The Trojan Horse of the PLC-Lobby: FprEN 50561-1

The mains grid is neither intended nor suitable for broadband data transmission. Although PLC (Powerline Communication) is able to disturb radio services and to render a valuable natural resource useless, the PLC-Lobby and the European Commission try to push through this unfit-for-purpose and superfluous technology against technical reason and by circumventing sound standards ...

CISPR is the Special International Committee on Radio Interference of the International Electrotechnical Commission IEC with central office in Geneva. It is concerned with the development of standards regarding electromagnetic interference. Disturbance limits for Power Line Telecommunications (PLT) systems are defined by the standard CISPR 22 and its European equivalent EN 55022 entitled *"Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement"*. The third edition of CISPR 22 has been published in the European Union in 1998 as EN 55022:1998, it prescribes limits above 30 MHz for **radiated disturbance** and between 0.15 and 30 MHz for **conducted disturbance at the mains ports** and **conducted common mode disturbance at telecommunication ports**.

The mains grid is neither intended nor suitable for broadband data transmission, because due to its inherent asymmetries it radiates electromagnetic energy like a transmitting antenna, causing interference to radio services. Therefore in 1998 it was not assumed that the mains grid would be used in such technically unfit manner. There was no PLC, which in a single connector - the power plug - combines the functionality of a mains port and of a telecommunication port. That's why in the Standard's formulations that combination had not been envisaged and this fact has been and still is exploited - although inadmissible in the future - by the PLC industry, which applies interpretation tricks so that the prescribed limits are often grossly exceeded.

For class B devices the limit for disturbances at the mains ports between 5 and 30 MHz is **50 dB(uV) (AV)**, to be measured between phase and ground as well as between neutral and ground. In compliance with this limit at most twice this voltage is possible between phase and neutral, that is 6 dB more, and so this standard limits the signal voltage fed into the mains grid by a PLC modem to **56 dB(µV) (AV)**.

One interpretation trick of the PLC industry is to simply ignore the measurement at the mains port - with the justification that it is *"not only"* a mains port. Another trick is to apply the 10% LAN utilization also for the measurement of the disturbance at the mains port, which actually is only allowed for the measurement of disturbance at the telecommunication port - with the justification that it is *"also"* a telecommunication port. The result is that the disturbance amplitudes in "Quasi Peak" measurement are only slightly lower, but in the alternatively possible "Average" measurement they are substantially lower than when correctly measured. There is even a published tutorial for this trick [1].

Shortly before the revised and clarified version **EN 55022:2006** [2] was due to come into force and to supersede the 1998 version in 2009, the PLC-Lobby successfully tried to prevent this through 5 members of the European Parliament. In April 2009 they addressed a parliamentary request [3] to the European Commission in which they raised the objection that a new testing flowchart which appears

by Karl Fischer, DJ5IL
Friedenstr. 42, 75173 Pforzheim, Germany
www.cq-cq.eu - DJ5IL@cq-cq.eu

in this edition and which, it was felt, forced the PLC manufacturers to apply a conducted emission test which the PLC industry claims it didn't have to do under the previous 1998 edition, would *"throw into jeopardy the future of powerline communications (PLC) technologies by imposing artificially low electromagnetic emissions limits that will make it impossible to place PLC equipment on the EU market from October 2009"*. And therefore they thought it would be appropriate for the time being to retain the existing version.

The Vice-President of the European Commission at that time, **Günter Verheugen**, replies to Caroline Lucas, MEP, in a letter dated 21 April 2009 [4] that only *"relatively few problems"* had occured due to PLC and further states: *"PLC technology does not interfere into military services since they typically do not operate in areas where there is a risk of interference. Emergency services now use advanced digital radio technologies to communicate. Shortwave broadcast reception has further been substituted by internet radio"*. And he replys to the 5 MEPs on 12 June 2009 that the European Commission would *"consult Member States and stakeholders in the context of the EMC Directive Working Party of 30 June 2009 on the consequences of the current situation. One of the possible options would be to maintain the 1998 standard for a longer period, pending the final adoption of the new emerging network standards that will be compatible with powerline communications networks. Another option would be to amend the 2006 version in a way to avoid that its limits unduly hamper PLC.*

