

# How Wireless Will Save Wireless from BPL

*The author contends that economics and the march of new technology will remove the interference potential of broadband over power line.*

Glenn O'Donnell, K3PP

**M**uch to the dismay of radio amateurs and many others, the FCC has recently given the green light to BPL. Granted, the language of the ruling implies interference-free BPL, but the realities of physics make this nearly unenforceable. This ruling should not come as a surprise to any of us, as Commissioners have made their intentions clear throughout the entire battle. No amateur should concede defeat, however. While this stage of the battle is over, all is not lost. In fact, we have in our corner an immensely powerful ally...economics.

## New Technologies on the Way

BPL will fail because it simply does not make economic sense. Power utilities will recognize this fact, and I believe they will realize this soon. A clear alternative must be behind my premise, for without one, BPL might actually gain enough momentum to inflict significant damage on the HF spectrum. Two impediments that stand in the way of BPL's success will be continued resistance by the ARRL and other radio interests, and exciting wireless technologies such as Wi-Fi,<sup>1</sup> WiMAX and a new standard being developed by an IEEE 802<sup>2</sup> working group called IEEE P802.22.

Wi-Fi is, of course, based on the collective family of IEEE Std 802.11 standards, with which amateurs have been experimenting for some time. It is the wireless data networking technology that has become pervasive in airports, coffee shops, and in countless other locations, including many of our homes.

WiMAX (Worldwide Interoperability for Microwave Access) is based on the IEEE Std 802.16 definition for high-speed wire-

less networking that can operate in bands up to 66 GHz, with a theoretical top speed of 75 Mbit/s (megabits per second) and a theoretical range of up to 30 miles. Realistic installations will likely run a few Mbit/s with a range of 3 to 5 miles. Even with these more modest specifications, WiMAX will be very attractive in many situations when products finally come to market on a large scale.

IEEE P802.22 is chartered to develop a fixed point to multipoint standard using cognitive radio techniques to allow the "harvesting" of unused spectrum allocated to the Television Broadcast Service on a non-interfering basis. It is intended to be a standard for Regional Area Networks, using cognitive radio techniques to allow non-interfering use of unused TV channels, where the RF propagation characteristics are more favorable than at frequencies above 1 GHz.

Each of these wireless networking standards/technologies holds promise as an alternative to traditional DSL and cable modem services for broadband Internet access. They can also provide advantages to these traditional wired services for many Internet users, including those who are highly mobile and those who reside in areas where traditional broadband is uneconomical or restricted by technical limitations. If this second benefit has a familiar ring to it, it is because this is precisely one of the major virtues being touted by BPL proponents. Suddenly, BPL is not an unrivaled panacea for the digitally deprived.

## Why Wireless Broadband?

As the wireless broadband and BPL camps battle for market dominance, it becomes clear that wireless broadband enjoys numerous advantages. I need only

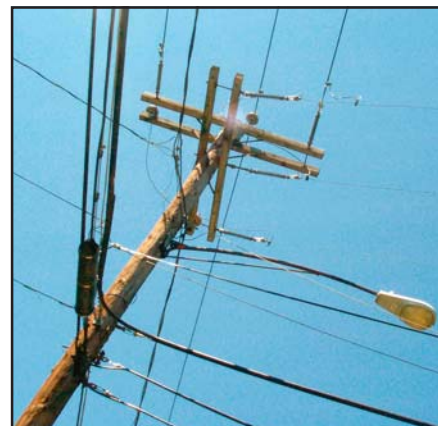


Figure 1—A typical BPL test installation.

focus on two that cooperate to drive any technology into ubiquity. One, make it inexpensive and two, address a market requirement that has far-reaching business and social implications, not just technically "cool" bells and whistles.

The latter is what marketing executives, entrepreneurs and Wall Street investors dream about. Sometimes a technology completely alters the landscape of human society. We call these developments *disruptive* technologies because they disrupt the status quo of business and of human behavior itself. Good examples of disruptive technologies include Edison's light bulb, the automobile, the PC and that brilliant little field called radio. Originally called wireless, we have returned to that moniker for radio-based technologies in the world of computing and digital communications.

The success of wireless data networking is truly remarkable. New business and home computers are almost guaranteed to have Wi-Fi-based wireless local area network (WLAN) capabilities built-in. The cost of consumer-grade wireless access points (WAPs) has plummeted well below \$100 and include additional features such as a router and security firewall. Business-class devices are also incredibly affordable.

