**Before the**

**Federal Communications Commission**

**Washington, D.C. 20554**

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| In the Matter of<br>Inquiry Regarding Carrier Current Systems,<br>including Broadband over Power Line Systems | )<br>)<br>)<br>)<br>)<br>) | ET Docket No. 03-104 |

**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, through the Office of Spectrum Management, is also responsible for managing the Federal Government's use of the radio frequency spectrum. NTIA respectfully submits the following comments in response to the Commission's Notice of Inquiry in the above-captioned proceeding.[1]

## I. NTIA SUPPORTS THE COMMISSION'S BPL INQUIRY AND ENCOURAGES THE COMMISSION TO MOVE FORWARD EXPEDITIOUSLY.

NTIA believes that Broadband over Power Line (BPL) holds great promise as a new source of innovation and competition in the broadband marketplace. It has the potential to open new avenues of Internet access, to enable new and expanded services for utility companies, and to create a new platform for further advances in communications technology. By moving swiftly to examine BPL and to establish appropriate rules for its use, the Commission can provide this emerging industry with a solid foundation upon which to build new services and products that will benefit American consumers and businesses. Thus, NTIA urges the Commission to move forward expeditiously with its BPL Inquiry.

## II. NOTWITHSTANDING BPL'S POTENTIAL BENEFITS, THE COMMISSION MUST ENSURE THAT OTHER COMMUNICATIONS SERVICES, ESPECIALLY FEDERAL GOVERNMENT OPERATIONS, ARE ADEQUATELY PROTECTED FROM UNACCEPTABLE INTERFERENCE.

In tailoring its rules to promote BPL deployment, the Commission must be certain to provide all communications stakeholders with adequate protections against BPL emissions that may cause unacceptable radio frequency interference. The federal government has extensive operations that potentially could be affected by BPL systems. Indeed, federal government agencies have over eighteen

thousand (18,000) frequency assignments in the 1.7 - 80 MHz spectrum in which BPL systems may unintentionally radiate.2 These assignments accommodate many tens of thousands of receivers operating throughout the United States, in many cases in close proximity to potential sites for "In-House" and "Access" BPL systems.[2] The systems that operate in this region of the spectrum provide numerous services, such as national fire emergency communications, federal and non-federal law enforcement communications, emergency operations, search and rescue, aeronautical and maritime communications, and disaster relief communications. Some of the Federal Government systems utilize Automatic Link Establishment (ALE), encryption and other technologies that affect the tolerance to interfering signals. Consequently, NTIA has broad concerns with radiated emission limits and other measures that may be needed to protect these systems.[3]

## III. NTIA IS LAUNCHING EXTENSIVE MODELING, ANALYSIS, AND MEASUREMENT EFFORTS FOR BPL AND WE ENCOURAGE THE COMMISSION TO CONSIDER OUR FINDINGS AS IT MOVES FORWARD IN THE BPL PROCEEDING.

In the inquiry, the Commission requests comment on how the Part 15 rules should be tailored to ensure that existing radio services are protected from harmful interference.[4] The Commission's inquiry also requests comment on the measurement methods to be used for BPL systems.[5]

NTIA has initiated modeling and analyses that address the interfering potential of BPL technology and the radiated emission limits needed to preclude unacceptable interference to federal government systems. This effort includes research of relevant technical studies and measurement efforts that have been performed throughout the world as well as regulatory approaches taken for BPL (e.g., carrier current systems) by other countries. NTIA's Institute for Telecommunication Sciences (ITS) is also commencing extensive measurements of experimental BPL systems. The measurements are designed to define the local ambient noise environment and reveal the most important BPL radiated emission characteristics for use in NTIA's modeling and analysis efforts. Based on the results of this effort, NTIA will recommend radiated emission limits and other operational restrictions for BPL systems that are necessary to preclude unacceptable interference to federal government systems.

NTIA additionally has a substantial interest in BPL authorization procedures, especially the measurement procedures for ascertaining compliance with radiated emission limits. These procedures must correctly determine compliance without undermining the protective effects of the limits. However, the procedures should not unnecessarily restrict the emission limits or cause service providers to incur undue costs or delays in deployment. The measurement performed by ITS will provide guidelines for development of compliance measurement procedures that NTIA believes are a key factor in ensuring compatibility with federal government systems. A copy of the measurement plan is provided in Appendix A.

