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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. 03-104
	)	
Amendment of Part 15 regarding new requirements and measurement guidelines for Access Broadband over Power Line Systems	)	ET Docket No. 04-37

COMMENTS OF THE NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION

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TECHNICAL APPENDIX

SUMMARY

On March 26th, President Bush established a national objective to make broadband access available and affordable to every American by 2007 and called for "...technical standards to make possible new broadband technologies, such as the use of high-speed communications directly over powerlines."[1] To this end, NTIA has completed additional BPL studies that, with the NTIA Phase 1 study, provide the basis for NTIA's recommended framework of technical rules for Broadband over Power Line ("BPL") systems that will responsibly address interference concerns and BPL operational requirements. NTIA urges the Commission to promptly adopt effective technical rules to enable BPL proponents to develop and implement the necessary new design features and operating practices and obtain requisite new authorizations in time to contribute significantly toward fulfillment of the President's vision for universal affordable broadband Internet access.

NTIA recommends adoption of several new BPL rule elements that couple with the Commission's proposed rules to reduce risks of interference from BPL systems to authorized radiocommunications. These rules also help ensure that interference from BPL systems would be eliminated expeditiously with little effort needed on the part of any radio operator. Relative to existing BPL rules, these recommended new rules will shift the emphasis away from elimination of interference from BPL systems toward prevention of interference through adaptation of well-proven spectrum management practices.

The potential benefits of BPL identified in the Notice of Inquiry ("NOI") phase of this proceeding warrant acceptance of a small and manageable degree of interference risk. The risks

[1] President George W. Bush, Remarks at the American Association of Community Colleges Annual Convention, Minneapolis Convention Center, Minneapolis, Minnesota (April 26, 2004) (available at http://www.whitehouse.gov/news/releases/2004/20040426-6.html).

likely will be moderated by a concurrent reduction in existing interference risks from power line noise throughout the spectrum up to 600 MHz. Strong existing radio noise emissions from power lines often span frequencies well beyond those used for BPL - this noise must be reduced to enable acceptable Access BPL performance while complying with the proposed field strength limits. Moreover, in the long-term, BPL deployment should yield additional motivation and resources for maintaining the electric power distribution system, predicting and preventing faults, and achieving more rapid repairs in an affordable manner. Thus, although limited reliability of electrical power systems was cast by some parties as a BPL drawback in the NOI phase, widespread deployment of BPL may actually induce substantial reliability improvements.

Reduction of Interference Risks

To reduce risks of interference from BPL systems, NTIA endorses the Commission's proposed field strength limits and its thrust to refine BPL measurement provisions that ensure compliance with these limits. In addition, to ensure that the Commission's proposed BPL notification database is useful for interference prevention, NTIA recommends specification of voluntary *a priori* frequency coordination procedures in connection with a requirement for BPL operators to notify planned BPL deployments at least thirty days in advance of activation. Concerned shortwave broadcast listeners and other radio operators could inform BPL operators of their local radio reception parameters to enable the BPL operator to avoid co-frequency BPL operations that may pose high risks of interference. BPL operators also could identify local radio communications operations by consulting the Commission's database of licensed radio stations. In response to advance notifications, NTIA would provide information on local Federal Government radio receiver operations that will enable reduction of interference risks. Many Federal Government receivers are positioned at known, fixed locations. The custodian of the

notification database could provide, on a web site, a standard form and e-mail address for alerting the BPL operator of potentially vulnerable radio operations.

NTIA also recommends mandatory power control and adoption of limited coordination areas, excluded frequency bands, and exclusion zones to protect the most sensitive and vulnerable Federal Government radio receivers. Because radio noise on power lines can vary by upwards of 20 dB throughout a day, a rule should require adjustment of BPL signal power to preclude unnecessarily high levels of radiated emissions. NTIA is evaluating the potential interference risk reductions accrued from power control, but it is obvious that reducing Access BPL emissions by about 20 dB (a factor of 100) when noise is at relatively low levels will substantially reduce interference risks. Prior to implementation of Access BPL in a coordination area, such as the National Radio Quiet Zone from which extraordinarily sensitive radio astronomy observations are made, the BPL operator should be required to contact the specified authority for the coordination area in order to mutually determine whether BPL constraints are needed to prevent interference. BPL operations should be prohibited nationally within certain excluded frequency bands, such as the band 74.8-75.2 MHz used for aircraft reception of marker beacons. BPL use of certain frequencies should also be prohibited in specified exclusion areas, for example, in small areas around United States Coast Guard ("Coast Guard") coast stations in the band 2173.5 – 2190.5 kHz used for Global Maritime Distress and Safety System communications.

Perhaps the most broadly effective reductions in BPL interference risks will be achieved through provisions for BPL compliance measurements. Existing Access BPL measurement provisions can mistakenly indicate compliance with field strength limits when the limits actually are substantially exceeded. NTIA agrees with the BPL Notice of Proposed Rulemaking (NPRM)

proposals to measure at a one-meter height at a uniform distance of ten-meters to simplify measurement logistics. However, measurement at the distances along the power lines (fractions of a wavelength) proposed in the BPL NPRM will fail to reveal the peak field strength in many cases. To prevent underestimation of peak field strength during compliance measurements, NTIA recommends a comprehensive search for the peak field strength along the power lines at a height of one-meter. To avoid the need to search for the peak field in the height dimension as well, NTIA recommends use of a 5 dB height correction factor. NTIA's analysis shows that use of a 5 dB height correction factor with the peak field strength measured at a one-meter height is a good estimate of the electric field strength not exceeded at 80% of the heights above one-meter. Because power lines have frequency selective radiation properties and BPL device frequencies are, or should be, tunable in frequency, a rule should require measurement of Access BPL radiated emissions with the BPL system bandwidth successively tuned to cover every frequency at which the BPL system can operate. NTIA concurs with the BPL NPRM proposal to use a loop antenna at frequencies below 30 MHz and an electric field antenna at higher frequencies. However, because a loop antenna measures magnetic field strength and the measurements are performed in the near-field, NTIA recommends that an appropriate magnetic-to-electric field strength conversion factor be applied to enable correct comparisons of measurements with the electric field strength limit. In order to ensure that the highest representative field strength levels are measured and the limits are not exceeded, NTIA further recommends adoption of guidelines for judicious selection of the three Access BPL deployments for *in situ* measurements and a rule specifying how those measurements are to be applied. Representative spectral power distributions of Access BPL signals should also be measured and included in the measurement report to facilitate identification of the BPL signals in the event they cause interference.

