved by removing the grilles when listening.*'

The supertweeter starts operating at 16kHz (with a third-order filter preventing lower frequencies from getting in) and takes high-frequency performance out to 51kHz. Why 51kHz when it's generally accepted that human hearing fizzles out at around 20kHz? Firstly, the 20kHz figure often bandied about is not an upper brickwall limit, but an average based on mathematical analysis of measurements of thousands of subjects. If you test 1,000 volunteers and find 50 per cent can hear frequencies up to 30kHz and 50 per cent can hear frequencies to only 10kHz, the math says the 'average' is 20kHz. So designing a speaker that stops at 20kHz will be

Tannoy

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Model: Eyris DC1
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fine for the 50 per cent of people whose hearing didn't make it that far, but not for the other 50 per cent that did!

That in itself is revealing of the falsity of oft-repeated truisms, but what's even more interesting (perplexing, even!) is that tests have shown that people who can't hear individual test tones with frequencies above 20kHz can still reliably tell the difference between musical examples that contain frequencies above 20kHz and the same examples that have been deliberately band-limited to remove frequencies above 20kHz—frequencies they'd been proved to be unable to hear!

Acousticians have yet to agree on just how this could be possible, but that's what tests by two independent research studies have shown. [T. Oohashi et al, High-Frequency Sound Above the Audible Range Affects Brain Electric Activity, AES Preprint No. 3207 and M. Lenhardt et al, Ultrasonic Speech Perception, Science, Vol. 253 (July 1991).]

Tannoy's view is that the ear is not hearing the sounds themselves, but artefacts caused by the inevitable phase anomalies that occur in music that's been band-limited for one reason or another. This rationale was explored by no less a figure than W. Marshal Leach [Differential Time Delay Distortion and Differential Phase-Shift Distortion as Measures of Phase Linearity, JAES, Vol. 37, No. 9].

This emphasis on phase accuracy is significant for another reason: Dual-concentric drivers are the only ones that preserve the phase accuracy of a musical signal across the crossover point. Conventional loudspeakers can be phase-correct at the crossover point (though this necessitates an increase in the cost and complexity of the crossover network), but even this cannot correct the phase of harmonics of notes whose fundamentals lie beneath the crossover point.

As if dual concentrics didn't have enough going for them already, there's the additional incentive that a dual concentric driver is a true point-source design, so that no matter where you sit in relation to the speakers, or whether you have the speakers on their side—or even upside down—all frequencies will arrive at your ears at exactly the same time, with perfect phase-coherence. In a multi-driver system, the sound from the driver that's furthest away will always reach your ears slightly later than the signal from the others. It's true the designer of a multi-way system can correct for this in the crossover network, but since it's possible to do this only for only a single listening position, with a single orientation of the loudspeaker cabinet, it's not really a workable solution, no matter what the glossy advertising might say.

The cone that encircles the high-frequency driver in the Eyris is rated with a diameter of 175mm, but this is the overall diameter of the driver, from one edge of the chassis to the other edge. The more important Theile/Small dimension, which reveals how much air a cone can move effectively, is 127mm. In a conventional driver, this would mean an effective cone area (ECA) of 126cm^2, but because there's a 40mm diameter exit 'throat' for the tweeter in the centre of the cone, the ECA is actually a few square centimetres less. The cone itself is made from paper, and the surround suspension from rubber.

Immediately below the dual concentric is the front-firing bass reflex port, which is approximately 36mm in diameter and 125mm long. It has a shell-like spiral pressed into its surface at the exit flare that reduces turbulence, preventing port noise.

