

Notice of Proposed Rule Making (NPRM) comments from William T. Murphy (private citizen) retired Senior Member of Technical Staff AT&T, 1999 after 30 years with AT&T. I graduated from University of Colorado with a MS in Telecommunications, 1996. My thesis was "Wireless Emergency Communications for Domestic Telecommunications Networks". I also hold a valid amateur radio Extra class license W0RSJ/3, and a General Radiotelephone License I currently operate on frequencies from 7 Mhz to 5 Ghz.

My comments cover the dockets below:

Carrier Current Systems, including Broadband over Power Line Systems, ET Docket No.03-104

Amendment of part 15 regarding new requirements and measurements guidelines for Access Broadband over Power Line Systems, ET Docket No.04-37

I

32. We propose to define Access BPL as a carrier current system operating on any electric power transmission lines owned, operated or controlled by an electrical power provider, as follows:

Access Broadband over power line (Access BPL): A carrier current system that transmits radio frequency energy by conduction over electric power lines owned, operated, or controlled by an electric service provider. The electric power lines may be aerial (overhead) or underground.

We believe that this definition is consistent with the concept of Access BPL and the current and planned deployment of this technology.

We request comment on this definition of Access BPL. Interested parties are invited to submit suggestions for alternative definitions. Such submissions should include a complete description of what would be included in the definition of Access BPL and why.

Comment:

(Access denotes that access to a network is provided. This is not the case if alarm monitoring of the power network is one of the reasons to deploy access BPL, this provides no access to a network. BPL is an adequate definition but should include the modulation type i.e.: BPL/ODFM/CDFM/etc.; or BPL/ 802.1xx. In the later case BPL/802.1xx only covers the current generation of BPL. Also a IEEE or other standard needs to be developed that will identify what BPL is and how it can be manufactured. If this is not accomplished competing modulation schemes will be used. The standard should comply to all part 15 modified requirements set forth by the FCC to minimize harmful interference to licensed services and should include time frames to mitigate interference. The standard should clearly indicate that service may be terminated and quality of service can not be guaranteed.)

We also request comment on whether there are entities that plan to own/operate Access BPL over the electric power lines but would not be electrical power providers or a subsidiary of the incumbent electric power provider.

Comment:

(Once a new method / technology of last mile access is available it will be utilized. The communications act of 1997 was supposed to open competition and provide the consumer lower

prices and extend TCP/IP and broadband services to rural America. As mandated by congress the FCC was tasked to develop ways for the LEC to go into long distance and the long distance providers to go into local service. For all common carriers this was a FCC requirement, and a lottery was to be used to select a regional common carrier to provide money loosing services to rural communities. It is apparent the 1997 communication ACT caused major money problems to all long distance companies that attempted to compete with the LEC for last mile access using LEC facilities.

As a result of this failure in portions of the communication Act of 1997 most long distance providers are looking at cable TV and now access BPL. One company, AT&T is planning to deploy a BPL network in New Jersey, can the others be far behind? And I do not believe the long distance companies are electric power providers or subsidiaries. It is interesting that a regulated common carrier would use a part 15 device in it's network.)

Access BPL Emission Limits

33. As indicated above, the commenting parties strongly disagree on the interference potential of Access BPL.¹ 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 15 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 systems.² 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.

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

¹ See ¶[Error! Reference source not found.], *supra*.

² We are however proposing to exempt Access BPL from the conducted emission limits contained in § 15.107(c), as explained below. See ¶0, *infra*.

interference and that they cease operation if they do cause such interference.³

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 communications.⁴ 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.

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.⁵ 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.⁶ 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.

Comment:

(Part 15 rules to modify measurements procedures for access BPL systems do require modification. I will let the ARRL and the NTIA help the FCC to modify the measurement standard.

³ 47 C.F.R. § 15.5(b).

⁴ Comments of ARRL at 3. *See also* ¶**Error! Reference source not found.**

⁵ *See* comments of AEC at 12; reply comments of Current Technologies at 10-11.

⁶ *See* reply comments of Current Technologies at 11; Main.Net at 3; AEC at 13.

COMMENT:

The following comments apply to paragraphs 34 to 36.

Suggesting that interference would not be wide spread may be a false premise.

If access BPL is only to be used by the power company to monitor their network transmission parameters this may be the case.

However if Homeland Security or Long distance providers use it the deployment will target the 100 major population centers and this will impact the maximum number of licensees, case in point the system at Manassas, VA. If access BPL was the answer to rural schools having Internet services as mandated by the white house why target the major population centers that already have DSL and BB cable service? Would it not be better to deploy access BPL in rural communities, most of which use a cooperative to supply power?

Point source emitters will become a major problem above 15 Mhz. As you go higher in frequency antenna gain rises. At 50 Mhz these devices will radiate and be capable of producing harmful interference miles from the source in the weak signal part of the 50 Mhz amateur band.

