Reduction of high-frequency EMFs during house reconstruction

Hugo Schooneveld

Dutch electrical hypersensitivity foundation ('Stichting EHS', the Netherlands)

The house was situated in a wooded area with relatively little high-frequency (HF) electromagnetic fields (EMF).Yet, the ever-increasing electronic gadgets of neighbouring dwellings, i.e. Dect phones, WiFi and other cordless communication networks, made it desirable to take measures for an efficient shielding against these threats. The planned house enlargement programme was the perfect occasion for designing a shielding programme against incoming HF EMFs.

Situation

The house in question is almost devoid of equipment spreading HF EMF. It is surrounded by a garden with high trees which absorb much of the fields from distant base stations for mobile communication. The house is separated from an adjacent 2-storey neighbouring house by two sets of double brick layers.
The neighbouring house is equipped with a Dect base station and several hand pieces. Moreover, other neighbours consider installing Dect phones and other cordless communication systems such as WiFi, Blue tooth. EMVs can easily be monitored by our HF meters and acoustic detector systems. Although signal strength is already surpassing the German SBM2008 exposure criteria, it was anticipated that signal strength would increase as time proceeds. Efforts to keeping HF radiation low were considered advisable. There is some pressure to increase the number of transmitter stations in the area.

Fig.1. Carbon-containing conductive paint from Biologa (Germany) in a 1-liter can.

Fig.2. Caparol-Electroshield (Germany) jn a 10-liter container with at the left a roll of self-adhesive conductive tape.

Rebuilding plan

The plan was to enlarge both the living room and the office with a one-storey building extension that projected into the garden from the backside of the house. This extension should be made as impermeable for HF fields as possible by a set of measures:

(1) Covering the flat roof surface with 5 mm mesh G-ES netting, comprising a network of silver threads covered with an insulating and nonconducting black plastic non-conducting coating. This material is supplied in rolls of 50m of length and a width of 1m. The overlap between adjacent layers should be at least 5cm.

(2) Inserting this material in the spaces of the double-layer of brick masonry of all extension walls.

(3) Shielding all woodwork -window frames and wood decorations- with conducting carbon-containing paint YShield HSF 54.

(4) Steel reinforcements mats in the concrete floor were interconnected by welding and equipped with a steel rod terminal that could be connected to earth, should such be desirable (Fig.9).

(5) Double-layer glass panels HR++ type were ordered to have a 'Special-S' coating. This coating type was found to reflect HF radiation better than regular glass or other coating types, according to measurement data of Pauli and Moldan.

(6) Walls shared with the neighbours were painted over their entire length and height with the Caparol's ElectroShield carbon-containing and conducting acrylic paint.

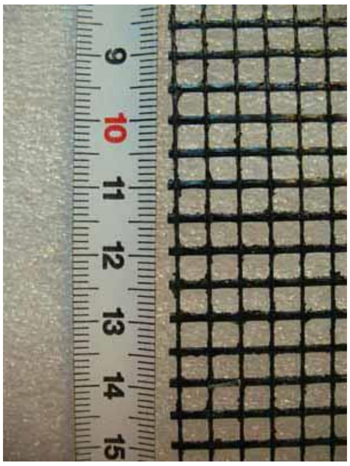

Fig. 3 Silver-containing 5mm mesh G-ES netting

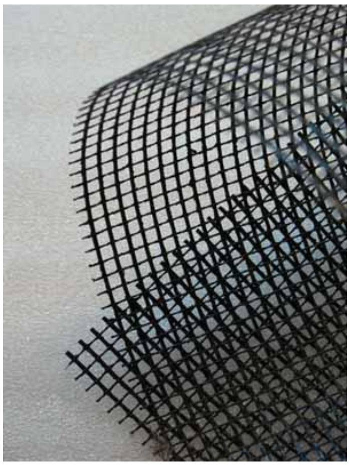

Fig.4 G-ES netting, flexible

Fig. 5 Heat-reflecting glass panel: HR++ Special Plus

Fig.6. Brick wall construction and filling: (from left to right): white calcium blocks, G-ES netting, mineral wool insulation, 4 cm space, outer brick wall layer.

