

**Comments for Notice of Inquiry (NOI) ET Docket 03-104**

1 July 2003

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Federal Communications Commission  
Washington, D.C. 20554

**Subject: Comments for ET Docket 03-104 (NOI for Broadband over Power Line).**

Terms and definitions:

**C63 PLC WG** : Calculated Impact of PLC on Stations Operating in the Amateur Radio Service.

Presented at the November 15, 2002 C63 Committee meeting Rockville MD.

By Ed Hare, ARRL Laboratory Manager.

**NOI**: Notice of Inquiry “Regarding Carrier Current Systems, including Broadband over Power Line Systems” ET Docket No. 03-104

**ARRL**: American Radio Relay League.

Issue #1: Measurements.

The following question, associated with paragraph 22, was posed: “How should Access BPL systems be tested for compliance, given that they generally operate in an environment where signals travel on overhead medium voltage lines?”

Paragraph 22 states “Since measurements at large distances are not always practical, the rules provide for measurements at distances other than those specified, with the use of extrapolation factors. The actual extrapolation factor can be determined empirically. Alternatively, an extrapolation factor of **40 dB** (emphasis mine) per decade can be used for frequencies below 30 MHz and an extrapolation factor of 20 dB per decade can be used when testing frequencies at or above 30 MHz”

C63 PLC WG, Japanese and Dutch Amateur Radio (VERON) measurements made at 3 Meters and extrapolated to 30 Meters using a 40 dB/decade extrapolation factor were found to be 20 dB different (lower) than actual measured values. This was also corroborated by the ARRL’s NEC-4 antenna-modeling calculations. A conclusion reached by these parties is that 40 dB applies well to small sources, but not for overhead power lines on HF, which is multiple wavelengths long. It must be remember that Part

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15 rules, as they exist today, were written for point source single frequency of emissions, not distributed large bandwidth sources.

I recommend that Part 15 be modified so that an extrapolation factor of 20 dB/decade be mandated below 30 Mhz in absence of actual measurements.

From the C63 PLC WG May, 2002 Report: "Below 30 Mhz, the FCC rules use/allow a different extrapolation than the Europeans, 40 dB/decade versus 20 dB/decade. Which, if applied, would cause the (5) PLC products measured to exceed the FCC limits by about 20 dB." Is the American public to assume that if the current FCC rules are left unchanged, that a governmental agency is providing a technical loophole for economic benefits to corporations that stand to gain from BPL ?

Issue #2: Interference to incumbent radio services.

Paragraph 20 asks:" What mitigation techniques are used by In-House BPL systems to avoid possible interference with licensed radio services, such as amateur radio, fixed, mobile and broadcast services? Is there a need to define frequency bands that must be avoided in order to protect the licensed services that use the same frequencies as In-House BPL systems?"

This question applies not only to In-House BPL systems, but also to Access BPL system.

It is well known that power line companies are inconsistent in fixing harmful interference coming from their equipment. At the very least, one has to just review the FCC enforcement letters sent out to power companies that refuse to willingly cooperate with radio amateurs. I personally have been involved with this type of incident. While living in Fort Wayne Indiana, I received electrical power from the Indiana & Michigan power company. I started to receive severe noise which I suspected was being caused by a bad insulator(s) on the power lines. This is a very common type of interference, and anyone that has experienced it, or helped resolve it, knows that this noise can be heard for miles. Troubleshooting efforts are exacerbated as the power lines act as transmission lines. At first, the power company was responsive, but could not track down the noise source. After a while, I received a phone call from the department supervisor that said the company had spent too much money on this problem and would not provide any further assistance. The single event that precipitated that phone call was the that power company sent an employee that was a ham to listen to the noise. He told the department supervisor that there was no interference since he could hear signals through the noise. Technically he was correct; the strongest signals could be heard through the S9+30dB noise level, but the remaining 90% could not! Is this the type of "standard" that amateurs will need to put up with from BPL issues from power line companies? I do not believe that this is what Nancy Victory, the administrator of the National Telecommunications and Information Administration (NTIA), had in mind when she recently stated "I also urge the Commission to promptly adopt any subsequent rule changes that may be appropriate to facilitate broadband PLC deployment, while ensuring

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that those rules prevent harmful radio frequency (RF) interference to other communications mediums.”

Paragraph 18 of the NOI states that “incumbent” radio services that must be protected from interference include “fixed, land mobile, aeronautical mobile, maritime mobile, radiolocation, broadcast radio, amateur radio terrestrial and satellite, and radioastronomy.” I must question, based on the proven track record of power line companies, weather power line companies will resolve interference complaints from all of these radio services in an efficient and timely manner.

