Comments In Response to Notice of Proposed Rule Making: FCC 04-29

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In the Matter of

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

1. Definition of Access BPL (see page 14 of the NPRM)

The definition should be revised to be:

"Access Broadband over power line (Access BPL): A carrier current system that transmits radio frequency energy by conduction over electric power lines owned, operated, or controlled by an electric service provider. The electric power lines may be aerial (overhead) or underground. The system is designed such that the signals are received by conduction directly from connection to the electric power lines. The lines are unintentional radiators. All necessary steps are taken to minimize radiation."

The proposed amendment to Section 15.3 by adding paragraph (ff) should be changed accordingly.

It is important that Access BPL be clearly understood to operate only by conduction and not by radiation.

2. Access BPL Emission Limits (see page 15, paragraph 33. "…we are proposing to subject Access BPL operations to the existing Part 15 radiated emission limits for carrier current systems…."

This should be modified such that the radiation limits in the frequency range 1.705 to 30 MHz are changed from 30 microvolts/meter at 30 meters to:

Frequency MHz	BPL Electric Field at 30 meters in uV/m	Measurement bandwidth in kHz
1.705 MHz	17.6 uV/m	3 kHz
3	10	3
10	3	3
30	1	3

The rationale for recommending these limits follows here.

It is well known that the limiting factor (relative to received signal to noise ratio) in the reception of HF signals is atmospheric noise. Therefore BPL limits should be established based on some relationship to expected atmospheric noise. This is especially important with BPL which is broadband in nature rather than single frequency.

Consider the reception of HF signals broadcast from Standard Frequency and Time Stations WWV and WWVH operated by the U.S. Government on frequencies: 2.5, 5, 10, 15 and 20 MHz. For illustration, reception is assumed by an electrically short whip, lossless, matched to the receiver impedance and operating over perfect ground. Receiver bandwidth is taken as 3 kHz.

Frequency MHz	BPL Received Level at 30uV/m in dBm	Atmospheric Noise (winter morning)		BPL level above noise in dB
2.5 MHz	-56.9 dBm	-120 dBm	(Fa=19 dB)	63.1 dB
5	-62.9	-116	(Fa=23 dB)	53.1 dB
10	-68.9	-108	(Fa=31 dB)	39.1 dB
15	-72.4	-109	(Fa=30 dB)	36.6 dB
20	-74.9	-117	(Fa=22 dB)	42.1 dB
30	-78.4	-121	(Fa=18 dB)	42.6 dB

Frequency MHz	BPL Received Level at 30uV/m in dBm	Atmospheric Noise (summer night)		BPL level above noise in dB
2.5 MHz	-56.9 dBm	-62 dBm	(Fa=77 dB)	5.1 dB
5	-62.9	-73	(Fa=66 dB)	10.1 dB
10	-68.9	-91	(Fa=48 dB)	22.1 dB
15	-72.4	-106	(Fa=33 dB)	33.6 dB
20	-74.9	-117	(Fa=22 dB)	42.1 dB
30	-78.4	-121	(Fa=18 dB)	42.6 dB

Noise levels were calculated based on noise measurements presented in CCIR Report 322, 1963 for the central part of the United States. Fa is the Noise factor for the frequency in question taken from the noise contours in the Report. In

accordance with standard practice the power density of the RF field times the effective aperture of the receiving antenna is the available power to the receiver.

$Pd=E^2/377$ watts/square meter
$Ar=0.75(\lambda^2/4\pi)$ meters squared (for a short whip over ground)

Received dBm= -78.4-20log(fmhz)+20log(EuV/m)

Noise levels presented are, of course, median values. Actual values vary, with the statistics presented in CCIR Report 322. As noted in the tables above, there is significant diurnal and seasonal variation at the lower end of the HF range. At 30 MHz the noise is primarily galactic noise.

