

Dear Sirs,

In the matter of Docket Number 03-104 (Broadband over Power Line)

Reply to comments.

In an earlier submission to this NOI (ref.1), the United Power Line Council, proponents of Broadband over Power Line (BPL), made the following (excerpted) statement:

"The UPLC is pleased to respond that there has been no interference reported in any of the field trials by its members. These trials have been conducted in accordance with the existing Part 15 limits and measurement procedures. In many cases, the FCC has assisted in the test measurements that have been taken. The experience gained from this process indicates that BPL systems comply with the Part 15 limits, and that the existing rules protect licensed users against interference from BPL systems. If anything, the existing rules may be too stringent and unnecessarily limit the range of BPL, but certainly the emission limits do not need to be reduced to prevent interference. "

Being hitherto unwilling to comment on BPL in the abstract, after some practical research this writer now feels able to address key elements within the UPLC's comments, and to more authoritatively submit comments on aspects of BPL. This submission is in four parts: (1) Description of an experimental field study and its results, (2) commentary on the nature of the BPL test in question with a rebuttal to key statements from the UPLC, (3) a suggestion for an adjustment to Part 15, and (4) some consideration of the consequences of the widespread introduction of BPL in its present form.

### **(1) A Field Study**

In order to garner a real feel for BPL's radiation effects, on August 15th. 2003 an expedition was made to Emmaus, near Allentown Pennsylvania, one of the current test sites for BPL, administered by Pennsylvania Power and Light (PP&L). Being reasonably certain that this controlled limited test environment was actually operating within the terms of Part 15, the endeavour was not to measure the actual amount of radiation, but to realistically establish its effects in context on very common, normal and expected usages of the spectrum the BPL scheme employs.

With no advance information as to the exact whereabouts within Emmaus of the tests, the intention was to methodically cruise the town searching for noises not attributable to normal and known interference sources, using a portable short-wave receiver of good and known performance (ref.2); to that end, a fairly elaborate route had been mapped out.

It proved entirely unnecessary. The noise took no finding.

On arrival and on the very first pass down Main St., at the intersection with Second St. (pretty much in the centre of the town) strong interference attributable to BPL was heard. It took the form of irrythmic clicks, scratches and noise bursts, discernable between 3MHz and 18MHz, 'peaking' at around 6MHz. Within those very broad constraints, it was completely broadband in character; there was no frequency checked free of the noise.

It was very easy to track which power lines were carrying the BPL, and which weren't, and to easily scope out the limited 'service area' downtown.

A small regimen of common, normal and expected uses of the radio spectrum was attempted at various locations within and just outside the BPL 'service area', varying from being parked directly under the power lines, on the opposite side of the road, in driveways of properties served, adjacent roads etc.

Results in summary, for anywhere within the 'service area':

Reception of typical amateur single-sideband and CW (Morse) transmissions on the heavily utilized HF bands at 3.5MHz, 7MHz, 10MHz and 14MHz was rendered almost completely impossible.

Aeronautical service transmissions at around 6.6MHz, 10MHz and 13MHz were inaudible.

Reception of all but the strongest shortwave broadcast transmissions was seriously impaired. Those which were unimpaired were extremely strong (propagationally 'single-hop') signals from within North America, with intended target areas (with the exception of Radio Canada International) outside of the US.

A few blocks away from the 'service area' the above common, normal and expected usage of the spectrum was unimpaired except for the usual radio noises found in an urban environment such as power-line noise, TV line frequency harmonics and computer/monitor products; amateur signals and normal to weaker broadcast stations were readily copiable, and the aeronautical stations which had propagation at that time of day were plainly audible.

It is to be emphasized here that the deterioration in availability to the spectrum for these common, normal and expected uses was not subtle; it was not a matter of a 'worsened noise floor'; it was not 'a bit of interference'; it was almost complete obliteration.

**The BPL made \*BAD\* interference.**

## **(2) Rebuttal to the UPLC's statement**

UPLC: "The UPLC is pleased to respond that there has been no interference reported in any of the field trials by its members. "

(a) Other than 'puff' pieces in the local press, the UPLC's members kept their trials quiet until publicized by others, and the technical nature and potential interference issues of BPL were obscured, understated or denied.