The aforementioned **flowchart for selecting test method** is in "Annex C" on p.54 of EN 55022: 2006. It explicitly describes the *"Mains"* port as one possible type of telecommunication port which has to be tested in PLC devices according to the test methods given in 9.3 for compliance with the limits given in tables 1 and 2 for mains ports. This aspect of the flowchart has been maintained by the creator of this standard CISPR/I also in the face of strong pressure from the PLC industry in order to put a stop to those interpretation tricks. It shows that CISPR/I regard it as imperative that the established limits for the mains ports should be applied, regardless of whatever their additional function is. And this approach has a solid technical foundation, because their emissions standards exist to protect the radio spectrum. It is a valuable and irreplaceable natural resource, like air and water, but its true value is only really appreciated when it is no longer available. These emissions standards with their test methods and limits are based on a rigorous, well documented approach and many decades of experience in real-world prevention of radio interference [5].

The Standard EN 55022:1998 was drafted before the question was raised of whether a PLC mains connection should be treated as a telecommunications port. It has no flowchart and does not explicitly state that a telecommunications port could be a mains type. However, it applies without qualification limits for conducted disturbance at the mains terminals - and these are exactly the same limits as are referred to in a Commission's document as *"too low to be complied with by today's PLC technologies"*. There is absolutely no difference as far as the mains terminals are concerned between EN 55022:1998 and EN 55022:2006. Any manufacturer whose equipment breaches the limits for the mains port disturbance voltage in tables 1 or 2 of EN 55022:1998 and yet has declared unqualified compliance to that standard has done so ignoring the standard.

And though the Working Party made clear that there really is no difference between EN 55022:1998 and EN 55022:2006, the European Commission nevertheless reserved their position and in August 2009 - in order to sponsor the PLC industry and against the advice of their own EMC Working Party - postponed the date of cessation of EN 55022:1998 to 1 October 2011.

By the way, Günter Verheugen founded his own lobby-enterprise, the *European Experience Company*, in 2010 together with his former head of cabinet Petra Erler. It is a consulting firm which advises companies particularly at EU-level and provides strategies for the relations with European institutions. The *European Experience Company* denies any lobbyism, but its offers and the excellent connections of the ex-Commissioner Günter Verheugen with the EU and its policy give rise to other assumptions. Today the former German top-man is not allowed to have contacts to authorities in Brussels - as a political consultant Verheugen is under surveillance by the EU.

Another attempt of the PLC-Lobby to water down the disturbance limits started in 2005. A Project Team was established under the pretext to produce an amendment to CISPR 22 to cover special requirements for PLT equipment. The first Committee Draft was released in February 2008 as **CISPR/I/257/CD**. However, the comments of 23 IEC members National Committees (NCs) and the European Broadcasting Union showed insufficient support for the selected approach as only 6 NCs supported the draft: Belgium, France, Israel, Italy, Spain and Switzerland. Interestingly the major European PLT technology providers, developers and manufacturers resided in 5 of these 6 countries. 8 NCs strongly opposed the draft - Australia, Austria, Cyprus, Denmark, Finland, South Africa, Sweden and the United States of America - and some well-founded comments revealed its true purpose: to camouflage an intended **18 dB** relaxation of the present PLT disturbance limits by introducing a revised method of measurement with an estimated Longitudinal Conversion Loss (LCL) of 24 dB in contrast to 6 dB in the old Standard [6]. My investigations revealed that this Project Team was

dominated by the PLC-Lobby [7]. But because no consensus could be reached, the Chairman stopped the project on 26 February 2010.

EN 55022:2006 is the current standard, it superseded the old EN 55022:1998 on 1 October 2011. This standard now prevents any interpretation tricks by the PLC industry and the EU has expressly confirmed that it also applies to PLC devices. Devices which claim compliance with the old standard - many PLC modems actually do not comply - are allowed to remain on the market for not more than 3 years after 1 October 2011. But new products on the market are bound to comply with EN 55022:2006 already now.

