



# Montreal Amateur Radio Club

P.O. Box 53047  
R.P.O. Dorval  
Dorval, QC H9S 5W4

November 27, 2005

Director General,  
Spectrum Engineering Branch,  
Industry Canada,  
300 Slater Street,  
Ottawa, Ontario K1A 0C8

Re: Canada Gazette, Part I, Vol. 139, No. 31 — July 30, 2005, Notice No. SMSE-005-05 — Consultation Paper on Broadband over Power Line (BPL) Communication Systems, July 2005

Dear Sirs,

The Montreal Amateur Radio Club has been in operation for over 70 years during which time it has served, and enjoyed the support of, its members, and represented amateur radio on their behalf. Our membership includes radio amateurs, short-wave listeners and other radio enthusiasts from within Montreal and surrounding areas. Our members have seen the technology of radio evolve over close to three-quarters of a century; they follow developments in the field of communications with interest and, as individuals and as a group, take part in all aspects of amateur radio. We are concerned that our members' ability to continue working in an active and effective way in both the technical and communication aspects of amateur radio will be compromised by Broadband over Power Line (BPL) Communication Systems as proposed in Industry Canada's July 2005 SMSE-005-05 Consultation Paper.

We realize the advantages that would be provided by the extension of broadband high-speed Internet service to Canadian households and businesses and, as a group involved in communication, we support that effort. Our concern is with the possibility of interference as mentioned in the Consultation Paper. We feel, based on reported experience gained with similar BPL systems operating in the United States, and following an examination of the suggested operating parameters for Canadian BPL systems as contained in the Consultation Paper, that our members are likely to experience significant BPL interference in all amateur radio bands that fall within the system's proposed 1.705 to 80MHz operating frequency range.

We believe that the suggestions given below will sufficiently reduce the level of BPL-generated interference to the point that BPL systems will be able to co-exist with nearby amateur stations.

We will address the various sections in the Consultation Paper point-by-point.

## **Section 6.0 Discussion and Proposals**

- We view with considerable concern Industry Canada's proposal to implement BPL systems with specifications that would allow for a vast increase in the levels of noise and interference encountered by radio users across the country. The effectiveness of radio communication depends critically on the noise level encountered at the operating frequency. The detrimental effect of a broadband radiator of interference, such as BPL, would be felt across the full 1.705 to 30MHz frequency range and in sections of BPL's 30 to 80 MHz range.

- Interference from BPL systems can be experienced by any radio user, not only the authorized users, authorized services or licensed services mentioned in the Consultation Paper. While the majority of our members are licensed amateur radio operators, we have a number of members who are short-wave listeners and it is unclear why they should not enjoy the same interference-free reception conditions that can be made available to licensed stations. The interests of all radio users in a radio spectrum free of BPL-generated interference must be respected.
- With regard to the "Department's role in the deployment and regulation of BPL systems in general." We feel that the mandate of Industry Canada ([www.ic.gc.ca/cmb/welcomeic.nsf/ICPages/Mandate](http://www.ic.gc.ca/cmb/welcomeic.nsf/ICPages/Mandate)), which includes business and economic growth, places Industry Canada and the Spectrum Management and Telecommunications group in a conflict of interest. We are aware that the network capacity of a BPL line depends on the level of the BPL network signal on that line, however so does the level of radiated emissions. The interests of radio amateurs and all radio users would be best served by setting emission limits that will ensure an interference-free radio spectrum. We feel that emission limits, and radio users' interests, have been compromised clearly in the interest of Industry Canada's desire to promote BPL systems.
- It would seem to be counterproductive to the effective regulation of interference for the benefit of all radio users, to permit, over wide areas of Canada, and from sources that are often in close proximity to receiving equipment, the generation of interference at the levels permitted in Section 6.2 (a) of the Consultation Paper. While remediation efforts might eventually solve an interference complaint, it would be preferable to set emission limits such that radiated signals do not cause objectionable interference.
- We note that the ITU has established regulations governing the generation of interference in member nations. The Regulations have the effect of a treaty on member nations and Canada is a member of the ITU. ITU Radio Regulation 15.12 states:

"administrations shall take all practicable and necessary steps to ensure that the operation of electrical apparatus or installations of any kind, including power and telecommunication distribution networks, but excluding equipment used for industrial, scientific and medical applications, does not cause interference to a radiocommunication service and, in particular, to a radionavigation or any other safety service operating in accordance with the provisions of these Regulations"

BPL systems, operating in conformity with the emission limits proposed in section 6.2 (a) of the Consultation Paper, would be able to produce interfering signals with an amplitude greatly exceeding current ambient noise levels and that of typical short-wave signals. It is difficult to see how the emission limits given in Section 6.2 (a) comply with ITU Regulation 15.12.