Interference Mitigation

NTIA agrees with the BPL NPRM proposals to require that Access BPL systems be capable of shut-down and adjustment of frequency usage to eliminate interference. However, the rendition of shut-down requirements in 47 CFR 15.5(c) is inadequate and misleading in the unique case of Access BPL. Shut-down is a last resort after first attempting the many other interference mitigation techniques available to Access BPL systems. For example, to ensure that suspected interference from BPL systems is quickly diagnosed and eliminated if confirmed, NTIA recommends that each notification of BPL deployment include a telephone point-of-contact for receiving interference complaints. This point of contact should be required to immediately determine and report to the complainant whether the BPL system is locally using the frequencies at which interference is suspected. If this does not dismiss BPL as the possible cause of interference, the point-of-contact should be required to perform or schedule a simple test in cooperation with the complainant that will determine whether the Access BPL network element(s) are the likely cause of interference. Specifically, the suspected BPL network element(s) could be briefly shut off or BPL device frequencies could be changed to eliminate co-frequency operation while the complainant is operating the receiver and reporting its performance. To ensure that diagnosis of suspected interference can be conducted independently of the BPL operator if so desired, for each type of device to be deployed, Access BPL system notifications should include the modulation type(s), number(s) of carriers, minimum and maximum carrier spacing, symbol rate(s) per carrier, range of transmission duty cycle, and the multiple access technique. Insofar as BPL signal identification using these parameters requires a spectrum analyzer, NTIA is further considering whether a code signal should be transmitted to

enable identification using a standard communications receiver - modulation of any such a code must not increase interference risks.

On the basis of worst-case oriented analyses of ionospheric propagation and aggregation of radiated emissions from Access BPL systems, NTIA concludes that hundreds of thousands of Access BPL devices conforming to current BPL rules (limits and measurement procedures) would have to be deployed nationally to cause a 1 dB increase in median radio noise power at any location, globally. Using NTIA's recommended rules, chiefly the mandatory power control and use of a 5 dB height correction factor, it would take millions of BPL devices to cause a 1 dB increase in median radio noise. NTIA is further studying this phenomenon and recommends that BPL advance notifications include the maximum number of Access BPL devices that will be deployed. These entries should be updated quarterly to reflect actual deployment in order to enable on-going predictions of ionospheric propagation and aggregation of BPL emissions to forecast the onset of any significant increase in radio noise levels. Thus, this is not a potential near-term issue that should delay adoption of BPL rules.

Other Authorization Provisions

Other Access BPL authorization provisions should require certification by the operator rather than verification by the manufacturer. This will align benefits and obligations with the responsible party, who will have strong incentives to minimize interference risks. Certification is appropriate because interference risks posed by Access BPL systems are high relative to other unintentional emitters and the newness of the Access BPL measurement procedures warrants review of measurement reports. NTIA agrees with the definition of Access BPL proposed in the BPL NPRM and recommends adoption of a complementary definition for In-House BPL. This would properly frame the respective rules and measurement guidelines to avoid misinterpretation

or overlooking of applicable rules. The measurement provisions most important to prevention of interference should be codified as rules rather than guidelines. For example, compliance measurement bandwidth should be a rule rather than a provision incorporated by reference in guidelines, because use of measurement bandwidths other than the intended 9 kHz and 120 kHz values could yield significant error and elevated risk of interference.

Recommended Near-Term Rulemaking Actions

Thus, in light of the scope of available studies and other evidence, NTIA further recommends that the Commission proceed expeditiously to rulemaking for In-House BPL and Access BPL using low- and medium-voltage ("LV" and "MV") power lines. NTIA concurs with the BPL NPRM proposal to review measurement guidelines for In-House BPL later, after international studies are completed. NTIA believes that expressed interest as well as available technical descriptions, operating experience and studies of potential interference are inadequate at this time to support establishment of rules for Access BPL using high voltage ("HV") transmission lines or any BPL use of frequencies outside the 1705 kHz to 80 MHz frequency range. This, too, could be revisited later. Finally, NTIA recommends establishing a new, dedicated rule part or sub-part of Part 15 for Access BPL. This recommendation is made because the Access BPL rules proposed in this NPRM are substantial, unique to Access BPL, and would be difficult to understand if incorporated into Part 15 of the Commission's Rules. Moreover, certain existing Part 15 rules for unintentional emitters should not be applied to Access BPL.

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COMMENTS OF THE NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION

The National Telecommunications and Information Administration (NTIA), an Executive Branch agency within the Department of Commerce, is the President's principal adviser on domestic and international telecommunications policy, including policies relating to the nation's economic and technological advancement in telecommunications. Accordingly, NTIA makes recommendations regarding telecommunications policies and presents Executive Branch views on telecommunications matters to the Congress, the Federal Communications Commission (Commission), and the public. NTIA is also responsible for managing the Federal Government's use of the radio frequency spectrum. NTIA submits these comments in response to the Commission's Notice of Proposed Rulemaking in the above-captioned proceeding.[2] These comments make frequent reference to NTIA's recently released Phase 1 report addressing potential interference from Broadband over Power Line ("BPL") systems, as supplemented by the preliminary elements of NTIA's Phase 2 report that are presented in the Technical

[2] Amendment of Part 15 regarding new requirements and measurement guidelines for Access Broadband over Power Line Systems, ET Docket 04-37, Notice of Proposed Rulemaking, FCC 04-29, released February 23, 2004, ("BPL NPRM").

Appendix, herewith.[3] NTIA has coordinated these comments with the Interdepartment Radio Advisory Committee ("IRAC").

DISCUSSION

In the Notice of Inquiry ("NOI") phase of this BPL proceeding, thousands of commenters expressed various degrees of support and opposition for BPL.[4] Proponents concluded that harmful interference is not expected but can be eliminated through various means if it occurs. Numerous other parties envisaged scenarios under which BPL systems could cause harmful interference to radio communications. NTIA believes that all of these views are reasonable because both interference-free and harmful interference scenarios could occur.[5] Thus, NTIA has focused on the following technical questions:

- What interference risks are posed by BPL, and if they are too high, how can the risks be suitably reduced while fulfilling at least the minimum BPL requirements?
- If interference from a BPL system is suspected, what are the difficulties in diagnosing the suspected interference and eliminating harmful interference?[6]

As set forth herein and in the BPL NPRM, satisfactory answers to those technical questions are available for In-House and Access BPL systems using low- and medium-voltage

[3] "Potential Interference From Broadband Over Power Line (BPL) Systems To Federal Government Radiocommunications at 1.7 – 80 MHz," NTIA Report 04-413, April 2004 ("NTIA Phase 1 study"). Available for download at NTIA's web site, URL: www.ntia.doc.gov.

[4] *Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems*, ET Docket 03-104, released April 28, 2003 ("BPL Inquiry").

[5] Devices authorized under Part 15 of the Commission's Rules generally are capable of causing harmful interference when concurrently operating with a co-located, co-frequency radio receiver. The rule provides that "[p]arties responsible for equipment compliance should note that the limits specified in this part will not prevent harmful interference under all circumstances." 47 CFR 15.15(c).

[6] NTIA refers to suspected interference because in many cases, degradation of reception is the result of problems in the receiver, its antenna, or the interconnecting transmission line. For example, rodents sometimes chew coaxial cables or twin-lead transmission lines and cause significant reductions or complete loss of the desired signal power that should reach the receiver. In many other cases, interference is realized but not caused by the suspected device.

