Before the

FEDERAL COMMUNICATIONS COMMISSION
Washington, DC. 20554

In the Matter of	)	
	)	
Carrier Current Systems,	)	**ET Docket No. 03-104**
including Broadband over	)	
Power Line Systems	)	
	)	
Amendment of Part 15 regarding	)	**ET Docket No. 04-37**
new requirements and	)	
measurement guidelines for Access	)	
Broadband over Power Line	)	
Systems	)	

To: The Commission

Comments of Cortland E. Richmond (Jr.)

This is the Comment of Cortland E. Richmond (Jr.) to ET Docket 03-104, Notice of Proposed Rulemaking, Carrier Current Systems including Broadband over Power Line Systems, and ET Docket No. 04-37Amendment of Part 15 regarding new requirements and measurement guidelines for Access Broadband over Power Line Systems. Note that both of these dockets being combined in one proceeding, this Comment will apply to both.

The writer has been working in EMC compliance since 1983, and was first licensed as a Radio Amateur in the late 1950's.

Commission remarks are indicated in italics.

In the Introduction to this proceeding, the Commission states it proposes to *"amend Part 15 of our rules to adopt new requirements and measurement guidelines for a new type of carrier current system that provides access to broadband services using electric utility companies' power lines.* "

This precis contains an inaccuracy. There is no new type of carrier current system; only the proposed modulation types are different. To the point: Radiation from conductors used will not be less than for older types of carrier-current systems operating at the same frequencies.

The Commission says additionally, *"... we must protect licensed radio services from any harmful interference that might occur. In this regard, we are proposing to require that BPL systems and devices incorporate capabilities to mitigate harmful interference should it occur."*

The Commission by the nature of its duties is required to do more than reactively mitigate interference. It is required both by the conditions of its creation, and treaties the United States is signatory to, to prevent foreseeable interference from developing. This appears not to have occurred.

In the Background, the Commission notes with regard to radio frequency carrier current systems that "*...Campus radio systems have been operating for over fifty years in the United States at many universities as unlicensed broadcast radio stations in the AM Broadcast band, see 47 C.F.R. 5 15.221.* ***Initially, the receiver and signal source were attached to the same electric power line. After the advent of the transistor radio, receivers are sensitive enough to be able to pick up enough radiated signal for adequate reception when placed next to the electric power line in a dormitory or other locations on the electric power lines.***" (Emphasis added)

Unsaid here -- and it needs to be said -- is that the transistor radios mentioned were still insensitive in absolute terms, the small loop antennas contained in them being so inefficient as usually to not allow reception of background radio noise. More sensitive radios, connected to more efficient antennas, will be much more susceptible to interference from currents placed on power lines.

The Commissions goes on to say that *" ...the availability of faster digital processing capabilities and the development of sophisticated modulation schemes have produced new designs that can overcome these technical obstacles. These new designs have led to the development of new BPL systems that use spread spectrum or multiple carrier techniques and that incorporate adaptive algorithms to counter the noise in the line. "*

But these technologies use the same old medium -- the power line. They are subject to the same old physical limits.

Of BPL systems the Commission says, *"The new low-power, unlicensed BPL systems couple RF energy onto the existing electric power lines to provide high-speed communications capabilities. "*

"Low-power" is quite a relative matter. Were a High School student to transmit radio programming using the same power on a broadcast station's frequency, he would be assured of an FCC letter. This too should not be put out of mind.

The Commission goes on: *"Most Access BPL systems today operate on frequencies up to 50 MHz with very low power signals spread over a broad range of frequencies. These frequencies are also used by licensed radio services that must be protected from harmful interference as BPL systems operate on an unlicensed basis under Part 15 of the Commission's rules."* But then is says, (at 33. Access BPL Emission Limits), *"While we agree that there is some potential for Access BPL to cause harmful interference to radio services, we also tentatively conclude that the likelihood of such harmful interference is low under the current limits"*

It is good the Commission is tentative, for it concludes incorrectly, and either knows, or should know, that it does so. On-channel emissions at Part 15 permitted levels are almost certain to produce harmful interference to a nearby short wave or VHF receiver, and up to hundreds of meters from a sensitive receiver with an efficient antenna. It has already happened . The Commission is reminded (again) of the widely deployed and hastily recalled Phonex "wireless" (really, carrier current) modems, which caused widespread harmful interference to Amateur Radio operations in the 80 meter band at Part 15 permitted levels some years ago .

The Commission itself in Part 15, at Section 15.15, General technical requirements, notes that
"(c) Parties responsible for equipment compliance should note that ***the limits specified in this Part will not prevent harmful interference under all circumstances****. …"*
(Emphasis added)

At 20, the Commission states that, *"On the other hand, BPL equipment manufacturers and service providers state that Access BPL does not pose an unacceptable risk of increased interference to licensed radio services. They note that there have been no complaints of interference from BPL and that the existing Part 15 rules adequately protect incumbent spectrum users. The BPL industry in general believes that Part 15 rules are not only adequate to protect other users of the spectrum,s6 but that higher emission limits are warranted in the 30-50 MHz band."*

Events, as it turns out, have provided ample evidence that BPL providers are over-optimistic. The BPL litany of "no complaints received" is belied by a growing number of actual reports. And Amateur HF SSB operation may be less susceptible to blocking than the largely narrow-band FM operations of low-band VHF users.