To say that interference will not occur from BPL is placing one’s head in the proverbial sand. If power line companies cite budgetary and staffing concerns as a major reason for their track record, where will they get the money for increased BPL interference issues? What will happen when there is no money (or staff) to field interference issues? The “incumbent” radio services will loose.

The FCC rules that apply to amateur radio state that harmful interference is the repeated disruption of radio communications. As my personal involvement indicates, power line companies can not allow monetary considerations to effect their subjective (ex: corporate bottom line) criteria of what constitutes harmful interference to the amateur service, as well as other incumbent radio services.

It must also be recognized that arbitrary loads on house-hold wiring may radiate BPL signals quite strongly. Does the homeowner know that he/she is responsible for clearing up this type of interference?

I recommend that In-House BPL and Access BPL be prohibited from using frequencies already occupied by incumbent radio services.

I recommend that power line companies be required to resolve interference issues within a specified time interval, or else be charged a fine on a daily basis until the interference issue is resolved.

I recommend that for BPL interference to any incumbent radio service, the definition of “harmful interference” be codified in an objective and measurable manner.

I recommend that the public be notified that they are responsible for solving interference issues arising from equipment (loads) on house-hold circuits. They must clearly understand that they are responsible for BPL emissions that occur in this capacity.

Issue #3 BPL as a threat to National Security.

Paragraph 9 states: “In addition, homeland security would be enhanced by creating new facilities to provide redundancy in case of disruption of one or more existing channels of communications.” These sentiments are echoed by Commissioner Kevin J. Martin who

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states: "Moreover, BPL systems serve an important homeland security function, providing a redundant data network.

I would like to point out the inconsistency of the FCC's position on homeland security by noting that the FCC's original proposal for an amateur radio allocation on the 60M band (5 MHz) needed to be withdrawn for homeland security concerns raised by NTIA!! If NTIA views radio amateurs as a potential threat for homeland security reasons, then how much more will that SAME threat be from millions of BPL emissions (broad band RF generators) throughout the United States??

I do not believe that I have to educate the FCC & NTIA to the fact that the Amateur Radio Service is a national resource that has proven itself in numerous emergencies. Floods, hurricanes, September 11, 2001; all illustrate where the Amateur Radio Service has saved lives. In 1977, I manned the amateur station at the only operational Johnstown PA hospital during the flood of 1977. For 2 days, I was the ONLY means of communications in or out of the hospital. I'm thankful that my girlfriend at that time was a nursing student, as I didn't understand 90% of the message traffic. What I did understand was how to setup, power, and use an emergency communication facility.

While the FCC points out that BPL could be a redundant channel of communications, it must also be pointed out that BPL requires a strong and fragile infrastructure to remain robust in times of emergency to provide the said redundancy! Amateur radio requires no such infrastructure.

It's well known that cell phones and the internet provide faster and more reliable communications during normal periods. During those times, the real benefit of Amateur Radio is not seen. During those times, we train, experiment, advance the state of the art, etc. However, make a burble in things, and cell phones and the internet shut down. There doesn't need to be a hurricane, terrorist attack etc. I've been in highway traffic jams where cell phones were flooded to the point you could not get through. A year or so back, we had a road construction crew cut a major internet trunk line that cut us off from the east coast. No great revelations here, but what needs to be understood is that it does not take a lot to cripple our fragile and heavily interconnected infrastructure.

When I was on staff at the Software Engineering Institute in the mid 1980's, the SEI was just starting to grapple with the issue of Information Warfare. Now, the Department of Defense (DoD) is extremely concerned about this situation. A crippling attack on our fragile infrastructure could yield nightmare scenarios for the effected regions. The benefit of Amateur Radio is that we don't rely on this infrastructure. We're independent. When cell phone and the internet go down, it really doesn't effect the Amateur Service.

Take an even more extreme scenario. I was first introduced to the concept of Electromagnetic Pulse (EMP) in the mid 1980's, as the amateur service was trying to get it's arms around what it could do with the issue. Back then, EMP usually meant we'd have numerous large radioactive craters around, and probably none of us would've been alive to run our amateur gear. Today, the threat of an EMP device doing damage to a

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large part of a region's infrastructure is no long in the realm of science fiction. Can you image the effects of an EMP device going off in New York harbor? A crippling attack on the United States does not require airliners flying into tall buildings. Destroy, or heavily incapacitate, a major metropolitan area and the resulting mayhem would not be pleasant. There would be no internet, cell phones, TV, home stereos to receive news etc. And no BPL. There are countless stations in the Amateur Radio Service that not only do not rely on the power grids, but are capable of providing emergency communications in the event of an EMP incident.

