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

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

REQUEST FOR FURTHER COMMENT
AND
FURTHER NOTICE OF PROPOSED RULE MAKING

Adopted: July 16, 2009 **Released: July 17, 2009**

Comment Date: [30 days after publication in Federal Register]
Reply Comment Date: [45 days after publication in Federal Register]

By the Commission:

I. INTRODUCTION

1. In this Request for Further Comment and Further Notice of Proposed Rulemaking (FNPRM), we address certain issues from the Commission's Report and Order on rules for broadband over power line systems and devices (*BPL Order*)[1] that was remanded by the United States Court of Appeals for the District of Columbia.[2] In the *BPL Order*, the Commission established technical standards, operating restrictions and measurement guidelines for Access Broadband over Power Line (Access BPL) systems to promote the development of such systems while ensuring that licensed radio services are protected from harmful interference. In *ARRL v. FCC*, the court remanded the *BPL Order* to the Commission for further consideration and explanation of certain aspects of its decision. Specifically, the court directed the Commission to provide a reasonable opportunity for public comment on unredacted staff technical studies on which it relied to promulgate the rules, to make the studies part of the rulemaking record, and to provide a reasoned explanation of the choice of an extrapolation factor for use in measurement of emissions from Access BPL systems.[3]

2. As directed by the Court, we have placed the unredacted staff technical studies into the record of the above proceeding and are requesting comment on the information in those studies as it pertains to our BPL decisions. We are also placing into the record certain additional materials that contain

[1] *See Report and Order* in ET Docket Nos. 04-37, 03-104 *(Amendment of Part 15 Regarding New Requirements and Measurement Guidelines for Access Broadband Over Power Line Systems, Carrier Current Systems)*, 19 FCC Rcd 21265 (2004) ("*BPL Order*").

[2] *See American Radio Relay League, Incorporated, v. Federal Communications Commission ("ARRL v. FCC")* 524 F.3d 227 (D.C. Cir. 2008).

[3] *Id.*, at 242.

preliminary staff research and educational information and were not previously available therein. In response to its remand of a portion of the BPL measurement procedure, we are also providing an explanation of our reasons for selecting 40 dB per decade as the extrapolation factor for frequencies below 30 MHz. We further explain why we believe the studies and technical proposal submitted earlier by the ARRL do not provide convincing information that we should use an extrapolation factor that is different from that which we adopted. We also note the existence of more recent studies that verify the correctness of our determination, although we do not rely on those studies as *post facto* rationale or justification for our decision.

3. Consistent with the opportunity provided by the court's remand and our stated intention in the *BPL Order* to review the decision on the extrapolation factor if new information becomes available, we are also re-examining the current extrapolation factor in light of the recently issued technical studies addressing the attenuation of BPL emissions with distance and efforts by the IEEE to develop BPL measurement standards. As the several studies now available show and as we have observed previously, there can be considerable variability in the attenuation of emissions from BPL systems across individual measurement sites that is not captured in the fixed 40 dB per decade standard. To address this variability, we are requesting comment on whether we should amend our BPL rules to 1) adjust the extrapolation factor downward to 30 dB or some other fixed value and, 2) as an alternative, also allow use of a special procedure for determining site-specific BPL extrapolation values using *in situ* measurements. The special *in* situ procedure we are proposing is based on a concept under consideration by the Institute of Electrical and Electronics Engineers (IEEE) working group on power line communications technology electromagnetic compatibility (EMC). In addition, we are clarifying that parties testing BPL equipment and systems for compliance with emissions limits in our the rules may measure at the standard 30 meter distance rather than only the shorter distances recommended in the BPL measurement guidelines. We request comments on the unredacted staff studies, our decision for selecting an extrapolation factor for BPL systems based on slant range method and the explanation provided herein, and our proposal to allow use of site-specific extrapolation factors as an alternative to the standard extrapolation factor. In the interim, as justified herein, we will continue to apply the standard as adopted in the *BPL Order*.

II. BACKGROUND

4. On October 28, 2004, the Commission adopted rules to regulate the operation of Access BPL systems as unlicensed, unintentional radiators.[4] Access BPL systems deliver high speed Internet and other broadband services over the utilities' medium voltage delivery power lines to homes and businesses; electric utility companies also use Access BPL devices to monitor and manage various elements of their electric power distribution operations. In adopting the rules for these devices, the Commission noted that Access BPL could provide a means to expedite the availability of broadband Internet service to consumers and businesses in rural and other underserved areas, introduce additional competition to existing broadband services, promote continued U.S. leadership in broadband technology, and bring important benefits to the American public.[5] However, the Commission also recognized that those substantial benefits might not be realized if BPL devices were to cause interference to licensed services and other important radio operations.[6] Accordingly, the Commission established technical standards, operating restrictions and measurement procedures for

[4] An unintentional radiator is defined in the rules as a device that intentionally generates radio frequency energy for use within the device, or that sends radio frequency signals by conduction to associated equipment via connecting wiring, but which is not intended to emit RF energy by radiation or induction. *See* 47 C.F.R. § 15.3(z).

[5] *BPL Order, supra* at 21266, 21271.

[6] *Memorandum Opinion and Order* in ET Docket Nos. 04-37, 03-104 *(Amendment of Part 15 Regarding New Requirements and Measurement Guidelines for Access Broadband Over Power Line Systems, Carrier Current Systems, Memorandum Opinion and Order)* ("*BPL Reconsideration Order*"), 21 FCC Rcd 9308, 9310 (2006).

Access BPL to minimize instances of interference and to facilitate resolution of such interference where it might occur.[7]

5. Following the issuance of the *BPL Order*, the National Association for Amateur Radio (ARRL) filed a Freedom of Information Act (FOIA) request seeking disclosure of Commission studies of emissions generated by Access BPL systems. In response to this request, the Commission released five staff studies in redacted form and made them part of the record in December 2004. ARRL, among others, sought reconsideration of the *BPL Order* on February 7, 2005.[8] The Commission on reconsideration amended its rules in part but generally denied ARRL's petition, making one clarification.[9]

6. Subsequently, ARRL, on behalf of licensed amateur radio operators, challenged the Commission's Access BPL decisions in the United States Court of Appeals for the District of Columbia. In its petition for judicial review, ARRL challenged the Commission's rules on four grounds, contending that (1) the Commission ignored long-standing precedent by authorizing the operation of unlicensed devices that could interfere with licensed devices and by no longer requiring that operators cease using the unlicensed devices if they actually cause interference; (2) the Commission violated the Administrative Procedure Act (APA) by failing to disclose in unredacted form certain technical studies prepared by the Commission's engineers that were relied upon in adopting the rules; (3) the empirical evidence does not support the Commission's decision to retain the existing 40 dB per decade extrapolation factor to measure Access BPL radiated emissions at frequencies below 30 MHz, which contain several bands used by amateur licensees; and (4) the Commission did not adequately consider an alternative proposal for reducing harmful interference that would have limited Access BPL systems to the frequency band between 30 MHz and 50 MHz, rather than between 1.7 MHz and 80 MHz.[10]

7. On April 25, 2008, the court granted ARRL's petition in part and remanded the rules to the Commission.[11] In its mandate, the court agreed with ARRL with respect to two of its claims.[12] The court stated that the Commission failed to satisfy the notice and comment requirements of the APA by redacting staff studies on which it relied in promulgating the rule and by failing to make a reasoned explanation for its choice of the extrapolation factor for measuring Access BPL emissions. Accordingly, the court directed that, on remand, the Commission make the unredacted staff studies part of the rulemaking record and provide an opportunity for notice and comment.[13] With respect to the extrapolation factor, the court directed the Commission to "either provide a reasoned justification for retaining an extrapolation factor of 40 dB per decade for Access BPL systems sufficient to indicate that it has grappled with the . . . [empirical data], or adopt another factor and provide a

[7] *See* 47 C.F.R. §§ 15.601-15.615.

[8] *See* ARRL Petition for Reconsideration (filed Feb. 7, 2005 in ET Docket 04-37). *See also*, ARRL Petition for Issuance of Further Notice of Proposed Rule Making and for Amendments of Regulations (filed Oct. 18, 2005) in ET Docket No. 04-37.

[9] On reconsideration, the Commission clarified rule section 47 C.F.R. § 15.611(c)(1), as requested by ARRL. *BPL Reconsideration Order, supra* at 9320, 9338.

[10] *ARRL v. FCC, supra* at 233.

[11] *Id.*, at 231.

[12] The Court was not persuaded by ARRL's arguments on the other two points, on which it found that the Commission had acted within its discretion.

[13] *ARRL v. FCC, supra* at 240.

reasoned explanation for it."[14] At this time, the Commission's Access BPL rules remain in effect until the Commission changes or affirms its rules in an Order on Remand.

III. ISSUES FOR COMMENT

A. Staff Technical Studies

8. In the *BPL* Order, *supra*, the Commission adopted operational and technical requirements and restrictions on Access BPL devices over and above those applied to other Part 15 devices. These included requirements for consultation with specific entities, mandatory listing of BPL installations in a public database, exclusion of certain frequencies from operation, exclusion zones, frequency notching, and a remote shut-down mechanism, and were based on the aggregate information from comments and technical studies submitted into the rulemaking record, including ARRL's and FCC staff's studies.

9. As indicated above, subsequent to the release of the *BPL Order*, the Commission on December 22, 2004 submitted five staff technical studies, in redacted form, into the record of the above-mentioned docket in response to a Freedom of Information Act (FOIA) request from ARRL. The staff studies measured emissions from various Access BPL systems at various locations in Pennsylvania, Maryland, New York, and North Carolina.[15] The studies were used in the decision-making process along with studies submitted by commenters such as ARRL and the National Telecommunications and Information Administration (NTIA). The Commission redacted certain portions of those studies on the basis that they represented preliminary or partial results or staff opinions that were part of the internal deliberative process.[16] On reconsideration of the *BPL Order*, ARRL alleged that the Commission violated the APA reasoned decision making requirements because it responded to ARRL's FOIA request belatedly and because it redacted certain information from the released information. The Commission disagreed with ARRL's above arguments,[17] and ARRL sought judicial review of the Commission's decisions in the *BPL Order* and the *Reconsideration Order*.