Further comments continue on the next page

NPRM:
21: *Southem indicates that it is unaware of any reported cases of harmful interference from use of its Access BPL technology' The HomePlug Powerline Alliance (Homeplug) states that its member companies have widely deployed In-Home BPL equipment in the consumer market over the last* ***2*** *years and there have not been complaints of interference, HomePlug contends that joint testing by the ARRL and HomePlug has demonstrated a very low probability of interference between its devices and amateur radio use.61 The In-House BPL industry advocates no change to Part* ***15****.*

This is two separate matters, both of which will come up again and again. It should suffice to say that a rock and roll band that practices out of earshot does not get noise complaints either. Once they move into the neighboring house, things start happening. Trials conducted so far have been conveniently, almost suspiciously, far from the known locations of amateur radio stations.

As to the ongoing technical work between the ARRL and the HomePlug Powerline Alliance; while reductions in interference have certainly been reported, the probability of harmful interference to an Amateur Station using a HomePlug device remains very high, especially as the sunspot number declines and desired signals become weaker. Interference to a short wave or low-band VHF receiver inside a dwelling where a home BPL device is operating will almost surely be severely affected by such on-frequency emissions it may generate.

NPRM:
22. A number of BPL proponents argue that the technical assumptions used by opponents of Access BPL to predict interference are incorrect. They dispute claims that the electric power lines will act like an efficient antenna and that signals from Access BPL devices will aggregate to raise the noise floor. Southern states that there is a high degree of variability in the ability of power lines to radiate BPL signals and that signals on power lines will tend to cancel each other out. It argues that its research to date would suggest that a BPL signal injection point can appear like a point-source radiator, with the power line having characteristics somewhere between a waveguide and an antenna." Thus, Southem contends that ARRL erred in depicting the power line as an efficient antenna for a single, discrete frequency.

There are of course no point source radiators outside of theoretical constructs, and power lines are far from point sources. The most optimistic of simulations, as noted in this writer's earlier Comment to the NOI, is that a pair of wires fed in balanced manner will radiate as well where RF is placed on them as a dipole antenna of the same length as the wire spacing. This is of special concern for Access BPL using HV wires more than about a meter apart.

Moreover, power not radiated at the point of injection will be radiated, with efficiency proportional to the wire spacing in wavelengths, along the wire pair in directions where the sum of the fields from each wire is non-canceling. Over the broad range of frequencies, this condition obtains only on a plane bisecting the plane of the wires. This is readily apparent from the simplest of examinations of parallel-wire fields. At a discrete frequency, it may be expected to result in a radiation pattern with lobes and nulls along the wire.

The NTIA in its recent report (POTENTIAL INTERFERENCE FROM BROADBAND OVER POWER LINE (BPL) SYSTEMS TO FEDERAL GOVERNMENT RADIOCOMMUNICATIONS AT 1.7 - 80 Mhz, Phase 1 Study), finds that the RF radiated in simulation of a 340 meter long power line with one BPL emitter at its center, will be nearly continuous along the line, such that mobile stations on a road near the power line may expect harmful interference, even at a frequency as high as 40 MHz. While 340 meters is not a whole physical plant the model strongly suggests that talk of a point source is best forgotten.

NPRM:
23. Current Technologies submits that its data indicate that BPL emissions drop off very rapidly away from the BPL source and that emissions fall off in point-source fashion. Ameren Energy Communications Inc. (AEC) states that the notion that the power lines will act as efficient antennas and pollute their surroundings with harmful interference is not supported by scientific measurements. AEC asserts that because of impedance mismatch in real-world power lines, a single power line is expected to be a rather inefficient radiator.

If emissions fell off in "point source" fashion, there would be no emissions from the extended wires of a (for example) rhombic antenna. If emissions fell off in a "point source" manner, "leaky feed line" antennas would not work. The Commission, however, has long experience with leaky feed line technologies used to create distributed RF fields in perimeter protection systems. And a coaxial cable with its shield disturbed radiates much less than a parallel wire feeder spaced (as power lines will be) too widely for the frequency of operation.

AEC's assertion resembles saying that because it's dark out, and fire is bright, a fire won't start. If an impedance mismatch sufficient to eliminate RF radiation exists, the wire won't take RF current to let it be used as AEC seems to wish to. If a wire does accept RF -- a function of the BPL injector -- then a current **does** flow and radiation **will** occur. AEC cannot have it both ways. The NTIA report recently issued confirms that problems will occur for some hundreds of meters along the line.

