

Cables

The transmission of signals through cables is disturbed in different ways.

These disturbances are heavily related to modern time and it's widely use of plastics and related topics and further of course to the material and form of the wire itself.

Cables were at first of no interest of mine, as my primary hobby is loudspeakers. But two friends Niels and Thorsten had made some convinced me to look deeper into that area. A new search, which led to so many interesting results, was started.

In the sea of audio worms offered on the market, one might loose the orientation and go for the price, assuming there is a connection - the more expensive the better sound.

I'm really not to judge between them, as they all are wrapped up in plastics, and I don't like the sound of that material at all.

In my ears it adds a fatness and muddiness to the bass and makes treble thin, by apparently increasing its lower and upper end, not to be seen by measurements.

As I hear it, it must have a kind of memory - much like the effect known from capacitors, and thereby works as *an active element in the dimension of time*, where it should be silent. This effect explains why it sounds of more than is measured.

What then? - At first we must make a choice - single core or multi-core.

Multi-core has, in my ears, a common sound of their own, which I don't find with single core.

Single core doesn't sound totally right either, if it is a round wire.

This I used in the beginning - 1 mm round pure silver in different insulation, where two materials fell out to be good as insulation: cotton and silk. But there should be others for you to find - flax for instance, which I haven't been able to find in pure form as thread.

All cable experiments were done with interconnect cables, as they transport all frequencies and differences are heard with ease.

The form and size of the wire itself influences the way sound is transmitted through it.

If you like the sound rounded off in a pleasant manner, you should use round wire around 0.7 mm in diameter. If you choose them thicker, you will spoil the precision in the treble.

If you like it very, very precise, you should use thin foil, but then the lower part of the sound register becomes far to thin without weight.

Here you have to compromise. I have found a balance I like, when the dimensions of the wire are 0.3 mm thick and 2.5 mm wide. But it is a matter of taste, and the dimensions can be used in fighting wrong tendencies other places, in the whole chain of components used.

As earlier mentioned, cotton and pure silk can be used for insulation. It can be bought as a woven tube.

If you are to classical music, you undoubtedly should choose *silver with silk insulation*, as the most neutral and with a very precise sound stage.

Two main discoveries concerning cables.

When the material of the wire is open to air, we have problems: These are oxidation on the surface of copper and sulphonation on the surface of silver.

The surface has to be closed from contact with the air. I was working with pure silver, preferring that material, so electrolytic plating with gold seemed natural. Surprisingly it sounded better with gold than without.

This observation led to a new version, silver first plated with copper and then with gold. That sounded even better, so at this point I paused - satisfied.

It seems as if the wire should have low resistance in the centre and higher and higher impedance towards the surface.

What drove me to my next experiment I can't tell, but I annealed some of the gold plated cable as well as the copper-gold, and big was my surprise, when I took the material out of my little kiln. The gold had disappeared. It couldn't have evaporated, so it had in some way reacted with the silver/copper - so to say, sunk into it - so the whole purpose with the gold plating was lost. The gold version turned white and the copper-gold version turned black. Well! I couldn't reverse the process, so there they were for closer listening.

The black version was really awful, but the white- Surprise! Surprise! It sounded most promising. The whole idea of protection was cancelled, and a new search began.

A series of plated wires was made with gold in varying thickness. 4,6,8,10,15,20,25 micron. Not at once of course, as it is rather expensive process, but all were annealed and gradually listened to always in four versions at a time.

A miracle occurred at 10 micron, 15 even better but at 20 and 25 it was as if the sound was effected in a slightly wrong manner.

It is easy to see when the thickness is right, the surface should ***look exactly like white paper*** used for machine writing. No metallic shine at all and no cream colour (too much gold)

To explain the physical effect, as I see it, we can regard a cable as a very long corridor with reflecting surfaces and even adjacent rooms and the current as waves of sound.

It is then obvious that the dimensions influence on the propagation of sound, as the reflective coefficient off the walls does and as the adjacent rooms - (the connectors and insulation) - do as well.

The mixed crystals formed by the silver and gold serves as dampening the reflections from the walls of the wire, seen from within. The surface has changed from metallic and mirror like reflection, to non-metallic and diffuse reflection - in other words from order to chaos like, also for the electrons to meet progressively. This slows down the speed at high frequency, which is forced out towards the surface.

For protection of the surface of the wire, another solution had to be found.

I had suspected the effect of plastic being caused from its ability to hold and deliver a static load.