10. In *ARRL v. FCC, supra*, the court determined that the APA requires the Commission to disclose the studies upon which it relies in promulgating rules, and it directed the Commission to make available for notice and comment the unredacted "technical studies and data that it has employed in reaching [its] decision."[18] In accordance with the court's mandate, and in response to a FOIA request from ARRL filed March 31, 2009, we have placed in the record complete copies of the five staff studies identified by the court, including the previously redacted pages.[19] The first two studies, included in a single file entitled *BPL Measurements in Allentown, PA*, contain data collected

[14] *Id.*, at 241.

[15] Two studies measured emissions from systems marketed by two specific Access BPL manufacturers (Amperion and Main.Net BPL systems in Allentown, Pennsylvania), and three others measured location-specific emissions in pilot Access BPL areas in Maryland (Current Technologies BPL system in Potomac), New York (Ambient BPL system in Briarcliff Manor) and North Carolina (Amperion/Progress Energy BPL system in Raleigh.) *ARRL v. FCC, supra* at 237.

[16] *See* Letter from Office of Engineering and Technology (filed Dec.22, 2004) in ET Docket 04-37) at http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6516886684, at 2.

[17] *See BPL Reconsideration Order, supra* at 9324-25.

[18] *ARRL v. FCC, supra* at 239-240.

[19] *See* Letter dated April 29, 2009 to ARRL from Julius Knapp, Chief, Office of Engineering and Technology.

on the Amperion BPL system and on the Main.Net BPL system, both in Allentown, PA.[20] The third study, *Emissions Measurements on Current Technologies Medium Voltage BPL System*, contains data collected on the Current Technologies BPL system in Potomac, MD.[21] The fourth study, *BPL Summary After Briarcliff Manor, NY Test*, contains data collected on the Ambient BPL system in Briarcliff, NY, and some staff reactions.[22] The fifth study, *BPL Emission Test Near Raleigh, NC*, contains data collected on the Amperion/Progress Energy BPL system in Raleigh, NC.[23] We observe that the redacted pages mostly contain information regarding specific test notes and test set-up recommendations with respect to the BPL systems at the various test sites,[24] certain requests from third parties,[25] and preliminary and partial data with respect to the noise floor[26] and with respect to the attenuation rate of the signal strength at the test sites[27] as well as the opinion of one staff member as to whether BPL systems are point-source systems[28] and that staff member's proposed options on how to treat these systems.[29] We seek comment on the information contained in these staff studies as it pertains to the issues in this proceeding.

11. In addition, we have several staff working papers and video files that contain data and information on research from BPL field tests that were used in preparing the staff studies and for staff education. These are materials that we would not routinely, and in this case did not, place in the record. However, in order to fully and most efficaciously continue to examine this issue, we believe it is important that we make available all potentially relevant research and information materials. We

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[20] *BPL Measurements in Allentown, PA* at http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6520215595, http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6520215596, and http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6520215597.

[21] *Emissions Measurements on Current Technologies Medium Voltage BPL System*, at http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6520215597 and http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6520215598.

[22] *BPL Summary After Briarcliff Manor, NY Test*, at http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6520215598 and http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6520215599.

[23] *BPL Emission Test Near Raleigh, NC*, at http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6520215599 and http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6520215600.

[24] *BPL Measurements in Allentown, PA*, slide 6, labeled "Conclusions Regarding Amperion" and slide 7, labeled "Recommendations for Amperion"; *Emissions Measurements on Current Technologies Medium Voltage BPL System*, slide 36, labeled "Recommended Future FCC Tests (to understand technology)".

[25] *BPL Measurements in Allentown, PA*, slide 48, labeled "Conclusions Regarding Main.Net" and slide 52, labeled "Other Issues".

[26] *BPL Summary After Briarcliff Manor, NY Test*, slide 9, labeled "Raleigh Received Levels at 23.2 MHz from One Overhead Injector" and slide 13, labeled "NTIA Results"; *BPL Emission Test Near Raleigh, NC*, slide 16, labeled "Test Description for Mobile Radio Measurements" and slide 23, labeled "Notch Depth".

[27] *BPL Measurements in Allentown, PA*, slide 40, labeled "Summary of Relative Average Levels".

[28] *BPL Measurements in Allentown, PA*, slide 3, labeled "Major Conclusions", slide 17, labeled "Under-Line Field Strength vs. Distance Down Line" and slide 50, labeled "Conclusions Regarding Access BPL"; *BPL Summary After Briarcliff Manor, NY Test*, slide 17, labeled "New Information Arguing for Caution on HF BPL"; *Emissions Measurements on Current Technologies Medium Voltage BPL System*, slide 35, labeled "Conclusions".

[29] *BPL Summary After Briarcliff Manor, NY Test*, slide 13, labeled "NTIA Results", slide 16, labeled "Skywave (<30 MHz)", slide 19, labeled "HF Issues and Options", slide 20, labeled "Low VHF Options", and slide 21, labeled "BPL Spectrum Tradeoffs and Proposals".

are therefore placing these additional materials in the record of this proceeding and invite comment thereon. A list of these additional materials is provided in Appendix E.

B. Distance Extrapolation Factor

1. Background

12. In the *BPL Order*, *supra*, the Commission specified measurement guidelines that require that BPL systems be tested *in situ* on three typical installations with overhead power lines.[30] Access BPL devices that operate on frequencies at or below 30 MHz are required to comply with the radiated emissions limits in Section 209 of the rules.[31] These limits are based on measurements made at 30 meters horizontal distance from the emitter (device under test). The Access BPL measurement guidelines specify that measurements should normally be performed at a horizontal separation distance of 10 meters from the overhead power line, or if necessary because of ambient emissions, measurements may be performed at a distance of 3 meters.[32] In addition, if measurements at these distances are not practical - for example, if a 10-meter distance places the measurement antenna on a roadway - safety or some other practicality may dictate increasing or decreasing the distance in order to position the testers out of harm's way. However, the field strength of radiated emissions decreases with increasing distance from the emitter. Because of this attenuation with distance, the field strength of emissions from a device measured at the 3 meter and 10 meter distances specified in the guidelines will generally be higher than those measured at the 30 meter distance on which the emission standard is based. In order to apply the emissions standard consistently, the standard against which measurements are compared must be adjusted to account for distance attenuation when measurements are made at a distance other than 30 meters.

13. The Commission therefore determined that it would be necessary to use distance extrapolation to convert the emissions standard for use *in situ* testing of Access BPL systems at the 10 meter and 3 meter distances recommended in the BPL measurement guidelines. For BPL operations on frequencies less than 30 MHz, some commenters in the proceeding recommended the use of an extrapolation factor of 20 dB per decade, while others recommended an extrapolation factor of 40 dB per decade.[33] The Commission concluded in the *BPL Order* that "[g]iven the lack of conclusive experimental data pending large scale Access BPL deployments," it would "continue the use of the existing Part 15 distance extrapolation factors" specified in the rules, *i.e.*, 40 dB per decade for frequencies less than 30 MHz and 20 dB per decade for frequencies at or above 30 MHz, "but with the slant range rather than horizontal distance."[34] It further stated that "[i]f new information becomes

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[30] *See Guidelines* in Appendix C of *BPL Order*, *supra*.

[31] See 47 C.F.R. § 15.611 and 47 C.F.R. § 15.209.

[32] *Id.*, at 2(b)(1).

[33] *BPL Order*, *supra* at 21310. "Decade," a 10 to 1 range, refers to the ratio of the specified measurement distance to the actual measurement distance. An extrapolation factor of 20 dB per decade treats field strength emissions as if they attenuate at a rate inversely proportional to the distance from the emitter ($1/r$), whereas an extrapolation factor of 40 dB per decade treats emissions as if they attenuate at a rate inversely proportional to the square of the distance from the emitter ($1/r^2$). If the extrapolation factor is 20 dB per decade instead of 40 dB per decade, the correction factor would be smaller, thus resulting in lower allowed values for the transmitted emission levels at the same distance from the emitter. *See* 47 C.F.R. § 15.31 (f)(1) and (2).

[34] *Id.* The slant range distance is the line-of-sight distance from the measurement antenna, which typically is at ground level, to the overhead power line where the BPL device is mounted, typically several meters above ground. The slant range method reflects the actual measurement distance from the measurement antenna to the BPL emitter whereas the horizontal distance method used with other Part 15 devices in this case is less than the actual distance to the emitter. For example, if the measurement antenna is located 10 meters horizontal distance from a power pole at

(continued....)

available that alternative emission limit/distance standards or extrapolation factors would be more appropriate," the Commission, "will revisit this issue at another time."[35]

14. ARRL filed a petition for reconsideration of the Commission's decision to use 40 dB per decade as the extrapolation factor for frequencies below 30 MHz.[36] In support of its argument that an extrapolation factor of 20 dB per decade should be used, ARRL also submitted, through *ex parte* comments, the results of three studies conducted by the United Kingdom's Office of Communications (OFCOM) and one by the Special International Committee on Radio Interference (CISPR) regarding emission measurements for BPL systems.[37]. On reconsideration, the Commission affirmed its decision to use the existing Part 15 distance extrapolation factor of 40 dB per decade decay rate for measuring BPL emissions on frequencies below 30 MHz, stating: "No new information has been submitted that would provide a convincing argument for modifying this requirement at this time."[38]

15. In *ARRL v. FCC, supra*, the court found that the Commission did not offer a reasoned explanation for its dismissal of empirical data that was submitted *ex parte* by ARRL, *i.e.*, the three studies conducted by OFCOM and additional ARRL analysis intended to suggest that an extrapolation factor of 20 dB per decade may be more appropriate for Access BPL.[39] The court faulted the Commission for summarily dismissing the data submitted by ARRL because such a conclusory statement "provides neither assurance that the Commission considered the relevant factors nor a discernable path to which the court may defer." The court ordered the Commission either to "provide a reasoned justification for retaining an extrapolation factor of 40 dB per decade for Access BPL systems sufficient to indicate that it has grappled with the 2005 studies, or adopt another factor and provide a reasoned explanation for it."[40]

16. The technical studies and proposal submitted by ARRL in 2005 include three empirical studies from OFCOM and a plan for a sliding scale extrapolation based on a 1996 CISPR standard. The first OFCOM study, "*OFCOM, Ascom PLT Measurements in Winchester (May 11, 2005)*" (Winchester Study) reported measurements of an underground Access BPL trial system in Winchester, United Kingdom, which used BPL equipment made by Ascom AG, a Switzerland BPL manufacturer.[41] In that study, OFCOM made radiated emissions measurements at 1, 3, 10, 30 and 100 meter distances from the BPL emitter at 3 operating frequencies (4.4 MHz, 19.8 MHz and 25.2 MHz) and concluded that the electromagnetic field attenuates at a rate between 20 dB and 25 dB per decade at this BPL installation.

