Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of:	)
	)
Carrier Current Systems, Including Broadband Over Power Line Systems	)
	) **ET Docket No. 04-37**
	)
Amendment of Part 15 Regarding New Requirement and Measurement Guidelines for Access Broadband Over Power Line Systems	)
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Comment of Douglas E. Smith

In this proceeding, the Commission proposes to define a scheme (â□œAccess BPLâ□□) for delivery of broadband data services over electric utility lines; regulate RF signal emissions from these services under existing Part 15 regulatons; and adopt various procedures to ensure such services don't interfere with existing radio communications.

This commenter fears the procedures proposed by the Commission are inadequate to protect various radio services from ruinous interference. I urge the Commission to take extreme care in authorizing this service, and suggest additional safeguards for existing services.

Characteristics of Part 15 emissions:

Traditionally, two types of RF emissions have been covered by Part 15 of the Commission's rules:

Unintentional radiators â□“ devices not designed to radiate RF signals, but that doÂ radiate such signals as an unwanted byproduct of their operations. Examples include computers and touch-activated lamps. These devices radiate over large parts of the spectrum, but at very low power. The interference they cause can be effectively eliminated by proper shielding and filtering.

Intentional radiators â□“ devices that are designed to radiate RF signals, without requiring a Commission license. Examples include children's â□œwalkie-talkiesâ□□, cordless computer keyboards & mice, and the â□œcarrier-currentâ□□ AM broadcast facilities once common on college campuses. These devices operate on specific â□œspotâ□□ frequencies. The interference they cause can be effectively eliminated by careful choice of frequency.

BPL systems fall into neither category. While it may be technically possible to adequately shield power lines, the cost would be staggering and obviously impractical. Filtering, of course, would prevent the desired broadband signals from reaching the subscriber. BPL does not operate on spot frequencies â□“ it occupies a wide swath of the spectrum â□“ so a simple

small change in frequency will not alleviate interference.[1]

The National Telecommunications and Information Administration (NTIA) agrees, stating: â□œ...application of existing Part 15 compliance measurement procedures for BPL systems results in a significant underestimation of peak field strength.â□□ And, â□œPart 15 measurement guidelines do not address unique physical and electromagnetic characteristics of BPL radiated emissions.â□□

Services subject to BPL interference:

The NPRM suggests BPL operates in the HF frequency band between 2 and 50MHz. However, nothing in the proposal prohibits operation on higher frequencies. Other sources have suggested frequencies as high as 80MHz might be used.

A number of radio services operate in the HF spectrum. Probably the most active are radio amateurs. Also active are CB radio operators, shortwave broadcasters, military stations, international aviation, diplomatic communications, and even mysterious â□œnumbers stationsâ□□ widely believed to be operated by the intelligence services. Higher in the spectrum, between 30 and 50MHz, services include rural fire departments and energy exploration communications, among other things.

The frequencies above 50MHz are, for the most part, occupied by television broadcasting. At my location, television channels 2, 4, and 5 are used by the three most-often-viewed stations. If BPL were to cause harmful interference in the 54-80MHz band, over-the-air television reception of popular stations at my location would become essentially impossible. The ongoing conversion to digital TV will not solve this issue.[2]

Means for other services to avoid BPL interference:

The Commission argues:
â□œ...we note that ARRL acknowledges that noise from power lines, absent any Access BPL signals, already presents a significant problem for amateur communications. We would therefore expect that, in practice, many amateurs already orient their antennas to minimize the reception of emissions from nearby electric power lines.â□□
That position makes a number of invalid assumptions about amateur stations and operating practices.

Amateur stations are unusual in that they are usually installed in residential areas, on relatively small plots of land. In most cases, the option to orient antennas to avoid power line interference does not exist. The NTIA response to the Commission's Notice of Inquiry[3] indicates their studies found fixed stations would experience interference to â□œlow-to-moderate desired signal levelsâ□□ within 460m of power lines. I know very few amateurs who own enough land to erect their antennas 460m from the nearest power line!

1It might, however, be possible to exclude particular frequency bands from BPL use.

2Station WTVF operates on analog channel 5, 76-82MHz. Their digital assignment is channel 56 â□“ which is outside â□œcore spectrumâ□□. WTVF will be required to move their digital operation back to channel 5 when the digital transition is complete.