Wi-Fi services are becoming more omnipresent, with coverage in airports, coffee shops and even McDonald's. Sometimes this is even provided free of charge, a trend that will accelerate. The cities of New York and Philadelphia have announced ambitious plans to offer free and comprehensive Wi-Fi coverage throughout their cities.<sup>3</sup> Other municipalities are pursuing the same goal.

This economic commoditization is a

<sup>1</sup>Notes appear on page 52.

snowball effect that resulted from market demand driving costs down, which drove more demand, and so on. Note that I start with market demand. This is the key to the hysteria of the wireless market. Any successful market must begin by creating or tapping into demand. This brings me back to BPL and its wireless broadband competition.

Both tap into demand for broadband access, but only wireless technologies can address the demand for mobile freedom. It is this very freedom that has fueled the explosive growth of cell phones and WLANs. We are now entering into a new era of wireless that promises even greater freedom and a continuation of the commoditization of wireless technologies. Wireless is cheap today and will become even cheaper.

WiMAX and IEEE 802.22 will not render Wi-Fi obsolete. Actually, the optimum wireless broadband network architecture will likely use a combination of wireless technologies, and will ultimately integrate and intercommunicate with advances in cellular technology. This interoperation of technologies will be transparent to the user. One minute you may be connected to Wi-Fi in the airport and then to a cellular-based network when you leave to come home, where you then link up to your home Wi-Fi that might connect to your Internet service provider using WiMAX. You will not notice these transitions and the services will be unified and cost-effective. A future that is centered on wireless broadband services is a viable, inexpensive proposal.

### Wireless Enhancements

These wireless broadband options will always be improving. The IEEE 802.16 Working Group and the WiMAX Forum, an industry consortium, are collaborating to enhance WiMAX and encourage its broader adoption. Among the enhancements are additional microwave spectrum and a refined architecture for hybrid WiMAX/Wi-Fi networking. Additional wireless broadband technologies (IEEE 802.22, for example) will provide additional options and solutions as they emerge. Standards are normally a dreadfully sluggish process, but wireless standards are progressing rapidly. This progress is indicative of the overall industry progress toward their development.

Within two years, business-class notebook computers will include WiMAX in addition to Wi-Fi for broad wireless networking that is nearly seamless.<sup>4</sup> This will be the catalyst that will “light the fuse” for the next wave of the wireless technology explosion. The demand is already there and proven by the success of Wi-Fi. As computing powerhouses like Intel, Cisco, Motorola, IBM, Dell and HP deliver WiMAX capabilities, the costs will