I would like to take exception to Paragraph 34, which states that hundreds of unlicensed devices are operating without causing harmful interference to licensed operations. This is not the case I have had increasingly high levels of harmful interference from cordless phones that impact 903.100 Mhz over the past four years, the only reason I have not complained is who will do anything? I invite the FCC to visit my station W0RSJ/3 and count the number of harmful carriers present at any time on this frequency.

How do you tell someone with a cordless phone to cease operation? How do you tell a access provider to cease operation, if it is carrying life line services from a long distance provider over voice / IP?

In paragraph 35, orientation of antennas to minimize noise is only part of the issue. Noise blankers were developed and allow modern HF and VHF transceivers to minimize existing power line noise if it is limited in intensity. In cases of extreme interference with non cooperative power companies the FCC has become involved in the past.)

However no blanker currently exists and is doubtful can be developed to remove the harmful interference that may be caused by access BPL. Access BPL uses a non compatible modulation schemes and will only get worse if CDMA / CSMA is deployed, it will spread harmful interference to licensed services. Research has indicated that a next generation of access BPL is currently under initial development. This new technology will deploy new modulation schemes and greater bandwidth. The current access BPL has a maximum bandwidth of 45 Mbs the next generation BPL can exceed 2 Gbs and will spread harmful interference to 2GHz and beyond if developed and deployed. Any next generation systems should not be part 15 devices and moved to a licensed microwave frequency band.

I also fail to understand why the FCC permitted this non compatible modulation schemes to be deployed in the first place. Technology exists to allow signals to be transmitted 20 dB or more noise and recovered, if this type of coding was used for access BPL more than likely no harmful interference would exist to impact licensed services.

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).⁷ 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?

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).⁸ 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.⁹ 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.

⁷ The Commission’s records reflect that there are approximately 18,237 Public Safety licenses (Radio Service Code - PW) for systems operating between 25-50 MHz. The historical trend in public safety systems is use of higher frequency bands. Although we are not imposing operating frequency limitations on Access BPL devices, we note that the equipment available to date operates on frequencies below 50 MHz.

⁸ For the protection of the AM Broadcast service, existing carrier current systems operating below 30 MHz are subject to a conducted emission limit of 1000 μ V in the AM broadcast band (from 535 to 1705 kHz). See 47 C.F.R. §§ 15.107(c)(2) and 15.221. However, carrier current systems operating above 30 MHz are subject to the general conducted emission limits that apply to frequencies below 30 MHz. See 47 C.F.R. § 15.107(a)-(c).

⁹ Conducted emissions are measured by connecting the Equipment under Test (EUT) to a Line Impedance Stabilization Network (LISN) that simulates the impedance of the power network while sourcing power to the EUT. Such a LISN would have to be capable of sourcing 1,000 volts to 40,000 volts to an Access BPL system. Furthermore, measuring instruments such as spectrum analyzers, voltmeters, etc. would also be connected to this LISN, thus high voltage hazards can affect both test equipment and test personnel.

We seek comment on these proposals.

Comments:

Paragraph 37, Other non amateur services use weak signal techniques in the HF spectrum. These systems may use automatic link establishment (ALE) to access network centers or Pot's dial tone for essential EMERGENCY COMMUNICATIONS to restore damaged infrastructure or pass vital command and control messages. I will use the SHARES network as an example: not all SHARES members belong to the government or operate on frequencies under the control of the NTIA.

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.

Comment:

Non compatible modulation schemes in Access BPL should not be used.

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.¹⁰ 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.

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.

¹⁰ See e.g., comments of Ambient at 9 and reply comments of Southern at 5.

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.¹¹ 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.¹² Main.Net states that it already has the capability to remotely control the operating frequencies and power of their installations.¹³

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.

Comments:

Paragraph 39, Providing unrupted service to customers through remote network management and provide utmost caution in the installation of systems to prevent harmful interference to insure uninterrupted service to customers.

It is not possible to have uninterrupted service to customers if a part 15 device MUST be turned off if it causes harmful interference to a licensed service. Please see my comments on ODFM in paragraph 41. Access BPL systems using ODFM may be interfered with by a licensed service and skip to a new frequency causing a potential service disruption.

Paragraph 40, Additional technical and administrative requirements may be feasible if ODFM is the only modulation scheme used. It must be so stated in the definition of access BPL and in a separate IEEE 803 xx standard. To meet the above statements the ODFM standard must be changed to allow a control operator to notch out frequencies on the fly if

¹¹ See comments of PowerWAN at 3.

¹² See comments of Ambient at 7-8.

¹³ See comments of Main.Net at 4; Ambient at 8; AEC at 19; reply comments of Mitsubishi Electric Power Products, Inc., Mitsubishi Electric Europe B.V. and Mitsubishi Electric Corporation (Mitsubishi Companies) at 5.

an interference report is received. The current technology borrows from the cellular industry and switched if interfered with, only to switch autonomously back at a later time to again cause a problem.