The solution is to set emission limit field strengths to the values suggested in our comments to Section 6.2 (a) below.

- Further guidance on electromagnetic compatibility issues can be found in European Community EMC guidelines, although it should be noted that EC directives have no force in Canada. Section 4.1.4 Article 4 states, with reference to interference producing equipment, that:
  - a: the electromagnetic interference it generates does not exceed a level allowing radio and telecommunication equipment and other apparatus to operate as intended.
  - b: the apparatus has an adequate level of intrinsic immunity to electromagnetic disturbance to enable it to operate as intended.

The key phrase is "...to operate as intended." in Section "a:" above. It is hard to see how BPL systems capable of producing interfering signals, with amplitudes above that of the desired signal, and far above typically encountered ambient noise levels, could allow radio equipment to receive the weak or moderate strength signals it is designed to receive.

- We have seen no business plans submitted by potential BPL providers. If the Canadian Government is going to expend time, money and regulatory effort on BPL, we feel that potential BPL providers must present a business plan with estimates of their user base and showing that BPL systems operators will be able to cover their setup and operating costs.
- Is HF-based BPL technology an appropriate method for distributing high-speed broadband Internet services? The broad base of installed DSL/ADSL and cable modem infrastructure must certainly provide a better starting point for the extension of high-speed access throughout Canada. The development of a complete new infrastructure seems un-necessary when DSL/ADSL and cable operators already offer competing services.
- HF-based BPL Internet systems employ a technology that is already at, or near to, its technical limits. Low and medium voltage power distribution lines can hardly be viewed as efficient network cables for the transmission of high-frequency signals. The variation in line impedance, presence of impedance discontinuities, and loss characteristics of power lines result in a rapid decrease in BPL signal strength along the line. The net result is a requirement to place BPL signal repeaters at intervals of a few hundred metres along the line.
- The bandwidth available with BPL systems can hardly compare with the channel capacity available through coaxial-cable, fibre-optic and wireless connections. If anything, it would appear that wireless operation in the bands above 2GHz offers Canadians the greatest promise of easy access to high-speed Internet signals. The spectrum space available in the microwave region provides bandwidth vastly beyond that provided by BPL systems and portability that is beyond BPL's reach.
- Rogers Communications and Bell Canada recently announced the formation of a joint venture (<http://www.inukshuk.ca/anglais/20050916press.html>) to provide high-speed broadband service throughout Canada. Inukshuk Internet Inc. will build a "Canada-wide wireless broadband network" that will also provide Internet service to "unserved and remote communities." As radio users, we feel that the service offered by systems such as Inukshuk, and other wireless providers (such as Storm Internet and IGS in Ontario) will provide portable high-speed service without the problems created by HF-based BPL systems.

## **Section 6.1 Equipment Standard and Approval Process**

### **Equipment Standard and Approval Process - Rationale:**

The design of BPL communication systems is such that the major source of the radiated interfering signal will be the power cables that carry the BPL signal, not the BPL signal injector, extractor or any other component in the system. This is borne out by tests performed on BPL systems operating in the United States and an exhaustive analysis of BPL emissions performed by the U.S. National Telecommunications and Information Administration (NTIA).<sup>1</sup>

### **Equipment Standard and Approval Process - Recommendation:**

All BPL signal-carrying cables must be considered part of the BPL system.

---

<sup>1</sup> NTIA Report 04-413, Potential Interference From Broadband Over Power Line (BPL) Systems to Federal Government Radiocommunications at 1.7 - 80 MHz, April 2004, Section 5.3

All BPL system operators must perform field strength measurements along the full length of all signal-carrying cables and obtain certification of compliance with the emission limits set out in Section 6.2-a as amended by our comments for that section.

**Equipment Standard and Approval Process - Rationale:**

While not the major source of radiated BPL interference, a signal injector, extractor, repeater, or any other radio frequency signal-generating device in the system could suffer RF leakage and radiate, or generate, out-of-band, out-of-specification, or unwanted signals.

**Equipment Standard and Approval Process - Recommendation:**

All radio frequency signal-generating hardware components must be considered part of the system.

Type approval must be obtained for all radio frequency signal-producing equipment. The equipment must demonstrate that it will perform correctly under all operating conditions it can reasonably be expected to experience.