This is by no means a unique situation. KCBS in Los Angeles operates on analog channel 2 â□“ and will be required to move its digital operation back to that channel from their temporary channel 60 assignment. WCBS in New York is analog channel 2 and digital 56. The San Francisco-area stations on analog channels 2 and 4 are assigned digital channels 56 and 57 respectively. There are many other examples.

3http://www.ntia.doc.gov/ntiahome/fccfilings/2004/bpl/FinalReportAdobe/VolumeI/EXECSUMMARY.pdf

Directional antennas for shortwave frequencies are large. Many amateurs lack the space to erect such antennas even for relatively high frequencies like 28MHz. Directional antennas for the 7MHz band are rare, and I am not aware of any amateur station in the U.S. using a unidirectional antenna on 3.5 or 1.8MHz.[4]

In any case, requiring amateurs to use directional antennas to avoid BPL interference makes it impossible to communicate with stations located in the same direction as the interference source. There are large variations in the density of amateur stations in the U.S., and around the world. An operator in Tennessee, precluded by an interference source to their northeast from contacting stations to the northeast of that state, would see a largeÂ decrease in the number of stations they could contact.[5]

Nor is BPL interference a point source that could be eliminated by nulling signals from a particular direction. BPL emissions come from the electric power lines. These lines completely surround many suburban homes. Even at my semi-rural location, my antenna is within 200 feet of power lines over the range of azimuths from roughly due north to roughly southeast. That's a pretty wide area over which communications could be impossible if I must point my antenna away from the lines!

Harmful interference to licensed services, from unlicensed services, is already illegal. The Commission writes â□œWe would therefore expect that, in practice, many amateurs already orient their antennas to minimize the reception of emissions from nearby electric power lines.â□ □ This is an acknowledgement that electric utilities are already causing harmful interference to the amateur service, in violation of Part 15. It seems absurd to reward such violations by requiring the victims to accept the interference.

There is nothing in the NPRM that suggests the Commission has considered the possibility of BPL signals being propagated through the ionosphere. Apparently it's felt the powers used are low enough that such interference is unlikely. This may not be the case.

This commenter has communicated with European stations on the 14MHz band while using a transmitter power of only two watts and a 1.5m-long helically-loaded whip antenna fastened to the trunk of my car. Contacts all over North America are common with this installation. It is not unreasonable to believe a power line, hundreds of meters in length and 10-20m above ground, could deliver similar field strengths at much lower powers.

Interference mitigation & reporting:

The Commission proposes creation of a database of BPL system locations. The theory is that this database would make it possible for those experiencing BPL interference to contact the offender and arrange for technical adjustments to eliminate or avoid the interference.

This database could be a useful tool. It would require at a minimum, the geographic location of the device; the name of the entity that owns or operates it; and a telephone number and mailing address at which that entity can be reached. It might be desirable for the Commission to collect additional information that might be of value in determining overall compliance with Part 15; and it might be desirable for such additional information to be kept confidential.

There mustÂ be a single database, and it mustÂ be accessible to the public, at no charge, on the Internet. It might be reasonable to allow the database operator to levy a small charge, to

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4A very small number of amateurs use multitower arrays, similar to those used by AM broadasting stations, to broadly concentrate their power in a desired direction. Such antennas are not continuously rotatable â□“ cannot be adjusted to minimize interference at a specific azimuth. In any case, such antennas require far more land than most amateurs can afford.

5There are far more amateur stations in Europe and New England than in, say, North Dakota and northern Canada.

cover postage and printing, when responding to inquiries through the mail.

It might be helpful to require BPL devices to carry some kind of identifying number; interference mitigation might be faster if the victim tell the BPL operator which specific device they suspect of causing problems.

But again, if BPL signals can be transmitted through the ionosphere, a database may be a moot point. It is quite possible that the source of BPL interference to amateur operation in Tennessee might be an access device in Maine, or South Dakota, or Texas.

The Commission also indicates that BPL providers claim the ability to â□œnotch outâ□□ specific frequencies. It is unclear from the NPRM how wide a band of frequencies can be â□œnotchedâ□□. Unlike broadcast stations (and unlike most VHF/UHF operation), users of the shortwave spectrum change frequency often. Ionospheric propagation means that 20.7MHz might be the most effective frequency for communications between Baltimore and Denver one day; the next, 11.3MHz might be more effective; and at night, 4.2MHz might prove the best choice. Amateurs, who are specifically prohibited from â□œlaying claimâ□□ to any particular frequency, often change frequencies dozens of times in a single operating session.