A administrative center or Network Operations Center must exist to manage the network. The NOC must have the capability to remotely turn off or switch a frequency band and turn off a unit.

A full and complete definition of Harmful Interference must be developed. This will hopefully come out of metrics developed in the measurement of access BPL submitted by the NTIA , ARRL and others.

Paragraph 41, In the current issue of "Newton's Telecom Dictionary, March 2004" the definition of ODFM is different than put forth in this document.

Newton states " ODFM will skip to a new frequency if it is interfered with." This document says just the opposite but most likely means the above, which is correct?

The definition ODFM must be clearly stated and the frequency range of each (new frequency) and it's bandwidth clearly documented. This would allow the Licensed services to see if they could be impacted. More than likely each manufacturer has a variation in frequency and bandwidth.

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.

Comments:

(All current systems should be made to comply. The reasonable period of time to reengineer and implement should be one year with no wavers. No next generation access BPL should be implemented without a new NPRM by the FCC.)

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.¹⁴ 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.

Comments:

Paragraph 43, IF the notification process is similar to PLC will the industry operating entity belong to the energy or telecommunications industry. I believe it should be the telecommunications industry. I further believe that the new entity should have a member at the National Communications System (NCS).

Since the data base will be proprietary the new entity must develop administrative standards to permit information to be given to all appropriate agencies and licensees if harmful interference is reported.

The new entity should be the only location to accept trouble tickets on Harmful Interference from licensed services and operate 7 X 24, 365 days a year. The new entity shall pass all interference complaints to the appropriate equipment owner. The new entity should follow the rule set forth in the definition of Harmful Interference to see that the access BPL device is repaired or turned off within (x) hours as determined by the NTIA , ARRL and others. If the Harmful Interference is not repaired within the designated time frame the designated entity should report this to a FCC Duty Officer and immediate action will be taken to terminate the interference. The new entity should call the reporting Licensed service to report the trouble is repaired. The new entity should prepare monthly reports to be posted on their WEB page showing the number of complaints received, number of valid complaints, mean time to repair broken

¹⁴ 47 C.F.R. §15.113 permits Power Line Carrier systems to operate on power transmission lines for communications important to the reliability and security of electric service to the public in the 9-490 kHz band. *See also* 47 C.F.R. §2.106, Note US294. Under the existing rules, information on power line carrier systems must be entered into a database coordinated by the United Telecom Council, formerly Utilities Telecommunications Council, (UTC), the designated coordinator and database operator for power line carrier systems. *See* 47 C.F.R. §§ 15.113 and 90.35(f). *See also Memorandum Of Understanding of the Purpose, Requirements, and Procedures for a Power Line Carrier Notification Activity between the Federal Communications Commission, National Telecommunications and Information Administration, and Utilities Telecommunications Council*, Reference IRAC DOC. 26177, approved December 13, 1988, revised July 13, 2003.

Comments:

out by Licensed Service (FCC only). The new entity must send a monthly report to the NCS and FCC and possibly the NTIA showing all Harmful Interference required a call to a FCC duty officer.

The FCC should develop a metric to determine if fines are required to repeat offenders. The FCC should stop deployment of access BPL to companies who repeatedly show an inability to manage harmful interference in their networks.

The Access BPL providers should provide the NCS and FCC metrics showing impact to their customers caused by harmful interference. The FCC should make this data available to equipment manufactures. This will allow them to develop new access BPL technologies that do not cause Harmful Interference to Licensed Services and thus impact the customers using Access BPL.)

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.

Comments:

(Each access BPL provider will have their own data base that will be used to manage their network. This should not be confused with a centralized data base used by the new entity.

To get the big picture the new single entity must develop its own data base and share it real time with the NCS, this is a vital issue for Homeland Security.)

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.

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.

(I have provided comments to the various paragraphs. I would ask that you take the time to look closely at these comments. Since the decision to deploy access BPL has been made the only issue is to see that Harmful interference to licensed services is mitigated in a reasonable time frame.

I also believe that data collected on harmful interference complaints will allow the industry with help from the NTIA, FCC, ARRL and equipment manufactures to develop new technology that can coexist with licensed services and produce undetectable levels of interference. This new technology should be developed specifically for the power networks and home use and not borrow technology cobbled from PLC or wireless networks. Until this has occurred we can only hope that Licensed Services can survive this potential threat to them and Homeland Security.

I urge the FCC not to allow any upgrades to next generation BPL or wavers to develop test systems under part 15, until new technology is developed that will not produce harmful interference.

I future request that new technology next generation systems once developed, and proven to not impact licensed services should be the technology of choice and no older systems be deployed at that time. All first generation access BPL should be retired within 4 years of second generation initial deployment.

The cost benefit of the added bandwidth and reduced administrative expenses due to a large reduction of interference complaints will make this attractive to BPL operators.)

