

A van den Hul profile

Having established his patented stylus tip, A.J. van den Hul took a physicist's approach to hi-fi cables.

by Steve Harris

A.J. van den Hul still has the microscope he inherited from his father, a recording engineer in the pre-war days, who had used it for checking wax masters:

'It is a very emotional piece of property. But with my first earnings, I bought a very good Zeiss binocular microscope. Advice: never use a point lightsource. Always use a fibre-optic ring light, so you can work underneath with no shadows.'

There is much of the professor about A.J. van den Hul: smiling kindly, explaining things patiently and precisely, but with a schoolboyish humour, as if he is afraid you might think that he took things too seriously. But looking into the microcosm of the diamond stylus or the crystal structure of a connecting wire, he has taken things seriously enough to help solve some of the major problems of audio. I asked him how it all started.

'When I was three, the World War started, and my father joined the Dutch resistance movement, and when he came back again in 1945, he was about finished. He died in 1948, and that was why I was left with a lot of his hobby articles but was never told how to deal with it. But it was the beginning of my hobby, and from 1948 I was building my first receiver, and building my first strongly-generating-over-the whole-band transmitter! But later I joined the Air Force, where I got a good education in radio and radar.

'Afterwards I entered the University, and began my work on measuring equipment, especially the proton accelerator. During that study, I was already teaching, and afterwards I continued, teaching physics in high school and technical high school. But in the late 1970s, as a result of the tip, I established my company.

'Coming from a more technical direction, you have to learn the language and the appreciation of sound. It's not just reproduction, it's reproduction with emotion. It's the emotional value which concerns me the most, how to translate emotional values into technical properties.

The line-contact stylus

'The van den Hul tip was thanks to a visit I made to a German manufacturer of stylus tips, who worked with equipment made of Meccano parts! Rotating axles in a Meccano hole always make an ellipse, so he was very good at making elliptical tips, and he didn't even know why! Anyway, he asked me, after we'd had a lot of good cognac, why elliptical tips were better than round ones. And I tried to explain to him that an ellipse was somewhat better, but when you describe the function of the ellipse, the logical result is that it should be better to shorten the contact area in the groove, so that the minor radius of the ellipse should be smaller and the major radius should be much larger.

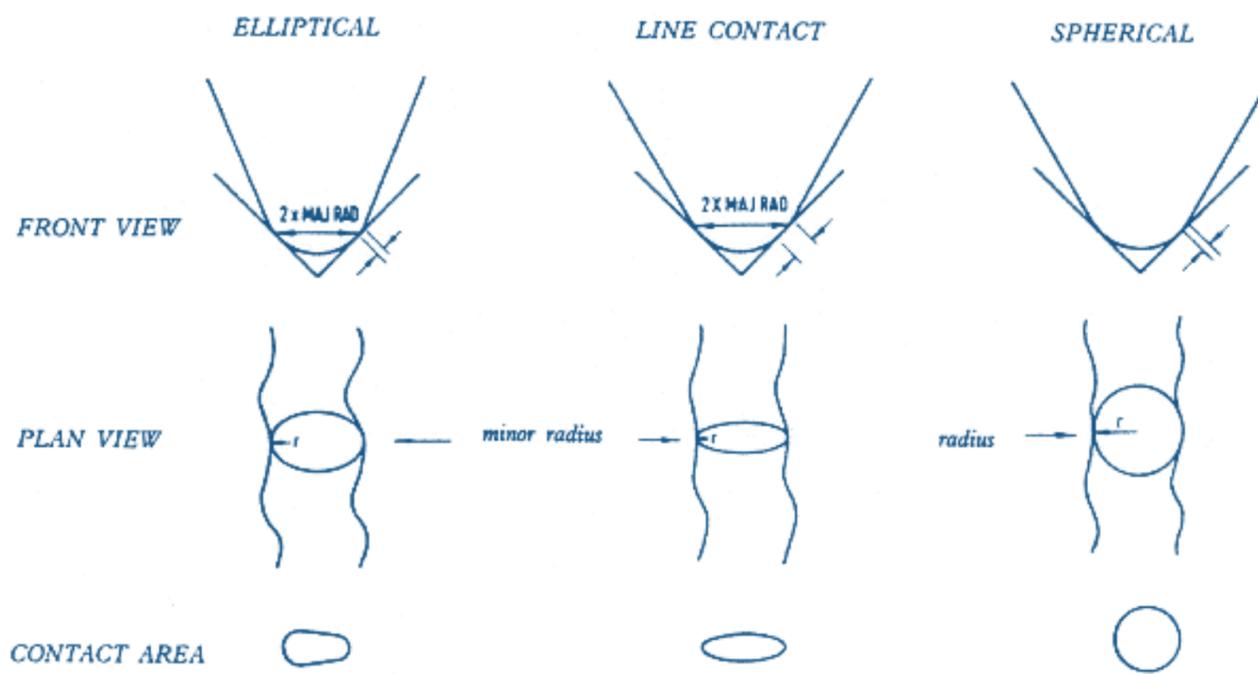
'The Shibata was really a round tip with flat areas cut on the rear. So the upper part [of the groove] you track with 18 microns minor radius, the lower part with 4 micron. So the resolution is always changing: when resolution is high on the right channel, it is low on the left and vice versa. In CD-4, this meant that the demodulator level was never stable.