The terminal plate on the rear panel is extremely unusual. It's circular rather than rectangular and there are five speaker terminals rather than the more normal two or four. Four of these terminals permit bi-wiring, the extra terminal is a 'ground' or 'earth'—not for the negative speaker connection, but for connection to the shield on a speaker wire so equipped (one with two conductors and a shield), or so you can run an extra wire from your amplifier's earth terminal. However, despite this multiplicity of terminals, the plate is arranged so that you can, if you wish, run ordinary two-core speaker wires to the Eyris. Removing the plate revealed that bi-wiring the Eyris would be a definite advantage, because the crossover is two completely separate sections, with the high-pass filter located on one PCB and the low-pass filter on another. The low-pass section comprises two cross-mounted inductors (one air-core, one iron-core), two polyester capacitors and a pair of 5W ceramic resistors. The high-pass section comprises three inductors (one of which is air-cored), five capacitors (four polyester and one electrolytic) and four 5W ceramic resistors.

Above the terminal plate are four threaded sockets, indicating that the Eyris' can be wall-mounted using optional mounting plates.

The Eyris cabinets are made from 18mm MDF except for the front baffle, which is 30mm MDF, and there's extensive crossbracing inside the cabinet. Three real-wood veneer finishes are available: Sycamore, American Walnut and Black Ash. The cabinets are 460mm high, 196mm wide and 260mm deep, resulting in an internal volume of around 11 litres.

Performance

I'll bet that every dealer in the world that demonstrates these speakers to a customer for the first time will play a track that has a single female vocalist with just a single acoustic guitar as a backing, or perhaps an absolutely minimalist band. Why? Because with such a track, played at a 'live sound, you are in the audience' volume level, the sound quality of the Eyris DC1s is absolutely spellbinding. I did exactly the same thing, just because I like the feeling of the hairs on the back of my neck standing on end, and I was able to do this with the Eyris DC1s playing track after track after track, from Tracy Chapman's haunting

Behind The Wall ('Last night I heard the screaming…') which still affects me the same way it did when I first heard it 'way back in '88, through Joan Armatrading's *Me Myself I,* though I ended up with Sarah Vaughn on the heaviest rotation. If you haven't yet heard Sassy sing, do yourself a favour and make your first time with the Eyris DC1s. [Editor's Note: Lone Hill has recently released the CD 'Sarah Vaughn with Clifford Brown: Complete Recordings.' It was reviewed in the February issue of *Australian HI-FI* (Volume 37 No 1) by John Shand, who says it 'captures her at her least affected and most jazzy…a must!']

What I found most amazing about the DC1s is not so much the extraordinary dynamics of the speakers—and take it from me, they're extraordinarily dynamic, able to deliver power levels you wouldn't have dreamed possible from a small bookshelf loudspeaker, particularly at higher frequencies—as the *promise* of dynamics when the music is simply playing at a normal, fairly constant volume level. This characteristic is difficult to describe, but I am reminded of a famous chess anecdote, where first you have to know that in chess, a 'threat' is defined as what a player could do if he could make two moves in a row. Anyway, in one famous world-championship game, one of the players complained to the referee that his opponent had a cigar in his mouth (it's not permitted to smoke during chess tournaments). When the umpire pointed out that the cigar in his opponent's mouth was not actually lit, the complainant replied: 'Ah, but you know how he values a threat!'

Low bass is obviously not one of the DC1's strengths, though you will be pleasantly surprised by how much bass information is presented, and by the tight, clean way in which this bass is delivered. For bass freaks, adding a subwoofer would be mandatory, but if you're not a fan of subwoofers, and are desirous of more bass, the logical step up would be to the Tannoy DC3 floor-stander, but I'd listen to the DC1 before making your decision because, as I said, I think you'll be pleasantly surprised. The limiting factors in bass with the DC1s are the same that apply to *all* small bookshelf speakers, irrespective of band or price: it all comes down to driver area, cone travel and cabinet volume. Taking these as the base line, the Tannoys still score better than you'd expect, because the cone travel is considerable—and very linear even at the extremes of excursion.

High-frequency performance is demonstrably superior, proved easily by listening to high-pitched instruments, particularly bells and chimes, but listening to a violin solo—even on CD, rather than SACD or DVD-A—will still be a revelation. However, if you listen to live recordings made in small venues, of any type of performance, I think it will be the ambience around the music that you'll find most remarkable: the super-tweeter seems to lift the sense of being present during the recording to a whole new level.