AEL also seems to think that scientific measurements are needed to establish harmful interference. All <u>that</u> needs is that interference "seriously degrades, obstructs or repeatedly interrupts a radiocommunications service operating in accordance with this Chapter."
Part 15, Section 15.3 Definitions., section (m): Harmful Interference.

NPRM:
24. Current Technologies states that aggregation of BPL signals is unlikely since in its system only two BPL devices in the same area can operate simultaneously, and even those two devices would operate on different frequencies, so they cannot affect the same receiver. Main.Net Communications Ltd. (Main.Net) similarly indicates that in its technology only one unit is transmitting on any given frequency at any given time in any given area. AEC also states that its BPL implementation does not lead to noise aggregation because its systems are broken into several cells and within a single cell, modems cannot transmit signals simultaneously. It argues that therefore only a single RF source will exist within the cell and no combined radiated emissions from multiple sources can occur. Main.Net further indicates that it has successfully implemented its technology in trials and commercial operations in over 60 locations in 25 countries throughout the world."

Simultaneity is not required. A near juxtaposition -- and at Part 15 levels, it is unlikely a victim receiver will only hear one BPL transceiver. Moreover, this assumes the fiction that wires don't radiate away from the point of excitation . And Main.Net appears here to have engaged in an exaggeration; its technology has not enjoyed freedom from interference overseas, nor do its trials appear to have been successful in coexisting with existing spectrum users.

NPRM:
25. In response to CORF's concerns with BPL emissions, BPL proponents submit that their systems would comply with the current Part 15 requirements. Southern states that emissions from its system are compliant with Part 15 requirements and, in fact, tend to be in the noise floor. ***Southern also*** *points out that its Access BPL devices do not even operate in three out of the seven frequency bands allocated for RAS as Access BPL operate only on frequencies below 50 MHz.*

This bears examining. The Quasi-peak detector used for Part 15 measurements suppresses noise-like signals; Radio Astronomy measures noise-like signals. Thus, the noise floor for Part 15 measurements may be quite high, while the noise floor for Radio Astronomy must be quite low. The loop antenna specified for Part 15 measurements is very insensitive, while the antennas used for Radio Astronomy are highly sensitive. If a measurement were crafted to offer the least possible protection to Radio Astronomy, quasi-peak detection and a loop antenna would be the likely result.

NPRM:
26. Finally, Ambient Corporation (Ambient) states that it is possible to avoid interference to nearby transceivers using the inherent frequency agile characteristics of advanced Orthogonal FrequencyDivision Multiplexing (OFDM) technol~gy.'~ Ambient states that if a sub-band is being used by a nearby transceiver, the BPL modem transmitter can be programmed to avoid transmitting on that sub-band, or "notch" it out.

This is good news, if true. The ability to receive signals is what the Commission is supposed to protect and why Part 15 exists. This writer is, however, curious how Ambient Corporation proposes to notch out interference to signals of stations located elsewhere. Will it operate monitoring stations and consult propagation charts so it can use in its service area only frequencies unlikely to be interfered with? And why does Ambient neglect to state it will avoid interfering with those who wish merely to receive the radio signals of stations licensed to transmit to them? Ambient and other BPL providers are required not to protect my transmitter (they ARE required to live with what a transmitter does to BPL) , but to protect someone else who may be receiving my signals or signals from thousands or hundreds of other possible points of origin.

This omission is even more disturbing when the Commission -- which is the US government's agency protecting radio listeners from interference -- also omits to mention the problem.

NPRM:
31. We recognize the significant concerns of existing radio users regarding the potential for harmful interference from Access BPL operations. After careful consideration, however, we believe that these interference concerns can be adequately addressed. We believe that Access BPL systems can operate successfully under the non-interference requirements of the Part 15 rules. Under these rules, operators of Access BPL systems will be responsible for eliminating any harmful interference that may occur.

Furthermore, we believe that the current Part 15 emission limits for carrier current systems in conjunction with certain additional requirements specific to Access BPL operations will be adequate to ensure that existing radio operations are protected against harmful interference from such operations. We therefore are proposing changes to our Part IS rules that we believe will facilitate the deployment of Access BPL technology while protecting licensed users of the spectrum. Specifically, we are proposing to: 1) define Access BPL for purposes of our rules; 2) maintain the existing Part 15 emission limits for Access BPL; 3) require that Access BPL devices employ adaptive interference mitigation techniques; 4) require that Access BPL providers maintain a database of installation locations and technical information; and 5) adopt specific measurement guidelines for both Access BPL and other carrier current systems to ensure that measurements are made in a consistent manner and provide for repeatable results in determining compliance with our rules. These proposals are discussed more fully below.