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a height of 1 meter and the power line is 11 meters up the pole, the slant range distance from the antenna to the power line is 14.14 meters, *i.e.*, $(10^2+10^2)^{1/2}$.

[35] *BPL Order, supra* at 21310.

[36] *See* n. 8, *supra*.

[37] *See* ARRL *ex parte* Citation of Additional Authority comments (filed July 8, 2005 in ET Docket 04-37) at http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6518006426.

[38] *BPL Reconsideration Order, supra* at 9317-18.

[39] *ARRL v. FCC, supra* at 241.

[40] *Id.*, at 242. The court did not separately address ARRL's contention that the Commission failed to consider a sliding scale extrapolation factor, assuming that it was properly before the Commission on reconsideration. *Id.*

[41] *OFCOM, Ascom PLT Measurements in* Winchester (May 11, 2005) at http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6518006428. Note that the FCC recommends making measurements no closer than 10 meters from the power line for safety reasons.

17. The second OFCOM study, "*OFCOM, DS2 PLT Measurements in Crieff (May 11, 2005)*" (Crieff DS2 Study) reported measurements of an Access BPL trial system in Crieff, United Kingdom, which used BPL equipment based on DS2 technology, a Spanish BPL chip manufacturer. This study concentrated only on the benefits of programmable notches in the equipment and does not provide any data on distance extrapolation.[42]

18. The third OFCOM study, "OFCOM, *Amperion PLT Measurements in Crieff (May 11, 2005)*" (Crieff Amperion Study) reported measurements of an overhead, pole-mounted Access BPL trial system, also in Crieff, United Kingdom, which used BPL equipment made by Amperion, Inc., an American BPL manufacturer.[43] Here, OFCOM made radiated emissions measurements at distances of 10, 30, 100 and 300 meters on a single operating frequency (23 MHz) from the BPL emitter and determined that the field attenuates at a rate of 28 dB per decade.[44]

19. ARRL's proposal for a sliding scale extrapolation factor referenced a 1996 CISPR Standard. This standard, which was published in 1996 well before Access BPL was developed, evaluates radio noise generated by high-voltage converter power stations and similar high-voltage installations and discusses methods on how to reduce radio noise from inherent power line components, such as mercury arc and thyristor valves.[45] ARRL pointed to a graph in the standard, Figure 17, which shows calculated values of the field strength attenuation of emissions from a vertical electrical dipole antenna as a function of the distance on a horizontal plane for different frequencies.[46] Based on this graph, ARRL then proposed a formula which effectively constitutes a sliding-scale calculation for an extrapolation factor that varies with frequencies.[47]

2. Discussion

20. In the period of time since the Commission's adoption of the *Reconsideration Order*, reports have become available on two new technical studies addressing attenuation of BPL emissions with distance, one by NTIA in October 2007 that describes a second phase of its simulation study on the potential for interference from Access BPL systems (NTIA Phase 2 Study) and the other by the

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[42] *OFCOM, DS2 PLT Measurements in Crieff* (May 11, 2005) at http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6518006429.

[43] *OFCOM, Amperion PLT Measurements in Crieff* (May 11, 2005) at http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6518006427.

[44] Subsequent to the filing of this OFCOM report into the record of this proceeding, Amperion submitted comments stating that the report "reflects information that is inappropriate for the public domain, especially the way it is inaccurately represented." Amperion argued that there are "discrepancies in the report," which it attributes to "[OFCOM's] unfamiliarity with the equipment and the hurried nature in which the testing was conducted." These discrepancies include that 1) OFCOM operated the BPL equipment at its maximum power levels, which was above the much lower level used for normal operations, without explaining that in the report, and 2) the system was not configured to comply with the Commission's limits. *See* Amperion Comments (filed May 20, 2005 in ET Docket 04-37) at http://fccweb01w/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6517611850, at 2-3. We note that operating the BPL equipment at maximum or typical power levels does not affect the determination of the attenuation characteristics of the signal.

[45] *Radio Interference Characteristics of Overhead Power Lines and High-Voltage Equipment – Part 2: Methods of Measurement and Procedure for Determining Limits,* CISPR 18-2, Amendment 2, (1996), (*CISPR 18-2*) at http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6518006430.

[46] ARRL *ex parte* comments at 6. *See also, CISPR 18-2* at 20.

[47] The formula ARRL recommended to the Commission to calculate extrapolation is as follows: Distance at 30 meters = distance at slant range – 20 log (30/slant range) – 20 log (15/frequency in Megahertz). ARRL *ex parte* comments at 6.

Federal Republic of Brazil (Brazil Study) in June 2008 that presents the results of a measurement study of BPL emissions.[48] In addition, we are aware that the IEEE working group on power line communications technology electromagnetic compatibility is working on a standard for EMC testing and measurements methodology for BPL equipment and installations (IEEE P1775/D2) that includes a provision for determining extrapolation (distance correction) factors on a site-by-site basis using *in situ* measurements as part of its work on that standard.

21. Consistent with our stated intention in the *BPL Order, supra*, to review the decision on the extrapolation factor if new information becomes available and the opportunity provided by the Court's remand of the extrapolation factor for explanation, we are reviewing our decision on that factor in light of the NTIA Phase 2 and Brazil studies and the site-specific option suggested by the IEEE P1775/D2 work. Our goal is to provide BPL measurement procedures that will adequately ensure compliance with the Section 15.209 emissions standard for emissions at or below 30 MHz without placing unfair or undue compliance burdens on equipment manufacturers and users. In conducting this review, we advise interested parties that at this point we continue to believe that our decision to apply the existing 40 dB per decade distance attenuation extrapolation factor in the rules for Access BPL operations, in conjunction with slant distance, on frequencies in this range was reasonable and appropriate.

22. We are also mindful that the Court has ordered that we provide a reasoned justification for retaining the 40 dB per decade extrapolation for Access BPL systems or adopt another factor and provide reasoning, and specifically remarked that we did not offer an explanation for dismissing the technical studies and technical proposal for an alternative extrapolation submitted *ex parte* in 2005 by ARRL. We therefore are providing an explanation of our reasons for selecting 40 dB per decade as the extrapolation factor for frequencies below 30 MHz and why we do not believe that the studies and technical proposal submitted earlier by the ARRL provide convincing information that we should use an extrapolation factor that is different from (and, specifically, less than) 40 dB. As discussed below, we believe that the NTIA Phase 2 and Brazil Studies further validate the use of 40 dB as the extrapolation factor. In addition, the sufficiency of our rules for ensuring compliance is further validated by the fact that we have not had any new complaints of interference for more than two years.

23. We also recognize, however, that there can be considerable variability in the attenuation of emissions from BPL systems at individual measurement sites, although NTIA's modeling results do not generally indicate that differences are expected to be typically as high as the 15 to 20 dB for an underground system such as was observed in the Winchester Study. To address this variability, we are requesting comment on whether we should adjust the extrapolation factor downward to 30 dB or some other fixed value and also specify and allow use of a special procedure for determining site-specific BPL extrapolation values using *in situ* measurements. The procedure for determining these site-specific extrapolation values would follow the general model under consideration in the IEEE P1775/D2 work.

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[48] *See Potential Interference From Broadband Over Power Line (BPL) Systems to Federal Government Radiocommunications at 1.7 – 80 MHz, Phase 2 Study, Volume I*, National Telecommunications and Information Administration (NTIA) Report 08-450, October 2007 ("*NTIA Phase 2 Study*"), at http://www.ntia.doc.gov/osmhome/reports/2007/bpl2007.html; and Federal Republic of Brazil, *Radio Interference Tests from Broadband Power Line Communication Systems*, ITU Radio Communication Group WP-1A, Document 1A-32-E, June 9, 2008 (*Brazil Study*) at http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6520190420. Both of these studies have been added to the record of this proceeding.

24. We are requesting that interested parties submit additional comment and information on the BPL extrapolation factor and on our proposal to modify the value specified for that factor and to alternatively allow use of special procedure for determining site-specific BPL extrapolation values. Such comment and information should address (1) the three studies and proposal for a sliding scale extrapolation factor submitted previously by the ARRL as part of its *ex* parte filing on July 8, 2005 in conjunction with its petition for reconsideration of the *BPL Order* and identified by the court, (2) the NTIA Phase 2 and Brazil studies with respect to findings on the extrapolation factor for BPL systems, and (3) our existing slant range method as it pertains to the effective field attenuation rate in a horizontal distance context. We further request submission of any other new empirical studies or information that may inform us regarding the BPL distance attenuation extrapolation factor. Our goal is to ensure that the extrapolation factor used when tests cannot be made at the standard measurement distance provides effective protection to authorized services from harmful interference without unnecessarily burdening Access BPL technology.

a. The 40 dB per Decade BPL Extrapolation Factor

25. In explaining our reasoning for adopting 40 dB per decade as the extrapolation factor value for BPL emissions, it is important to understand that this is a measurement protocol (or "tool"), not an adjustment to the emissions standard. We first observe that a concern in the BPL proceeding was that BPL systems are not traditional point-source emitters. Rather, they could act to some extent in a manner similar to line source emitters that would radiate along the power lines, and, therefore the emissions from these systems would not attenuate in the same manner as a typical point-source emitter.[49] In addressing this concern in the *BPL Order*, *supra*, the Commission agreed with the ARRL that Access BPL systems on overhead lines are not traditional point-source emitters.[50]

26. The Commission also observed that NTIA's earlier BPL computer simulation modeling as reported in the Technical Appendix to its June 2004 comments showed results indicating that the attenuation in field strength of emissions from BPL systems with distance from the power line is consistent with the existing distance extrapolation factors for unlicensed devices in Section 15.31(f)(1) and (2) of the rules when used with the slant range to the power line.[51] No party offered analysis or argument to dispute NTIA's results. These simulation results were conducted using the widely recognized and employed National Electromagnetic Code (NEC) software for analyzing radio propagation. Although we do not rely on NTIA's more recent Phase 2 simulation results to justify our earlier decision, we note here that those results indicate that the attenuation at individual locations can be expected to vary around the standard 40 dB value with frequency, configurations of line arrangements on poles, and other site-specific characteristics. We are therefore aware that measurements of the emissions from BPL systems at different distances will vary, but cluster around the 40 dB per decade factor. As the NTIA simulation results show, this variation is to be expected when measuring emissions below 30 MHz from points near the ground at distances close to a source of emissions.