No doubt there will be many comparing the Eyris DC1 with the Sensys DC1—if only because of the similarities in the model numbering! So far as appearance goes, it's chalk and cheese in my book. I can't see many people opting for the clunky Sensys design (which has a regularly-shaped rectangular cabinet with an eye-like supertweeter perched on top like a Triffid gone wrong) when they could be looking at the suave and elegant Eyris. If I had my eyes closed during such a comparison, I have to say that I'd still choose the Eyris DC1s, which seem to me to be more dynamic, with a smoother, more seamless sound and perhaps a tad more bass. However, if my wallet were to have a say, the price differential could swing the pendulum back towards the Sensys. Ultimately, it's the type of Solomon-like judgement that's always up to the individual, if only for reasons of individual personal circumstances.

I found the Tannoy Eyris DC1 were very amplifier-friendly and not overly fussy about the power levels made available to them: they worked happily with a low-powered home theatre receiver I keep for this specific purpose, though the sound quality obviously improved as the power available to the speakers became greater—though this would have been partly due to the quality of the amplifier improving, I dare say. That the Eyris DC1s perform well even with home theatre receivers isn't so surprising when you consider Tannoy obviously intends them to be used in home theatre systems, either as both front main left and right and surround speakers (with the Eyris DCC as the centre-channel), or as surrounds with the floor-standing Eyris DC3s up front and a DCC in the centre. Playing back movie soundtracks from DVD, the crispness and intelligibility of the dialogue from the Eyris DC1s was exceptional, particularly off-axis.

Conclusion

Tannoy's Eyris DC1s are excellent loudspeakers that will integrate into any room, both visually and acoustically, delivering a purity of sound that others can only hint at, primarily thanks to the dual concentric driver, but also because of the 'wideband' technology in the shape of Tannoy's thin-titanium super-tweeter.

James Ross

LAB REPORT

Readers interested in a full technical appraisal of the performance of the Tannoy Eyris DC 1 should continue on and read the LABORATORY REPORT published on the following pages. All 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.

Test Results

There's no doubting the linearity and extension of the Tannoy Eyris DC1 when you look at *Figure 1*, which shows its performance with a band-limited pink noise test signal. Barring the tiny incursion above the 80dB line between 100Hz and 170Hz, which would in any case be removed if trace smoothing were applied (the trace is not smoothed), the response extends from 48Hz to 30kHz ±2.5dB. And, as if this weren't impressive enough, look at the all-important midrange, where between 300Hz and 8kHz the response is easily within just a single dB of reference.

That midrange linearity is shown to even greater effect in *Figure 2*, which shows the high-frequency performance of the Eyris when measured with a different test stimulus, a gated sine signal. Look how the response seems to hug the 85dB line between 700Hz and 3kHz. Response starts spreading above this, but once again, remember that this is a completely 'raw' trace: the smoothing that's typically applied would obscure the peaks and dips. The extremely sharp and deep dip at 26kHz intrigued me: I'm not sure if it's a measurement artefact or a characteristic of the super-tweeter. Even if it were characteristic of the tweeter, the 'Q' is so high that the dip would be completely inaudible.

Figure 3 shows near-field measurements of the bass/midrange driver and the port. In this case, because of the co-axial design, it's not possible to make a truly accurate measurement of the driver above 200Hz, so it's only possible to consider the graphed response below this frequency. You can see that output starts falling fairly steeply below 100Hz, but does so in a controlled fashion. The port output shows it does quite a bit of work, no doubt accounting for most of the bass extension measured in the pink noise response. It appears the port has been tuned by ear rather than by a computer, because the maximum port output doesn't quite align with the driver minima, which obviously works with this design. One side-effect, however, is the obvious port resonance at around 1.2kHz. It would be better if this was not present, but it didn't appear to have any effect on the Tannoy's sound quality.