This writer is doubtful that entities as recalcitrant in the face of evidence as statements issued by BPL proponents suggest they may be, will cooperate enough to meet their obligations under Part 15. If the Commission acts to ensure that interference -- as defined in the Radio Rules and the FCC regulations, not BPL marketing-speak -- is eliminated, then BPL can de3ploy without irreparable harm to radio users. However, the Commission appears even now unable to enforce rules mandating cessation of interference from power companies whose only emissions are accidental. The writer is not optimistic this will improve if they connect actual radio transmitters to their power lines.

NPRM:
Access BPL Emission Limits
33. As indicated above, the commenting parties strongly disagree on the interference potential of Access BPL.89 Existing spectrum users are concerned that emissions from Access BPL systems and devices could adversely affect their operations. BPL proponents, on the other hand, suggest that any impact from Access BPL would be minimal and some argue that emission levels higher than the current Part 15 limits would be acceptable and allow more cost-effective system implementations. At this time, we believe that we should proceed cautiously. We recognize that unlicensed operations in the HF band presents a number of unique challenges given the propagation characteristics of this range of frequencies and the diversity of licensed users. Accordingly, in order to better ensure protection of existing radio services, we are proposing to continue to apply the existing Part I5 emission limits for carrier current systems to Access BPL systems. While we agree that there is some potential for Access BPL to cause harmful interference to radio services, we also tentatively conclude that the likelihood of such harmful interference is low under the current limits and that where such interference does occur, there are remedies that the Access BPL operator can employ to eliminate such interference. On balance, we believe that the benefits of Access BPL for bringing broadband services to the public are sufficiently important and significant as to outweigh the potential for increased harmful interference that may arise. Furthermore, as indicated above, we are proposing to subject Access BPL operations to the existing Part 15 radiated emission limits for carrier current system. In addition, as discussed in the next section herein, we are proposing that Access BPL devices include technical capabilities and administrative procedures to ensure that the potential for harmful interference is minimized and that any instances of harmful interference are quickly resolved.

This commenter does not consider the extant NPRM an example of how to "proceed cautiously." If this is caution, an avalanche is soil erosion. The Commission is proceeding at full speed into shoal waters -- and in someone else's boat. Broadband has been overhyped, the need for BPL to convey it is fantasy, and the reluctance of the American consumer to embrace it -- the Commission's own figures show almost all can GET it without BPL -- is noteworthy.

The existing Part 15 limits and regulations are barely adequate for less aggressive interference sources. They are not likely to prove sufficient to protect radio services from a widely deployed BPL infrastructure. And when the Commission itself, in the person of its chairman, refers to BPL, a technology legally unprotected from interference, and one which must moreover shut down if it causes interference, as one which " ... *could also improve the provision and management of electric power systems,*
homeland security, and protect vital elements of our Nation's critical infrastructure."
one may be forgiven for wondering how secure we may expect to be.
(See STATEMENT OF CHAIRMAN MICHAEL K. POWELL *Re: Carrier Current Systems, including Broadband over Power Line Systems; ET Docket No. 03-104)*

NPRM:
34. While we appreciate the interference concerns raised by existing radio users, we note that Access BPL will operate in compliance with the current Part 15 rules that limit emissions from unlicensed carrier current systems to very low power levels in comparison to licensed radio operations. We believe that the current Part 15 levels will limit the harmful interference potential of Access BPL devices to relatively short distances around these devices. ***In this regard, we note that hundreds of kinds of unlicensed devices are successfully operating under the current Part 15 limits without causing harmful interference to licensed operations.*** *Furthermore, all unlicensed devices operating under Part 15 are subject to the condition that they not cause harmful interference and that they cease operation if they do cause such interference.*
(emphasis added)

The Commission ignores the different modulations and spectrum occupancy of BPL, such that comparison with isolated, narrowband emitters must be done with some forethought. A 30 dBµV/m signal is indeed stronger than many one would normally receive, and capable of causing harmful interference. However, an oscillator signal from a digital device occupies just one frequency, and the probability this one frequency will be used by a radio listener nearby is therefore quite low. BPL will at least potentially occupy many HF frequencies (and perhaps at low band VHF, too) at once. Thus, the probability it will cause harmful interference is MUCH higher than that a random, conventional Part 15 unintentional radiator would. Add in the promise of reaching every dwelling near an electric line and that probability is raised to a higher level.

NPRM:
*35. We recognize that amateur operations are likely to present a difficult challenge in the deployment of Access BPL in cases where amateurs use high gain outdoor antennas that are located near power lines. In considering this interference potential, we note that ARRL acknowledges that noise from power lines, absent any Access BPL signals, already presents a significant problem for amateur communication^.^^*

We therefore would expect that, in practice, many amateurs already orient their antennas to minimize the reception of emissions from nearby electric power lines. Further, we note that many Access BPL technologies have the capability to avoid using specific frequencies, if necessary, to avoid interference. This would permit Access BPL devices to avoid the use of amateur frequencies when in close proximity to amateur outdoor antennas.
(Emphasis added)

The Commission does not generally require Amateur Radio Stations use directive antennas, and then, only at UHF (Part 97, 97.313 (f)). The Commission has even declined to assist Amateur Radio stations who wish in the face of neighborhood or local opposition or rules to erect modest antennas of limited directivity and it is incomrehensible that it would insist on larger ones and use them to justify imposing a predictable interference source on Amateurs and other users of the radio spectrum. Moreover, many, if not most, Amateur Radio stations would be unable to erect, or if able to erect, afford, antennas of the directivity needed to avoid interference from power lines running down every street. The Commission already receives numerous complaints about power line interference -- and has in tehapst taken action against electric utilities to enforce the Rules.