Requiring these stations to contact BPL operators each time they change frequency is obviously impossible. It is likewise impossible for BPL operators to devote personnel to juggle their frequency usage every time a station in their service area changes frequency. It is probably necessary to require BPL operators to notch allÂ spectrum assigned to specific services â□“ notably amateur, shortwave broadcasting, CB, and aeronautical.

The previously cited NTIA comments make a number of additional valuable suggestions. BPL operators should be required to routinely initiate operation at minimum power, increasing power only if necessary to provide reliable service. (and only if no interference results) They should be required to use filters and other methods to remove BPL signals from lines where they are not needed.

Amateurs should be forgiven if they express considerable skepticism of the ability of BPL operators to mitigate interference. Part 15 of the Commission's regulations clearly states that operators of devices that interfere with licensed radio services must correct that interference. Commission staff is frequently required to contact utilities[6] to remind them of their obligations under the rules. These obligations stem from *unintentional*Â emissions that bring no revenue to the utilities. We are quite worried about utilities' willingness to cooperate when the emissions are intentional and bring revenues to the companies.

Economic benefits of BPL?:

Most people believe additional competition results in lower prices. That certainly seems to be the FCC's purpose in working to accomodate BPL. In theory, adding a third choice for broadband will cause prices to drop, making broadband more accessible to those currently using dialup, or no Internet access at all.

A recent story[7], based on a Commerce Department study, notes that broadband prices have actually increasedÂ between 11 and 16% since 2001. This despite the growing deployment of DSL broadband over telephone lines in areas already served by broadband over cable TV facilities.

6Letter from the Commission's Northeastern Region to Mr. Jeff C. Hafer, Manager--Network Operations FirstEnergy Corp. :http://www.arrl.org/news/enforcement_logs/2004/0221.html

Letter to Mr. Wayne H. Brunetti, Chairman, President and CEO, Xcel Energy http://www.arrl.org/news/enforcement_logs/2004/0320.html

7*E-Commerce Times:* http://www.ecommercetimes.com/perl/story/19478.html

Many of the costs of offering Internet access are constant, regardless of the technology used to deliver the data to the customer's home. An Internet provider requires mail servers, web servers, a billing system, and a â□œbackboneâ□□ connection, among other infrastructure and staff. All of this is technically identical, and costs the same, whether that provider's customers are connected via cable TV, DSL, or BPL. These fixed expenses set a â□œfloor priceâ□□, below which a provider cannot cut prices without losing money, regardless of delivery technology.

BPL is also touted as the way to get broadband to rural residents. Yet another article[8] indicates BPL will require â□œrepeatersâ□□ at least every 1,000 meters. Can this infrastructure be supported by customer revenues in the few very isolated areas served by neither cable TV nor DSL?

Is BPL worth the destruction of the amateur radio service? Over the years, amateurs have developed a number of technologies that today see widespread deployment in commercial, government, and military service:

- Shortwave communications
- Frequency modulation
- Single sideband, suppressed carrier (â□œSSB voiceâ□□)
- VHF local communications
- Direct-conversion receivers
- Telephone patching
- Data communications over radio
- Low-Earth orbit satellites
- â□œStore-and-forwardâ□□ data radio networks

Amateurs have discovered and/or researched a number of physical phenomona:

- Ionospheric propagation
- Sporadic-E propagation
- Meteor scatter
- â□œSpritesâ□□
- Communications via passive satellites (including the Moon)
- Tropospheric ducting
- Trans-equatorial VHF propagation

One must wonder what other technologies will go undiscovered or undeveloped if BPL results in the demise of the Amateur Service. And one must wonder how much those technologies could have meant for America, in economic benefits.

Conclusion:

Broadband-over-powerline technology is a serious threat to a number of important radio services. It is technically possible to eliminate the interference threat, though at considerable expense to the BPL operators, and possibly at the non-economic expense of rendering BPL unable to compete with other broadband technologies.

In a time when the Commission is acting to promote wireless technologies, it certainly seems reasonable to encourage Americans to study in wireless and related fields. The Amateur Service has done this for over eighty years. It certainly doesn't make sense to now promulgate rules that make this study impossible.

The Commission should consider with extremeÂ care whether the creation of a service that serves a tiny number of people is worth the potential destruction of some of its oldest and

8*Mobile Radio Technology*, March 1, 2004

most valuable radio services.

Respectfully submitted,

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