Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of
ET Docket No. 03-104
Inquiry Regarding Carrier Current
Systems, Including Broadband over
Power Line Systems

Reply Comments to:
Ameren Energy Communications, Inc., July 7, 2003

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July 23, 2003

SUMMARY COMMENTS

As both licensed radio amateur and short wave broadcast listener for 35 years, I believe BPL will have a detrimental impact on both these services. More than ever, the amateur service is necessary to provide an experience group of operators and technical talent in times of emergency. The shortwave broadcast service, while not as well subscribed as in past years, is on the verge of a technical breakthrough in digital communcations under the Digital Radio Mondial (DRM) standard. As a communication engineer with 25 years experience, I wish the commission will study and approve standards using sound engineering practice.

This is a reply comment to the above referenced filing. The filing makes a number of unsupported technical statements and makes speculative conclusions that are misleading. In its Notice of Inquiry(NOI) for broadband over powerlines (BPL) the commission seeks to define the technical standards that would be appropriate for expanded BPL use in the 2-80Mhz frequency range. The services most like affected in this frequency range include marine , aeronautical, amateur and international shortwave broadcast. It is in these latter two services were the greatest potential for problems exists.

Currently, local power line communication systems that are BPL-like are regulated by Part 15 of the FCC rules. FCC Part 15 rules require that the operator of an unlicensed emitter not cause harmful interference to licensed and/or authorized radio services. The emission limits and the non-interference rule work together to allow most unlicensed devices to operate without causing widespread interference. However, they are not an absolute remedy and often result in many unresolved cases of interference.

BPL is different from local systems in that it will be coupled to overhead electric transmission lines that are distributed throughout a neighborhood. While these lines behave like transmission lines at power line frequencies they become efficient radiators at higher frequencies and should be treated as antennas. Antennas enhance the radiated signal by acting as dipole, monopole, loop or longwire antennas, each of which has well known and predictable gains of 2-25dB. As such, BPL can be expected to cause higher radiated emissions than the existing local Part 15 emitters.

Ameren Energy Communications(AEC) is an operator of one of the BPL experimental licenses. As such it should be in a position to provide the commission with empirical measurements and techniques that would be appropriate information for future rulemaking. Unfortunately, they have not done so, and yet their filing consists of very limited amount of data from its field trials , and a large amount of techno-babble that seeks to minimize the effects of interference to other services. They conclude in their summary "BPL systems do not pose an interference risk". Unfortunately, their methods leave considerable doubt.

DETAILED COMMENTS

Specifically, the following comments are for Section II, Interference from BPL Emissions:

A. High-Pass Filter Circuits. This section suggests that a transformer without a high-pass filter circuit and a relatively small attenuation to BPL signals would somehow block interference. This is an incorrect conclusion since the BPL signal itself will cause the interference.

B. Signal Injection. This section attempts to mystify wave propagation on an overhead wire by analyzing the situation with transmission line techniques. These techniques are routinely used by power engineers to analyze 60Hz electric transmission lines. While appropriate in electric power distribution, antenna theory is more useful to characterize the effects of higher frequency signals. BPL signal injection should be analyzed as an antenna feedpoint and the overhead wires as radiating antenna elements. Although they did not so state, the radiation patterns shown in figures 1 and 2 show remarkable similarity to plots produced by NEC based antenna modeling programs such as EZNEC. Figures 1 and 2 show substantial azimuthal gain that is likely to increase the radiated emissions, and corresponding interference, by 7-10 dB or more.

C. Interference Mitigation Techniques. This section makes an unsupported and probably erroneous statement that the way to avoid interference is to design digital filters to avoid certain bands. While it might be theoretically possible, there is no reference to any practical and realizable set of digital filters that could provide more attenuation than analog types. Analog filter sets typically offer 30dB notches and a digital improvement might be so computation impractical as to prevent its use.

D. Emission Models.

1. Analytical Models. This section attempts to discredit so-called "analytical models" for emission. While not so stated, it is assumed these model are the same techniques antenna engineers have used since the 1930's. There is a long standing body of knowledge and techniques that allow emmisions to be modeled with accurate and reliable results. A good basic text would be Antennas, John D. Kraus, McGraw-Hill, 1950.

2. Numerical Models. This section characterizes numerical computer models using the finite element method as "primarily a research tool, not planning tools" and requiring "prohibitive computational complexity". In fact the ARRL, as part of their filing on this NOI, has done extensive but preliminary modeling using the computer program EZNEC. EZNEC is an implementation of the NEC antenna modeling computer program for PC computers that uses finite elements analysis. Their results would indicate a much more serious and detrimental effects from BPL than from existing Part 15 radiators.

E. Field Trials. This section states some emissions exceeded the Part 15 limits but hard numbers were not supplied. The ARRL has provided a measured result of 33-65dB more noise in at least one existing BPL test site. This would contradict AEC findings.

G. Emission Limits. This section again tries to treat the overhead wiring as a transmission line instead of antennas and concludes that the "line radiates only a small portion of the total injected energy". By itself, this statement would be true but it omits the significant amount of radiated emission which would cause interference. In addition, almost all the radiated emissions would be caused by the conducted emissions radiating from the lines acting as antennas. Undoubtedly new emission limits, both conduction and radiated, should be set but it could be assumed that antenna effects alone would require a substantial reduction in the limits.

IV. Equipment Authorization Process. A. Interference with Licensed Radio Services. This section makes a totally unsubstantiated claim that "BPL has no posed an interference risk to licensed radio services". AEC also promises to use "sophisticated equipment filters" "if interference should manifest". AEC should supply hard data and test results of any hardware that support these conclusions before making such statements.

CONCLUSION

Contrary to what AEC is reporting there is a clear case for interference from BPL to licensed and authorized services. As demonstrated by empirical and antenna modeling results, the interference mechanisms of BPL should be much better understood before additional deployment is authorized. The following are recommendations and conclusions that should be evident from the preceding discussions.

1. The Commission should seek results and data from models that accurately predict the emissions from BPL. BPL should not be treated as a "point source" but as a system with overhead conductors and radiators. Open field type radiated emission measurements would provide considerable understanding of the interference potential.

2. The Commission should gather hard data from existing experimental BPL installations. The data should be measured in as many typical locations throughout the BPL service area. Measurements should be made by an impartial organization.

3. The Commission should seek a demonstration of prototype or realistically simulated interference reduction hardware and software.

4. The Commission should consider that the existing services, by their nature and purpose, are more necessary for the general public good than BPL. Furthermore, even a slight risk of disruption of these services through harmful interference is too great a risk.

Submitted,
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