NRPM:
36. We also disagree with ARRL and others that suggest that interference caused to amateur and other radio operations by Access BPL systems complying with our Part 15 limits will be widespread. Although we agree with ARRL that Access BPL on overhead lines is not a traditional point-source emitter, we do not believe that Access BPL devices will cause the power lines to act as countless miles of transmission lines all radiating RF energy along their full length. Rather, the primary source of emissions will be the individual couplers, repeaters and other devices and, to a lesser extent, the power line immediately adjacent thereto. Regarding the cumulative interference effect of Access BPL across wide geographic areas, data submitted by Access BPL proponents, such as AEC and Current Technologies, show that radiation would be the highest in the vicinity of an Access BPL emissions source. In addition, as indicated above, Current Technologies, Main.Net and other Access BPL equipment manufacturers state that in their implementations only a limited number of devices transmit simultaneously on the same frequency in the same geographic area and that there is no cumulative effect from multiple Access BPL devices transmitting at the same time in the same area. Nevertheless, to ensure that any effect of the power line is taken into consideration when testing for compliance with our Part 15 rules, we are proposing to modify the measurement procedures for Access BPL systems, as set forth in Appendix C, to specify that emission measurements be made at several specific distances from the Access BPL equipment source, and that measurements be taken parallel to the power line to find the maximum emissions from the BPL system. We seek comment on our proposed measurement guidelines.

Evidence collected by Amateur Radio operators, recently confirmed by NTIA measurements, is that for some distance from and along power lines in BPL test areas, BPL does cause harmful interference, and a reasonable extrapolation to a fully populated system suggest irresistibly that the interference caused will be difficult or impossible to avoid. The NTIA report concludes that adequate measurement of Access BPL power line radiated noise may not be possible at ground level, or close to it. The NTIA therefore suggests that measurements be conducted at the height of the power lines, but at 10 meters distance from them.. NTIA also notes that the practice of centering radiated measurements on EUT's results in underestimating actual interference levels, however, the Commission seems at Appendix C to have addressed the issue of making measurements from power lines and not merely from the installed EUT. It remains to raise the antenna to obtain a more accurate estimate for elevated power line installations. The NTIA report says:
"NTIA's measurement results to date (see Appendix D, §D.5) indicate that electric field strength generated within tens of feet of the power lines at two (2) meters above ground level generally are 3 dB to 15 dB lower than values generated at a height of ten (10) meters (*i.e.*, typically one (1) meter above the height of power lines).
This level of uncertainty is unacceptable, and this commenter cannot endorse applying a correction factor to the readings taken at or near ground level.

NTIA also points out problems inherent in using a loop antenna in the near field, where wave impedance may be undefined In addition to imprecise conversion from magnetic to electric field levels, loop antennas are often insensitive enough that some have thought their signals undetectable even when they caused interference. Since victim receivers largely use electric field antennas, the writer concurs with the NTIA that BPL emission measurements should be made with a calibrated rod antenna, not a loop. One compelling reason to do so is that entities required to reduce emissions will be unable to comply if they cannot measure the emissions they must reduce.

NPRM:
37. With regard to potential interference to the non-amateur radio services, such as public safety, maritime and other operations, we believe that the risk of harmful interference from Access BPL operations is low. In general, we believe that a properly designed and operated BPL system will pose little interference hazard to non-amateur services such as aeronautical, maritime and public safety.

However, we recognize in our analysis that public safety systems merit particular attention because of the often critical nature of their communications. In analyzing the potential for harmful interference to public safety systems we took into account the fact that low-level Part 15 signals from Access BPL devices attenuate rapidly as the distance from the device increases; and that most public safety systems are designed so that mobile and portable units receive a signal level significantly above the noise floor.
From an interference analysis standpoint, this latter characteristic distinguishes public safety systems from amateur radio stations using high-sensitivity receivers to receive signals from transmitters often thousands of miles away. However, it is foreseeable that under certain rare circumstances a public safety unit could: (a) operate in close proximity to an Access BPL device; (b) be tuned to a frequency radiated by the Access BPL device; and (c) be receiving a weak signal from a distant, or obstructed, public safety base station. In general, potential harmful interference under these conditions would be limited to public safety units operating on systems using low-band VHF channels (25-50 MHz). Therefore, it appears that the interference protections we propose herein -- and the strict "no interference" restriction inherent in the Part 15 rules -- will be adequate to foreclose such rare instances of harmful interference to public safety systems. While we tentatively conclude that the measures proposed herein are adequate, we request comment on whether any additional measures are needed to protect particular operations, such as public safety. For example, should we require Access BPL system to coordinate with public safety agencies that use the HF band for state-wide public safety communications?