(b) In the specific case of Emmaus (although there might be other parts of town served of which the writer is unaware) choosing a downtown/industrial area for a trial definitely minimized exposure to other spectrum users who might complain, typically residing elsewhere. (The choice of downtown, which certainly would have ready accessibility all or most other forms of broadband connectivity, seems at odds with the one valid selling point of BPL, being broadband where other means are unavailable.)

(c) Only someone who is both aware of and knows what BPL interference sounds like in the first place would be able to complain effectively about it.

(d) Indeed, a general complaint to PP&L about "crackling interference to my radio" raised no BPL-specific flags with the customer service representative, who seemed (at least overtly) unaware of its existence, even when it was later specifically mentioned. Given this kind of response, it is easy to see how a BPL "no interference" resulting report could be achieved.

In summation, efforts were expended to minimize exposure of the tests, localize them to constituencies unlikely to find complaint, not let it be known what interference might result, and to not properly characterize and attribute complaints which did occur.

UPLC: "The experience gained from this process indicates that BPL systems comply with the Part 15 limits, and that the existing rules protect licensed users against interference from BPL systems."

Comply they might, but there is demonstrably no protection against interference whatsoever for licensed users. None.

UPLC: "If anything, the existing rules may be too stringent and unnecessarily limit the range of BPL . . . "

The emperor's new clothes are so cool, he wants more, please. The cozy blanket of Part 15 is the only thing that - perhaps legally, but certainly not in practice - allows them to make the "non-interference" claim straight-faced.

In such lights it is difficult to read the UPLC's statement and position as being other than disingenuous, specious and cynical.

### **(3) Proposed Part 15 Revision.**

UPLC: "These trials have been conducted in accordance with the existing Part 15 limits and measurement procedures. "

There is little doubt that this is true, since a lot of attention has been paid to the trials, including and especially by the FCC.

UPLC: ". . . but certainly the emission limits do not need to be reduced to prevent interference. "

This does beg a response to a question posited by the FCC in the Notice of Inquiry, being in essence, whether FCC Part 15 needs modifying to accommodate BPL.

This writer is of the opinion that the FCC should indeed re-evaluate Part 15 as a result of these BPL trials:

Part 15 was written and has evolved to cover most technology applications, and although having higher (worse) limits than set by most other technically advanced nations, has - when adhered to - served well in keeping untoward emissions from technological products under control. It, upon examination, seems not to consider the pernicious effects of broadband radiations as exemplified by BPL, which exhibits \*maximum\* allowed signal levels at \*all\* frequencies within its bounds. Although within the letter of the regulations, with known emission levels measured quasi-peak over given bandwidths at given frequencies, the broadband nature of the emissions calls the measurement doctrine as a whole into question as a reasonable arbiter of interference impact, which surely was its original intent.

The large majority of signals from products which are tamed to pass Part 15 are typically single or a number of discrete frequencies, with perhaps a smattering of lower-level carriers and aperiodic "hash" thrown in. Other spectrum users if affected can and do accommodate these either by, say, avoiding interfering frequencies or the application of nowadays prosaic filtering and signal processing to minimize or remove their effect.

There is no such avoiding BPL. It is spectrally everywhere. Filters have no effect. The modulation scheme is neither truly impulsive nor predictably repetitive enough to succumb to digital signal processing elimination techniques. There is no avoiding BPL. Unlike conventional devices whose radiations corrupt only a very tiny percentage of the spectrum, within its very wide bounds BPL unremittingly eats it all whole.

**BPL does not 'share' the spectrum. It dominates it.**

A different way of looking at this broadband conundrum is to consider the simplistic case of a single signal at Part 15 maximum, which is then subjected to spread-spectrum modulation, i.e. made broadband. If the spreading is 100:1, the measured level by Part 15 methodology at any frequency within the spread will be -40dB with respect to the initial signal. Imagine now that the spread signal is amplified by 40dB; the Part 15 measurement is now back up at the maximum allowable - only it is maximum \*everywhere\* within the spread, too. Within the rules, the one single signal and one a hundred times more energetic count the same. This is the root cause behind BPL's devastating and demonstrated interference potential.