The robustness of BPL as a redundant means of communications during times of natural or man-made emergencies is only as good as it's most fragile link. I live in a very rural area of South Central Pennsylvania. I loose power enough times that I have a generator system for my home to provide power for my well, furnace etc. The power lines that deliver my electrical energy, and the power lines that the FCC wants to deliver BPL, are NOT robust to mother nature. Tree branches in our area are only trimmed every few years due to budgetary constraints. Where's the money going to come from for the power company to address my BPL interference concerns?

Issue #4: Ecomonics.

Paragraph 1 of the NOI states: "...BPL could play an important role in providing additional competition in the offering of broadband infrastructure to the American home and consumers. In addition, BPL could bring Internet and high-speed broadband access to rural and underserved areas, which often are difficult to serve due to the high costs associated with upgrading existing infrastructure and interconnecting communication nodes with new technologies."

As stated above, I live in a very rural area. The only options I have for internet communications are dial-up telephone lines or Satellite internet. The fastest baud rate I can get is about via telephone lines is 32.2 Kbps. Two of my children are enrolled in the PA Virtual Charter School, and our other boy is homeschooled. All three use the internet regularly. Additionally, my wife does not drive due to an epilepsy condition, and uses the internet to regularly shop. While the 32.2 Kbps line can at times be slow, we have not found it to effect our quality of life – we certainly are not missing out on the "Digital Revolution" that is being touted by the government. True, we can not download first run movies, but then again why would I want to, when I can view them with my Satellite DSS system?" For a person like me in a "rural and underserved" area, having DSL or BPL would NOT provide any real improvement in my or my family's quality of life!!

Look at it from the converse point of view. If I really wanted DSL type service, I wouldn't be living where I am! There are numerous subdivisions with available housing for me to choose from. I submit that those in "rural and underserved" areas my not be that eager to get high speed internet access as the FCC might think!

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The American public is being told BPL will improve their quality of life not because of any quantum increase in lifestyle, but because the power companies will make money with BPL!! I submit that, except for convenience, BPL will not substantially increase the quality of life of the subscribers to warrant the overwhelming hazards caused by effectively trashing the HF and VHF radio spectrum.

Reading through the NOI, it seems the public will reap "dramatic windfalls" (according to Chairman Powell) and BPL can "achieve great things" (according to Commissioner Martin). Commissioner Martin says "I was able to watch a DVD quality movie, play a highly interactive video game on the internet, and print pages from a news web site on a printer in another room -- all simultaneously. I was impressed..." Have we come to the point in our society where this is what it takes to impress someone? Does watching a DVD quality movie, playing an internet game, and printing pages justify the destruction of the HF and VHF spectrum and the virtual elimination of an emergency communications service? All for instant and selfish gratification to shallowly "wow" the senses, completely oblivious of societal impact.

Does the commission have data that shows that the BPL initiative is warranted? Depending upon one's sources of information, it seems that around 75% of Americans have access to high speed internet (eg: DSL, Cable-modem). Since cellular networks provide high speed access, as do Satellite TV providers, the actual percentage is higher. Coming up with accurate numbers is of course difficult, but I submit that today there are only around 15% to 20% of Americans that do not have access to high speed internet. As DSL moves outwards, and Satellite internet costs decrease, this percentage will naturally decrease. Taking all those into account, it would seem that only around 15% to 20% of Americans will reap "dramatic windfalls" by BPL?. There are significant hazards to implementing BPL; are the hazards (discussed above) warranted to provide 15% of the population with high speed internet services (of which a percentage of those may not even want it)?

Also, the speed of BPL (in terms of bits per second) is proportional to the number of users. It can be readily seen that the touted "DSL Type" connection speeds would apply only under a very narrow set of circumstances.

Who pays for the cost of BPL? The power companies will need to make substantial investments to make BPL a reality. I doubt the power companies will absorb these costs; rather, I believe they'll pass them on to their consumers.

In summary, there are already numerous ways to obtain broadband internet access. Added BPL and destroying the usage of the HF and VHF spectrum does not benefit anyone.

Issue #5 Conducted Emissions Standards.

Paragraph 20 ask the question "Should the Part 15 rules specify both radiated emission

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limits and conducted emission limits for BPL systems, or would one type of limits be sufficient to control interference from both low speed and high speed BPL?" Since all carrier current systems inject RF signals into the power line for communication purposes, would conducted emission limits be more appropriate to protect authorized radio services?