("LV" and "MV") power lines. NTIA believes that this rulemaking is timely for application of those technical answers in appropriate regulatory solutions that reflect careful limitation and management of interference risks. NTIA's vantage point includes many years of experience in successful management of interference risks. The rules must ensure that BPL systems will consume only a small amount of spectrum resources, not otherwise utilized by radio systems.

The technical answers at hand for In-House and LV/MV Access BPL are reliable and should be applied as soon as possible. NTIA has not studied Access BPL systems that use high-voltage ("HV") transmission lines and suggests that this highly-specialized form of BPL be considered later. Moreover, compliance measurement procedures for In-House BPL systems procedures should also be revisited later as suggested by the Commission.[7] Rather than delay this rulemaking until these and perhaps other issues are further addressed, NTIA prefers to proceed expeditiously with this rulemaking in order to establish modified rules that yield reduced interference risks and greater regulatory certainty for BPL proponents and radio interests alike. BPL using HV transmission lines and measurement guidelines for In-House BPL can be revisited later.

I. NTIA CONCURS WITH THE COMMISSION'S DEFINITION OF ACCESS BPL AND SUGGESTS ADOPTION OF A DEFINITION FOR IN-HOUSE BPL

The Commission proposes a definition for "Access BPL" that includes in its scope all "...electric power lines owned, operated or controlled by an electric service provider."[8] NTIA agrees with this definition and that it is needed in order to properly specify the rules and measurement guidelines applicable to Access BPL. Likewise, the Commission should consider a definition of "In-House BPL" to properly frame the applicable rules and measurement guidelines.

[7] BPL NPRM, at ¶47.

[8] BPL NPRM, at ¶32 and Appendix B, ¶2.

Adoption of a definition for In-House BPL together with the Access BPL definition would fully define all forms of BPL. To this end, NTIA suggests the following draft definition:

> In-House Broadband over Power Line (In-House BPL): A carrier current system that transmits radio frequency energy by conduction over electrical power lines that are not owned, operated or controlled by an electric service provider. The electric power lines may be aerial (overhead), underground, or inside walls, floors or ceilings of user premises. In-House BPL devices may establish closed networks within the user premises or provide connections to Access BPL networks, or both.

II. BPL IS A WIN-WIN PROPOSITION TO THE EXTENT THAT EXISTING AND FUTURE POWER LINE NOISE PROBLEMS ARE REDUCED

The many potential public benefits of BPL technology and BPL capabilities for eliminating interference argue strongly for accepting a degree of interference risk.[9] In fact, existing power line noise and reliability problems that were cast as BPL detriments in the NOI phase of this proceeding likely will be remedied as a result of widespread Access BPL deployment. NTIA does not expect Access BPL systems to compound existing risks of interference from radio frequency noise generated by electrical power distribution systems – a problem that has been explained in numerous comments.[10] Instead, to the benefit of radio proponents, strong power line noise emissions likely will be reduced in the process of deploying BPL systems. Many commenters noted that electrical power distribution systems occasionally fail (*e.g.*, during adverse weather) and concluded that BPL will not be reliable.[11] NTIA disagrees and believes that in the long-term, Access BPL likely will induce improved reliability of the electrical power distribution system and enable more expeditious restoration of electrical service

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[9] BPL NPRM, at ¶¶1, 3, and 10-13.

[10] In Comments in response to the BPL Inquiry (July 7, 2003), ARRL argues that "[p]ower line noise is the single most frequently identified source of HF interference to licensed Amateur Radio operators." ARRL Comments at ¶3. In Comments in response to the BPL Inquiry (July 7, 2003), Ambient Corporation states "[i]n the absence of BPL, noisy power lines may create interference with existing spectrum uses." Ambient Corporation Comments at 9.

[11] *See, e.g.*, Comments in response to the BPL Inquiry of: Joseph Hance, February 28, 2004, at ¶1; Donald T. Lane, February 20, 2004, at ¶1; Richard Casey, February 27, 2004, at ¶2; David Norris, March 1, 2004, at ¶3.

when failures occur. NTIA believes that such a reliability enhancement to critical infrastructure would greatly benefit individuals, businesses and the government – everyone - regardless of whether they subscribe to Access BPL.

Reduction of strong power line noise is a basic technical requirement necessary for acceptable performance of BPL systems under the field strength limits proposed by the Commission and endorsed by NTIA. As in radio systems, the signal-to-noise power ratio ("S/N") at BPL receivers must exceed certain thresholds in order to achieve reliable transmission with the requisite throughput. If the noise power at the BPL receiver is unnecessarily high, the BPL signal levels also will have to be unnecessarily high. Reducing power line noise can enable reductions in BPL signal power such that operation near the field strength limit may not be needed. Most strong power line noise emissions span not only the frequencies of prime interest for BPL operations, but also many other radio frequencies at Medium Frequency (MF), High Frequency (HF), Very High Frequency (VHF) and lower Ultra High Frequency (UHF) bands not used by BPL (generally spectrum below 600 MHz). Thus, reducing power line noise should reduce certain interference risks, perhaps including risks at frequencies used by the BPL system. Moreover, deployment of BPL could increase the likelihood that problematic power line noise will be diagnosed and repaired.

Apart from the BPL measurement campaigns, NTIA has measured field strength levels from power line noise that are higher than the limits proposed for BPL radiated emissions and these existing anomalies pose greater local interference risks than Access BPL. In contrast, during its BPL measurements, NTIA observed that power line noise levels in the vicinity of BPL systems were substantially lower than predicted typical levels that include as a component the typical levels of power line noise. Substitution of BPL emissions for the strong, much wider-

bandwidth power line noise emissions will broadly reduce risks of interference to radiocommunications. This is not to say that NTIA expects there will be a net, nationwide reduction of interference risks; instead, NTIA believes there will be at least partial offsetting of the interference risks posed by BPL.

When considering the reliability aspects of electrical service and Access BPL, it is instructive to consider electrical service failures and restoration under scenarios that include and exclude widespread BPL deployment. Presently, without Access BPL, electrical utility companies: maintain substantial crews and equipment sufficient to rapidly repair certain numbers and geographic distributions of failures; monitor and forecast adverse weather and other leading indicators of potential failures in order to marshal resources in advance of potential failures; and pool service restoration resources among companies in preparation for numerous, potentially widespread failures. Detection and diagnosis of many types of failures rely on "complaints" from electricity consumers. These operations balance the costs of electrical service with the amount of resources available for diagnosis and repair of failures. With widespread deployment of Access BPL, however, it will be possible to speed detection and diagnosis of electrical system failures and there likely will be increased demand and revenue subsidies for qualified electric system repair and maintenance personnel and equipment.[12] In today's high-productivity environment, by adding Access BPL to the equation, the new manpower and equipment needed to install and maintain BPL systems likely will create economies of scale that benefit the reliability of both electrical power distribution and BPL.

