Antenna Wire

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Of course it may be clear that the best antenna litz can be used with a low resistance. By keeping the resistance in the antenna cable low, the energy is fully radiated instead of converted into heat. This makes it obvious to use a thick copper cable which has a low resistance after all. That is indeed true for direct current, but for HF other laws apply.

The Skin effect

HF currents have the property of running mainly on the outside of a conductor. This phenomenon is called the Skin effect. For direct current the diameter of the conductor is important but for HF currents the surface of the cable is important. The higher the frequency, the greater the skin effect. Just look at the table below where we take three different conductors and show the resistance per meter at different frequencies.

Frequentie MHz	1 mm2 koper, per meter	1 mm2 Aluminium, per meter	1 mm2 RVS, per meter
1.8	102 mOhm	129 mOhm	820 mOhm
3.5	140 mOhm	178 mOhm	1,048 Ohm
7	196 mOhm	248 mOhm	1,420 Ohm
14	276 mOhm	348 mOhm	1,928 Ohm
21	337 mOhm	425 mOhm	2,317 Ohm
28	388 mOhm	490 mOhm	2,645 Ohm
50	518 mOhm	652 mOhm	3.472 Ohm

By using several small conductors in a cable, the surface area is increased while the total cable diameter remains limited. If possible, use braided cable consisting of several thin conductors. Just look at the table below:

Frequentie	22 x 0,25mm koper, per meter	22 x 0,25mm Aluminium, per meter	22 x 0,25mm RVS, per meter
1.8	24 mOhm	31 mOhm	639 mOhm
3.5	32 mOhm	42 mOhm	639 mOhm
7	44 mOhm	56 mOhm	643 mOhm
14	60 mOhm	77 mOhm	660 mOhm
21	72 mOhm	92 mOhm	683 mOhm
28	83 mOhm	106 mOhm	714 mOhm
50	109 mOhm	139 mOhm	840 mOhm

We’ll take braided copper cable, all right?

The Insulation

With braided copper cable the electrical HF conduction is fine It is strongly recommended to use

insulated antenna wire at all times. When the cable will be used uninsulated, it will work well in the beginning. Over time, the cable will corrode, affecting the outside of the conductor. The outside is exactly the part of the conductor through which the HF current flows. So make sure you have good weatherproof insulation, such as varying temperatures and UV light from the sun. Now we've had all aspects of antenna wire, haven't we?

Stretching

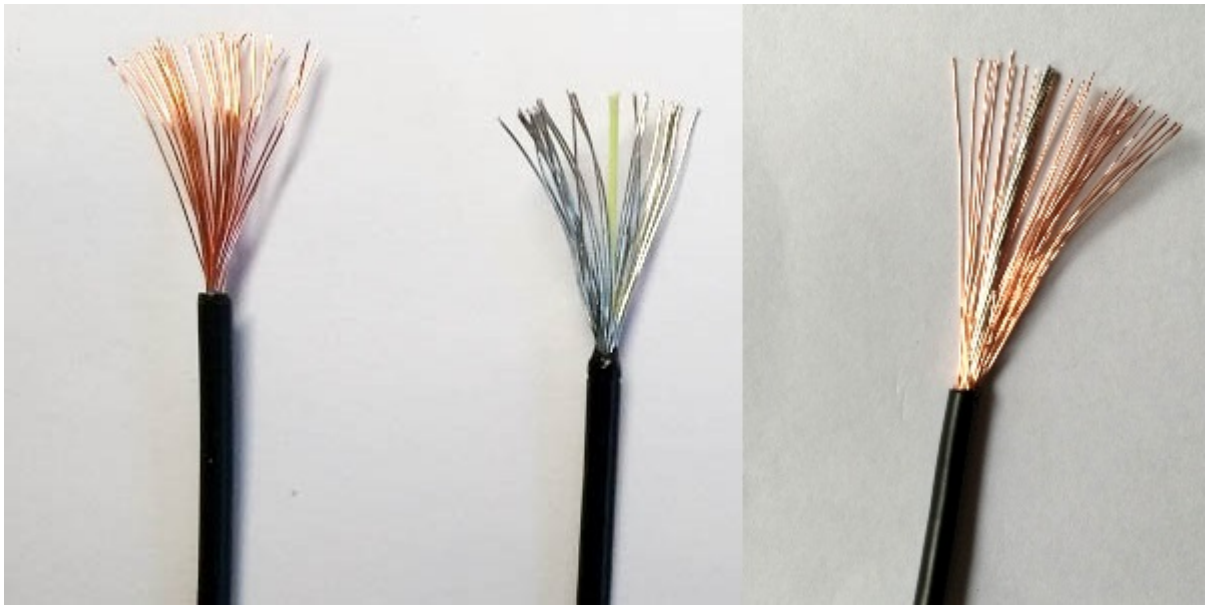
Copper tends to stretch quite quickly, causing the antenna to sag and become longer and longer. This is not such a problem for very short antennas, experiments and holiday setups. I myself regularly use antenna wire that consists only of copper for my holiday EndFed antennas for example, the stretch is hardly noticeable here. For permanent set-ups or heavier antenna applications (think of a dipole antenna with hanging 1:1 BalUn) only copper wire is not suitable. The chance of a break is very high and the antenna will soon stretch and sag. Now what?

Stainless steel

Stainless steel has excellent elongation properties and can handle an enormous tractive force. Then why don't we use stainless steel? Simply because the HF conduction of this material is not optimal. Doesn't it work at all? No, it will work, but due to the higher resistance, a small percentage of the emitted energy is converted into heat. The goal of the radio amateur is to transmit as much energy as possible, isn't it

Then what?

There are suppliers who sell harddrawn copper. This is pre-stretched copper wire, so it won't stretch so fast anymore. Disadvantage is still the limited breaking force and the fact that this is quite stiff. HF Kits opts for antenna litz consisting of a combination of a good conductor and a strong material that can easily handle the pulling force. We have been looking for a reliable local party that can produce the antenna litz according to our specifications. Besides the "real" antenna litz, HF Kits also offer experimental wire. It has been quite a search but in the end we are proud to offer the following assortment.



Experiment litz: This wire consists of 1.0 mm2 braided copper wire with UV resistant black insulation. The total diameter is about 2 mm. Perfect for experiments or holiday antennas. Because the core only consists of copper, this wire will stretch over time and continue to stretch. The tensile

strength of this wire is therefore also limited.

Link to the web-shop – >Experiment Wire

Copper/Kevlar Wire: This antenna wire is produced especially for HF Kits local in the Netherlands. The wire consists of a Kevlar core with around 1.1 mm2 tinned copper braiding. 1x 0,4 mm Kevlar en 24x 0,25 mm copper. The insulator consists of black UV resistant PE. The total diameter is about 2.5 mm. Tension force approx. 50 kg. In this way a strong, flexible and relatively light wire is obtained.

Link to the web-shop – >Copper/Kevlar Wire

Copper/stainless steel litze: This Antenna litze is specially produced for HF Kits in the Netherlands. The wire consists of a stainless steel core (7x 0.35mm) with 1.0 mm2 (56 x 0.15 mm) of blank copper around it. The insulator consists of black UV resistant PE. The total diameter is about 2.5 mm. Tension force approx. 100 kg. This is a robust antenna wire with a very long life span. As far as we are concerned, this is the best choice for permanently placed antennas.

Link to the web-shop – >Copper/Stainless steel Wire

Links to this topic:

https://nl.wikipedia.org/wiki/Skineffect

http://chemandy.com/calculators/round-wire-ac-resistance-calculator.htm