The final graph in the series shows the impedance modulus for both the left and the right speakers, with the two traces overlaid to give an impression of quality control. As you can see, everything is spot-on down to 150Hz, after which the traces start diverging ever so slightly until down near 20Hz, the lower of the two resonant peaks is at 19Hz in one speaker and 21Hz in the other. Across the audio band the impedance is well-behaved and remains generally high and easily controllable, with the minimum at 5.3Ω at 176Hz. Above 2kHz, however, the impedance falls and continues to fall until at 25kHz, it reaches 4.1Ω, where it appears to level out. Some amplifiers might experience difficulty driving such a low-impedance load at such a high frequency, so ensure you trial the Eyris with the amplifier that you will be using to drive them in your own home.

Like all small speakers, the Tannoy Eyris DC1 isn't particularly efficient at turning electrical energy into acoustic output, though the 85dBSPL at one metre (for a 2.83volt input) reported by *Australian HI-FI Test Laboratories* is a better result than most. Even so, it would be better not to skimp on amplifier power. *Steve Holding*

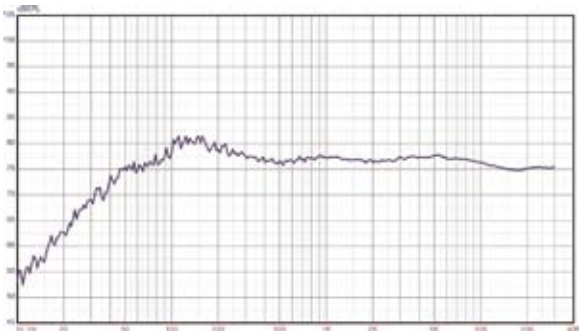

Figure 1: Pink noise frequency response (unsmoothed) at one watt at 1.5 metres.

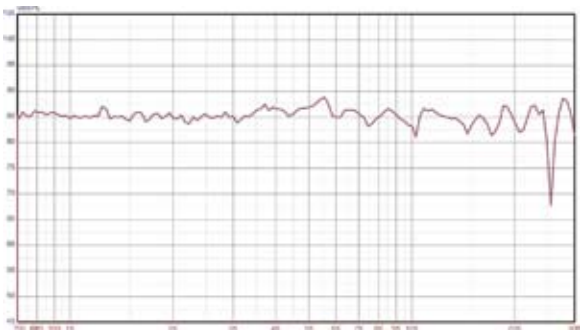

Figure 2: Gated sine frequency response (unsmoothed) at one watt, at 1.5 metres.

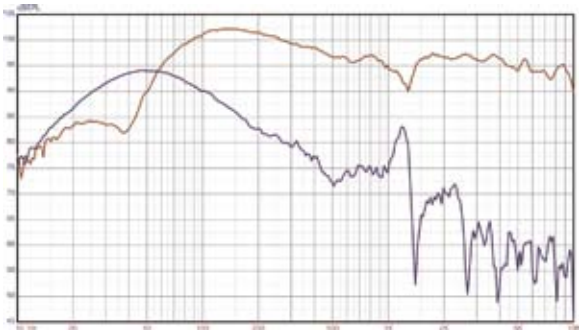

Figure 3: Nearfield frequency response of both bass drivers and reflex port. (Note data for ports has not been re-scaled to compensate for differences in radiating area.)

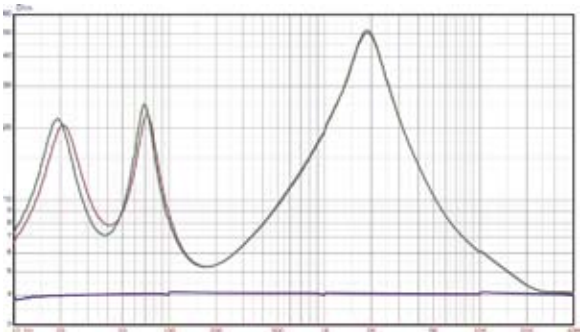

Figure 4: Impedance vs frequency, with both left and right speakers graphed (see copy). Trace under is that of a reference 4Ω precision resistor, measured at the same time for calibration purposes.