[12] David Tobenkin, Comments at 9 (December 24, 2003).

III. NTIA AGREES WITH THE COMMISSION'S TREATMENT OF EMISSION LIMITS AND RECOMMENDS THAT SUPPLEMENTAL EMISSION RESTRICTIONS BE EMPLOYED IN LIMITED FREQUENCY BANDS AND GEOGRAPHIC AREAS

NTIA concurs with the Commission's proposal to continue to make Access BPL systems subject to existing radiated emissions limits for carrier current systems.[13] Perceived BPL interference risks preclude relaxation of radiated emission limits for BPL systems, and interference risks can and should be suitably reduced through refinement of the compliance measurement provisions.[14] However, additional emission restrictions are needed in certain frequency bands and geographic areas in order to protect radiocommunications consistent with current rules and practices. These restrictions would have the following forms: geographic "coordination areas," wherein BPL deployments at any frequency in those areas must be pre-coordinated by BPL operators; excluded bands, in which certain frequencies are not to be used by BPL in any geographic area; and small geographic "exclusion zones," wherein BPL emissions are forbidden at specified frequencies in accordance with protection requirements and electromagnetic compatibility studies. These coordination areas, excluded bands and exclusion zones would be defined in the rules for Access BPL systems and would virtually eliminate certain interference risks. For example, the National Radio Quiet Zone ("NRQZ") would be a BPL coordination area; the band 74.8-75.2 MHz used for aircraft reception of marker beacons used in conjunction with the Instrument Landing System ("ILS") would be an excluded band; and there would be exclusion zones around Coast Guard coast stations in the 2173.5 - 2190.5 kHz band used for distress alerting.[15] BPL proponents have already demonstrated capabilities

[13] BPL NPRM, at ¶33 and Appendix B, ¶4.

[14] NTIA BPL Phase 1 study, §7.12, and Technical Appendix, at §§2, 3 and 5.

[15] *See* Phase 1 study, §4.6. The NRQZ exists to protect radioastronomy operations at Green Bank, West Virginia. *See* 47 CFR 21.113. Spectrum management authorities of the NRQZ already enjoy excellent rapport with the local electric utility operator for the cooperative elimination of power line noise. Intentional emissions by Part 15 devices

for implementing these restrictions, *e.g.*, by notching out frequencies allocated to the amateur radio service. NTIA believes that only a minimal number of such restrictions should be codified in the rules in light of the *a priori* frequency coordination procedures NTIA recommends. NTIA is continuing to study potential coordination areas, excluded bands and exclusion zones to identify the minimum requisite set of such restrictions.

IV. THE COMMISSION'S ACCESS BPL OPERATIONAL REQUIREMENTS WILL BE EFFECTIVE AND NTIA SUGGESTS IMPLEMENTATION OF COORDINATION PROCEDURES TO FURTHER REDUCE INTERFERENCE RISKS

NTIA believes that BPL operators, as the parties responsible for eliminating harmful interference, will voluntarily implement equipment, organizational elements, and installation and operating practices that prevent interference and facilitate interference mitigation. Market appeal of BPL could quickly evaporate if BPL systems were to endemically cause interference and have to be shut down with operating authorizations swiftly revoked if necessary.[16] Thus, BPL operators have strong incentives to prevent and eliminate interference. However, to preserve the high degree of regulatory certainty enjoyed by licensed radio operators, the rules for Access BPL should require implementation of the most widely effective operational features for preventing and eliminating interference. The Commission proposes to require BPL systems to have operational capabilities such as dynamic or commanded power reduction, commanded shut-down, and local exclusion of BPL use of specific frequencies or bands.[17] The Commission also

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are forbidden at 2173.5 - 2190.5 kHz in order to protect maritime and aeronautical distress alerting and other safety communications. *See* 47 CFR 15.205. Although BPL radiated emissions are unintentional, distress and safety communications in the 2173.5-2190.5 kHz band must be possible using the weakest, barely intelligible signals that are highly vulnerable to interference. The ILS system is an aeronautical radionavigation system. By definition, "harmful interference" is "[i]nterference which endangers the functioning of a radionavigation service or of other safety services..." and the interference risks posed by BPL systems constitute such endangerment. 47 CFR 2.1.

[16] Conditions for revocation of equipment authorizations are specified in 47 CFR 2.939.

[17] BPL NPRM at ¶¶40 - 42 and Appendix B, ¶4.

proposes a requirement that BPL operators notify key BPL system parameters to an industry-operated entity that will enter and maintain these parameters in a publicly accessible database.[18] NTIA fully supports those proposals as discussed below and proposes to require *a priori* coordination of potentially affected receiving stations at known locations or service areas. NTIA believes that imposition of coordination requirements on BPL operators to receive and consider coordination data will not result in significant costs while providing the substantial benefit of preventing interference to radio receivers at known locations. Further, to speed resolution of cases of suspected interference, NTIA recommends that BPL operators be required to promptly diagnose suspected interference and eliminate actual interference from BPL systems.

Adaptive or commanded power control reduces interference risks by maintaining the desired signal near the requisite, minimum power level, in response to measured or predicted transmission channel conditions. Power line noise resulting from ingress of ambient radio noise can vary by upwards of 20 dB throughout the day and seasonally, especially at frequencies below 12 MHz. Additional variations in power line noise power can arise at frequencies generally below 600 MHz from faults in power distribution components and operation of certain customer premises equipment. Rather than setting BPL device output power at a constant level that is high enough to yield the requisite BPL S/N during peak noise levels, interference risks can be significantly reduced by adjusting power consistent with variations in noise power that cannot reasonably be eliminated prior to BPL deployment. Assuming that protection of local receivers at locations is pre-coordinated, as discussed below, BPL power increases can be suitably limited or locked-out at the locally used radio frequencies as needed.

BPL frequency tuning capabilities can be used to prevent or rapidly diagnose and

[18] BPL NPRM at ¶43 and Appendix B, ¶4.

eliminate interference. Interference would be prevented by precluding BPL operation on locally used frequencies when there is insufficient distance separation for interference-free, co-frequency operation with respect to radio receivers at known nearby locations. This includes mobile receivers at frequencies above 30 MHz that routinely operate within a known base station coverage area.[19] The distance separation criteria for virtually risk-free, co-frequency operation would be applied by the BPL operator when selecting BPL frequencies within pre-established coordination zones or in the course of the frequency coordination in response to BPL deployment notifications. To quickly diagnose claims of interference while sustaining BPL service, the BPL operator could determine whether a BPL system is the cause of suspected interference by shifting its operating frequency. If it is determined that the BPL system is causing interference, the interfering BPL system could be commanded to use only non-interfering frequencies. To achieve these benefits, NTIA believes that BPL systems should be required to have frequency agility that is capable of precluding BPL transmissions in bands of at least 3 kHz at frequencies below 30 MHz and 30 kHz at frequencies above 30 MHz. In addition, insofar as many BPL frequency constraints may be needed at some locations, it would be beneficial if BPL devices were capable of using frequencies anywhere throughout the frequency range authorized for BPL operations. Furthermore, to avoid potentially impairing mobile radiocommunications over sizable contiguous areas, geographically adjacent Access BPL network elements should not use the same frequency bands if the bands are used by mobile radio receivers.