The Part 15 rules should indeed specify both radiated and conducted limits for BPL systems.

According to research performed by the ARRL, BPL systems conduct at least 20 dB more energy onto the mains than the limits set for other devices. There should be no exceptions granted to BPL systems operating under Part 15 regardless of conducted or radiated emissions.

For devices on a BPL power line, will the manufacturer's AC filtering be acceptable? Will increased filtering be required, resulting in increased consumer product cost?

Will there be failures, performance issues, etc to existing equipment if BPL is used? What does the FCC pose for liability in cases like these?

Issue #6: Interference to BPL from incumbent radio services.

According to the C63 PLC WG, amateur stations can run over 200 volts/meter to nearby locations. BPL running under Part 15 must accept this interference. This sounds unambiguous, but consider a more practical situation of a neighbor's little boy that can't download his internet game because the nasty ham operator next door is on the air. I'm concerned at the level of rigidity the FCC will put forth to back members of the Amateur Radio Service when complaints such as this occur.

The Dutch have already terminated BPL experiments. The summary listed on the ARRL Web Site says "NUON in the Netherlands is not going to offer its digital services through the power lines any longer. It will stop its services in the beginning of July. They have determined that the technology is too limited and that it is still not commercially attractive to offer internet services through the power lines. NUON claims that the test they performed shows that it is possible to offer internet services on a small scale. However, the technology is not ready yet for a large scale applications. One of the biggest problems is that it is very susceptible to interference. The Telecom Agency of the Dutch Government has determined through measurements that signals are too strong and cause interference to radio communications" The full story is at <http://www.webwereld.nl/nieuws/14920.phtml><http://www.webwereld.nl/nieuws/14920.phtml>

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Issue #6: Other Studies.

There are several other studies and tests that have been performed that show that BPL, in its present conceptual form, is unsuitable for harmonious coexistence of incumbent users of the HF spectrum.

“Power Line Communications – A Risky Undertaking”  
( <http://www.darc.de/referate/emv/plc/PLT-Market-version.pdf> )  
Gaston Bertels, EUROCOM Chairman (Germany).

The last paragraph states: “All this results in an economical dilemma: the most universal existing network, accessible to the broad masses, does not appear as being compatible with the ever growing demand for fast digital communications and huge amounts of information exchange. No wonder leading manufacturers hesitate to take the risk of investing capital in PLT technology”.

“PLC in Finland” ( <http://www.darc.de/referate/emv/plc/plc-oh.pdf> )

“The Finnish Minister of Transport and Telecommunication, Mr. Olli-Pekka Heinonen, had answered to the question of a Member of Parliament regarding the introduction of PLC in Finland: ‘For the present, because of the technical problems encountered, introduction of PLC technology is not possible’”

Official press release on PLC issued in Japan, from the Ministry of Public Management, Home Affairs, Post and Telecommunications:  
( [http://www.soumu.go.jp/joho\\_tsusin/eng/Releases/Telecommunications/news020809\\_3.html](http://www.soumu.go.jp/joho_tsusin/eng/Releases/Telecommunications/news020809_3.html) )

“The MPHPT [Ministry of Public Management, Home Affairs, Posts and Telecommunications] set up the Power Line Communication Study Group in April this year to investigate the possibilities of joint use along with existing radio communications, with regard to increasing used frequency bandwidth to increase speed of power line communications. The group's report has now been announced, and has determined that, at this stage, increasing the frequency bandwidth that is used in power line communications would be difficult, and proposed that qualification be put in place to implement feasibility tests in areas such as promoting modem research and development.”

The British have significant concerns on BPL systems, and overtly raise concerns on BPL interference to military HF systems and Aeronautical users. Please refer to “Notes on the Final report of the RA’s TWG on the Compatibility of DSL and PLT with Radio Services 1.6 to 30 Mhz”  
( [http://www.qsl.net/rsgb\\_emc/Notes%20on%20Fin%20Rpt%20Ver%201.pdf](http://www.qsl.net/rsgb_emc/Notes%20on%20Fin%20Rpt%20Ver%201.pdf) )

An excellent list of the technical measurements and studies that have been performed on BPL systems can be found on the ARRL’s Web Site  
( [http://www.remote.arrl.org/tis/info/HTML/plc/#Amateur\\_Interference\\_Studies](http://www.remote.arrl.org/tis/info/HTML/plc/#Amateur_Interference_Studies) )



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Thank you

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