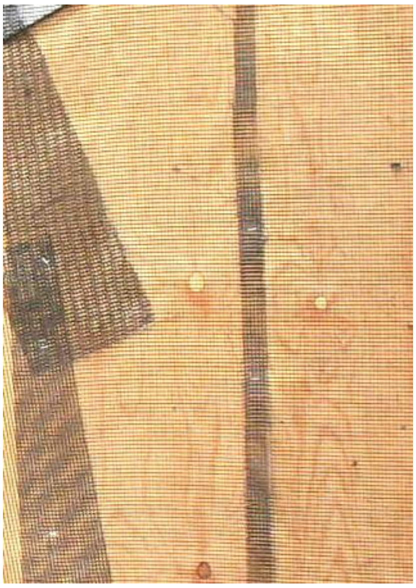

Fig.7. G-ES netting, overlapping pieces, nailed against wood board

Note on the heat-shielding glass panels (Fig.5)

Such windows panes as the HR++/Special-S variety are relatively expensive, but the infrared reflection helps keeping heat inside during winter and outside during summer. It helps reducing heat transfer and that pays itself on the longer term.

Fig. 8 Treatment of wood with HSF54 paint. Two solid layers (one of the sliding doors) are next covered with two finish layers (not shown yet).

Fig. 9 Reinforcement of concrete floor with steel mats, welded together at some points**.** Note that small piece of rod pointing downwards for an earth connection, if so

required.

Note on the conductive paints used

The product Biologa YShield paint (Figs.1, 8) is relatively expensive but is indispensable for a decorative painting of smaller structures such as wood linings etcetera. Its adhesion capacity to any type of ground layer is remarkable, due to its content of acrylic binding medium. However, stain spots and spilling cannot be removed. It gives a nice and regular matt black appearance and provides a perfect grounding base for subsequent finishing paint layers. How permanent such combinations are on the long run remains to be determined.

The Caparol product ElectroShield (Figs. 2, 10) is a much cheaper commercial product originally developed for other larger scale applications. It contains a large amount of heavy black material (carbon) that forms compact deposits on the bottom of the container. Such deposits can only be redispersed with considerable mechanical force and even then rather large aggregates of different size will remain. After a certain dilution with tap water (not recommended by the manufacturer!) a slurry results which can be applied onto plastered walls with a large paint roller. Advice: always roll in the same direction for an optimal result.
The porous structure of the walls should have been closed with a suitable filler material available from regular paint shops. The results is a solid black surface with rice grain-looking aggregates, easily visible with raking light. Some might like the surface effect.

Note on G-ES netting (Figs 3,4)

Although the carbon content and black appearance suggests otherwise, this product appears not to make electrical connections when layers are touching each other by overlapping fragments. Only if the thread structure is damaged and the silver threads are exposed and interconnected by nails etcetera will sheets make contact. This cannot be done under outside conditions. The message is not to use too small isolated gaze fragments.

The netting is taped and nailed to the inner layer of the double brick wall and next covered with a 6 cm heat-isolating mineral wool blanket. An air space of 4cm is kept for the outer brick layer (see Figs. 6, 7).

Grounding the painted wall

To make the carbon layers as conductive as possible, and also to confer to the manufacturer's instructions, the paint should be grounded. That would also reduce the risk of electrocution, should one touch the conductive layer with electrically charged objects. The base of the walls were therefore provided with a 5cm broad strip of self-adhesive and conducting tape. This strip was to paint over with the carbon paint for an ideal contact and finally connected to earth.

Warning for dirty power

Walls covered with a conductive paint will reject high-frequency fields effectively. If the treatment is meant to reduce low-frequency fields at the same time, then the paint layer should be grounded. Conducting self-adhesive strips were attached to the naked wall before over painting. One of the ends of the strip was to make contact with a 6×6

cm stainless steel part screwed onto the wall and which served as a anchoring point for an earth connection.
However, the 230V – 50 Hz power provided by the electricity company was not entirely 'clean' in this case. The earth thread running with along with the 220V threads were contaminated with dirty power transients by capacitive induction. The consequence of an earth connection would be that the wall emits transient electrical field disturbances. For that reason this metal plate was left unconnected because the owner of the house felt uncomfortable with the earth connection in pace.
One should find out how 'clean' the earth thread is in any specific location. There are no rules or suggestions for an acceptable voltage pollution. Experimentation is required. Access points should be accessible and detachable for that reason.

Also the steel concrete floor reinforcement was left unconnected to earth for the same reason (Fig.9).