The NTIA study indicates that mobiles operating near and along power lines even hundreds of meters from an associated BPL coupling device or repeater might experience harmful interference within tens of meters of an elevated power line.

Non Amateur services generally coordinate their operation through local frequency coordinators. It is logical therefore to require that BPL entities also coordinate their operation with coordinating bodies, and prudent that they be required to defer to those coordinators.

NPRM:
38. Accordingly, we are proposing to maintain the existing Part 15 radiated emission limits for Access BPL systems and devices. In addition, we are proposing to exempt Access BPL systems from the existing conducted emission limits of Section 15.107(c). Because Access BPL systems are installed on power lines that can carry 1,000 volts to 40,000 volts, conducted emission measurements are very difficult to measure, and present safety hazards in connecting test equipment to these lines.97 We do not believe that this exemption would have any impact on interference potential since Access BPL would still be required to comply with our radiated emissions rules. We seek comment on these proposals. We further seek comment on whether Access BPL would in some instances operate in the AM broadcast band (from 535 to 1705 kHz), and whether specific conducted requirements are needed in such situations.

It does indeed seem unnecessary and hazardous to test BPL devices for conducted emissions on energized HV lines. However, it also seems prudent, to detect variations in equipment, to require a conducted emission test in the laboratory before equipment is shipped and installed. The writer urges the Commission adopt a modified version of 15.103 for Access BPL devices, if only to track power output n the installed equipment plant.

NPRM:
Access BPL Operational Requirements
39. Notwithstanding compliance with the Part 15 emission limits, we wish to emphasize that Access BPL would also operate under our Part 15 non-interference conditions. Thus, operations must cease if harmful interference to licensed services is caused. Given that there is significant investment in the deployment of the service, we agree with several commenters that Access BPL providers would have a strong incentive to exercise the utmost caution in installing their systems to avoid harmful interference and ensure uninterrupted service to their customers. In addition, given the typical attachment of BPL products to medium voltage lines and the possible use of BPL systems to control and monitor the electrical system, we believe that Access BPL systems likely will be managed on a more controlled basis as compared to other typical Part 15 operations.

The writer is less trusting that the Commission. BPL entities have reacted to reports of interference by denying they happened, and when they could not deny that, by insisting interference wasn't harmful at all because the user was in a vehicle and could go elsewhere. This "dog ate my homework" approach to compliance should not inspire the Commission to put much trust in BPL providers before it sees them comply.

NPRM:
40. To further address the interference concerns raised in the Inquiry, we are proposing certain additional technical and administrative requirements for Access BPL. First, we are proposing to require that Access BPL systems and devices incorporate capabilities that would allow the operator to modify system performance to mitigate or avoid harmful interference to radio services. Such adaptive interference mitigation techniques would include, for example, the capability to reduce power levels on a dynamic or remote controlled basis, and the ability to include or exclude specific operating frequencies or bands. This capability would allow operators to avoid localized and site-specific harmful interference.

The writer notes that interference is defined with respect to receivers, not transmitters. BPL providers must respond to reports of interference to reception, not merely to detection of transmitted signals somewhere nearby. They must do so expeditiously, willingly, effectively, and without requiring "scientific" proofs. Absent this attitude -- a considerable change to judge from some BPL proponents' remarks -- no amount of technical mitigation will do any good. The technical means are absolutely necessary. They are not enough.

NPRM:
41. We believe that this requirement is reasonable and practicable for Access BPL operators and equipment manufacturers to implement. We observe that a number of Access BPL devices currently employ OFDM modulation techniques, which facilitate the ability to dynamically select the specific frequencies used to provide service and to avoid use of specific frequencies where operation might result in harmful interference. In this regard, we note that PowerWAN states that "notching" of specific frequency is technically feasible. Ambient indicates that its equipment will be able to notch out individual frequencies "on the fly," in response to short term changes in the RF environment. Main.Net states that it already has the capability to remotely control the operating frequencies and power of their installation.

Again, they must be willing and able to do these things. There is no great evidence so far that they are either.

NPRM:
42. Second, we propose to require that Access BPL devices incorporate a shut-down feature that would deactivate units found to cause harmful interference, and thereby allow speedy implementation of interference mitigation measures. It is our understanding that most Access BPL devices already possess this capability. We seek comment on these proposals and invite suggestions for alternative approaches.

