

Before the
Federal Communications Commission
Washington DC 20554

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

Comments of HomePlug Powerline Alliance

The HomePlug Powerline Alliance is pleased to submit these Comments in response to the Notice of Inquiry (NOI) regarding Carrier Current Systems, including Broadband over Power Line systems.

Introduction

HomePlug devices communicate through a home's electric power wires, allowing every power outlet to also serve as a connection to an in-home data network. The Commission regulates these devices as unlicensed carrier current systems under Part 15 of its rules. The requirements in Part 15 have proven effective in protecting against interference to licensed services, and therefore there is no demonstrated need for additional or changed rules. Stability and predictability in regulation encourages the long-term effort and resources needed to develop and deliver to consumers new and innovative products. Any additional rulemaking efforts should focus on the goal of removing uncertainty and foster additional innovations and products.

Background

The HomePlug alliance was formed solely to enable and promote cost effective, interoperable, and standards-based home powerline networks and products and introduced the HomePlug 1.0 specification in 2000. HomePlug today is the leading group for In-House BPL products and technology domestically and internationally. Forty-two leading companies from the semiconductor, electronics manufacturing, retail distribution and service provision industries all have committed themselves to create and promote networks based on existing powerline infrastructure. Companies participate in the organization from Europe, and Asia, as well as from North America.

HomePlug devices communicate through a home's electric power wires, allowing each power outlet to double as a network connection. The result is a network used to transmit data at up to 14 Mbps between outlets. The presence of data on the electrical wiring has no effect on the electric service in the home. At present, 17 companies manufacture 58 different products that comply with the HomePlug standard. All of the devices individually interoperate and provide networking benefits to thousands of users in the United States and other countries.

Benefits of In-House BPL

In-House BPL captures the promise of networking using ubiquitous power lines in the home in a manner complementary to Access BPL, DSL, cable broadband, and Wi-Fi. Power lines are the most pervasive network medium in the world, with multiple outlets in almost every room of each home and business. As Internet use becomes even

more pervasive throughout homes and businesses and consumers plug a new generation of electronic devices into the Web, In-House BPL presents a cost-effective, easy-to-adopt home networking solution for consumers around the globe.

Conceptually, In-House BPL is very simple - any number of power-line modems are plugged into electrical outlets. Each modem connects to a computer or other device over ordinary Ethernet, USB wires, or a Wi-Fi link. Together they form a local area network, in much the same way as any other wired or wireless LAN. Collectively the modems can be used to distribute broadband Internet access delivered to the home by DSL, cable, or Access BPL. They also can be used for printer and file sharing, and any other need for connecting digital data streams and devices, either to the Internet or among themselves. The pervasive nature of power outlets encourages the use of powerline networking for a variety of devices, from home audio and video systems to gaming platforms to home automation.

HomePlug 1.0 modems create this network over the powerline using Orthogonal Frequency Division Multiplexing (“OFDM”). As the Commission recognized in its NOI, OFDM uses a number of closely spaced carriers to create a wideband signal, in HomePlug’s case between 4.5 MHz and 21 MHz. The payload data stream is divided into smaller subsets, and individual carriers transport a subset of the data which is then reassembled into its original stream at the receiver modem. The powerline channel can be hostile to effective communications, so HomePlug modems regularly estimate channel conditions to continually adjust the optimal use of the carriers for data transmission.

The powerline medium is shared among devices by a carrier sense multiple access (CSMA) technique with extensions to avoid channel collisions. This scheme ensures that the modems wait for the medium to be clear before transmitting, and also ensures that only one unit transmits at any given instant.

Ensuring data network security is also important, since several homes may be on the same electric service connection. HomePlug encrypts each packet with DES encryption at the physical layer to ensure security between neighboring networks. The protocol is designed such that even networks using different encryption keys can cooperatively share the channel.

Proper operation of all these technical mechanisms and interoperability among devices manufactured by different companies is enforced through interoperability testing performed on all products that carry the HomePlug certification mark. Each device is tested to ensure conformance with the HomePlug standard and against other devices to ensure that devices from multiple manufacturers effectively work together.¹ These devices provide up to 14 Mbps raw bit rate on the powerline, with application level throughput exceeding 5 Mbps in over 80% of outlet pairs.

HomePlug has begun the process of developing the next-generation standard, dubbed HomePlug AV. HomePlug AV is being designed to support distribution of data

¹ HomePlug devices do not interoperate with devices that do not match the standard, much like other networking technologies. (Ethernet devices do not interoperate with token ring, for instance.)

and multi-stream entertainment throughout the home, including video up to and including High Definition Television (HDTV). Throughput of over 50 Mbps is targeted for this application, and a selection process among multiple expected technology proposals is expected to take place during the fall of 2003. While these proposals are not yet finalized, an important aspect of the selection process is ensuring that effective communication is maintained within the FCC's existing Part 15 limits applicable to carrier current systems.

Additional Regulation of BPL Is Not Needed

BPL devices are regulated as unlicensed carrier current systems under Part 15 of the Commission's rules. Devices subject to Part 15 requirements have become ubiquitous throughout our society and the emissions limits imposed under Part 15 have proven effective at protecting against harmful interference. These limits have proved useful at protecting sensitive licensed services throughout the spectrum even with the extraordinary growth in the numbers of devices. The same limits govern emissions from BPL systems and have proven to be adequate to protect against interference to licensed services.