NTIA expects to conclude its modeling, analysis, and measurement efforts by the end of 2003. NTIA intends to submit its findings to the Commission, and we urge the Commission to consider those findings as it moves ahead with successive stages of the BPL proceeding.

## IV. CONCLUSION

In summary, NTIA supports the Commission's efforts to investigate new technologies that could foster new communications services and bring additional options for Internet access to the American public. NTIA looks forward to working with the Commission and the communications and power industries in developing the appropriate regulatory framework to permit BPL to flourish while protecting federal systems from interference.

Respectfully submitted,


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August 13, 2003

**APPENDIX A**

**Summary of Measurement Plan**
**for Emissions Radiated by Experimental**
**Broadband over Power Line Systems**

**July 18, 2003**

## 1. Introduction

The Federal Communications Commission has issued a Notice of Inquiry[1] that requests comments about Broadband over Power Lines (BPL). BPL uses power lines to provide broadband communications services, including Internet access, to homes and offices. The Commission seeks comments on:

1) The potential interference effects of BPL, if any, on authorized spectrum users;

2) Test results from BPL experimental sites;

3) The appropriate measurement procedure for testing emission characteristics for all types of carrier current systems; and

4) Changes that may be needed in Part 15 technical rules and the equipment approval process to foster the development of BPL and to ensure that interference is not caused to other services as a result of this technology.

The BPL Inquiry defines two types of BPL as "Access" and "In-House." Access BPL uses medium voltage power lines to bring broadband access to homes and offices. In-House BPL uses existing electric utility wiring (low voltage lines) to devices within a building.

The following plan describes proposed measurements that will quantify unknown aspects of BPL signals. The measurements will be conducted at several sites where systems are currently deployed for testing purposes. The objectives of this plan include:

1) Measure the signal power and the co-located background noise power for several locations, radials and relevant bandwidths.

2) Measure the peak, average and quasi-peak levels of the above.

3) Measure the above for both horizontal and vertical polarization in a few locations.

4) Convert the received power to field strength.

5) Measure the peak and average power levels over a day in a few locations to examine the time variability of the received power.

6) Measure the received power along one or more radials from the BPL site to determine the distance from the source to the near-field boundary.

7) Measure the peak and average power levels of BPL signal harmonics and intermodulation products at frequencies up to 1,000 MHz.

The technical descriptions of BPL systems that will be examined are based on information supplied by the system operator. Certain technical details of the systems will likely be considered proprietary information by the system operator, and will be treated appropriately by NTIA.

The measurement setup is shown in Figure 1. Equipment will be calibrated before the measurements are made. An antenna, positioned 10 meters above the ground on the Radio Spectrum Measurement System (RSMS)-4 vehicle2 and 2 meters above the ground on a tripod, will be used to measure the received power over a frequency range that extends above the frequencies of the BPL desired, conducted emissions. The signal from the antenna is split into two measurement systems so that simultaneous peak and average power measurements can occur. One of the systems will alternately measure quasi-peak levels. A preselector will be used on each system to prevent an overload condition from occurring and improve the sensitivity. Computers will be used to control the measurement systems and store the data.

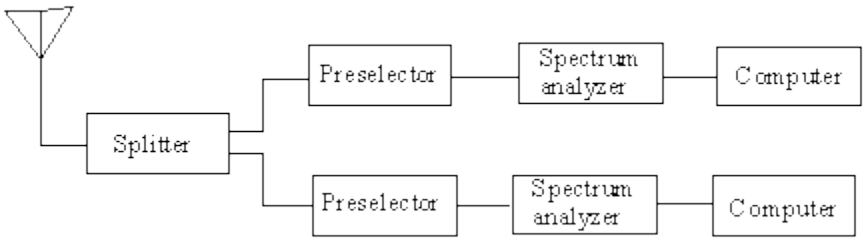


Figure 1. BPL Measurement Setup.