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[49] *See BPL Order, supra* at 21281-82.

[50] *Id.* To ensure that the effects of the power line as a radiator are taken in to consideration when testing for compliance with the rules, the Commission adopted measurement procedures that specify that measurements are to be made at specific distances from the Access BPL equipment signal source and that measurements are to be taken parallel to the power line to find the maximum emissions from the system.

[51] *See* Technical Appendix to NTIA comments (filed June 4, 2004 in ET Docket 04-37) ("NTIA Technical Appendix") at http://fccweb01w/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6516212607; *see also, BPL Order, supra* at 21310 and 47 C.F.R. § 15.31(f)(1) and (2).

27. While we recognize the potential value and importance of empirical data with respect to this issue, there were no significant studies that examined the very large number of measurements that would be needed to address the different site characteristics that affect the attenuation of emissions below 30 MHz. In this regard and as discussed below, the studies submitted by the ARRL in its 2005 *ex parte* provided only anecdotal information on two different types of installations (overhead and underground) from two single sites, and also had certain methodological shortcomings. These studies did not provide sufficient information to support a statistically valid and comprehensive description of how BPL emissions attenuate over the short distances at which measurements are made.

28. We specifically observe that only two of the studies (the Winchester Study and the Crieff Amperion Study) collected data relevant to the extrapolation factor. In addition, those two studies each report only a few measurements on a small number of operating frequencies along a single perpendicular path each at two small and very dissimilar BPL installations (one underground and one overhead) on power line configurations which may not be representative of power line configurations in the United States. In order for a study to provide statistically significant information on the attenuation of BPL emissions in the close vicinity of power lines and to adequately include signal conditions under different configurations of power lines on a pole or underground installations, a much larger body of empirical data at sites with varying configurations of power line attachments to poles and differing site characteristics would be needed. Moreover, such samples would need to demonstrate that they are conducted on power distribution systems representative of those found in the U.S.

29. Second, the RF propagation environments in which BPL emissions are measured can affect the results such that results from a given site may not be characteristic of the general rate at which BPL emissions attenuate. The measurements in these two studies were taken near the ground (as are measurements BPL emissions under our measurement procedure), where the field strength of radio signals, and particularly those below 30 MHz, is typically affected to a significant degree by reflections and absorption by the ground, nearby vegetation, vehicles, structures, measuring equipment, equipment stands, and even the positions of the persons making the measurements.[52] Of particular importance in this context are the presence and configuration of other power lines in addition to the power line to which the BPL device is attached and of metallic structures and vehicles. Because of the effects of these factors, the field strengths of radio signals emitted at the same power level will often vary significantly when measured near the ground at different locations that are the same distance from a source. Thus, in order to obtain empirical data from which general conclusions about the attenuation characteristics of Access BPL emissions may be drawn, it is necessary to have a very large number of observations from different BPL installations and from different locations at those installations. The small number of observations provided by the measurements in the Winchester and Crieff Amperion studies is not sufficient to form a basis for establishing a value for the extrapolation factor.

30. We note that even at the two installations examined in the OFCOM studies, the data describe that the electromagnetic field attenuates at different rates. In addition, the data does not even appear sufficient to determine whether the type of BPL technology and architecture made a difference in the field attenuation rate. Moreover, OFCOM itself recommends that "[d]uring the course of future PLT leakage emission measurements, further work is undertaken to confirm this finding elsewhere."[53]

[52] If unobstructed, radio waves will travel in a straight line from the transmitter to the receiver. But if there are obstacles near the path, the radio waves reflecting off those objects may be absorbed or arrive out of phase with the signals that travel directly and reduce the power of the received signal.

[53] *OFCOM, Ascom PLT Measurements in* Winchester at 32.

We therefore saw nothing in the studies submitted by the ARRL that would warrant selection of a different (lower value) extrapolation factor.

31. With respect to its proposal for a sliding scale extrapolation factor, we observe that the ARRL did not provide an explanation as to how its formula was derived or how to use it to determine the extrapolation factor, nor did it provide a rationale for selecting such a formula. Further, even the CISPR graph has no explanation for the data showed thereon. In addition, we have no information as to the relationship between the performance of emissions from BPL technology and the specifications for reduction of power line noise adopted in the standard.[54] We therefore were unable to determine whether or how the sliding scale factor proposed by the ARRL could be used to represent the attenuation of emissions from a BPL system.

32. Accordingly, the extrapolation factor adopted in the *BPL Order*, *supra*, and affirmed in the *BPL Reconsideration Order*, *supra*, was based on the best information available at the time each of those decisions were made, while acknowledging that it might be desirable to revisit this issue if more information would become available, as we are now undertaking herein as discussed below.

b. Review of the Extrapolation Factor

33. In reviewing the BPL extrapolation factor, we intend to seek new information and studies, including those with empirical research, and to consider new approaches for the extrapolation that could use a lower value for the attenuation rate of emissions. Looking at new information, shortly after the release of the Commission's *BPL Reconsideration* Order, *supra*, NTIA published its "Phase 2 Study." This study illustrates the application of the Commission's BPL rules and measurement guidelines in a case study. Using the well-known and validated simulation software it employed in its Phase 1 Study, NTIA created an elaborate power line model that approximates existing overhead Access BPL power line structures in the U.S.[55] After applying the emissions limits and methodology from the BPL measurement guidelines, NTIA analyzed the noise floor increase expected in nearby receivers as a result of BPL operations. NTIA states that its simulations confirm that "at or above 10 MHz, the simulation results show good agreement between the rate that field strength decays and the Part 15 distance extrapolation rate using the slant range distance to the Access BPL device and power lines." NTIA does, however, further state that "the simulations in the 4 to 8 MHz frequency range exhibited somewhat slower rates of field strength decay with distance than would be expected by the distance extrapolation rate in the Part 15 rules for Access BPL systems. This difference was up to 6 dB less than the distance extrapolation rate."[56]

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[54] NTIA indicates in its comments that strong existing radio noise emissions from power lines must be reduced to enable acceptable Access BPL performance. Thus, the environment described in the CISPR standard (*e.g.*, power line noise caused by mercury arc and thyristor valve, etc.) may not be applicable with BPL deployments, because many of these components could be replaced with alternative noise-reducing components or configurations. *See* NTIA comments (filed June 4, 2004 in ET Docket 04-37), at iv-v.

[55] *See Potential Interference From Broadband Over Power Line (BPL) Systems To Federal Government Radiocommunications at 1.7-80 MHz, Phase 1 Study, Volume I*, NTIA Report 04-413, April 2004 ("*NTIA Phase 1 Study*") at http://www.ntia.doc.gov/ntiahome/fccfilings/2004/bpl/. NTIA's simulations employ the Numerical Electromagnetic Code (NEC) NEC-4 software package is an algorithm and generic computer application that performs the complex calculations needed to model an antenna in order to simulate a variety of power line configurations. Developed in the 1970s by Gerald Burke, the Numerical Electromagnetic Code (NEC) is a popular antenna modeling method for wire and surface antennas. The code was made publicly available for general use and has subsequently been distributed for many computer platforms from mainframes to personal computers. NEC-4 currently requires a separate license to use. *NTIA Phase 2 Study*, *supra* at page 6 and at Section 3.

[56] *NTIA Phase 2 Study*, *supra* at Section 6.2.1. This 6 dB figure refers to the difference between NEC-modeled field strength at 30 meters and the field strength at 30 meters predicted by the FCC extrapolation rules.

34. We also observe that, like OFCOM in the United Kingdom, the regulatory agencies of other countries are testing BPL systems as part of the international forum's discussions on BPL technology.[57] The recently released study from the Federal Republic of Brazil reports results that show attenuation of emissions from BPL that is greater than the 40 dB per decade extrapolation factor, which indicates variation on the other side of the results found in the OFCOM studies. Here again, the amount of data collected is relatively small.[58] We believe that the information in the NTIA Phase 2 and Brazil studies, when viewed in light of the NTIA's Technical Appendix and the OFCOM studies taken together not only provide validation for our previous conclusions selecting 40 dB per decade as the extrapolation factor, recognizing that there will be variation around that value at individual locations, but also inform our further consideration of this matter.

35. There may be other new studies of the attenuation of BPL emissions with distance. We request that interested parties provide additional empirical information and studies regarding the distance extrapolation factor for use in measurements of emissions from Access BPL operating below 30 MHz. Such information and studies will be most useful if they are compiled using the FCC measurement guidelines[59] and cover various BPL technologies that operate below 30 MHz. The data should also cover the different operating frequencies of BPL emitters in their typical deployment configurations and the field strength attenuation at these frequencies. Access BPL systems from which data is collected also should be representative of power line configurations (underground and overhead) and current BPL network architectures in the United States.[60]

36. We also observe that the slant range distance in the measurement procedure works with the 40 dB per decade factor to yield extrapolated measurement values that have the effect of imposing a more conservative emissions standard than would be derived if using the horizontal distance from a power pole.[61] In this regard, at relatively short distances, *i.e.*, distances 30 meters or less, the slant range measurement method effectively reduces the emission limit for BPL systems with respect to the horizontal distance from the pole because at any given horizontal distance from the pole, the slant range distance is longer than the horizontal distance. This is simple geometry resulting from the height of the power line on which the BPL emitter is installed. (The hypotenuse of a right triangle is longer than either of the sides.)[62] When extrapolated values at 40 dB per decade of slant range

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[57] *See* comments from Jeff A. Krauss (filed Dec. 9, 2008 in ET Docket 04-37) referring to the work in the International Telecommunication Union (ITU) Radio Communication Group Working Party 5C, Document 1A-77-E, Nov. 3, 2008; and to the study from Federal Republic of Brazil, *Radio Interference Tests from Broadband Power Line Communication Systems*, ITU Radio Communication Group WP-1A, Document 1A-32-E, June 9, 2008.