It suddenly came to me, that layer of linoleum on floors doesn't build that up. This material is heavily based on linseed oil, which is a drying oil why that was tried for protection of the surface.

At first the wire and later on the wire with its silk insulation was dipped in the oil and dried at 60 to 70 degree Celsius in an electrical oven. It takes 2-3 days.

The listening results were *well beyond expectation*. I had feared it to have some deteriorating effect - big was the surprise, as it turned out to be even better than the gold plated. It was therefore with misgivings the same procedure was done with the gold plated wire - was all that much money just thrown away? Luckily their better inside treatment of the signal worked clearly through.

Used as digital connections I must say the gold plated annealed and with linseed oil treated cable is without competitions - but the price of manufacturing - Ugh!

The linseed oil has a secondary very positive effect, as its affinity to oxygen is very high, whereby the surface of the metal is cleaned effectively from oxidation and kept in that condition.

Wires have an orientation created by crystallisation of the metal, much like domains in magnetic material, so it is advisable to mark that, if they are cut from a longer piece of wire.

When connected they must have opposite direction to one another. In this way the difference of sound is greatest, when the cable as a whole is turned - if you can hear the difference hidden. β -----

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Listen for s, t and f sounds and the whole atmosphere in recordings of choir.

A marvellous recording to judge from is the Philips recording of Misa Criolla by Ariel Ramirez with José Carreras. Philips 420 955-2

Among other things listen for the choir, you should clearly understand the words sung.

Another record I can recommend, is a Opus 111 recording:

“Songs of the world” with Moscow children's choir. OPS 30-157.

Here you are presented children voices and Orf instruments with great clarity, and a marvellous piano, so naturally recorded.

In general Opus 111 recordings are very good and worth buying, if you can find recordings of your taste in their catalogue.

Cables for the loudspeaker

These can be made in exactly the same manner.

You may here consider if you want single connection or multi way connections, and balance the dimensions of the silver for the unit to connect.

Single termination:

The dimensions found for the interconnect-cables works fine, if the length is within 3 meters.

Multi-way termination:

Treble: dimension 0.15-0.2 mm thick 2 - 3 mm wide

Midrange: dimension 0.3-mm thick 2.5-3 mm wide

Bass: dimensions 0.4-0.5 mm thick and 4-6 mm wide
To get the cables to look nice you can, after the treatment with linseed oil, put on an extra and thicker tube of silk.
Beware of synthetics, when you buy these tubes. They can be pure synthetic or have synthetics within, without the dealer to know. It is advisable to check it with fire.
Cotton shall glow, with no melting when the open fire is blown out. Silk shall be unwilling to burn, but melt, bubble up and smell like burnt human hair.
I like the end result to behave in a manner, so you can't feel or detect it to have a metallic wire inside. So I don't hesitate to put it all into the linseed oil once again, and put on a third tube, to get that behaviour from the end product. It sounds, as if, the better the wire is protected from the outer world, the better it sounds. It's so totally contrary to plastic insulation.

Power-cables.

These very well insulated cables have also been tried used for the main power.

Here they showed their ***true qualities with the most surprising and inspiring results.***

A recently performed listening test of an OTL vacuum tube amplifier showed the importance of that part. With normal power-cables it sounded very wrong, fat, with loose of dynamic, distorted and unable to establish a steady soundpicture of a single instrument. It was rather funny to hear a single acoustic bass split into two. But a metamorphose occurred, when those treated with linseed oil were used,. Now the amplifier was most interesting, the best of that type I have ever heard. Further tests with these cables have showed the same effect of cleaning up on all other amplifiers even switch mode and pure digital. This only when silk was used, ***cotton with its more aggressive character wasn't good.***

That the effect is so big is most disturbing.

How many amplifiers around the world play with ***just a part of their capacity*** solely because of a bad connection to the power plug? It seems unfair that regulative for high voltage is destroying our possibility for enjoying music.

These cables are probably illegal, so don't leave them connected, when you are not present. I have been presented an idea of protection that may solve the problem by further insulation with a tube of woven glass. This material strengthens the construction and protects it from heat (up to the melting point of glass), but it must be impregnated with anti-static liquid, as glass also is a static material. Impregnation with linseed oil seems to work, but for many people it don't look sufficiently nice, and it still is a question if it is legal.

Legal or not – it is so easy to change that part, that you can use it when you want to listen seriously, and change it to the legal ones for background music or keeping your equipment stand by. This way of thinking leads to the next chapter.