So it is no wonder that the European Commission in the interest of the PLC-Lobby once again tries to undermine the disturbance limits for PLC devices and to get rid of the strict EN 55022:2006. Therefore in 2010 it reminded the **European Committee for Electrotechnical Standardisation CENELEC** on the previously issued mandate M313 [8] to prepare a draft for a new standard. But the attempts of the joint Working Group of ETSI and CENELEC, which was formed as a result of this mandate, to draft a standard failed because the interests of PLC-Lobby and Radio Services proved impossible to reconcile. In this letter [9] CENELEC is urged to draft a modified version of EN 55022:2006 which only applies to PLC devices and it is made clear that *"a prompt outcome to the standardisation process would be highly appreciated by the Commission"*. The undersigned **Pedro Ortún Silván** at that time was Director of the division *"New Approach Industries"* within the *"General Directorate Enterprise and Industry"* of the European Commission. Until November 2009 his boss was Günter Verheugen ...

The first draft prEN 50561 for this standard comes from a Working Group which again is dominated by the PLC-Lobby. Only 10 of 31 NCs voted in favour of it, the rest either opposed or abstained. CENELEC then embarked on a review of the draft at the Commission's request and so the little changed second draft **FprEN 50561-1** [10] emerged, which is now put to the final vote by the NCs until 2 November 2012 - though the EMC consultant employed by the European Commission and CENELEC put forward that this standard does not meet the EMC Directive's essential requirements. CENELEC has decided to discount the expert's view ...

Compared with **EN 55022:2006**, **FprEN 50561-1** would in no single respect improve but in many respects even seriously degrade the protection of radio services from harmful interference - only PLC would benefit from this standard. Here are the key items of criticism:

Item 1:
The current standard EN 55022:2006 anywhere between 5 and 30 MHz limits the voltage fed into the mains grid by a PLC modem to 56 dB(uV). Many PLC modems on the market do not comply with this limit, but they have to do so not later than by 1 October 2014, and for new devices the interpretation tricks described are no more possible. Anyone supporting this draft helps the PLC-Lobby and the European Commission to legalize these violations of disturbance limits in the future, because FprEN 50561-1 plans a limit of 95 dB(uV) and thus an increase by some 40 dB corresponding to a power factor of 10000. This tremendous increase in power is also dangerous because it potentiates the risk that nonlinear components produce harmonics and intermodulation products which fall within the *"excluded frequency ranges"*.

Item 2:
Neither EN 55022:2006 nor FprEN 50561-1 prescribe limits for radiated disturbances below 30 MHz and the limits of both standards for conducted disturbances at the mains ports are identical between 0,15 and 30 MHz. But contrary to the current standard EN 55022:2006 without stipulated frequency notches, FprEN 502561 would permit these limits between 1,6065 and 30 MHz even within the *"excluded frequency ranges"* and even higher levels far above these limits outside of these ranges. Lines 204-207 of the draft state that when user data is being transmitted by the PLC port the disturbances from the PLC port may exceed the limits of Table 1 at frequencies between 1,6065 MHz and 30 - and these are exactly the limits of EN 55022:2006 - provided that only within the *"excluded frequency ranges"* given in Table A.1 - which are the Amateur Radio and Aeronautical mobile bands - the level of the transmitted signals shall comply with the disturbance limits. Therefore the term *"excluded frequency ranges"* is a wilful deceit because it only means that these frequency ranges are excluded from the otherwise granted violation of limits but not from the emission of disturbances in general - There are no really excluded frequency ranges ! Across the whole Shortwave spectrum the allowed disturbance emissions would be at least exactly as high as according to the current EN 55022:2006, but within many frequency ranges they would be even much higher. But because - though not stipulated by the current EN 55022:2006 - notching of the Amateur Radio bands already became a de-facto-standard for most manufacturers of chip-sets for PLC modems with typical notch-depths of about -35 dB, according to this draft about 35 dB or 6 S-Units higher disturbance levels would be allowed within the Amateur Radio bands. In other words: Both the Amateur Radio and the Broadcasting bands would not profit from this standard, not even if the de-facto-standard of notching of the Amateur Radio bands would be nonexistent, because the current EN 55022:2006 limits

the disturbances across the whole Shortwave to a value which according to the draft applies only to the notches. This draft allows across the whole Shortwave about 35 to 45 dB higher disturbance levels than EN 55022:2006 with the additional de-facto-standard of notching of the Amateur Radio bands. Within the Amateur Radio bands this means 35 dB or 6 S-Units higher disturbance levels, cumulative effects by multiple PLC installations not even considered. Based on my practical experiences with numerous PLC installations in the vicinity of my own Amateur Radio station I can say that such disturbance levels make Amateur Radio definitely impossible !