So, yes, Part 15 does indeed need changing given the practical effects of BPL and like broadband systems: The total amount of energy poured out by the modulation scheme within its own frequency bounds should be taken into account, over and above the present peak level by frequency method. Under such a reckoning, the maximum permitted detected level under Part 15 of a deliberately broadband modulation scheme such as the BPL at Emmaus should be reduced perhaps in the order of 40dB, maybe more.

This would roughly equate its disruptiveness to that of 'normal' Part 15-controlled interferences, for common, normal and expected usages of the spectrum. This would still not eradicate it, and it would still well exceed the

existing noise floor, and it would still be spectrally everywhere, but the degree of interference impact would be comparable. How this would affect the modulation scheme's viability in the BPL context would surely not be the FCC's concern.

#### **(4) Considerations of BPL's implementation**

The denial of common, normal and expected usage of the HF spectrum to huge numbers of citizens is not only unconscionable, but asking for trouble in many respects:

(a) The interference potential runs both ways; it is easy to envision a circumstance where a perfectly legal transmission from a licensed user could disrupt BPL messaging; 'paying customer' expectations and social aspects would lead to a dangerous *de facto* inversion of the supposed rights of licensed vs. unlicensed users under Part 15. This has potentially severe ramifications.

(b) The effective denial of use to citizens of a presently unfettered news and information source (short-wave broadcast etc.) could turn politically very ugly; comparisons with the cold-war USSR where such was commonplace would be inevitable.

(c) There are those who actually communicate hundreds and thousands of miles deliberately using transmissions within FCC Part 15 radiation limits. An immediate implication is that huge networks of BPL being radiated by reasonably effective antennas strung on tall poles will likewise ionospherically propagate raising the overall noise floor significantly not only within the US, but outside the US (indeed worldwide) where the FCC has no jurisdiction.

(d) A curious dichotomy arises; presently the power line companies are expected to quickly and effectively address interference caused by the power distribution system. (That their performance in this is somewhat spotty, requiring intervention by the FCC in many cases, is well publicized (ref. 3), and does not bode well for their ability to satisfactorily cope with BPL related problems.) At the same time, there is the expectation that demonstrably worse interference deliberately introduced as BPL by the same power companies should be accepted. This, again, could have far-reaching tortuous consequences.

#### **Summary**

It is hoped that the findings and observations in this submission have been of some use in highlighting that:

(a) BPL **\*DOES\*** cause demonstratedly **\*BAD\*** interference,

(b) The power line companies have not unsurprisingly been disingenuous in their attempts to promote BPL,

(c) As it stands, Part 15 affords no protection for existing licensed users against such broadband modulation schemes,

(d) There is a reasonable adjustment to Part 15 measurement methodology to approximately equate the disruptiveness of interference from broadband schemes to that of more 'traditional' radiations controlled under Part 15, and

(d) Imposition of such a fundamentally incompatible scheme as BPL will inevitably create untold technical, social and political headaches.

**In closing, the corruption and pollution of spectrum supporting ionospheric propagation - and to such banal purpose - would be astonishingly poor stewardship of a profoundly useful and magnificent natural resource.**

Disneyland in Yosemite?

Respectfully submitted,

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References:

(1) United Power Line Council (UPLC) comments:

[http://svartifoss2.fcc.gov/prod/ecfs/retrieve.cgi?native\\_or\\_pdf=pdf&id\\_document=6514284754](http://svartifoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6514284754)

(2) Radio Shack DX-398 (Sangean 909)

(3) Power line interference issues:

[http://www.arrl.org/tis/info/HTML/plc/FCC\\_enforcement/FCC\\_Enforcement\\_Letters.htm](http://www.arrl.org/tis/info/HTML/plc/FCC_enforcement/FCC_Enforcement_Letters.htm)