'A constant [minor] radius should track what has been cut with a constant radius, and then the resolution factor is high. That was the idea behind it, but the question was, how to make such a tip? It took me a while. I did a lot of calculations on an IBM 370 at the University. Occasionally some funny shapes came out, but the one I took as first choice became the van den Hul Type I. The minor radius was 3 microns and the major one was about 85. Type II has radii of about 7 microns and about 45 microns. This is less critical of fit in the groove, so a moving-magnet cartridge, with less support to keep it in the correct position, will do well. But if you use a Type II for m-c cartridges, that is not the highest resolution possible.

'After the Type I was made, I started to promote the tip, modifying cartridges. Some people were very angry that I did it, because they said I was killing records and scratching and cutting information away from the groove. But I was sure I didn't. It's the same as a razor blade: as long as you move the razor blade perpendicular over the surface, it will not cut anything.



A.J. van den Hul in his workshop, at home in the village of Oene, Holland



Elliptical (or bi-radial), line-contact and spherical styles: the 'footprint' of contact area (drawn to larger scale) shows the asymmetrical contact area of the elliptical type

'Looking at the Type I, the total contact area is the same or more than with a round (spherical or conical) tip, it is not less. And there is another thing. With a round tip, a noise particle will take a long time to pass; with my tip it will take a very short time, so the annoyance by the noise is much less.

'But the most important thing is record wear. I measured temperatures using a thermistor with a thin wire around the tip. A conical tip went up to about 140 deg C, but my one was 60 deg. I would like to come down further, but this was the lowest possible value.

'By making tip shapes and listening very carefully, I became aware of other things in sound that were important. When you start, it's just left and right, but when you work with sound a longer time you realise that there is more information, low-level information, reverberation, distortions, detail. I'm happy that the tip did the job at that time, even when I did not realise what the potential was. So, conclusion: records in the past were much better than we ever thought, only we did not have the correct tracking. With the correct tracking, we can enjoy all the recorded music from the past really much better.

'As soon as I found the manufacturer for the tip, he applied for the patent in his name and said "I want to protect you"; in the end I had to go to court to get all the patents back, excluding Switzerland, because I had given it to him not realising what his real aims were. In the first contracts, there had already been the claim that I should be the patent owner.

'It's very difficult, when you have a good idea, to get the product protected. The only one I know who really did it well was Dolby. It's not just the idea but its also the patent attorney who helps you to describe the idea for the claim.

'I build about 500 cartridges a year and re-tip or repair about 1200. Instead of a reduction in the number of cartridges that are sent, I'm getting more and more busy! But the people who bought cartridges gave me a good start to the company, so I must support them. Sometimes I receive cartridges where I have replaced the tip four times, and the client is so happy that he wants it replaced a fifth time.'

Is it possible for you to train anyone else to do this work?

'I tried, but I gave up, because those I did train damaged so much that I had to spend more time repairing or replacing cartridges. It needs an extremely sensitive eye, and an extreme sensitivity for movements of the hand, you have to apply very minor forces. When I've been digging in the garden, I can't do it for a day: when I've been cutting wood, I can't do it for about a week!'