[58] *Brazil Study* at section 1.2. In contrast to OFCOM's results pointing to an empirical extrapolation factor between 20 and 27 dB per decade, the Brazilian results point to an empirical extrapolation factor of 40 dB or better.

[59] *See Guidelines* in Appendix C of *BPL Order, supra.*

[60] See as an example, the *NTIA Phase 1 Study, supra* at Sections 2-1 and 2-2.

[61] The rules specify that "[t]o the extent practicable, the device under test shall be measured at the distance specified in the appropriate rule section. The distance specified corresponds to the horizontal distance between the measurement antenna and the closest point of the equipment under test, support equipment or interconnecting cables as determined by the boundary defined by an imaginary straight line periphery describing a simple geometric configuration enclosing the system containing the equipment under test." 47 C.F.R. § 15.31(f). However, for Access BPL devices operating on overhead power lines, the Commission adopted the slant range method due to the location of the BPL device on a power pole that is typically several meters above ground and above the measurement antenna. *See* Guidelines in *Appendix C* of the *BPL Order, supra,* and Figure 1 in Appendix D.

[62] For example, using a 40 dB per decade distance extrapolation factor, the maximum permitted emission level at a horizontal distance of 10 meters is 48.62 dBμV/m, whereas the maximum permitted emission level at a slant range of 14.87 meters (assuming the power line is 12 meters in height, thus the measuring height with the antenna at 1 meter from the ground would be 11 meters; and horizontal distance is 10 meters from the power pole) is

(continued....)

distance are plotted against the horizontal distance, the effective slant range emission limit curve more closely follows the emission limit curve based on a 20 dB per decade extrapolation factor than the emission limit curve based on a 40 dB per decade extrapolation factor.[63] NTIA's modeling results effectively support this observation.[64] We also note that given that our BPL measurement procedure requires that compliance measurements taken at 30 meters or less, the effect of the slant range distance provision is significant at all distances where the extrapolation factor can be used. We seek comment on our slant range method as it pertains to the effective field attenuation rate in a horizontal distance context and on NTIA's findings with respect to the extrapolation factor in its Phase 2 Study.

37. From all of the above, we observe that while 40 dB per decade continues to best describe the attenuation rate of emissions from BPL systems, there is also considerable variability around that value at different sites. The result of this variability is that the actual attenuation at some sites could be less than 40 dB per decade and using the current extrapolation factor at such sites could produce an adjusted measurement that would be less than the signal that would be measured at the standard 30 meter measurement distance specified in Section 15.209. We request comment on whether it would be desirable to modify the value of the BPL extrapolation factor to be 30 dB per decade or some other value. This lower value would apply a more conservative approach that would compensate for those cases where the actual attenuation is less than 40 dB. While we do not have statistics that indicate the distribution of cases where the attenuation rate is less than 40 dB per decade, we believe that the additional margin provided by a 30 dB standard would encompass a large number of such cases. A 30 dB standard would also substantially reduce the remaining differences in under-adjustment of measurements at locations where the attenuation rate might be less than 30 dB per decade. We further note that extrapolated emission limits based on our proposed 30 dB extrapolation factor when applied to slant distance are comparable to the extrapolated emission limits based on a 20 dB extrapolation factor applied to horizontal distance.[65]

38. We recognize that reliance on a 30 dB per decade extrapolation factor could increase the compliance burden for BPL equipment and systems that are tested at locations where the attenuation rate is in fact greater than 40 dB per decade. We are therefore clarifying that in all cases measurements of BPL equipment and systems may be made at the 30 meters distance specified in Section 15.209 and that where possible, the Commission's staff will make measurements at this distance when testing for compliance. Further, to provide manufacturers and system operators the opportunity to use a higher extrapolation rate at locations where they believe the attenuation rate is higher than 30 dB per decade, we are also considering allowing parties testing BPL systems for compliance with the radiated emissions limits to determine distance correction factors on a site-by-site basis using an *in situ* measurements procedure. The site-specific extrapolation factor would be an alternative to the proposed 30 dB per decade standard and would replace the existing alternative method currently in the rules but that is not included in the BPL measurement

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41.74 dBμV/m, a level that is 6.89 dB more stringent. If the horizontal distance is at 3 meters, the maximum permitted emission level is 69.54 dBμV/m, whereas the maximum permitted emission level at a slant range of 11.40 meters (assuming the power line is 12 meters in height, thus the measuring height with the antenna at 1 meter from the ground would be 11 meters; and horizontal distance is 3 meters from the power pole) is 46.35 dBμV/m, a level that is 23.19 dB more stringent. *See* Appendix D.

[63] *See* illustration in Figure 2 in Appendix D.

[64] *See NTIA Phase 2, supra* at Section 2.5.

[65] This is true for measurement distances greater than 12 meters. At measurement distances less than 12 meters, the extrapolated emission limits based on the proposed 30 dB factor applied to slant distance are much more stringent than extrapolated limits based on a 20 dB factor applied to horizontal distance. *See* Figure 3 in Appendix D, *infra*.

procedures.[66] This alternative method would only be applicable to Access BPL devices operating on overhead power lines on frequencies below 30 MHz.

39. Under this plan, which as indicated above is based on a concept under consideration in the IEEE P1775/D2 effort, entities conducting measurements would be allowed to determine an extrapolation factor specific to the site by fitting a straight line to measurements of field strength in dBμV/m vs. logarithmic distance in meters from the nearest conductor carrying BPL emissions, where the extrapolation factor would be taken as the slope, *n*, of that line. The slope *n* any point on the straight line is μV/m would be:

$$n = (\log E_1 - \log E_2)/(\log D_2 - \log D_1)$$

where E_r is the measured field strength at distance D_r

The field strength at any distance D along the best straight line fit is estimated from the value of *n* as:

$$\log E_r = \log E_2 + n(\log D_2 - \log D_r)$$

40. The extrapolation factor would be derived from a best fit straight line fit determined by a first-order regression calculation from measurements for at least four lateral distances from the overhead line, at no less than 3 meters from the lateral plane and differing from each other by at least 3 meters. Additional provisions of this procedure are set forth in the proposed modifications to our Access BPL measurement procedures in Appendix C. If these measurements allow a straight line to be calculated or drawn with reasonable fit (the minimum regression coefficient would be 0.9), the best straight line fit would be used to calculate field strength at the 30 meters standard measurement distance in the rules according to the equation above. If the four measurements do not fall near any straight line or negative slope, measurements at a new distance would be added until a reasonable straight line is indicated. In addition, measurements that obviously show a "null" would be ignored. Parties employing site specific extrapolation values would be required to provide a record of the measurements under the above procedure and to submit those measurements and their derivation of the *in situ* values with any measurements in certification applications or other compliance submissions to the Commission. We believe the availability of this procedure or an appropriate similar alternative site-specific approach would substantially alleviate the measurement concerns associated with the extrapolation factor and the variability in attenuation rates that may be observed in the field.

41. We request comment on the suitability of an extrapolation factor lower than 40 dB per decade and the above *in situ* procedure for determining the field strength of BPL emissions in locations where measurements cannot be made at the lateral distance of 10 meters from the overhead line. Interested parties are invited to suggest alternative values for the extrapolation factor that would account for the variability of attenuation rates without unfairly burdening manufacturers of users of BPL equipment and systems. Parties submitting such suggestions should also provide information to support their proposal. Interested parties are specifically requested to address 1) whether use of the proposed procedure would provide an appropriate and reliable means of accounting for any variation in the attenuation rate at individual sites; 2) the effect that an extrapolation factor lower than 40 dB per decade would have on the effective emission limits for Access BPL devices operating on overhead power lines when used in conjunction with our slant range method; and 3) any special

[66] The rules currently provide for the use of an alternative method using measurements made at a minimum of two distances on at least one radial to determine the proper extrapolation factor at frequencies below 30 MHz. *See* 47 C.F.R. § 15.31 (f)(2).

provisions that may be necessary to ensure that site-specific attenuation rates derived through this procedure reliably and fairly represent the attenuation rate at individual sites.

IV. PROCEDURAL MATTERS

42. *Initial Regulatory Flexibility Analysis for the Further Notice of Proposed Rule Making.* As required by the Regulatory Flexibility Act, 5 U.S.C. § 603, the Commission has prepared an Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on small entities of the proposals suggested in this document. The IRFA is set forth in Appendix A.

43. *Initial Paperwork Reduction Analysis.* The Request for Further Comment and FNPRM does not contain proposed information collection(s) subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. In addition, therefore, it does not contain any new or modified "information collection burden for small business concerns with fewer than 25 employees," pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. 3506(c)(4)..

44. *Comments.* Pursuant to sections 1.415 and 1.419 of the Commissions rules, 47 C.F.R. §§ 1.415, 1.419, interested parties may file comments and reply comments on or before the dates indicated on the first page of this document. Comments may be filed using: (1) the Commission's Electronic Comment Filing System (ECFS), (2) the Federal Government's eRulemaking Portal, or (3) by filing paper copies. *See Electronic Filing of Documents in Rulemaking Proceedings*, 63 FR 24121 (1998).

- Electronic Filers: Comments may be filed electronically using the Internet by accessing the ECFS: http://www.fcc.gov/cgb/ecfs/ or the Federal eRulemaking Portal: http://www.regulations.gov. Filers should follow the instructions provided on the website for submitting comments.

  - For ECFS filers, if multiple docket or rulemaking numbers appear in the caption of this proceeding, filers must transmit one electronic copy of the comments for each docket or rulemaking number referenced in the caption. In completing the transmittal screen, filers should include their full name, U.S. Postal Service mailing address, and the applicable docket or rulemaking number. Parties may also submit an electronic comment by Internet e-mail. To get filing instructions, filers should send an e-mail to ecfs@fcc.gov, and include the following words in the body of the message, "get form." A sample form and directions will be sent in response.

