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## The EMCIA's position on PLT

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# The EMCIA's position on PLT

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First published in the EMC Journal, July 2009, pp 19-22, [www.theemcjournal.com](http://www.theemcjournal.com)  
(marked-up with changes 2 September 2009)

Last year, the EMC Industries Association ([www.emcia.org](http://www.emcia.org)) chose me as their President, a decision that they have not yet come to regret (but its still early days). If you haven't heard of the EMCIA, it's probably because it has been run for the benefit of its members and has kept a low profile as far as the rest of the world is concerned.

But recently, the EMCIA has decided that there are various issues in EMC that are not being correctly addressed, and that it ought to try to play a part in getting them resolved, for the benefit of all. The first issue they have decided to address is the situation surrounding PLT (powerline technology), also known as broadband-over-powerline (BPL) or powerline communications (PLC).

(PLT has been around for years, using low data rates and frequencies below 150kHz, and causing no interference problems. We are concerned with the more recent 'broadband PLT' that does not comply with CISPR emissions limits, and this is what is discussed below.)

If in your house you use an Ethernet adaptor that communicates by using the mains power cables in the wall, instead of a dedicated Ethernet cable, you are using PLT.

Some background: the Single European Market, with its CE Marking directives for products, was created for two reasons:

- i) To achieve the economies of scale that had been observed to work so well in Japan and Northern America, by converting the differing import regulations of the various European nations into a single set, so that a single product design could be tested for compliance and sold to all of them.
- ii) To keep cheap rubbish out (more accurately: protect responsible manufacturers from non-compliant products that could increase safety risks beyond those generally considered tolerable by Europeans, or damage the very important radio spectrum).

Well, item i) has been achieved, but not ii). Enforcement of regulations has an associated cost, and most European Union (EU) Member States apparently decided that they would enjoy the economic benefits of membership whilst saving money by not doing very much enforcement.

This is the governmental equivalent of being a teenager (who can confusingly now be 30 or more years of age) who prefers to live with his/her parents because of the financial benefits, but who doesn't actually want to help with the housework.

As many of us know from personal experience, such situations usually do not last for ever, and so it has proved for the EU. Discovering in 2005 that between 30 and 50% of products actually supplied in the EU did not comply with EU Directives they are supposed to [1], worried the European Commission (EC) greatly, because societal studies show that when such 'free loading' exceeds 15% they risk the collapse of the society itself.

This has resulted in the first change to the CE marking approach in the EU, since its inception – EU Regulation 765, 2008 on Accreditation and Market Surveillance. From the 1<sup>st</sup> January 2010, "Reg 765" will require Member States to perform at least a specified minimum of effort in enforcing EU Directives in their countries, and they will have to provide figures to show that they are, in fact, doing their bit.

So it's very ironic, that whilst one part of the EC was busy being worried about the lack of product compliance, another part of it (DG Enterprise) was busy adding to the problem by encouraging the use of PLT – a technology that comes nowhere near complying with the EMC standards notified under the EMC Directive, which are intended to protect the radio spectrum from intolerable interference.

The original justification given by DG Enterprise for permitting the use of PLT, was that it provided competition for delivering broadband Internet services, especially to remote places where running additional cables would be very costly.

Since the mains cables already exist, why not use them to carry the data? Well, the reason, well established by numerous investigations and field trials, is that the mains cables make very good antennas for the MHz frequencies needed to communicate the data, and since the data has to be sent over them at a very high level because of all the noise on the mains, PLT ends up broadcasting its signals all over the short-wave radio communication bands (known as the HF spectrum or HF bands).

This is known as 'Access PLT', but it has not been a commercial success and since other technologies are now a better bet for the future it is unlikely to ever take off. But PLT is also used for distributing high-rate data inside the home, where it has recently found a niche for distributing HDTV from room to room, or replacing Wi-Fi for people whose walls and floors attenuate 2.45GHz too much.

Whereas Access PLT had *some* political justification – however misguided this might appear to those who were concerned to protect the HF spectrum – there is *no political justification* for in-house PLT (unless you believe there is a political reason to turn people into couch potatoes), and yet DG Enterprise continues to support it.

Lay waste to the HF spectrum, causing untold difficulties and increased costs for the BBC, NATO, MOD, etc., spoil a natural resource that has huge safety benefits during large-scale disasters as well as providing an alternative broadcast medium for those who can't or won't use internet access, not to mention damaging the hobbies of many Radio Amateurs – all so that people don't have to string extra wires around in their homes? It hardly seems an equitable bargain.

You will find a wealth of technical detail about PLT and the test standards in Tim Williams' excellent analyses in Issues 80 and 82 (January and May 2009) of the EMC Journal, plus Richard Marshall's article in Issue 81 (March 2009) – and also in the articles by those same two independent EMC experts in this Issue.

There is also a wealth of historical documents on PLT posted on the EMC Journal's website at [www.theemcjournal.com/plt](http://www.theemcjournal.com/plt). I recommend you read the correspondence between ADDX and DG Enterprise – for myself, I have never read such well-written technically-competent questions, and I never even *imagined* ever reading such arrogant, weasel-worded, patronising replies, which failed to address any of the questions and were devoid of any meaningful technical content.

All this excellent material leaves me free to discuss the EMCIA's concerns about PLT in this brief article using a general, more hand-wavy approach, as follows.

#### **A) PLT is an extremely noisy technology**

The mains noise emissions from a single Ethernet-over-Powerline product, widely sold throughout the EU, is conservatively equivalent to that of *at least* 1,000 products that only just meet the limits in their relevant harmonised emissions standards.

This is like having the total mains noise emissions of all the houses in a small village injected into the mains distribution at one point in a house! And of course this could conceivably happen in every house or apartment in a town, or even in a large city.