The Access BPL deployment notification requirements proposed by the Commission should be made retroactive and BPL operators should be required to notify planned deployments at least 30 days in advance of implementation and to consider the coordination data they receive

[19] A mobile receiver operating via ionospheric signal propagation can be located virtually anywhere relative to a base station or other mobile stations with which it is communicating.

regarding local radio receiver operations in order to prevent interference. Spectrum management science and engineering have yielded various applicable algorithms for optimally planning frequency usage that avoids risking interference. Advance notification would, via e-mails, allow local radio receiver operators to inform the BPL operator of potential interference situations involving radio receivers at known locations or mobile receivers that are routinely operated in the planned deployment area. This action would be voluntary on the part of any radio operator. BPL operators should extract local frequency assignment data from the pertinent Commission databases, identify the locations and frequencies used by local radio receivers, and plan BPL operating frequencies in a manner that avoids BPL interference to local co-frequency radio receivers.[20] To protect federal government radio communications, in response to each advance notification, NTIA plans to provide the BPL operator with information that will enable prevention of interference to local federal radio operations. To effect this frequency coordination, a single, centralized, web-based database should provide details of planned BPL system deployments sufficient to enable identification of local radio operations that may be affected. NTIA recommends that planned BPL system locations be notified in the form of one or more geographic coordinates (in decimal degrees) and associated radii (in kilometers). One or more such coordinate-radii pairs should be notified to describe a planned, near-term deployment area without including an excessive amount of area outside the area where deployment is planned. NTIA further recommends notification of the earliest anticipated date of actual operation within each deployment area so that NTIA can properly prioritize its responses to notifications.

[20] When applied with appropriate distance separation guidelines for co-frequency BPL and radio operations, the BPL operator can determine frequency plans for Access BPL network elements that avoid certain locally used radio frequencies where necessary to prevent interference.

To facilitate radio operator diagnosis of suspected interference from BPL systems, notifications of Access BPL deployments should include the BPL device multiple access technique, modulation details (modulation type, carrier spacing parameters and data rate on each carrier), and the method of power control. The multiple access technique and modulation details would sufficiently describe the BPL emission waveforms to enable identification of BPL emissions using a spectrum analyzer. BPL transmission of identifying codes could facilitate identification of BPL emissions using a conventional radio receiver; however, NTIA is further considering the potential need and whether transmission of such codes would increase interference risks. Using these notified parameters, diagnosis and confirmation of suspected BPL interference could be made independently of the BPL operator, if so desired. However, there should be no fundamental need for such actions if, as NTIA recommends, the BPL operator is required to quickly diagnose suspected interference and eliminate harmful interference upon complaint.

Advance notifications for each deployment area should also specify the maximum number of each type of Access BPL device to be deployed in the specified area. Subsequent notifications should be submitted at least quarterly for each deployment area, as needed, to report the total numbers of each type of device that have been deployed and to update other advance notification parameters. The identity of the device manufacturer(s) should not be included in these notifications without their explicit approval. Among other things, over time this data will assist NTIA in updating its predictions of increases in ambient radio noise due to ionospheric propagation and aggregation of emissions from BPL devices. NTIA's studies to date indicate that such a problem could occur only well in the future after hundreds of thousands or perhaps millions of Access BPL devices are deployed. *See* Technical Appendix, §4.

To further facilitate diagnosis of suspected BPL interference and elimination of actual BPL interference, NTIA suggests that each BPL operator be required to provide a single, telephone point of contact for each deployment area in addition to the e-mail address NTIA suggests for purposes of frequency coordination. The telephone point of contact should be required to receive complaints of suspected interference and be capable of accomplishing rapid diagnosis during the same telephone session, or shortly thereafter, by a mutually agreed schedule. Specifically, upon receipt of such a telephone call, the BPL operator should perform or schedule a test in which the frequency(ies) of the suspected BPL interference source(s) is (are) changed to determine whether this test eliminates the interference. Alternatively, the BPL operator could perform this test by briefly deactivating the suspected BPL interference source(s) (*e.g.*, during a time of little or no traffic on the BPL network element(s) involved). These simple, rapid tests would determine whether the BPL operations are likely causing interference. This requirement would enhance the utility of the proposed shut-down and frequency agility capabilities and expedite resolution of cases of actual interference. NTIA has sufficient evidence that shows such a requirement is practicable and effective. In the course of conducting BPL measurements, NTIA personnel requested shut-downs and confirmations of BPL frequency usage via telephone and these requests were executed in a matter of seconds under pre-arranged conditions. Although such speedy responses may not be routinely practicable in response to complaints of suspected interference, a requirement to be capable of frequency shifts or shut-down of BPL network elements coupled with the BPL operators' incentives to preclude filings of interference complaints with the Commission should yield prompt resolution of cases of suspected BPL interference.

V. NTIA RECOMMENDS CERTIFICATION BY ACCESS BPL OPERATORS RATHER THAN VERIFICATION BY MANUFACTURERS TO ALIGN AUTHORIZATION OBLIGATIONS AND BENEFITS WITH THE RESPONSIBLE PARTY

NTIA recommends that Access BPL systems be authorized under the Commission's certification procedures rather than verification procedures as proposed in the BPL NPRM.[21] Although many unintentional emitters are subject to verification procedures, NTIA believes that Access BPL devices pose interference risks that are among the highest of the various kinds of authorized, unlicensed devices. Moreover, the requisite compliance measurement guidelines are new and untried. NTIA further recommends that authorizations for In-House BPL devices continue to be granted to BPL equipment manufacturers upon verification but that authorizations for Access BPL systems be granted to each qualified operator rather than the Access device manufacturers.

Under the Part 15 framework, the device manufacturer is responsible for compliance testing and the device operator is responsible for eliminating any harmful interference the device may cause. This divorcing of compliance testing and interference resolution responsibilities is reasonable for devices that are marketed to the general public and pose very low interference risk. However, all these responsibilities should be aligned and placed on Access BPL operators because they receive the BPL service revenue benefit and have strong incentives to ensure that interference risks are properly limited and technical standards are not violated. A somewhat analogous focus of responsibilities is made for cable television systems.[22] This assignment of responsibilities should obviate the need for any special labeling of Access BPL devices.

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[21] Certification procedures and requirements are specified in 47 CFR 2.1031-1057 and 15.101.