- Paper Filers: Parties who choose to file by paper must file an original and four copies of each filing. If more than one docket or rulemaking number appears in the caption of this proceeding, filers must submit two additional copies for each additional docket or rulemaking number.

  Filings can be sent by hand or messenger delivery, by commercial overnight courier, or by first-class or overnight U.S. Postal Service mail (although we continue to experience delays in receiving U.S. Postal Service mail). All filings must be addressed to the Commission's Secretary, Office of the Secretary, Federal Communications Commission.

  - The Commission's contractor will receive hand-delivered or messenger-delivered paper filings for the Commission's Secretary at 236 Massachusetts Avenue, NE, Suite 110, Washington, DC 20002. The filing hours at this location are 8:00 a.m. to 7:00 p.m. All hand deliveries must be held together with rubber bands or fasteners. Any envelopes must be disposed of before entering the building.

- Commercial overnight mail (other than U.S. Postal Service Express Mail and Priority Mail) must be sent to 9300 East Hampton Drive, Capitol Heights, MD 20743.

- U.S. Postal Service first-class, Express, and Priority mail must be addressed to 445 12th Street, SW, Washington DC 20554.

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V. ORDERING CLAUSES

45. Accordingly, IT IS ORDERED that pursuant to Sections 1, 4, 301, 302, 303(e), 303(f) and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 1, 4, 301, 302, 303(e), 303(f) and 303(r), the Request for Comment and Further Notice of Proposed Rule Making is hereby adopted.

46. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this Request for Comment and Further Notice of Proposed Rule Making, including the Initial Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch

Marlene H. Dortch
Secretary

APPENDIX A

Initial Regulatory Flexibility Analysis

As required by the Regulatory Flexibility Act of 1980 as amended, [1] the Commission has prepared this present Initial Regulatory Flexibility Analysis (IRFA) of the possible significant economic impact on small entities by the policies and rules proposed in this Further Notice of Proposed Rulemaking ("FNPRM"). Written public comments are requested on this IRFA. Comments must be identified as responses to the IRFA and must be filed by the deadlines for comments provided on the first page of the FNPRM. The Commission will send a copy of this FNPRM, including the IRFA, to the Chief Counsel for Advocacy of the Small Business Administration (SBA).[2] In addition, the FNPRM and IFRA (or summaries thereof) will be published in the Federal Register.[3]

A. Need for, and Objectives of, the Proposed Rules.

Consistent with the opportunity provided by the court's remand and our stated intention in the *BPL Order* to review the decision on the extrapolation factor if new information becomes available, we are re-examining the current extrapolation factor in light of the recently issued technical studies addressing the attenuation of BPL emissions with distance and efforts by the IEEE to develop BPL measurement standards. As the several studies now available show and as we have observed previously, there can be considerable variability in the attenuation of emissions from BPL systems across individual measurement sites that is not captured in the existing fixed 40 dB per decade standard.

We propose to amend Part 15 of our rules to adjust the extrapolation factor downward to 30 dB for Access Broadband over Power Line (BPL) systems and, as an alternative, also allow use of a special procedure for determining site-specific BPL extrapolation values using *in situ* measurements. Specifically, as a means to address the concerns that the rate of attenuation of BPL emissions at a specific site can differ from the existing 40 dB per decade standard, we are proposing to modify our rules and measurement procedures for Access BPL to specify the use of a 30 dB extrapolation factor and to allow parties testing BPL systems for compliance with the radiated emissions limits to determine distance correction factors on a site-by-site basis using an *in situ* measurements procedure when measurements cannot be made at the measurement distance of 30 meters as specified in the rules. In addition, we are clarifying that parties testing BPL equipment and systems for compliance with emissions limits in our the rules may measure at the standard 30 meter distance rather than only the shorter distances recommended in the BPL measurement guidelines. Our actions will ensure that the BPL measurement rules would not unnecessarily burden this technology while providing appropriate protection from harmful interference for authorized services.

B. Legal Basis.

This action is taken pursuant to Sections 1, 4, 301, 302, 303(e), 303(f) and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. Sections 1, 4, 301, 302, 303(e), 303(f) and 303(r).

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[1] *See* 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. §§ 601-612, has been amended by the Contract With America Advancement Act of 1996, Pub. L. No. 104-112, 110 Stat. 847 (1996)("CWAAA"). Title II of the CWAAA is the Small Business Regulatory Enforcement Fairness Act of 1996 ("SBREFA").

[2] *See* 5 U.S.C. § 603(a).

[3] *See* 5 U.S.C. § 603(a).

C. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Will Apply.

The RFA directs agencies to provide a description of, and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules, if adopted.[4] The RFA defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small business concern" under Section 3 of the Small Business Act.[5] Under the Small Business Act, a "small business concern" is one that: (1) is independently owned and operated; (2) is not dominant in its field of operations; and (3) meets may additional criteria established by the Small Business Administration (SBA).[6]

Nationwide, there are a total of approximately 27.2 million small businesses, according to the SBA.[7] A "small organization" is generally "any not-for-profit enterprise which is independently owned and operated and is not dominant in its field."[8] Nationwide, as of 2002, there were approximately 1.6 million small organizations.[9] The term "small governmental jurisdiction" is defined generally as "governments of cities, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand."[10] Census Bureau data for 2002 indicate that there were 87,525 local governmental jurisdictions in the United States.[11] We estimate that, of this total, 84,377 entities were "small governmental jurisdictions."[12] Thus, we estimate that most governmental jurisdictions are small.

The proposed rules pertain to manufacturers of unlicensed communications devices. The appropriate small business size standard is that which the SBA has established for radio and television broadcasting and wireless communications equipment manufacturing. The Census Bureau defines this category as follows: "This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment."[13] The SBA has developed a small business size standard for firms in this category, which is: all such firms having 750 or fewer employees.[14] According to Census Bureau data

[4] *See* U.S.C. § 603(b)(3).

[5] *Id.* § 601(3).

[6] *Id.* § 632.

[7] *See* SBA, Office of Advocacy, "Frequently Asked Questions," http://web.sba.gov/faqs (accessed Jan. 2009).

[8] 5 U.S.C. § 601(4).

[9] Independent Sector, The New Nonprofit Almanac & Desk Reference (2002).

[10] 5 U.S.C. § 601(5).

[11] U.S. Census Bureau, Statistical Abstract of the United States: 2006, Section 8, page 272, Table 415.

[12] We assume that the villages, school districts, and special districts are small, and total 48,558. *See* U.S. Census Bureau, Statistical Abstract of the United States: 2006, section 8, page 273, Table 417. For 2002, Census Bureau data indicate that the total number of county, municipal, and township governments nationwide was 38,967, of which 35,819 were small. *Id.*

[13] U.S. Census Bureau, 2007 NAICS Definitions, "334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing"; http://www.census.gov/naics/2007/def/ND334220.HTM#N334220.

[14] 13 C.F.R. § 121.201, NAICS code 334220.

for 2002, there were a total of 1,041 establishments in this category that operated for the entire year.[15] Of this total, 1,010 had employment of less than 500, and an additional 13 had employment of 500 to 999.[16] Thus, under this size standard, the majority of firms can be considered small. We do not believe this action would have a negative impact on small entities that manufacture unlicensed BPL devices. Indeed, we believe the actions should benefit small entities because it should make available increased business opportunities to small entities. We request comment on these assessments.

D. Description of Projected Reporting, Record keeping and Other Compliance Requirements.

The FNPRM does not contain proposed new or modified information collection requirements.

E. Steps taken to Minimize Significant Economic Impact on Small Entities and Significant Alternatives Considered.

The RFA requires an agency to describe any significant alternatives that it has considered in reaching its proposed approach, which may include the following four alternatives (among others): (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for small entities.[17]

In this FNPRM, we are proposing to modify our rules and measurement procedures for Access BPL to specify the use of a 30 dB extrapolation factor and, as an alternative, to allow parties testing BPL systems for compliance with the radiated emissions limits to determine distance correction factors on a site-by-site basis using an *in situ* measurements procedure when measurements cannot be made at the measurement distance of 30 meters as specified in the rules. In addition, we are clarifying that parties testing BPL equipment and systems for compliance with emissions limits in our the rules may measure at the standard 30 meter distance rather than only the shorter distances recommended in the BPL measurement guidelines. We seek comment on the alternatives and the clarification.

F. Federal Rules that May Duplicate, Overlap, or Conflict with the Proposed Rules.

None.

[15] U.S. Census Bureau, American FactFinder, 2002 Economic Census, Industry Series, Industry Statistics by Employment Size, NAICS code 334220 (released May 26, 2005); http://factfinder.census.gov. The number of "establishments" is a less helpful indicator of small business prevalence in this context than would be the number of "firms" or "companies," because the latter take into account the concept of common ownership or control. Any single physical location for an entity is an establishment, even though that location may be owned by a different establishment. Thus, the numbers given may reflect inflated numbers of businesses in this category, including the numbers of small businesses. In this category, the Census breaks-out data for firms or companies only to give the total number of such entities for 2002, which was 929.

[16] *Id.* An additional 18 establishments had employment of 1,000 or more.

[17] 5 U.S.C. § 603(c).

APPENDIX B

Proposed Rules

For the reasons discussed in the preamble, the Federal Communications Commission proposes to amend 47 C.F.R. Part 15 to read as follows:

PART 15 – RADIO FREQUENCY DEVICES

1. The authority citation for part 15 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 302, 303, 304, 307 and 544A.

2. Section 15.31 is proposed to be amended by adding paragraph (f)(3); and re-designating paragraphs (f)(3) through (f)(5) as (f)4) through (f)(6), to read as follows:

Section 15.31 Measurement standards.

* * * * *

(f) * * *

* * * * *

(3) For Access BPL devices operating at frequencies below 30 MHz, the results shall be extrapolated to the specified distance by using an extrapolation factor of 30 dB/decade. Measurements may be performed at a distance closer than that specified with the radiated emissions limit in section 15.209 of this part; however, an attempt should be made to avoid making measurements in the near field. The distance correction to the emission limit for measurements on overhead power line installations shall be based on the slant range distance, which is the line-of-sight distance from the measurement antenna to the overhead line. Alternatively, a site-specific extrapolation factor may be used in lieu of the 30 dB/decade standard. This extrapolation factor shall be derived from a best fit straight line fit determined by a first-order regression calculation from measurements for at least four lateral distances from the overhead line. Compliance measurements for Access BPL and use of site-specific extrapolation factors shall be made in accordance with the Guidelines for Access BPL systems specified by the Commission.