In particular, we request comment on whether we should have specific requirements regarding the above mitigation approaches. For example, should we require that each Access BPL device be capable of operating across a minimum range frequencies and have the capability to remotely exclude a specific percentage of frequencies within this range. We also seek comment on the cost and effectiveness of these or alternative approaches. To the extent possible, we encourage potential BPL providers and BPL equipment manufacturers to work with amateurs and other existing licensed services to develop such appropriate mitigation requirements. We seek comment on the appropriate period of time that we should allow for BPL systems to come into compliance with any new requirements that we may adopt pursuant to this rule making proceeding. We further seek comment on whether Access BPL systems currently deployed should be required to be brought into compliance with the new rules, and if so, what period of time should be afforded for them to come into compliance.

This is not a radical departure from existing practice under Part 15. Each operator must be able to deactivate an interfering device. It is this writer's understanding that claims to be able to notch out certain frequencies hinge on software generation of the OFDM signals. This is perhaps not an altogether effective means of protecting an adjacent frequency, having demonstrated a less tan "brick wall" characteristic, but it is already "built in." Other modulation types should indeed have provision to protect frequencies which may, by reason of the vagaries of propagation, be momentarily useful for short wave reception. However, this raises a serious question: If frequencies are occupied by BPL signals, how will anyone be able to TELL they are supporting useful propagation? A means must be provided to do so.

Yes, existing BPL systems must be brought into compliance with tighter standards, if only to avoid being shut down completely due to reports of harmful interference.

NPRM:
43. Finally, we propose to subject Access BPL systems to a notification requirement similar to the notification requirements in our rules for power line carrier (PLC) systems. Under this requirement, an Access BPL system operator would submit information on its system to an industry-operated entity. The objective of the proposed notification would be to establish a publicly accessible database for Access BPL information to ensure that the location of Access BPL systems and their operating characteristics are identified if harmful interference occurs and to facilitate interference mitigation and avoidance measures. We propose that this notification includes information on the location of the installation, the type of modulation used and the frequency bands of operation. We seek input on these proposals. We also request comment and suggestions on the appropriate industry-operated entity that we should select to receive the notifications and maintain the Access BPL data base. We also seek comment on other approaches for making this information available. For example, would it more reasonable to allow each Access BPL operator to maintain a database of its own rather than require a more centralized data base?. Commenting parties are requested to submit information on the benefits of such approaches. We further seek input on any resulting burdens that the proposed notification requirement may place on entities operating Access BPL systems, and any impact of a notification system on the availability of customer data as well as how any concerns regarding the proprietary nature of that data can be addressed.

Existing frequency coordinators are well able to handle this responsibility, if their BPL databases are made available to the public.

NPRM:
44. Equipment Authorization. We propose to retain the Verification procedure for Access BPL. Consistent with the objective that our regulatory requirements keep pace with technology development, we recognize that we must balance administrative burdens and the need to ensure compliance with our rules. We agree with commenting parties such as Phonex Broadband Corporation (Phonex) and UPLC that the authorization procedure for BPL should be the same as for all unintentional radiators, including traditional types of carrier current systems. ***Low-speed carrier current systems, which for a number of years have been operating inside buildings, have rarely been a source of harmful interference to radio communications, and the use of the verification procedure has been adequate to ensure that such systems comply with the rules.*** *We seek comment on this proposal.*
(emphasis added)

Low speed, traditional carrier current installations cannot create a regulatory approach to BPL. For one thing, they do not in this country share bands with existing spectrum users. Indeed, power companies not long ago strenuously opposed allowing an Amateur Radio long-wave allocation, even at reduced power. Because of the high-profile and large impact of BPL, it is incumbent to scrutinize its operations **more** carefully as it is rolled out, not less so.

NPRM:
45. Access BPL Measurement Guidelines. Because Access BPL is a new implementation of carrier current techniques, as discussed, supra, there are no existing measurement guidelines for this type of equipment. We tentatively propose that Access BPL systems, including all BPL electronic devices, e.g., couplers, injectors, extractors, repeaters, boosters, concentrators installed on the electric utility overhead or underground medium voltage lines etc., be measured in-Jitu to demonstrate compliance with our Part 15 rules, at a minimum of three overhead and three underground representative locations, using the measurement guidelines in Appendix C. Consistent with existing FCC measurement procedures, measurements below 30 MHz must be performed with a magnetic loop antenna, while those above 30 MHz are performed using an electric field sensing antenna. For Access BPL in underground installations, the proposed guidelines employ the common principle of measuring radiated fields along a number of radials at a specified distance from the periphery of the pad-mounted above-ground transformer where the Access BPL equipment is located, to find the maximum emissions. For Access BPL installed on overhead lines, in order to take into account the effect of the long power line associated with the Access BPL equipment, our proposed guidelines specify measurements at fixed horizontal distances from the power line where the Access BPL source is installed. Thus, rather than finding the maximum emissions across a number of radials, - as currently performed for other Part 15 emitters - the receive antenna is moved down-line, parallel to the power line, starting from the Access BPL equipment location, to find the maximum emissions. Down-line distances used in this sequence of measurements are specified in terms of wavelength of the Access BPL mid-band frequency. We seek comment on these guidelines.