Naturally, van den Hul progressed from re-tipping to building his own cartridges.

'Yes, I entered an arrangement with Empire of Switzerland, but it took about three years to get into production. I started off with the Grasshopper, which is really my own thing, to get as much out of the groove as is possible with today's knowledge and understanding.

'When I make a cartridge, the first thing that it touches is the lead-in groove of that EMI record, Elly Ameling. When the noise is very soft and very smooth and even, coming from all directions, I know it's working nicely.

'The length of the cantilever can be changed; the rubber can be changed; the suspension wire can be changed; so there are three main tuning systems. I can just change to get what a classical music lover really wants, which is spaciousness, or to get what a pop music lover wants, which is more dynamics.

'Winding coils for the Grasshopper, I found so much difference in wire that I was automatically attracted to the subject. That was the door-opener (or the can-opener!). As a student, you are told, conductors are conductors: but there's a big difference between one and the other (and not the one who stands in front of the orchestra). It's not just a little story.'

The cable minefield

Conventional audio measurements fail to explain the sonic differences between cables, which is why so many 'experts' reject the whole idea of audiophile cables. With the help of his former Dutch distributor and an Advantest spectrum analyser, van den Hul has tried to produce measurements which convincingly correlated with 'cable sound'.

First, he explained, the general signal levels passing through the cables in a hi-fi system are much lower than you might at first realise. Taking an example of a pre-amplifier of nominal 1V output with typical impedances, he showed that the actual voltage drop over a 0.1 ohm interconnect might be just 2 microvolts, and thus the real signal level in the cable may be in the range -114dBV to -174dBV. So the subtleties of spatial information are carried by very tiny currents indeed.

FFT spectrum analysis of a 500Hz single-cycle pulse at around -85dBV showed up differences: the best van den Hul cable showed a regular, evenly declining set of harmonics from 500Hz upwards; for one well-known American audiophile cable, the graph showed an uneven energy trend with the harmonic peaks smeared together and noticeable extra energy in the 7kHz region.

Such characteristics are attributed to the molecular-level capacitive and diodic effects at the crystal boundaries, and they correlate with distortion and harshness in the reproduced sound. Seeing the similarity between this cable effect and the low-level crossover distortion of a Class A/B amplifier, van den Hul called it Cross Crystal Distortion.

'This can give you the idea, "Aha, I hear more, there's more detail!", but it's not true, it's just more harmonic distortion. My main aim is to reduce Cross Crystal Distortion as much as I can, to take out harshness from the sound. That's why a lot of people recognise my products as very soft: sometimes they don't like it, they say it lacks information. But what they have been used to is a spiky sound.'

A hi-fi sound rather than a musical sound?

'Yes, the reason is that people didn't hear that in the 1970s is that amplifiers had the same effect, so there was no difference between cables and amps. When the amps got better, the cable had to be better.'

Having developed manufacturing processes to produce a long-crystal structure, van den Hul's main preoccupation is with ageing, which he says will always tend to break parts of the metal structure into smaller crystal groups and increase Cross Crystal Distortion so that the sound gradually 'goes off'. Mechanical ageing of wire takes place due to the manufacturing process and bending, but chemical ageing due to oxidisation and atmospheric pollutants will also degrade the sound.

'When you buy a new car, and it's shiny, and you drive it home, you park it outside your house and it's not clean anymore. It's certainly not clean after a year. Oxygen-free copper is just oxygen free at the moment it's made. As soon as it's finished, it starts to oxidise again: it sounds dim and starts to be harsh. Therefore it's better to protect the wire.'

Unprotected wires, he says, soon start to sound worse because of ageing. This leads to what he calls the buying curve, a cycle of insidiously-deteriorating performance which drives enthusiasts to buy something new every year or so.

Now (Dec. 1990), van den Hul is working on an advanced optical transmission system for digital interconnection, but no doubt he will continue trying to persuade users and manufacturers to look more closely and scientifically into the micro-world of copper (or silver!). On a planet full of chemical and electromagnetic pollutants, as he says, 'The inside world must be clean...'

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