* * * * *

APPENDIX C

Measurement Guidelines for Broadband Over Power Line (BPL) Devices Or Carrier Current Systems (CCS) and Certification Requirements For Access BPL Devices

The Measurement Guidelines is amended by adding paragraph (2)(b)(2) and redesignating paragraphs (2)(b)(2)-(4) as (2)(b)(3)-(5) to read as follows:

2. Access BPL Measurement Principles

* * * * *

(b) Radiated Emissions Measurement Principles for Overhead Line Installations

* * * * *

(2) For Access BPL devices operating below 30 MHz, if the site-specific alternative extrapolation method is selected, the extrapolation factor is determined by fitting a straight line to measurements of field strength in dBμV/m vs. logarithmic distance in meters from the nearest conductor carrying BPL emissions, where the extrapolation factor would be taken as the slope, *n*, of that line. The slope *n* any point on the straight line is μV/m would be:

$$n = (\log E_1 - \log E_2)/(\log D_2 - \log D_1)$$

where E_r is the measured field strength at distance D_r

The field strength at any distance D along the best straight line fit is estimated from the value of *n* as:

$$\log E_r = \log E_2 + n(\log D_2 - \log D_r)$$

The best fit straight line fit is determined by a first-order regression calculation from measurements for at least four lateral distances from the overhead line, at no less than 3 meters from the lateral plane and differing from each other by at least 3 meters. If these measurements allow a straight line to be calculated or drawn with reasonable fit (the minimum regression coefficient would be 0.9), the best straight line fit would be used to calculate field strength at the 30 meters standard measurement distance according to the equation above. If the four measurements do not fall near any straight line or negative slope, measurements at a new distance would be added until a reasonable straight line is indicated. In addition, measurements that obviously show a "null" will be ignored.

* * * * *

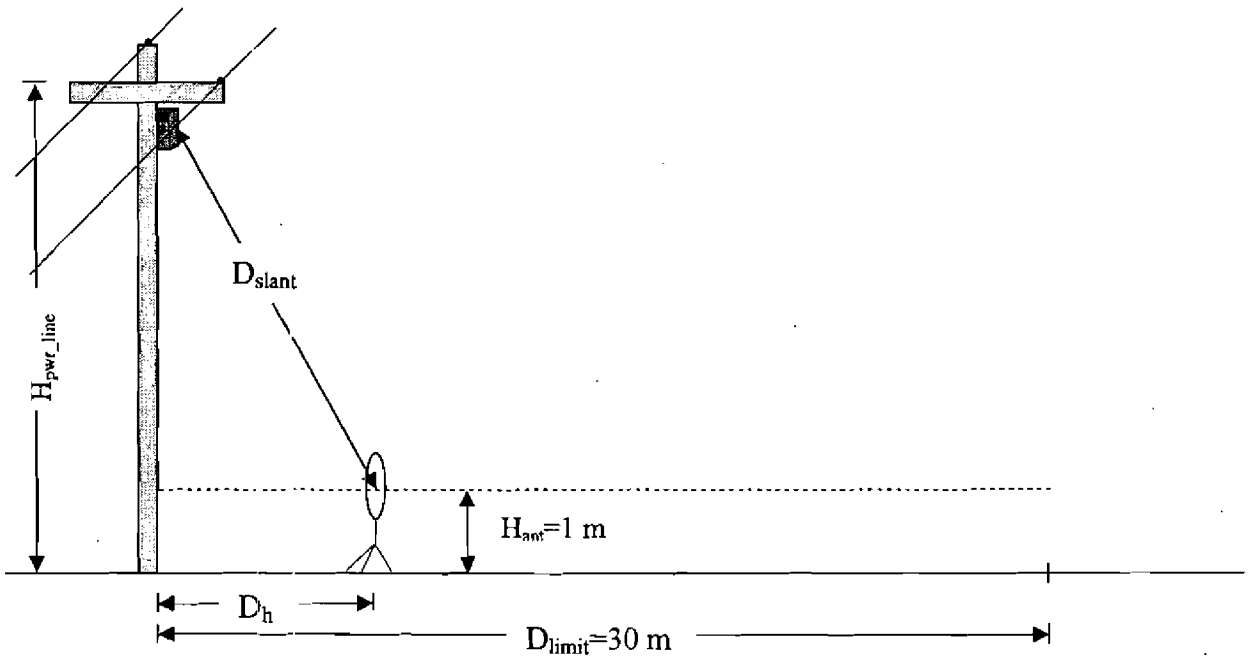
APPENDIX D

Slant Range Method

I. SLANT RANGE METHOD FOR MEASURING BPL EMISSIONS ON OVERHEAD POWER LINES

The Commission adopted a slant range method for measuring BPL emissions on overhead power lines in Appendix C of the *BPL Order*. With the slant range method, the distance correction for the overhead-line measurements of BPL emissions is based on the slant distance, which is the line-of-sight distance from the measurement antenna to the overhead line, illustrated in Figure 1 below. Slant distances are calculated based on the height of the power line and the horizontal (lateral) distance (D_h) from the measurement antenna to the power pole (see Equation 1, below). Slant range distance corrections are made in accordance with Section 15.31(f) (*e.g.*,using 40 dB per decade extrapolation factor for frequencies below 30 MHz).

Figure 1 – Testing configuration of BPL devices using slant distance



D_{slant} is the slant path distance, in meters;
D_h is the horizontal distance (lateral distance from the power pole), in meters;
D_{limit} is the distance at which the emission limit is specified in Part 15 (*e.g.*, 30 meters for frequencies below 30 MHz)
H_{pwr_line} is the height of the power line, in meters; and
H_{ant} is the measurement antenna height, in meters.

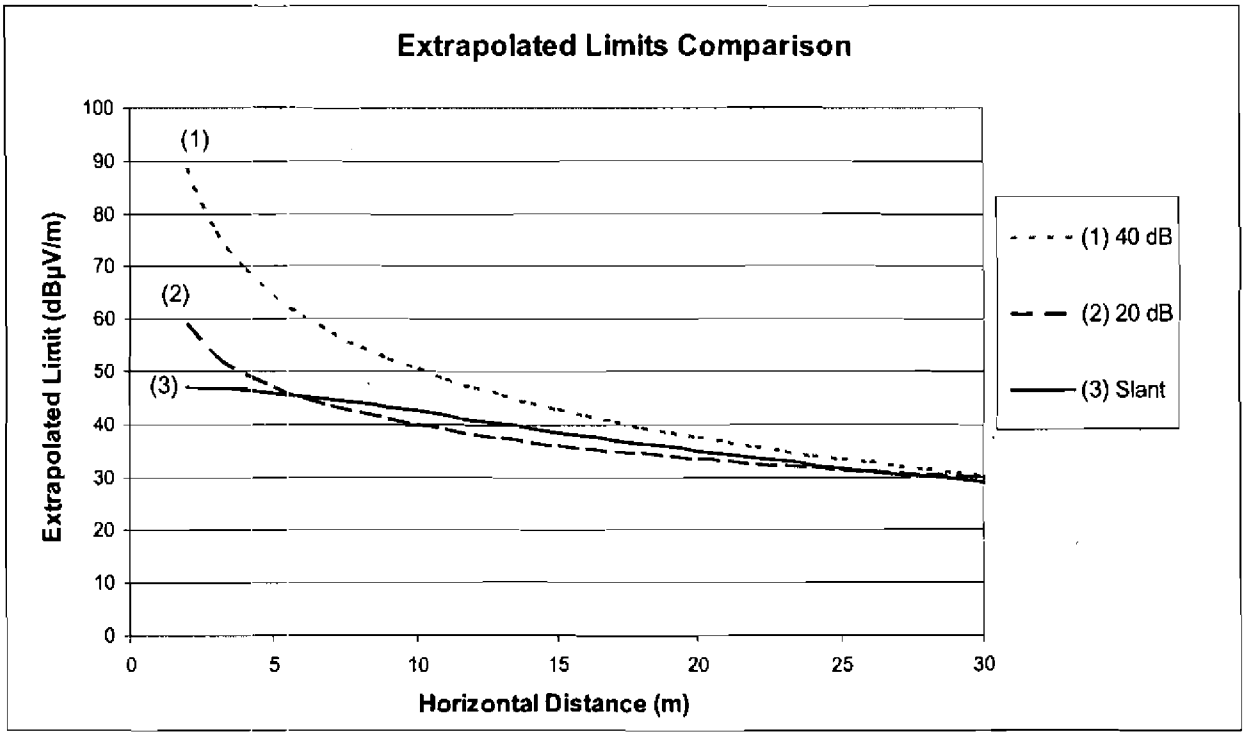
II. EXTRAPOLATED LIMITS COMPARISON

A. Existing 40 dB Extrapolation Factor Applied to Slant Distance

Figure 2 illustrates a comparison between the extrapolated emission limits with respect to horizontal distance when using extrapolation factors of 40 dB (trace (1)), 20 dB (trace (2)) and when using the Commission's slant range method calculated using the existing 40 dB per decade extrapolation factor (trace (3)). Calculations are made according to Equations 1 and 2 below.

The slant range (trace (3)) below is based on a sample calculation using the existing rule of 40 dB extrapolation factor applied to slant distance corrections for a power line with a height of 12 meters and with the measurement loop antenna at 1 meter from the ground.

Figure 2 – Extrapolated Limits Comparison with Existing 40 dB Extrapolation Factor Applied to Slant Distance



As illustrated by the example above which uses a power line height of 12 meters, the Commission's slant range method using a 40 dB extrapolation factor applied to slant distance provides an extrapolated emission limit graph that more closely follows the 20 dB extrapolated emission limit graph than the 40 dB extrapolated emission limit graph, applied to horizontal distance.