FIG. 10. Painting the wall black with two successive layers of Caparol, using a roller brush.

Fig. 11. Two layers of decorative paint are necessary for making the black invisible.

Note of finishing the painted wall (Figs. 10, 11)

Due to the excellent adhesive capacity of the black paint material, all kinds of standard wall paints or wall papers can be applied in any colour. However, a double layer of paint may be advised when transparency is a problem.

Effective measures in two steps

Incoming HF fields have largely been reduced by these measures. Most HF meters will give very low reading: usually less than 0,1µW/m2 (see Table 1). No Dect phones can be heard, not even with the highly sensitive Profi Spion HF detector. Mobile phone use becomes problematic and one has to step outside for a proper call quality.

Health effects

Biologically speaking, it was all worth the effort. The owner had suffered from electrical hypersensitivity for many years and was hardly able to use his personal computer without falling ill. After completion of this shielding programme his general health improved markedly over the months and computer use became possible again for a few hours per day.

To reach a full health recovery, it would be necessary to eliminate or reduce all EMFs produced by household equipment. Two approaches were followed:

1. Changed habits: EMF producing items were used for brief periods only and were unplugged immediately after use. Use of a landline telephone and internet connections. No WiFi, smartphone, digitally enhanced (Dect) or cordless telephone was allowed, neither by visitors. Working distance between keyboard, monitor, and PC peripherals was as long as cords permitted (several meters).

2. Reduced emissions of ELF radiation by household equipment and power tools. Several adjustments were made. PC and LED monitor were specially assembled for minimum radiation. Classical incandescent lamps were maintained or were replaced by halogen bulbs. Fluorescent bars, energy saving lamps and LED lights were removed, as well as dimmers.

The wiring system was replaced by shielded wires and the metal shielding was earthed. Wall contacts were all earthed and extension cords were shielded as well. Wherever present, metal frames of equipment and furniture was earthed. That eliminated the radiation of ELF.
To reduce the intake of dirty power from the main distribution net, GS filters were installed on each of the 3 phases where they entered the house. Solar photovoltaic cells on the roof and their inverters produce substantial dirty power signals entering the home net. Double GS filters were plugged close by each inverter output. This reduced the electrical pollution; however, but not the magnetic pollution by AC currents.
Automatic circuit breakers were installed in selected electricity groups, which switched off power where none was required. Bedrooms were kept free from electrical equipment at night, as well as from the adjacent rooms.

Conclusion

The owner of the house felt pretty well after these electrical adjustments. His working capacity was almost normal and optimal. Little remained to be dealt with. However, his hypersensitivity for EMFs had not entirely disappeared and presented itself under new and not-foreseen circumstances. Only on the long term, after several more years, sensitivity appeared to subdue to some extent.

The conclusion is that previous exposures to HF EMFs, which attributed to the EHS condition, were effective at dosages far below the ICNIRP guidelines. The German SBM2008 guidelines of Baubiologie Maes, (www.maes.de) are more relevant for the electrosensitive, but only in combination with other measures that result in the elimination of both high- and low-frequency EMFs.

Measurement of HF fields

Meter Gigahertz Solutions HF 59B, equipped with an isotropic antenna.

Table 1. Field measurements after the operations	
HF values on the street	10µW/m2
Front side of the house, outside	2µW/m2
Front inside, behind regular glass	0.9µW/m2
Backside of the house, outside	1µW/m2
Backside, in living room, behind protective glass	0.02 – 0.4 µW/m2
Backside, in office, behind protective glass	0.02 – 0.2 µW/m2

Suppliers

- G-ES netting, Y-Shield conductive paint HSF54, grounding tape and steel connection part: www.biologa.de
- Caparol ElectroShield: www.caparol.de
- Glass HR++ Special S from local glass pane supplier
- Data on EMF-protective glass coatings, see P. Pauli and D. Moldan in http://drmoldan.de/html/HF%20Buch%202003%20%20Pauili%20&%20Moldan%20-%20Leseprobe.pdf

Hugo Schooneveld, PhD

Author of the book: '*Elektrostress Handboek – Leren omgaan met ziekmakende elektromagnetische velden.* ISBN 978-90-9027793-6. EMV-EHS Publisher, Wageningen 2014.

W: www.stichtingEHS.nl
W: www.hugoschooneveld.nl
E: hugo.schooneveld@stichtingEHS.nl

File: Shielding house