[22] Ideal coaxial cable TV distribution systems are not expected to radiate emissions; however, actual cable systems unintentionally radiate emissions from faulty connections, unauthorized cable set-top boxes, points where cable or amplifier shielding is poor, and improper cable terminations. Cable set top boxes are subject to manufacturer

Manufacturers of In-House BPL devices should continue to be subject to Part 15 compliance measurements and labeling requirements and receive the authorizations consistent with current provisions of rule Parts 2 and 15.

Because Access BPL systems pose relatively high interference risks, certification rather than verification should be required. Measurement procedures being considered for Access BPL systems are new and unique. Thus, the Commission should have the opportunity to review the measurement reports that must be submitted with applications for authorizations that are subject to certification. The Commission's repository of measurement reports may help diagnose any systematic interference that may arise from BPL systems, such as cases involving particular power line configurations or specific types of devices; however, NTIA's studies do not indicate that systematic interference problems should be expected.

VI. NTIA SUPPORTS THE COMMISSION'S PROPOSED MEASUREMENT GUIDELINES AND SUGGESTS ADDITIONAL STEPS TO FURTHER REDUCE INTERFERENCE RISKS

The BPL Inquiry stated that existing Part 15 rules "...do not specifically provide measurement procedures that apply to systems using the power line as a transmission medium."[23] NTIA's Phase 1 Study showed that refinements, clarifications and adaptations of Part 15 compliance measurement provisions are needed for Access BPL systems to reduce potential measurement inaccuracies and improve the validity of results for all deployed BPL systems. Otherwise, the existing field strength limits provide inadequate certainty that interference risks will be confined to the levels allowed by the field strength limits and other provisions. The Commission independently arrived at the same conclusion and proposed a number of BPL

Declaration of Conformity as specified in 47 CFR 15 and the balance of the cable distribution system is subject to operator measurement under Part 76.

[23] BPL Inquiry at ¶2.

compliance measurement provisions that account for unique characteristics of BPL systems.[24] NTIA's understanding of key proposed revisions to measurement guidelines and recommended refinements are presented below.

A. A MEASUREMENT DISTANCE OF TEN METERS SHOULD BE USED WITH RESPECT TO OVERHEAD POWER LINES AND BPL DEVICES WITH A MODIFIED DISTANCE EXTRAPOLATION FACTOR

Part 15 specifications of different measurement distances for frequencies below and above 30 MHz and, particularly, the thirty-meter measurement distance specified for frequencies below 30 MHz present logistical complications during *in situ* measurements. NTIA agrees and endorses the Commission's solution to require a uniform measurement distance of ten meters. However, NTIA's measurements and modeling indicate that the change in BPL field strength with increasing distance from the BPL device and power lines is not well approximated by the existing Part 15 distance extrapolation factor.[25] NTIA's recommended solution to this anomaly is to uniformly apply a ten-meter standard measurement distance, present explicit equivalent field strength limits for those distances, and provide the appropriate distance extrapolation. NTIA is further reviewing the Commission's proposal to utilize the slant-path distance to the power line as a basis for extrapolation.[26]

A ten-meter horizontal measurement distance already is specified for Class A radiated emission limits (*i.e.*, for frequencies above 30 MHz), and so, legacy measurements made at this distance will remain useful. Establishing this same measurement distance uniformly for other Access BPL limits will ease the measurement burden by eliminating two other measurement

[24] BPL NPRM at ¶¶ 45-47 and Appendix C.

[25] 47 CFR 15.31(f) applies 20 dB and 40 dB per decade distance extrapolation factors to adjust field strength measured at a distance other than the specified measurement distance.

[26] BPL NPRM at ¶46.

distances for BPL systems. This logistical easement will enable better focus on other, more complicated measurement provisions that may introduce new burdens. Moreover, a ten-meter measurement distance appears to satisfy important criteria of safety, measurement sensitivity, and avoidance of misinterpretation of local field strength peaks as being the overall peak emission level. While field strength can fall and increase with increasing distance well beyond the recommended ten-meter measurement distance, the overall peak level consistently occurs at one or more locations within ten meters of the power lines and BPL device. Secondary local field strength peaks further than ten meters from the power lines and Access BPL devices generally are substantially lower than the overall peak; hence, they will pose substantially less interference risk than arises at locations where field strengths are near the limiting value.

The BPL NPRM proposes to allow measurement at a horizontal distance of three meters in cases where a ten-meter measurement distance is not practicable. NTIA agrees that alternative measurement distances should be permitted and utilized when necessary. NTIA further recommends that specific field strength limits should be specified for the ten-meter measurement distance at all permissible BPL operating frequencies. In other words, the new BPL rules will have already applied appropriate distance extrapolations in the specification of equivalent field strength limits at the new ten-meter measurement distance. NTIA is developing equivalent field strength limits and distance extrapolation factors on the basis of the radiation and propagation properties of Access BPL emissions and will provide its findings as soon as possible.

B. MEASUREMENTS SHOULD FULLY ADDRESS RADIATION FROM BPL DEVICES AND POWER LINES TO WHICH THEY ARE CONNECTED

Certain Part 15 provisions require that measurements be made on radials emanating from the device under test, which assumes that the device under test is the radiating element

generating peak levels of field strength.[27] However, NTIA measurements and analyses show that in most cases, peak field strength levels are not centered on the BPL device and multiple segments of the power lines and impedance discontinuities are the most significant BPL signal radiating elements.[28] Thus, BPL compliance measurements should address both the BPL device and the power lines to which it is connected.

NTIA's BPL measurements discovered that the peak BPL field strength is not necessarily located at the BPL device. This unusual phenomenon was confirmed and further investigated by evaluating numerous models of BPL devices and power lines using the Numerical Electromagnetic Code ("NEC") to predict radiated fields. For the case of a two-meter high, horizontally polarized measurement antenna that is oriented parallel to the power lines (*i.e.*, a typical height for land mobile receiver antennas), NEC analysis of simple power line models shows the peak electric field to be centered at or near the BPL power line coupler. However, when the same horizontally polarized measurement antenna is reoriented to be perpendicular to the power lines, NEC shows multiple peaks of BPL electric field strength occurring at locations tens of feet from the power lines and BPL devices. Peak vertically polarized electric fields at a height of two meters occur at several locations under power lines at various distances from the BPL device.

NTIA's further analysis of radiated emissions from overhead Access BPL systems shows that relatively high emissions can occur at various distances from the BPL device along the power line, in some cases at regular distance intervals. *See* Technical Appendix, §3. The peak field strength level can occur at any fraction or multiple of a wavelength from the BPL emitter.

[27] 47 CFR 15.31(f)(5)

[28] *See* NTIA Phase 1 study, §5 and Appendixes D and E.