I have seen a technical argument that seems quite reasonable, that estimates the figure to be more like *100,000* products that just about meet their emissions limits, on the basis that the PLT device blankets the major portion of the HF spectrum and is always on – equivalent to plugging in the mains noise of all the households in a *small town* – at just one point in each house.

### **B) Many warnings have been given about PLT**

Several theoretical investigations by leading organisations (York University, ERA Technology, NATO, BBC, RSGB, Netherlands Broadcasting Authority, etc.) over recent years have all shown that PLT technology must be expected to cause a significant increase in the background noise levels in the HF (short-wave) bands worldwide, if deployed Europe-wide.

Some of the research indicated that an Access PLT system covering the whole of Greater London would significantly raise the noise floor in the HF bands as far away as Plymouth, while others claimed it would be detected as far away as Moscow.

They also showed that near to a PLT product, HF reception could be rendered impossible for a radius of several hundred metres.

Field tests in Japan found that these predictions are not unreasonable, and that a single PLT system could also interfere with Radio Astronomy in the HF bands at distances of up to 219km, and its harmonics could interfere at UHF at up to 12km.

The HF bands are used for vital communications with impacts for safety, national security and defence, and proved invaluable in coping with both 9/11 in New York and the Boxing Day tsunami, when the ‘normal’ telecommunications and radiocommunications (including cellphones and the emergency services’ own systems) all failed. So the raising of the noise floor in the HF bands can have very serious safety consequences.

### **C) An example of one PLT vendor’s claims of EMC compliance.**

Recent correspondence on the subject of one particular product has revealed the claims made for compliance with the EMC Directive by the product’s manufacturer, when challenged. EMC enforcement agents throughout the EU seem content to accept these claims, despite them being erroneous in every respect.

**Claim 1:** Our product conforms to the EMC Regulations as amended, and the Product has been tested by an accredited independent Test House. The tests carried out simulated the conditions in which the Product is likely to be used.

**Rebuttal 1:** Their Declaration of Conformity referred to CISPR/1/89/CD as the test standard used by the test house. But this is not a harmonised standard, so cannot be used to provide a presumption of conformity to the EMC Directive.

Worse, it is just a committee draft which was widely criticised and subsequently (and acrimoniously) withdrawn from IEC website. It is a totally discredited document.

The actual emissions when measured are at least 30dB above the maximum limits set by the relevant harmonised standard. A level that – when measured in all of the EMC test houses that anyone in the EMCIA has ever visited – would unquestionably result in a ‘failure to comply’ report.

**Claim 2:** Customers and enforcement agencies have also looked at our product and have had it tested for EMC regulations compliance.

**Rebuttal 2:** From our contacts throughout Europe, we understand this claim to be untrue, or – at the very least – intentionally misleading. Yes, they may have "looked at our product" – but they have certainly not formally endorsed its compliance with the EMC standards.

**Claim 3:** Our product design has a 'notching out' feature that can be used to block out the frequency that is the cause of problem in 'short wave' region of the electromagnetic spectrum.

**Rebuttal 3:** They can only block their emissions over a part of the spectrum – since some of the spectrum must remain unblocked to allow data to be communicated. Emissions in those unblocked parts of the spectrum still contravene the essential requirements of the EMC directive.

Also, recent analysis has shown that, in real life, 'notching' (e.g. to protect Digital Radio Mondiale) will have limited effectiveness, maybe none, due to intermodulation in the rectifiers that are certain to be connected to the mains supply.

**Claim 5:** We have sold about 75,000 products, but enforcement officials in the UK have only received 81 complaints, only 3 of which have not been resolved.

**Rebuttal 5:** There are several excellent reasons why the number of complaints (whether resolved or not) cannot provide any real understanding of the potential of any product to cause unacceptable interference. See Richard Marshall's article elsewhere in this Issue. What other product of similar sales volume would be regarded as satisfactory if it had received "only" 81 complaints?

#### **D) Other manufacturers are likely to copy PLT emissions**

Because certain vendors are (so far) being allowed to get away with selling Ethernet-over-Powerline PLT products that do not comply with the relevant harmonised emissions standards, using laughably incorrect compliance justifications such as those given above, many manufacturers of other classes of product will probably become interested in copying their emission levels.

By doing so, they can remove costly and large components from their product's mains filters. High-volume manufacturers could save millions of GB Pounds each year, a persuasive argument at any time, but especially so in today's difficult economic climate.

Of course, having such products on the market would quickly make noise levels on the mains supply network very much higher than they are at present, making it likely that PLT products would no longer work as well.

More importantly – this would add to the damage that the PLT products are doing to the HF spectrum – on which many specialist users (including UK Coastguard, Defence and National Security) rely, and would have significant safety implications.

DG Enterprise has recently started to claim that because there has been a low level of complaints of interference due to PLT products, this shows that they actually comply with the Essential Requirements of the EMC Directive (but see Rebuttal 5 above).

Although such statements are logically and technically incorrect [2], since they are being made by the people who have overall responsibility for the EMC Directive - manufacturers will be able to copy such statements in their EMC Technical Documentation and use them as justification for their non-PLT products having similar extremely high levels of conducted mains emissions.

The result would be that the value of the HF bands will be compromised forever, and for no good reason – PLT products would no longer be reliable, so very few people would use them anymore.

[1] Ivan Hendrikx, “The Future of Market Surveillance for Technical Products in Europe”, Conformity, April 1, 2007 (but not a joke!), [www.conformity.com/PDFs/0704/0704\\_F01.pdf](http://www.conformity.com/PDFs/0704/0704_F01.pdf)

[2] Keith Armstrong, “Absence of proof is not proof of absence”, EMC Journal, Issue 78, September 2008, [www.theemcjournal.com](http://www.theemcjournal.com)

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