**Section 6.2 Prospective Technical Requirements**

**Prospective Technical Requirements - Rationale:**

It must be pointed out that experience with U.S. BPL systems have shown them to be sources of significant radiated interfering signals.<sup>2</sup>

**Prospective Technical Requirements - Recommendation:**

The interference problems experienced by amateur radio operators in areas served by U.S. BPL systems indicate that harmonization with U.S. systems by direct adoption of U.S. technical standards (emission limits and frequency of operation) and system equipment must be avoided. With modification, or operated under different guidelines, it might be possible to use U.S. equipment in Canada without suffering the interference problems being experienced in the United States.

**(a) Emission Limits**

This is really the crux of our concerns with BPL systems. The emission limit field strength question actually has two parts. First, what should the emission limit(s) be and second, at what measurement distance from a BPL line should the emission limit be specified?

Properly established emission limits would reduce the number of BPL-generated cases of interference to the point that any remaining complaints could be resolved on a case-by-case basis. An emission limit that would allow BPL systems to be operated so that they produce interference far above signal and existing noise levels would seem to be of no value.

**Emission Limit Field Strength - Rationale:**

As with all communication systems, the capabilities of amateur stations are determined by the amplitude of a received signal as compared to the total noise present (signal-to-noise ratio). The characteristics of external noise sources have been measured by the ITU for a variety of environments, "business", "residential", "rural" and "quiet rural".<sup>3</sup> The internal noise in virtually all modern amateur HF receiving equipment allows for the reception of signals with amplitudes to "quiet rural" ITU noise levels and below. While inhabited areas do not always provide a "quiet rural" environment, radio amateurs frequently engage in communications using received signals that are close to the existing ambient noise levels and down to "rural" ITU noise levels. Experienced radio operators, in some cases, are able to achieve CW communications with signal strengths below the ambient noise level. Emission limit field strengths must be set so that BPL systems do not compromise the communication ability of amateur radio stations by significantly raising the existing, pre-BPL, noise level.

**Emission Limit Field Strength - Recommendation:**

---

<sup>2</sup> <http://www.arrl.org/tis/info/HTML/plc/interference.html#articles>

<sup>3</sup> ITU-R P.372-8

Drawing from ITU-R P.372-8<sup>4</sup>, and using the values for a “rural” noise environment and assuming a receiver bandwidth of 2400Hz (a typical value for modern SSB receivers), a BPL-generated field strength of 0.3microvolt/m over the 1.705 to 30MHz frequency range would not, in most circumstances, create significant interfering signals. Amateur operators use the low-noise characteristics of the 6m (50 to 54MHz) amateur band for weak-signal operation and experimentation, so the same value, 0.3uV/m, should be adopted for the 50 to 54MHz portion of the BPL 30 to 80MHz operating range. It should be noted that, in some locations, ambient noise levels in the 50 to 54MHz range approach receiver minimum discernable signal levels and a lower field strength could be justified.

#### **Emission Limit Measurement Distance - Rationale**

Since the above field strength was chosen to give an appropriate signal-to-noise (received signal to BPL interference) ratio, the emission limit field strength should apply at the antenna location. Residential landscapes are very varied, however it is tantamount to impossible to find situations that would allow for the suggested 30m BPL-line-to-antenna separation. Power lines are strung along poles running down residential streets and extend right into residential dwellings. Within a house, apartment or condominium that has power wiring in its walls, ceilings and floors, it would be difficult to achieve even a separation of 3m in most cases. More typical values would be in the range of 1 to 2 metres. In the case of tower-mounted antennas that are located at the rear of a house, it might be possible to achieve a 10m separation.

#### **Emission Limit Measurement Distance - Recommendation:**

The BPL-line-to-antenna measurement distance that will be used to set the emission limit field strength should be 1 metre. Studies have shown that it is possible for the field strength to increase at distances that are within or close to the near-field of a BPL line; the (0.3uV/m) emission limit should apply at all distances from the measurement distance outwards. The certification measurements mentioned in Section 6.1 above should be sufficiently comprehensive as to ensure that a BPL system is operating within the emission limits.

#### **Emission Limits - Summary:**

In order to not reduce the operating capability of amateur radio stations, the emission limit in all amateur bands between 1.8 and 30MHz should be 0.3microvolts/m at 1m from a BPL line. The same emission limit of 0.3uV/m at 1m from a BPL line should apply within the 50 to 54MHz portion of BPL’s 30 to 80MHz operating range. The above field strengths should apply from the 1m measurement distance outwards.