The writer agrees these are a good start. For a reasonable, practical test method, one could do far worse than the NTIA recommendations. One shortcoming in the Commission's test is use of a loop antenna. The Commission has neglected to require it be oriented in all three axes with respect to the power line However, as the NTIA has pointed out, a rod antenna would be more effective for these measurements,. And since services receiving interference mostly use antennas responsive to electric fields, it makes sense to allow BPL providers to avail themselves of a similarly sensitive antenna.

NPRM:
46. In addition, we specifically solicit comments on the height of receive antennas used for radiated emissions measurements for Access BPL systems operating on overhead power lines and on the possible use of correction factors to account for antenna height. The proposed guidelines in Appendix C recommend a fixed loop antenna height at 1 meter and scanning the height of electric field sensing antennas from 1 to 4 meters. While these recommendations correspond to standard practice for other types of devices (especially when measured on a test site), these heights may not capture the maximum emissions from an overhead power line. In Appendix C, we address this issue by specifying that distance extrapolation for emission measurements on overhead lines be based on slant-range distance from the Access BPL location on the pole to the measuring antenna, rather than on horizontal distance. However, this technique does not account for field strength reductions caused by ground effects. We seek comment on the following:
(a) Is it necessary to require that emission measurements be conducted at antenna heights greater than those proposed in Appendix C?
(b) Is it practical and safe to make in-situ emission measurements at antenna heights up to the height of an overhead medium voltage power line (typically 11 meters) when operating 10 meters from the power line? As an alternative to requiring higher antenna heights, should we specify that measurements that are performed at heights significantly lower than the power line be subjected to a correction factor to estimate the maximum field strength that would have been observed at a higher measurement height? How should such a correction factor be determined?

Yes, it will be necessary to raise the measurement antenna above heights proposed in Appendix C.. NTIA hints that the maximum fields are straight up, but no one would want to try elevating an antenna and feed line through HV lines. The NTIA's investigation shows too much variability between low heights and power-line-level measurements to make correction factors a reasonable alternative to raising the antenna.

NPRM:
41. Measurement Guidelines for Other Carrier Current Systems. In the Inquiry, the Commission observed that the International Electrotechnical Commission (IEC), International Special Committee on Radio Interference (CISPR) Subcommittee 1 on Interference Relating To Multimedia Equipment, Working Group 3 on Emission from Information Technology Equipment is developing conducted emission limits for new BPL technologies. We note however that this international work on a standardized measurement method for In-House BPL is still under way, including work on the definition of a line impedance stabilization network (LISN),'06 associated injection methods, and conducted emission limits for systems using the power line port as a communication port. We tentatively propose in the interim, pending the completion of such work, to retain the three-installation radiated emissions method for In-House BPL and traditional CCS, using the measurement guidelines in Appendix C, which clarify principles used regarding in-situ test buildings, device installation location within a building, measurement distances from the building, measurement of emissions from overhead power feed lines to the building, and device operation. We seek comment on the measurement guidelines of Appendix C for In-House BPL and CCS.

Because victim receivers are often inside the same buildings as In-House BPL, the three-installation method should be augmented by tests located similarly to common home installations, perhaps plugged into a power line on which BPL is injected with an integral rod antenna raised. An active rod antenna might substitute for an actual receiver.

NPRM:

IV. CONCLUSION

48. In conclusion, we believe that Access BPL has the potential to offer a number of significant benefits, such as 1) increasing the availability of broadband services to homes and businesses; 2) improving the competitiveness of the broadband services market; 3) improving the quality and reliability of electric power delivery; and, 4) advancing homeland security. We believe that our proposals contained herein to adopt new Part 15 technical and administrative rules for Access BPL will help promote and foster the development of this new technology with its concomitant benefits while at the same time ensuring that existing licensed operations are protected from harmful interference. We further believe that our proposed measurement guidelines for Access BPL and CCS will ensure that emission measurements for determining the compliance of these systems with FCC requirements are made in a consistent manner, and with repeatable results. We request comments on these conclusions and on all aspects of the proposals contained herein.

The writer believes the present incarnation of BPL, and the NPRM itself, to be seriously flawed. BPL should have been engineered with a "low probability of intercept" but has instead come out of the starting gate blowing horns and beating drums, as it were. The Commission, in turn, has not critically examined BPL before endorsing it. This is, in the writers view, shirking an important responsibility. The NPRM is neither neutrally worded, nor does it convey a properly skeptical attitude towards a radio interference source with the potential to destroy much of radio as it has developed.

Nevertheless, Part 15 offers means to make BPL's impact less onerous that it could be. It remains now through the Comment and Rulemaking process, to see if the Commission, and BPL providers, will respond to that process as they should, in hope of which this Comment is

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