Thus, the proposed Access BPL measurements at distances of 0, 1/4, 1/2, 3/4 and 1 wavelength along the power line from the BPL emitter may not consistently reveal the peak level of radiated emissions. NTIA recommends a comprehensive search for the overall peak field strength at the one-meter measurement height along key segments of the power lines at the specified horizontal measurement distance. This should not amount to an undue measurement burden insofar as local peaks of field strength often occur at regular distance intervals along the power line and measurement personnel will be able to fairly quickly identify the location of peak field strength. NTIA is further studying field strength trends along the power lines and intends to provide additional guidelines to facilitate identification of the peak field strength and its location (*i.e.*, the key power line segments where the peak is likely to be found). However, this proceeding should not await development of such guidelines because their purpose is to ease measurement burdens rather than establish fundamental requirements.

C. MEASUREMENT ANTENNA HEIGHT SHOULD BE ONE METER AND A 5 dB HEIGHT CORRECTION FACTOR SHOULD BE APPLIED

Measurements must ensure BPL compliance with field strength limits in all directions of radiation associated with the most likely cases of potential interference, including rooftop locations higher than power lines.[29] Conceptually, this can be accomplished either through direct measurement at various heights and directions or by application of a standard measurement antenna height with an adjustment factor that accounts for other heights. NTIA concurs with the Commission's proposed one-meter antenna measurement height even though the vast majority of radio receiver antennas used by the federal government are two meters or higher above the ground (*e.g.*, vehicles, building roofs, towers, and aircraft). The existing Part 15 and American

[29] Many radio receivers operating in the 1.7-80 MHz frequency range use antennas located at or above the heights of local power lines. Compliance with field strength limits at and above the power line height also controls the

National Standards Institute standard measurement antenna height of one meter is associated with compliance measurements at an open air test site ("OATS") at which associated ground reflection effects are controlled and have been factored in calibration of signal propagation and measurement antenna gain, but the one meter height can be reliably used with a height correction factor outside of the pristine OATS environment.

NTIA's assessment of the relationship between field strength from overhead Access BPL systems and measurement height above ground level has confirmed that peak field strength often occurs near the height of the power lines carrying BPL signals. *See* Technical Appendix, §2. However, the peak BPL field strength can occur at other heights well below and above the power line, and there is no clear, consistent trend with frequency or other parameters that may guide measurement personnel. In apparent recognition of this phenomenon, the Commission proposes to vary measurement antenna height between one and four meters at frequencies above 30 MHz as is the norm for compliance testing at an Open Air Test Site. Rather than require a measurement search for the peak BPL field strength in both height and distance along the power line, however, NTIA believes that measurement height should be addressed using a height correction factor. NTIA's analysis shows that a 5 dB height correction factor used in connection with measurements at a one-meter height would fulfill this goal.

Using NEC models, NTIA has evaluated the distributions of heights and magnitudes of peak field strength from over one-thousand combinations of nineteen power line configurations, polarization and location, at each of twenty-five BPL operating frequencies. This analysis reveals that 80 percent of the local field strength peaks at any height will be within 5 dB of the peak electric field strength measured along the power line at a height of one meter. In the large

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composite interfering signal level generated at distant receivers by ionospheric propagation of unintentional emissions from widely deployed BPL devices. This mechanism is being investigated in phase 2 of NTIA's studies.

number of potential cases modeled by NTIA, the field strength at any polarization exceeds the peak value measured one-meter height by up to 20 dB in small spatial regions. Use of the 80 percentile value of 5 dB rather than the 100 percentile value of about 20 dB avoids undue constraint on BPL systems without significant impact on interference risks. Thus, NTIA recommends that at all frequencies, the peak field strength should be estimated to be 5 dB higher than the peak value measured along the power line at one-meter height. NTIA further recommends that for each representative BPL deployment, the locations and magnitudes of the six highest field strength levels measured at one meter height (plus 5 dB height correction factor) be recorded in the measurement report for overhead Access BPL systems.

D. ALL BPL OPERATING FREQUENCIES SHOULD BE CONSIDERED AND BPL EQUIPMENT SHOULD INCORPORATE THE NECESSARY OPERATIONAL POWER CONSTRAINTS

Existing Part 15 measurement guidelines generally are tailored for devices that operate at fixed frequencies or have uniform emission characteristics over the tuning range of the device. However, Access BPL systems have, or should have the frequency agility proposed in the NPRM. Access BPL radiation characteristics are not uniform across all possible operating frequencies. Thus, to properly address frequency-selective radiation characteristics, measurements should be made sequentially with the Access BPL devices operating at all frequencies at which they are capable.[30] This should be accomplished using the maximum possible BPL device output power and operational duty factor. In the event that the applicable limit is exceeded during measurements, the results of all *in situ* measurements at three representative sites at a given operating frequency may be adjusted downward by the difference

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[30] For example, a BPL system that has 5 MHz bandwidth and can be tuned between 5 MHz and 30 MHz would be measured while tuned to 5 MHz, 10 MHz, 15 MHz...and 30 MHz. This principle should not be confused with the requirement to adjust measurement frequencies throughout frequency ranges specified in §15.33.

between maximum output power and the maximum compliant power level that will be used operationally at that frequency.[31] Consistent with §15.15(b), the Access BPL equipment should be modified to prevent inadvertent Access BPL operation at power levels that may result in field strength that exceeds the applicable limits.

E. MEASUREMENTS BELOW 30 MHz SHOULD USE A CALIBRATED LOOP ANTENNA WITH AN APPROPRIATE MAGNETIC-TO-ELECTRIC FIELD CONVERSION FACTOR AND AN ELECTRIC FIELD ANTENNA SHOULD BE USED ABOVE 30 MHz

NTIA is continuing to study the conversion between levels of magnetic field strength measured with a shielded loop antenna and electric field strength when measurements are performed at a horizontal distance of ten meters. In the far-field of a radiated emission, the ratio of electric-to-magnetic field strength (*i.e.*, wave impedance) is 377 ohms.[32] However, in the near field, such as at the ten-meter recommended measurement distance, NTIA's work to date indicates that wave impedance may vary from 1 ohm to over 2,000 ohms at various locations. NTIA's on-going study of wave impedance is focusing on the six measurement locations where electric field strength is highest and it is not yet clear whether the magnetic-to-electric field strength conversion factor will differ significantly from the presently assumed value of 377 ohms. NTIA will report its analysis findings as soon as possible insofar as this conversion factor should be codified in this proceeding.

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[31] The requirement to perform *in situ* compliance measurements at three representative deployment sites should specify how the results are to be applied in order to achieve compliance with field strength limits.

[32] For example, consistent with "Ohms Law," to convert a measured magnetic field strength in dBμA/m to an associated electric field strength in dBμV/m in the far filed region, one would add 20 log (377 ohms), or 51.2 dB, to the measured magnetic field strength.

