

# **Comments on Consultation Paper on Broadband Over Power Lines**

## **(BPL) Communications Systems, with Particular Reference to Amateur Radio**

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### **Summary of Position**

From available technical information and results of test systems, it is not yet clear that the deployment of operational BPL systems will not raise compatibility problems with other users of the radio spectrum.

Consequently, implementation of operational BPL systems in Canada should not proceed until compatibility issues with other users of the radio spectrum are addressed, or that clear processes for addressing them are identified and accepted by all concerned parties.

### **Critical Elements to be Addressed**

Critical elements in the evaluation of new radio services are:

1. Technical evaluation of systems.
2. Measurements of the levels, time-variability and spectrum of unwanted emissions produced by those systems when in normal and degraded operation.
3. Development of equipment for estimating the properties of unwanted emissions for more complex systems under more varied circumstances.
4. Studies of impact on other users of the spectrum.
5. Definition of unwanted emission targets that the BPL System operator should meet. Since BPL is not defined as a “service” in the ITU sense, these definitions might not be within the existing Radio Regulations.

6. Accepted methods by which compatibility issues would be addressed, both at the system and individual user level.

## **Comments**

### **1. Technical Evaluations**

Technical studies of test links have been carried out in Canada and elsewhere. However these have been based upon much simpler networks that are envisaged in practice, an over relatively short timescales, which are in general insufficient for the assessment of the effects upon unwanted emissions of component degradation and damage either of the in this document the word “**service**” is not used in the ITU sense, but in the sense of a “**service to customers**”.

BPL hardware, or more importantly, of insulator degradation, joint corrosion and other problems with the power line infrastructure being used. It is not clear that the diversity of equipment in existing power distribution systems was truly represented in the previous trials.

### **2. Measurements on BPL Systems**

From the tests so far it is not clear what the impact will be upon radio transmission and reception operations within which are based upon the use of equipment at its sensitivity limits, but measurements by radio amateurs fraternity clearly indicate very strong interference that render operation impossible in at least some cases. It is clear from this that in some instances, enough radio-frequency energy can be emitted to cause problems for other users of the spectrum.

### **3. Testing of Operational Systems**

Extensive attempts have been made to develop testing techniques for estimating the aggregate unwanted emissions from a complex BPL system, comprising multiple, complexly-connected links. These tests are mainly based upon breaking the networks into elements each of which is driven with particular amplitudes and phases.

The results are highly geometry specific, so it is not clear as yet what the error bars on such estimates would be. Considering the large potential impact on other spectrum users due to the signals emitted by the power lines, it is critical that this phase be satisfactorily completed before serious deployment be considered. One set of propagation estimates show BPL in the 15 to 30 MHz range being radiated, and through ionospheric reflection, being received thousands of kilometres away. It seems that simple inverse-square law calculations are not sufficient here, and that other propagation modes need to be included.

#### **4. Impact on Other Spectrum Users**

That significant levels of radiated power can be produced by BPL test systems is borne out by measurements made by radio amateurs. The impact upon radio amateurs could be very serious, particularly in suburban areas where radio amateurs have power poles within tens of metres of their homes. In general, radio amateurs are affected by direct emission of the data signals in bands they are using.

Other services such as Fire, Police, Ambulance could well suffer from spurious emissions radiated by BPL systems. Since harmonic emissions by BPL systems will be a combination of the nature of the modulation and transmission process, together with additional harmonic generation in accidental non-linear elements such as dirty or cracked insulators and corroded joints, it is not clear as yet as to the extent to which harmonic generation can be usefully accessed and recorded. There have been instances where cracked insulators have generated harmonics of the 60 Hz power service extending up to hundreds of MHz and rendering radio communications impossible. We are very conscious here on the West Coast that we have to face the fact of a possible disaster in the form of earthquakes and forest fires to name but two. In that event we would not want any interference from BPL to contend with.

#### **5. Definitions**

The ITU Radio Regulations contain descriptions of the characteristics of spurious and out-of-band emissions, and the levels above which performance degradation would be caused to other users of the spectrum.. We need to agree on such levels for BPL systems or to decide that the levels

in the Radio Regulations will be applied to BPL when compatibility issues are being addressed.

## **6. Application of Definitions**

If BPL systems are broadly deployed, we will need clearly agreed processes whereby the definitions in Section 5 can be applied to real instances of compatibility problems. We cannot predict all the possibilities, so a very clear set of tools and test equipment in this area will be needed.

## **Conclusion and Recommendation**

At this point it is not clear that all the above points have been met, and so far some serious interference issues have been reported during the operation of test systems. On the basis of information available at this date, it is not clear that BPL systems can be implemented without major impact on other legitimate users of the radio spectrum. We of the Victoria New Horizon Amateur Radio Club propose that further work needs to be done to investigate the compatibility of BPL with the activities of legitimate users of the radio spectrum before Canada considers seriously their broad deployment.

Since cross-border transmission is not an issue here, there is no need to follow any United States course of action on BPL systems. The fact is that we in Canada already lead in the Broad Band field, and are using good proven technology to service some of our remoter areas.

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