#### **(b) Interference Mitigation Requirements for Access BPL Systems**

##### **Rationale:**

The ability to control BPL radio frequency line power and/or frequencies-in-use will help to identify a source of interference. Remote shutdown will be useful when interference resolution efforts have failed, or in emergency circumstances which require that HF communications can proceed unhindered by interference from BPL systems.

##### **Recommendation:**

BPL systems certainly should include mechanisms that allow for the remote control of radio frequency power, operating frequencies, and provide remote shutdown capability. This capability should be used, in combination with notching and filtering, as part of the commissioning and certification of each BPL system. System parameters should be recorded for future reference and be incorporated into system certification documentation.

---

<sup>4</sup> <http://www.bbc.co.uk/rd/pubs/whp/whp013.shtml>, Emission limits, A new proposal based on a limited increase in the noise floor, Section 3. J.H. Stott

### **6.3 Operational Requirements**

#### **(a) Prohibited Frequency Bands - Rationale:**

Amateur radio operators are often involved in emergency communications. During the recent Katrina hurricane disaster in the United States it was discovered that regular communication services, including cell phone and emergency communication systems, failed to operate due to the loss of power and other infrastructure. However amateur radio stations, by virtue of their self-contained nature and with a long history of service during disasters, continued to provide emergency communications. BPL, by virtue of its wideband operating characteristics, will cause interference not at a single frequency, but throughout a wide range of frequencies.

#### **Prohibited Frequency Bands - Recommendation:**

Operation of BPL systems within amateur radio bands should be strictly controlled so as to eliminate the possibility of interference. Preferably, operation of BPL systems in amateur bands will be prohibited.

#### **(b) Geographical Frequency Restrictions and Coordination Requirements**

No comment.

#### **(c) Interference Resolution - Rationale:**

BPL systems will introduce into the electronic environment a new element, broadband interference, the source of which might not be obvious. Also, as opposed to other types of interference-producing equipment, a widely installed BPL system can create interference over a wide area.

#### **Interference Resolution - Recommendation:**

Radio users should have some means by which they can easily learn of the presence of a BPL system in their area. BPL providers should have a corporate or local Web page that includes system information, such as up-to-date coverage areas.

BPL providers should establish a point-of-contact for reporting complaints and to provide follow-up information. They should also establish procedures for the speedy resolution of interference complaints. Complaint tracking should be performed to judge the success of remediation efforts, the time required to solve a problem and to provide statistical information on problem resolution efforts. Objective criteria should be established for evaluating the effectiveness of complaint resolution efforts. There should also be clearly defined time frames within which BPL system operators must respond to a complaint and a time limit for the resolution of a complaint. If a complaint is not resolved within a specified time, it should be referred to Industry Canada. In order to ensure easy access to complaint data, Industry Canada should maintain the complaints database. Database information should include the location of the complaint, the nature of the interference being reported, the frequency, or band of frequencies, in which the interference is being observed, the date and the time.

#### **To summarize:**

Most of our club members are also Internet users and can appreciate the benefits of widely available high-speed access. They are also aware of BPL communication systems and the interference problems these systems have created in the United States and elsewhere. Canadian BPL systems built along the lines of U.S. systems will surely lead to the same result - highly disruptive interference for Canadian radio amateurs and other radio users. The emission limits contained in the Consultation Paper would not provide an adequate level of protection from interference. We believe that it is in the interest of all radio users that interference levels not be allowed to rise. If BPL systems are to be installed in Canada, they should employ frequencies that do not produce interference in the heavily used HF frequency range, and comply with emission limits that do not significantly raise existing noise levels or adversely affect radio users or the communication abilities of radio amateurs.

We also believe that alternative broadband technologies such as cable (coaxial or fibre-optic), DSL/ADSL and microwave wireless systems offer Canadians far better capabilities than does BPL. These alternative

systems also do not create the interference problems associated with HF-based BPL systems. As to the real future of Internet communication technology, we feel that available bandwidth, portability and ease of access will clearly lead to the adoption of high-speed wireless systems operating in the region of 2.4GHz and above.

We appreciate the opportunity to comment on Industry Canada's Consultation Paper on BPL Communication Systems and hope that you will find our suggestions helpful.

Submitted on behalf of the Montreal Amateur Radio Club

Sincerely,

James R. Hay, President

[jrhay@haya.qc.ca](mailto:jrhay@haya.qc.ca)