F. REPRESENTATIVE POWER LINES USED FOR BPL MEASUREMENTS SHOULD BE CAREFULLY SELECTED TO ENSURE THAT PEAK EMISSIONS ARE MEASURED

In light of the highly varied parameters and radiation properties of power lines, compliance measurements should address BPL devices installed on power lines that yield the highest levels of field strength. One or more highly-reflective impedance discontinuities likely should be included in the power lines at various distances from the BPL coupling point in order to ensure that all important standing wave conditions are generated at all frequencies.[33] NTIA is continuing its studies to identify power line features that cause the highest levels of field strength and believes that the results need not be presented in rules, *per se*. The findings of this study will provide guidelines rather than basic regulatory infrastructure.

G. CERTAIN ADDITIONAL MEASUREMENT PROVISIONS SUCH AS MEASUREMENT BANDWIDTH SHOULD BE MANDATORY FOR BPL

In the framework of Part 15, many compliance measurement provisions are cast as guidelines and within these guidelines certain ANSI and CISPR measurement procedures are incorporated by reference.[34] For example, a requirement to use a quasi-peak detector is specified as a rule, but the measurement bandwidth is two levels removed from rule status by virtue of incorporation by reference from guidelines. NTIA believes that the measurement bandwidth should be specified as a rule for BPL, specifically 9 kHz bandwidth at frequencies below 30 MHz and 120 kHz bandwidth at frequencies above 30 MHz. Likewise, use of the above recommended measurement height correction factor and limits for three- and ten-meter measurement distances should be embodied as rules. NTIA believes that the BPL compliance measurement provisions deemed most important to limitation of interference risks should be

[33] *See* NTIA Phase 1 study, §§7.2 and 7.9, which provide a degree of guidance.

[34] *See, e.g.*, 47 CFR 15.35.

codified as rules rather than guidelines.

H. SPECTRAL POWER DISTRIBUTIONS OF BPL EMISSIONS SHOULD BE MEASURED AND INCLUDED IN THE MEASUREMENT REPORT

In the course of its BPL measurement campaigns, using a spectrum analyzer, NTIA was able to quickly distinguish Access BPL emissions from other signals and noise by virtue of advance knowledge of the BPL system modulation and multiple access parameters but no knowledge of the operating frequencies. Identification of In-House and Access BPL signals could be further facilitated by inclusion of measured spectral power distributions in the compliance measurement report, and such data may provide other unforeseen benefits. This will assist interference diagnosis independently of adjustments to the BPL system. However, as stated earlier, positive identification of BPL interference can be readily accomplished via telephone with the radio operator, and remote-control adjustment of BPL system frequency usage or a brief shut-down of BPL network elements. NTIA does not expect that any radio operator will ever need to diagnose suspected interference from BPL systems because this is the responsibility of the BPL operators.

VII. ACCESS BPL MAY WARRANT ITS OWN RULE PART OR SUB-PART OF PART 15

NTIA suggests presentation of Access BPL rules in a new, dedicated rule part because weaving the appropriate Access BPL provisions into Part 15 may yield unclear, confusing rules.[35] Under similar circumstances, the Commission established technical rules for cable television systems in a new rule part.[36] The rules proposed in the BPL NPRM and the additional

[35] Rules for In-House BPL should be established in Part 15 as suggested by the BPL NPRM.

[36] 47 CFR 76. Like Access BPL systems, cable television systems are unintentional radiators. Ideal cable systems radiate no emissions and imperfections result in signal leakage. In sharp contrast, ideal Access BPL systems radiate emissions, endemically, albeit unintentionally.

Access BPL provisions recommended in this pleading are substantial. Many of these rules are unique to Access BPL and others derive from existing rules with special adaptation:

- Certification by the Access BPL operator rather than the manufacturer is inconsistent with Part 15.

- Access BPL amounts to a service, and as such, many of the contemplated technical rules could be viewed as service requirements that are inconsistent with the scope of Part 15.

- Coordination procedures, coordination areas, excluded bands or exclusion zones needed for Access BPL are not presently specified in Part 15.

- BPL equipage requirements for power control, frequency tuning and notching, and shut-down are not presented in Part 15.

- Procedural requirements for elimination of interference from Access BPL systems do not exist in Part 15 rules for unintentional emitters.

- Certain Part 15 provisions should not be applied to Access BPL (*e.g.*, measurement on radials from the device under test, §15.31(f)(5)).

- Specifications of the BPL operator notification requirements are more detailed than those in Part 15 for power line carrier systems.

- Many new and substantially modified measurement provisions should be specified as rules for Access BPL:
    - a uniform ten-meter measurement distance, perhaps with a three-meter option, rather than various distances at different frequencies;
    - a 5 dB height correction factor;
    - measurement with the Access BPL system operating at all frequencies at which it is capable of operating;
    - interpretation of *in situ* measurement results from 3 representative sites;
    - magnetic-to-electric field strength conversion factor for near-field measurements at frequencies below 30 MHz;
    - specification of equivalent field strength limits for ten- and perhaps three-meters in lieu of distance extrapolations;
    - measurement of spectral power distributions;
    - specification of measurement bandwidths.

VIII. FURTHER REGULATORY ACTION MAY BE NEEDED AFTER ADDITIONAL STUDIES ARE COMPLETED AND ADDITIONAL EXPERIENCE IS GARNERED.

NTIA believes that the In-House and LV/MV Access BPL rules proposed in the BPL

NPRM and recommended by NTIA constitute an appropriate basis for rulemaking at this time. The Commission has authorized Access BPL operations only under experimental licenses even through existing rules for carrier current systems accommodate BPL. As the rulemaking drew closer, the Commission ceased granting geographically unlimited BPL experimental licenses. Now, it is time to adopt rules that will enable development and implementation of In-House and LV/MV Access BPL that are compatible with radio communications.

Other potential BPL issues can be revisited under future actions, if necessary. The BPL NPRM notes that In-House BPL measurement guidelines should be updated if warranted based on studies by the International Special Committee on Radio Interference ("CISPR"). NTIA has not studied Access BPL using HV transmission lines. In the interim, based on expressed frequency preferences and available studies, the In-House and Access BPL operating frequency range should be limited to 1,705 kHz to 80 MHz (minus excluded bands and areas).[37] Oversight of potential future ionospheric interference is needed, but NTIA concludes that this interference could occur only in the long-term and NTIA intends to monitor BPL deployment in order to predict the potential onset of such problems.

IX. CONCLUSION

NTIA recommends a number of refinements to the modified rules proposed for BPL systems and believes that the Commission's proposals as extrapolated herein will fully alleviate the concerns of all parties to this proceeding. NTIA believes that these rules will prove to provide a reasonable and safe approach to reducing interference risks from BPL systems and expediting effective provisions for elimination of interference from BPL systems. Because these

[37] Experimental licenses granted Access BPL use of 1.7-80 MHz and NTIA studied BPL only in that frequency range. Interference risks exist from xDSL and Cable TV at other frequencies, potentially complicating diagnosis and elimination of interference from BPL systems.

proposed rule modifications effect reductions in on-going interference risks, they should be placed into effect as soon as possible. Moreover, these rules create an environment in which BPL proponents can properly gauge investment risks and fulfill the protection requirements of radio communications.

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