HomePlug sees no need for additional regulation of BPL by the Commission. The regulations that exist today in Part 15 have protected against interference with licensed services while providing the freedom for innovation that has made BPL systems such as HomePlug possible. A light hand in regulation of unlicensed devices repeatedly has proven itself by providing opportunities for new technical approaches that markedly

improve consumers' lives and the American economy. Now-familiar innovations such as fax machines, modems, spread spectrum cordless phones as well as burgeoning uses such as Wi-Fi and ultra-wideband all have their roots in Commission proceedings that have not mandated technical approaches or standards, but instead provided an adequate framework for protection to licensed services.

Therefore there is no need for the Commission to mandate frequency bands for In-House or Access BPL. This is a role for industry consortia and standards groups, and competing approaches can have value within the marketplace. Some providers may wish to provide integrated systems that bridge the differences between the two categories. The Commission should not stifle innovation through excess controls on a burgeoning industry.

Regulation Should Address Interference Potential, Not Technology

Licensed spectral users clearly hold a legitimate expectation to protection from harmful interference. Regulation of BPL should focus on addressing interference potential rather than unnecessarily strict technology mandates that may limit future opportunities for technical innovation. Devices inside the home may well have different interference potential than devices mounted outside on the electricity distribution infrastructure, and regulations should treat these situations accordingly.

In today's Part 15 regulations the Commission provides an incentive for responsible manufacturers to avoid interference to licensed services. Part 15.5 clearly states that unintentional emitters such as carrier current systems must operate in a non-

interference mode, and that upon Commission notification of resulting interference all operation must cease until the interference has been corrected. This provides a powerful incentive for responsible manufacturers to avoid potential interference and thereby avoid the substantial cost and damage to business reputation of correcting an interfering system.

The Commission sought comment in the NOI on the potential for interference between BPL and DSL or cable modem service. No such interference exists between HomePlug and these services. In fact, HomePlug developers specifically aim to provide HomePlug products for distributing broadband access throughout homes served with DSL and cable modem services. HomePlug and DSL use different frequency ranges, and cable modems use shielded cables, and this ensures there will be no interference between HomePlug devices and DSL or cable modems.

The FCC asked in the NOI about the impact on potential interference of high-pass filters at the transformer. HomePlug devices do not rely on the transformer to provide any interference mitigation. While we do not believe Access BPL systems utilize high pass filters as described in the NOI, we defer to the Access BPL industry to comment.

Measurement Procedures

Interference from BPL is largely a radiated phenomenon and not a conducted one. While BPL systems use the electrical wiring as a transmission medium, unintentional radiation is created by these systems. The Commission should continue to address this radiation from the emissions perspective as it does today, because radiated emissions are most likely to impact licensed services, not conducted emissions. As such, controlling

conducted emissions offers no potential public benefit as it does not serve to protect the licensed spectral users. If any conducted emissions standard is defined, this standard should be based on sound science that demonstrates the relationship between conducted and radiated emissions. Maintaining the approach of controlling radiated emissions would retain the scheme that has proved so successful in other digital devices.

Stability and predictability in regulation encourages the long-term effort and resources needed to develop and bring products to the marketplace. Part 15 of the FCC's rules provide a mechanism for BPL systems to verify that they meet the Commission's emissions regulations. As the Commission recognized in its NOI, any changes made to these rules must not disrupt the commercial distribution of these devices. HomePlug devices are now active in thousands of homes with no reports of harmful interference. Any refinement of test procedures the Commission may consider should aim not only to control potential interference, but also to allow BPL to flourish without artificial and arbitrary hurdles. This best allows the public to experience the benefits of this technology.

BPL systems operate like other digital devices in that they use wires as a transmission medium for signals, and the unshielded and variable nature of these wires provides an opportunity for these wires to potentially radiate. As such, BPL manufacturers have shouldered the burden of conducting tests in actual field environments pursuant to the FCC's requirements in Part 15 to ensure that their devices meet emissions level requirements. This testing is difficult and requires significant

expertise because the resulting signal levels are often overwhelmed by much stronger ambient signals in the frequency bands of use.

HomePlug manufacturers willingly accept this testing burden for their products, and therefore compliance testing should remain a radiated test as currently provided by the Commission's rules. While efforts are underway in industry and standards groups to find a conducted emissions proxy for radiated emissions testing, to date these efforts have concluded that existing conducted emission test methods do not adequately predict the emissions from actual BPL installations. Some studies have suggested that radiation prediction from simple conducted emissions tests may be a futile effort altogether. Before seeking to replace radiated emissions test with a conducted emissions proxy, the Commission should ensure that such a proxy is based on sound science to avoid an arbitrary standard that will not enhance the public interest.

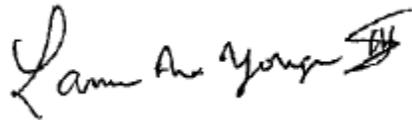
The Commission sought input on equipment authorization procedures. In-House BPL systems that attach to the internal home wiring should continue to be subject to either Verification or Declaration of Conformity. No other unintentional radiator requires certification (except radar detectors due to their unique interference potential).

Conclusion

BPL technology is an important new innovation that provides substantial benefits to consumers for sharing and distributing digital information, whether it be Internet access or home entertainment applications. In Part 15 of its rules the Commission has succeeded in fostering such innovation while preventing interference between unlicensed

devices and licensed services. No need has been demonstrated that the Commission should now change its rules governing In-House BPL devices. Therefore the Commission should decline further rulemaking at this time. Doing so would remove uncertainty and foster further innovation in this exciting technology.

Respectfully Submitted,

A handwritten signature in black ink that reads "Lawrence W. Yonge III". The signature is written in a cursive style with a prominent initial "L" and a stylized "III" at the end.

Lawrence W. Yonge III
Technical Working Group Chair
HomePlug Powerline Alliance
2694 Bishop Drive, Suite 275
San Ramon, CA 94583

July 7, 2003