Item 3:
According to this draft there is no stipulated suspension of disturbances when no user data is transmitted, because lines 211-213 state: *"Without user data transmission, the unsymmetrical disturbances from the PLC port shall comply with the disturbance limits given in Table 1 between 150 kHz and 30 MHz ..."*

Item 4:
The planned *"Dynamic Power Control"* measures the *"symmetrical mode insertion loss"* of the mains grid and the higher the losses the higher is the injected power. But because these losses mainly consist of electromagnetic radiation loss, the higher the radiation from the mains grid and thus the disturbance potential the higher is the injected power. This method of power control is profitable solely for PLC, but from the viewpoint of radio services it even potentiates the disturbances and therefore it is counterproductive !

Conclusion:

EN 55022 was written by experts in order to protect the radio spectrum - whereas FprEN 50561-1 was written by the industry in order to be able to sell PLC devices. Actually there is no necessity whatsoever for a new standard - the real purpose of this draft standard is to raise the existing well-considered limits for disturbance power levels up to 10000-fold and to flood the European market with PLC devices. If it is approved, it will render the valuable natural resource Shortwave completely useless for the Amateur Radio service and nearly useless for the Broadcasting service.

FprEN 50561-1 undermines the liability to protect Radio Services from harmful interference which all members of the International Telecommunication Union accepted by commitment to the *"Radio Regulations"* of the ITU, because they prescribe:

"S15.12 § 8 Administrations shall take all practicable and necessary steps to ensure that the operation of electrical apparatus or installations of any kind, including power and telecommunication distribution networks, but excluding equipment used for industrial, scientific and medical applications, does not cause harmful interference to a radiocommunication service and, in particular, to a radionavigation or any other safety service operating in accordance with the provisions of these Regulations."

The Broadcasting service on the especially valuable Shortwave offers with very simple means access to latest information from around the world which are often not at all, delayed, censored or only with higher efforts available through other media. But PLC disturbs the Shortwave in particular, and so every administration sponsoring PLC infringes the *European Convention on Human Rights* because Article 10 reads:

"Everyone has the right to freedom of expression. This right shall include freedom to hold opinions and to receive and impart information and ideas without interference by public authority and regardless of frontiers."

PLC is not a radio application and under the EMC-Directive it is on equal terms with any other electronic device concerning disturbances, and even so this technology is sponsored by the European Commission against technical reason as I have pointed out. If this standard would be approved, other manufacturers of electronic equipment could appeal to it and claim the same excessive limits. FprEN 50561-1 and the EMC-Directive together are like legalizing commerce with hard drugs and forbidding their use at the same time - this absurd combination is exemplary for the neoliberal and lobby-driven policy of the European Commission. The second part of this article entitled *"Doomed to Fail: FprEN 50561-1"* [11] will prove that this draft standard is unnecessary and inadmissible ...

references

1. Hensen, C. : "*CISPR 22 Compliance Test of Power-Line Transmission Systems*", Proceedings of the 6th International Symposium on Power-Line Communications and its Applications (ISPLC), Athens, Greece, March 27-29, 2002.
2. http://cq-cq.eu/EN55022-2006.pdf
3. Written Question from von Alejo Vidal-Quadras, Fiona Hall, Satu Hassi, Pilar del Castillo Vera and Erika Mann to the EU-Commission, 2 April 2009.
4. http://cq-cq.eu/Verheugen_Lucas.pdf
5. CISPR 16-4-4 *"Statistics of complaints and a model for the calculation of limits for the protection of radio services"* contains in Annex A values of the mains decoupling factor which were determined by measurements in real mains grids in the 1960s. It is deemed that these mains decoupling factors are still valid and representative.
6. http://cq-cq.eu/cispr22.htm
7. http://cq-cq.eu/cispr22part2.htm
8. http://cq-cq.eu/M313.pdf
9. http://cq-cq.eu/Ortun_Silvan.pdf
10. http://cq-cq.eu/EN50561_Draft.pdf
11. http://cq-cq.eu/DJ5IL_rt005e.pdf

DJ5IL_rt004e.pdf
Original version: 13.10.2012
Revisions: 16.10.2012, 28.11.2012