Measurements using various bandwidths will be made to determine the characteristics of the BPL signals and their intermodulation and harmonic products. An ITS stepped measurement routine will be used to collect peak and average power, as a function of frequency, for 3 kHz and 10 kHz bandwidths below 30 MHz and 10 kHz and 30 kHz above 30 MHz. Quasi-peak measurements also will use the ITS stepped measurement routine with the bandwidth specified for compliance measurements. The repetition interval of the BPL signal will be determined from the operator's technical data that describes the BPL signal. If the data are unavailable, the interval will be determined empirically at the first measurement location. The peak and average power will be measured over the repetition interval.

**4. Measurement Procedure**

Ensure that the antenna's main beam has an unobstructed view of the BPL source. Photograph the antenna's view of the BPL source. Transmit the same, repeatable test signals over the network for each signal measurement. At the first location, examine the BPL signal envelope to confirm or discover the repetition interval. Record the envelope over one period. Start the peak value measurement system. Start the average value measurement system to run concurrently with the peak value system.

Upon completion, switch to the quasi-peak system and perform a stepped measurement. When the measurement system finishes, turn off the BPL signal. Run the three measurements again.

Proceed to the next location and repeat the measurements in the above paragraph. Generally speaking, most receiving antennas of concern in the 1.7 – 80 MHz spectrum are vertically polarized so these polarizations will be used. In a few locations, average power measurements will be made using both polarizations, noting that horizontally polarized receiver antennas are also used and propagation effects may depolarize the BPL signals.

The above measurements produce samples of the received power. It is desirable to increase the time spent recording received power in a given location to examine the time variability of the radiated level. The power should be sampled over an hour's time and a complementary cumulative distribution function (CCDF) calculated. This would yield a better peak value as well as giving an indication of how often other levels occur. Five hourly measurements would produce CCDF graphs to show time variability throughout the day.

The RSMS-4 vehicle will be driven along a road that approximates a radial from the BPL test site. Signal power will be sampled approximately every wavelength along the route. Several routes and several frequencies will be measured.

Measurements will be made over two-weeks to be coordinated with the BPL network administrators.

The measurement product will be a report that describes the measurement methods and presents the graphical results. The first graph will show the signal envelope over one measurement period. The next graph will show the peak received field strength as a function of frequency. The abscissa will contain the BPL frequencies that are receivable by the system. The third graph will show the average field strength as a function of frequency. The fourth graph will show the quasi-peak level as a function of frequency. Several series of these graphs will be produced, one series for each measurement location. In some series, graphs showing two polarizations will be produced.

For a few locations, CCDF graphs will be computed showing the probability that the signal amplitude does not exceed a threshold. Each graph will show the variations in signal amplitude over each hour that data was collected.

The last set of graphs will show the received signal power as a function of distance away from the BPL site. An analysis will be performed to identify a distance beyond which the power decreases at a rate of $1/(r^2)$.

[1] *Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems*, ET Docket 03-104, Notice of Inquiry, FCC 03-100 (released April 28, 2003) ("BPL Inquiry").

2 As a result of non-linear elements in the electrical power distribution system, BPL systems may radiate emissions at frequencies substantially higher than the frequencies actually used intentionally within the BPL system. Thus, BPL emissions in spectrum other than 1.7-80 MHz may also be of concern to federal government users.

[2] In-House and Access BPL systems are described in more detail in the BPL Inquiry. BPL Inquiry at ¶ 2.

[3] NTIA recognizes that interference can occur directly via conducted emissions (i.e., signals carried over wires) as opposed to radiated emissions. However, conducted emissions limits and the electromagnetic interference problems they prevent are outside of NTIA's purview. Consequently, NTIA will be addressing conducted emissions only in relation to radiated emissions.

[4] BPL Inquiry at ¶¶ 18-20.

[5] *Id.* ¶ 21.

1 *Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems*, ET Docket 03-104, Notice of Inquiry, FCC 03-100 (released. April 28, 2003) ("BPL Inquiry").

2 The NTIA RSMS is a mobile, self-contained computer-controlled radio-receiving system capable of many measurement scenarios over a broad range of frequencies.