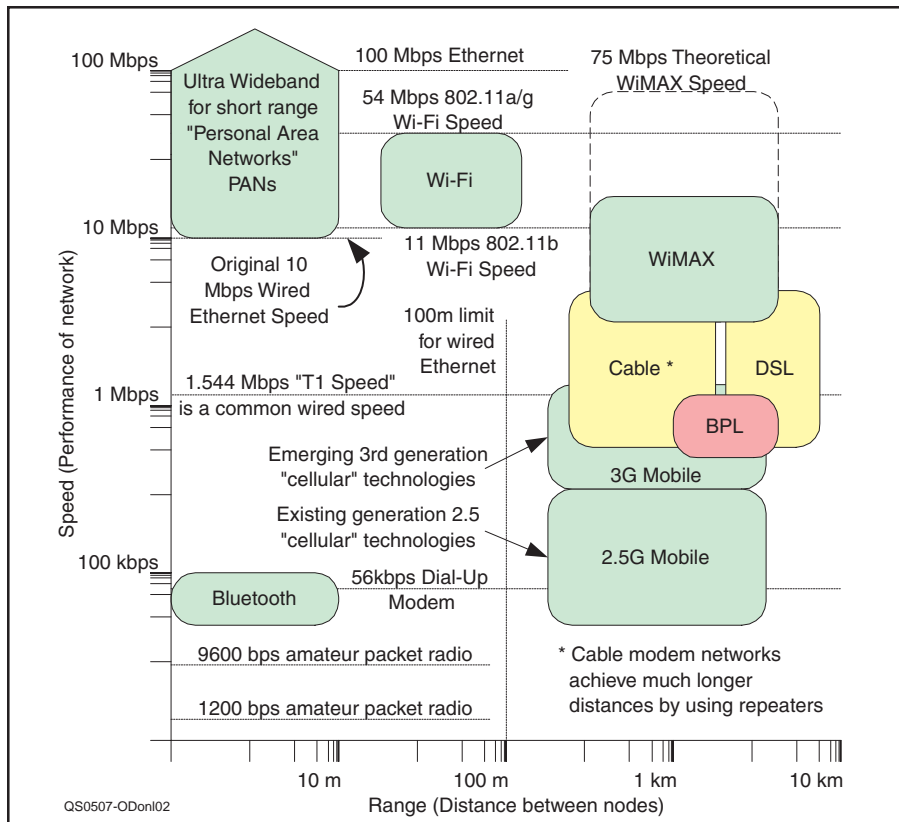


Figure 2—This chart shows the speed versus the range of broadband wireless technologies compared with wired options.



Figure 3—During a recent visit to a newly installed BPL test site, ARRL CEO David Sumner, K1ZZ (right), and Lab Manager Ed Hare, W1RFI, made some noise measurements at and near the site. With the strong support of its members, the ARRL has been in the forefront of the fight to prevent interference from BPL systems.

come down. This will accelerate demand, which will drive down costs, and so on. You get the picture. The snowball is starting to roll and the next waves of wireless development beyond WiMAX will follow the same evolutionary path.

Wireless options for Internet access do not have to wait for such commoditization. It is available now at a cost comparable to DSL, cable modem and BPL. The commoditization, however, will allow wireless to conquer not only BPL (a certainty), but potentially also DSL and cable. These latter two will be more difficult because of an

already massive installed base that BPL does not enjoy. In fact, traditional communications providers including AT&T, British Telecom, Covad Communications, Deutsche Telekom, Qwest, SBC and Time Warner Telecom are eager to exploit wireless broadband to expand their existing services.<sup>5</sup>

In developing nations, it is much more realistic to supply communication services using wireless than it is to string millions of miles of new wired infrastructure. China and India alone have over 2 billion people, most of whom have no telephones, let alone Internet. This is seven times the total United



**Figure 4—There's some sophisticated test gear inside Ed Hare's BPL/mobile station, otherwise known as his car.**

States population who might be buying services and equipment. Of course, many of these people are woefully impoverished and worry more about basic survival than any form of communications technology. Still, the numbers are staggering and the standard of living is rapidly growing in both countries. Wireless service is the communications choice in these bustling economies as governments recognize that wireless technologies can enable them to leapfrog entire generations of (expensive to install) "legacy" technologies and to boost them into the global Internet economy.

### BPL's Dismal Future

BPL doesn't stand a chance against such a relentless and inexorable onslaught. BPL's economic snowball effect will either fail to gather enough momentum to sustain itself (my personal view) or it will, at a minimum, lag wireless broadband options by a crippling margin. Both scenarios paint a dismal future for BPL. It is important to note that this view is not merely a perspective by this technology industry pundit and radio amateur. BPL has failed numerous trials in Europe, Asia and North America for some of the economic reasons I highlight in this article.<sup>6</sup> Many of these have been well chronicled by the ARRL and other respectable media outlets.

The inevitable victory of wireless broadband over BPL poses an interesting business opportunity for power utilities that is already showing some early promise.<sup>7</sup> These utilities have a unique success factor for broadband delivery. They have rights-of-way to run cable. Instead of running BPL, they can run fiber to strategic points and serve users from those points using the most appropriate

wireless broadband solution for a given situation, or they can leverage wireless broadband in place of fiber in areas where it makes more economic sense. This will be cheaper than BPL, it will offer superior data services, and it spares them the constant assault from radio amateurs and other victims of BPL's RF pollution.

BPL remains a potential scourge on the future of Amateur Radio and we must all do everything we can to ensure that we are afforded the protection to which we are entitled under existing FCC rules. To use a sports metaphor (appropriate, as I am an avid contesteer!), the best defense is a strong offense. The many defensive efforts against BPL's potential to cause interference to licensed radio services are valiant and have succeeded in many cases. We must reinforce these defensive measures by launching a powerful offense around wireless broadband options. Each of us should learn about these options and promote their adoption through education. The growth of wireless broadband services will come regardless of the amateur community's activities, but we have enough critical mass to accelerate this trend. If we do, BPL will die, power companies can succeed in broadband services and our spectrum will be clean.