One might argue that there is no such thing as a lossless short whip over a perfect ground, but that is not the issue here. The interfering noise adds, in space, with the atmospheric noise to establish the receive signal to noise ratio. The noise figure of the receiver is not significant compared with the external noise.

The issue of what BPL interference limits to establish at 30 meters distance from power lines is difficult; however, it seems to me that allowing BPL noise to exceed atmospheric noise by more than 40dB continuously round the clock for all seasons of the year, is an untenable position for the Commission. The problem is made even more difficult by the broadband nature of the noise. The received noise power increases linearly with bandwidth, which would not be the case with narrow band interference.

It is strongly recommended that special radiation limits be established for BPL under Title 47 Part 15 with the bandwidth for measurement being explicitly cited. Specifically the following limits are suggested:

Frequency MHz	BPL Electric Field at 30 meters in uV/m	Measurement bandwidth in kHz
1.705 MHz	17.6 uV/m	3 kHz
3	10	3
10	3	3
30	1	3

The Commission should also present the limits in graphical form to allow interpolation at intermediate frequencies. Measurements could be permitted with different bandwidths if the interference is broadband in nature and the results normalized to 3 kHz. Typically, HF receiver bandwidths range from 200 Hz to 6 kHz. The Commission should consider extending the above limits to 50 MHz or the highest Access BPL operating frequency.

Following is a restatement of the tabular summary of BPL interference above atmospheric noise for a winter morning considering the revised limits suggested above.

Frequency MHz	**BPL Received Level, revised, in dBm**	**Atmospheric Noise (winter morning)**	**BPL level above noise in dB**
2.5 MHz	**-64.9 dBm**	**-120 dBm(Fa=19 dB)**	**55.1 dB**
5	**-76.9**	**-116 (Fa=23 dB)**	**39.1 dB**
10	**-88.9**	**-108 (Fa=31 dB)**	**19.1 dB**
15	**-95.9**	**-109 (Fa=30 dB)**	**13.1 dB**
20	**-100.9**	**-117 (Fa=22 dB)**	**16.1 dB**
30	**-107.9**	**-121 (Fa=18 dB)**	**13.1 dB**

The Commission's proposed amendment to Section 15.109 should be recast considering the new limits cited above.

3. Access BPL Operational Requirements (see page 18, paragraph 42.)

The Commission's requiring a shut-down feature in the BPL system is very good. It is further proposed that each BPL system be shut down completely for 6 hours each week. This could be Monday morning local time from 12:01 AM to 6:00 AM. This quiet time would allow for appropriate ambient noise tests and analysis. This quiet time requirement should continue for at least 12 months after operational status for each separate BPL system (or after a major change to the system).

Existing Access BPL systems currently deployed should be brought into compliance with new standards. Six months time should be allowed.

Prior to startup of any new Access BPL system, a public announcement and disclosure of all technical details and measurements should be made available to licensed users (in the local area) of the spectrum.

Each Access BPL system operator should maintain a "Public File" listing ownership details and all technical information related to the system including a history of all measurements. The "Public File" should be locally available.

4. Access BPL Equipment Authorization and Measurement Guidelines (see page 19, paragraph 45.)

The Commission's requirement for *in situ* compliance measurements is good.

The following comments apply to APPENDIX C: PROPOSED MEASUREMENT GUILDELINES.

Under "1. <u>General Measurement</u>…" add:

8) The reference bandwidth for measurements shall be 3 kHz. If the interference is noise like in structure then a noise bandwidth in the range of 0.6 to 6 kHz may be used with results normalized to 3 kHz.

9) For frequencies below 30 MHz, an active whip less than λ/8 in length may be used as an alternate to a magnetic loop. Appropriate calibration data shall be presented to verify accuracy. As with an active magnetic loop, care should be taken to guard against overload.

Note: the active whip permits the possibility of mobile measurements following power lines over large distances. The magnetic loop exhibits directional qualities that likely would preclude mobile operation.

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