- At measurement distances greater than 5 meters, the extrapolated emission limits for slant distance based on the existing 40 dB factor are LESS stringent than extrapolated emission limits based on 20 dB extrapolation factor for horizontal distance, by a maximum of 2.69 dB.
- At these same measurement distances (greater than 5 meters), the extrapolated emission limits for slant distance based on the existing 40 dB factor are MORE stringent than

extrapolated emission limits based on 40 dB extrapolation factor for horizontal distance, by a maximum of 15.3 dB

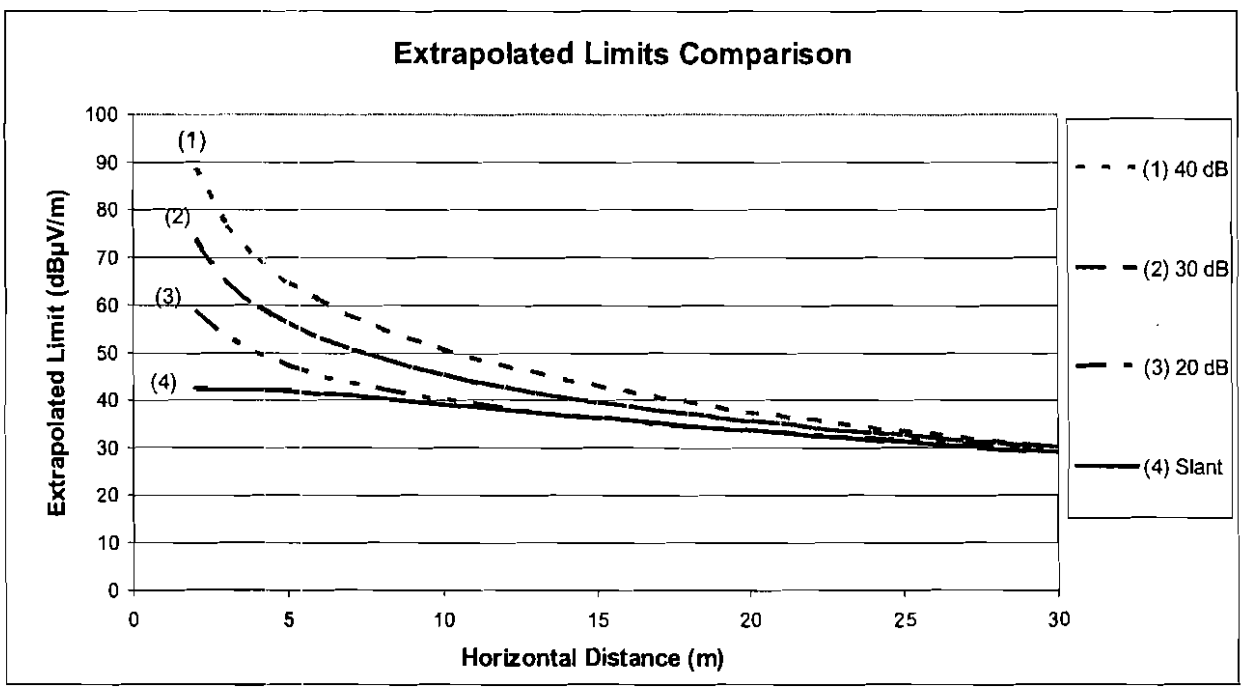
- However, at measurement distances less than 5 meters, the extrapolated emission limits for slant distance based on the existing 40 dB factor are MORE stringent than extrapolated emission limits for horizontal distance based on either 20 dB or 40 dB extrapolation factor.

B. Proposed 30 dB Extrapolation Factor Applied to Slant Distance

Figure 3 illustrates a comparison between the extrapolated emission limits with respect to horizontal distance when using extrapolation factors of 40 dB (trace (1)), 30 dB (trace (2)) 20 dB (trace (3)) and when using the Commission's slant range method calculated using the proposed 30 dB per decade extrapolation factor (trace (4)). Calculations are made according to Equations 1 and 2 below.

The slant range line graph (trace (4)) below is based on a sample calculation using the proposed rule of 30 dB extrapolation factor applied to slant distance corrections for a power line with a height of 12 meters and with the measurement loop antenna at 1 meter from the ground.

Figure 3 – Extrapolated Limits Comparison with Proposed 30 dB Extrapolation Factor Applied to Slant Distance



As illustrated by the example above which uses a power line height of 12 meters, the Commission's slant range method using the proposed 30 dB extrapolation factor applied to slant distance provides an extrapolated emission limit graph that is comparable to the 20 dB extrapolated emission limit graph applied to horizontal distance.

- At measurement distances greater than 12 meters, the extrapolated emission limits for slant distance based on the proposed 30 dB factor are within 1 dB of the extrapolated emission limits for horizontal distance based on a 20 dB extrapolation factor.

- However, at measurement distances less than 12 meters, the extrapolated emission limits for slant distance based on the proposed 30 dB factor are MORE stringent than extrapolated emission limits for horizontal distance based on a 20 dB extrapolation factor.

III. SLANT DISTANCE CALCULATION

The slant distance is calculated using the following formula:[18]

$$d_{slant} = \sqrt{\left(h_{pwr_line} - h_{ant}\right)^2 + \left(d_h\right)^2} \qquad \textbf{(Equation 1)}$$

where d_{slant} is the slant path distance, in meters;
d_h is the horizontal distance (lateral distance from the power pole), in meters;
h_{pwr_line} is the height of the power line, in meters; and
h_{ant} is the measurement antenna height, in meters.

IV. EXTRAPOLATED EMISSION LIMIT CALCULATION

The extrapolated emission limit (in dBμV/m) is calculated using the following formula:[19]

$$E_{extrap} = E_{meas} - N \cdot Log_{10}\left(\frac{d_{limit}}{d_{slant}}\right) \qquad \textbf{(Equation 2)}$$

where N is the distance extrapolation factor, *e.g.*, 40 for frequencies below 30 MHz;
d_{limit} is the horizontal measurement distance corresponding to the Part 15 emissions limits, *e.g.*, 30 meters for frequencies below 30 MHz;
d_{slant} is the slant path distance, in meters;
E_{meas} is the measured electric field strength at a horizontal distance, d_h, in dBμV/m; and
E_{extrap} is the electric field strength value after applying the distance extrapolation factor, in dBμV/m.

[18] *See NTIA Phase 2, supra* at Section 2.5.1.

[19] *Id.*

APPENDIX E

List of Additional Materials Included in the Record

Index of BPL Files

Summary Studies Including HomePlug Emissions and Noise Near Power Lines

File Name	Title and Date	Description
Index of BPL Files.doc	"Index of BPL Files", 4/16/2009	Index of BPL files
Field Strength Measurements Relative to ARRL Concerns Regarding BPL-wEmbeddedDate.ppt	"Field Strength Measurements Relative to ARRL Concerns Regarding BPL", 10/16/2003	Presentation including measurements of ambient spectrum levels near residential power lines and of access BPL emissions
BPL--FccLab to OET 12-03-2003a-wEmbeddedDate.ppt	"Broadband Over Power Line (BPL) Test Results and Considerations", 12/3/2003	Presentation including measurements of ambient spectrum levels near power lines, measurements of access BPL emissions, and tests of in-house BPL interference to reception on portable shortwave radio and on fixed amateur HF antenna (spectrum levels and embedded audio)**
BPL & Ambient Noise7.xls	*Spreadsheet*	Supporting Data: Raw data and plots of ambient noise measurements near power lines and of access BPL emissions—used in "Field Strength Measurements Relative to ARRL Concerns Regarding BPL" and "Broadband Over Power Line (BPL) Test Results and Considerations"
HomePlug Test In Gary Hendrickson neighborhood.xls	*Spreadsheet*	Supporting Data: Raw data and plots of ambient and Homeplug-generated spectrum levels measured on an HF amateur antenna—used in "Broadband Over Power Line (BPL) Test Results and Considerations"

** Should be played in Power Point slide show mode due to embedded audio. See file at http://www.fcc.gov/oet/info/bpl/.

Raleigh Test Results (Amperion)

File Name	Title and Date	Description
BPL Test in Raleigh_V-AM-S1.mp4 *BPL Test in Raleigh_V-SSB-S1.mp4* *BPL Test in Raleigh_V-AM-S2.mp4* *BPL Test in Raleigh_V-SSB-S2.mp4*	"BPL Interference Test Near Raleigh, NC—July 1, 2004"	MPEG4 video files documenting BPL sounds observed at two fixed sites (S1 and S2) as a radio receiver operating in either AM or SSB mode was tuned across spectrum used by BPL system
BPL Test in Raleigh_V-AM-D2.mp4	No title	MPEG4 video file documenting reception of a shortwave radio broadcast while driving toward overhead power lines carrying BPL signals

Briarcliff Manor Test Results (Ambient)

File Name	Title and Date	Description
Briarcliff Test Report-2004final-wEmbeddedDate.ppt	"BPL Emission Tests In Briarcliff Manor, NY, August 17 - 19, 2004"	Presentation documenting Briarcliff Manor tests of an access BPL system
Briarcliff Manor BPL Video Files-L01a.doc	"Briarcliff Manor BPL Video Files"	Description of video files of driving tests from Briarcliff Manor
BriarcliffVid1_320x240x15-300kbps-32kbps.mp4 *BriarcliffVid2_320x240x15-300kbps-32kbps.mp4* *BriarcliffVid3_320x240x15-300kbps-32kbps.mp4* *BriarcliffVid4_320x240x15-300kbps-32kbps.mp4* *BriarcliffVid5_320x240x15-300kbps-32kbps.mp4* *BriarcliffVid6_320x240x15-300kbps-32kbps.mp,* *BriarcliffVid5_640x480x30-3800kbps-32kbps.mp4* *BriarcliffVid6_640x480x30-3800kbps-32kbps.mp4*	"BPL Interference Test—Briarcliff Manor, NY—August 17-19, 2004"	MPEG4 video files documenting interference to reception of simulated radio transmissions during driving tests. Files with names containing "_320x240x15-300kbps-32kbps" are medium-resolution videos. Files with names containing "_640x480x30-3800kbps-32kbps" are high-resolution files (videos 5 and 6 only)
BriarcliffLevelVsGPSCoord16.xls	*Spreadsheet*	Supporting data: GPS coordinates and received levels during driving tests in Briarcliff Manor