### A Never-Ending Pursuit

I would be remiss if I did not give a warning to coerce continued vigilance. Wireless broadband services can easily expand to any frequency. With our voracious appetite for bandwidth, it is conceivable that wireless broadband services themselves could someday pose a threat to amateur frequencies in the UHF and microwave ranges. Those who will be driving wireless broadband development in the future will be examining potential expansion opportunities. Un-

derutilized spectrum will be vulnerable, so the "use it or lose it" adage will apply. If we want to retain spectrum reserved for the amateur service, we must use it and prove its value to us. While I don't believe this will develop into a serious threat, we cannot take any threat lightly. Spectrum defense is a never-ending pursuit, even after we write the obituary for BPL.

*Glenn O'Donnell, K3PP, is an ARRL Life Member and a top independent technology industry analyst who advises Global 2000 organizations on technology trends and best practices for capitalizing on technology. He has no vested interest in any particular wireless broadband technology or vendor other than to accurately analyze industry developments. He enjoys contesting and DXing and has been a licensed amateur since 1977. Special thanks to Carl Stevenson, WK3C, for his valuable input to this article. You can reach the author at [k3pp@arrl.net](mailto:k3pp@arrl.net).*

### Notes

<sup>1</sup>Wi-Fi is a registered trademark of the Wi-Fi Alliance.

<sup>2</sup>IEEE and 802 are registered trademarks of The Institute of Electrical and Electronics Engineers, Inc.

<sup>3</sup>Philadelphia public wireless initiative: [www.phila.gov/wireless/](http://www.phila.gov/wireless/); New York City Wireless: [www.nycwireless.net/](http://www.nycwireless.net/).

<sup>4</sup>Wireless convergence is expected by late 2005 or early 2006: [news.zdnet.com/2100-9584\\_22-5349359.html](http://news.zdnet.com/2100-9584_22-5349359.html).

<sup>5</sup>All are members of the WiMAX Forum.

<sup>6</sup>BPL economic failure examples include aborted trials in Menlo Park, California ([www.arrl.org/news/stories/2004/10/21/100/](http://www.arrl.org/news/stories/2004/10/21/100/)) and Manassas, Virginia ([www.arrl.org/news/stories/2004/06/04/102/](http://www.arrl.org/news/stories/2004/06/04/102/)).

<sup>7</sup>Utilities using WiMAX or preceding wireless technologies: Oakdale Electric Cooperative in rural Wisconsin; Brazilian electric utility cooperative CERTEL is using wireless technology similar to WiMAX. Wireless broadband providers are succeeding with WiMAX services: [www.mobilepipeline.com/news/18900229](http://www.mobilepipeline.com/news/18900229). Q57

## Web Links to More Information

- [www.arrl.org/bpl/](http://www.arrl.org/bpl/). The comprehensive ARRL BPL site includes a BPL tutorial.
- [www.wimaxforum.org/home](http://www.wimaxforum.org/home). The main site for the WiMAX Forum.
- [www.intel.com/netcomms/technologies/wimax/](http://www.intel.com/netcomms/technologies/wimax/). Lots of good technical information on WiMAX and Intel's WiMAX products.
- [en.wikipedia.org/wiki/Wimax](http://en.wikipedia.org/wiki/Wimax). On-line encyclopedia information on WiMAX.
- [www.ieee.org](http://www.ieee.org). Institute of Electrical and Electronic Engineers (IEEE), the international standards body driving most wireless broadband definitions.
- [www.ieee802.org](http://www.ieee802.org). The main Web site for IEEE 802 overall.
- [www.ieee802.org/11](http://www.ieee802.org/11). The IEEE 802.11 working group's main Web site.
- [www.ieee802.org/16](http://www.ieee802.org/16). The IEEE 802.16 working group's main Web site.
- [www.ieee802.org/22/](http://www.ieee802.org/22/). The IEEE 802.22 working group's main Web site.
- [www.fcc.gov/wbatf/](http://www.fcc.gov/wbatf/). FCC's Wireless Broadband Access Task Force.
- [www.bbwxchange.com/](http://www.bbwxchange.com/). News updates on wireless broadband industry and regulatory developments.