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Federal Communications Commission  
Washington, D.C.

In Reply to FCC Notice of Inquiry, ET Docket No. 03-104

To the Commission:

I would like to comment as an interested individual on this "Inquiry Regarding Carrier Current Systems, including Broadband over Power Line Systems." I believe the concept of "Broadband over Power Line" (BPL) is technically and economically very questionable. It should not go forward without very critical evaluation by disinterested (neutral) organizations with suitable expertise. **There is a strong potential for harmful and essentially uncontrollable interference to licensed and passive radio services if BPL is widely adopted.**

Personal Introduction. While I will be commenting from the point of view of the Amateur Radio Service (ham radio), my professional experience is relevant to this topic. I hold a Ph.D. degree from the Massachusetts Institute of Technology in Physics and Radio Astronomy. I have over 30 years experience in radio astronomy instrumentation and computer technology. I recently retired as Director of Information Technology at the Yale University Faculty of Engineering.

In addition, I served as Station Manager and Chief Engineer of a college radio station (WSRN) and actually designed and installed its carrier current AM station in 1960's. I hold the Amateur Extra class ham license AA6E. Finally, I am a member of the International Union of Radio Science (URSI), the IEEE, the American Astronomical Society, and the American Radio Relay League.

Comments. I will comment section by section from NOI 03-104, where possible.

II. The distinction between "In House BPL" and "Access BPL" is critical. As noted, a number of "In House" systems are on the market. While these may or may not cause problems of interference with the amateur (and other) radio services, they are essentially local, and can reasonably be managed as any other source of local interference, such as

computer systems themselves, Ethernet cabling, etc. (This is not to say that household "Electromagnetic Compatibility" is not a very serious issue for the amateur radio service. It is.)

"Access BPL" is an entirely new interference problem, however, because it involves placing (presumably) moderate-to-high-level radio frequency currents on a regional AC power infrastructure that was designed solely for transmission of 60 Hz power. Such RF currents, in an unbalanced and unshielded transmission system, have the potential to blanket entire metropolitan areas.

III-VIII. Older carrier current technology, as noted, was exclusively for narrowband signaling below 2 MHz. This experience is almost entirely irrelevant to the proposed Access BPL service, which may cover a broad range of frequencies up to 80 MHz.

IX. The principal benefit claimed, that homes and offices have large number of existing power outlets that could offer flexible data network connections is correct. This market is already well-served by "In House" products operating under existing FCC regulations. For local premises data communications, these products can work quite well with the common access technologies of ADSL, TV cable modem, or direct satellite service. The correct focus is on "Access BPL" -- does it provide a feasible, needed service that is compatible with existing licensed and passive radio services?

XXX. (and following) The Commission correctly identifies interference as the key technical issue. While the Commission's detailed questions concerning modulation and signal injection methods may produce useful information, I would prefer to consider "first principles". The typical regional medium-voltage power distribution system uses wiring separated by perhaps 4 - 8 feet, as appropriately required to transmit kilovolt AC power over air-insulated wires that sway in the wind. Because the RF balance is not controlled, and the inter-conductor spacing may be a significant fraction of a wavelength, we expect that as an RF transmission line (up to 80 MHz), the power lines will be quite "leaky".

I note that AC power transmission systems are already notorious in the amateur radio community as powerful and troublesome sources of RF interference - without any BPL signaling. While some utility companies respond to the FCC requirements and actively work to control such interference, the sheer scale of the power grid and the limited technical resources of the utility companies make such interference difficult to prevent. Furthermore, power utilities have little direct incentive to ensure their systems are "radio quiet". We can expect the same if BPL is added to the picture.

Another relevant example would be the interference problems generated by cable TV (CATV) utilities. CATV traditionally uses coaxial cable that is designed to efficiently transmit RF frequencies with low signal loss. Even so, signal leakage from CATV

systems is well-known to amateurs -- and to other services. Note that certain CATV frequencies have been prohibited in order to protect the aeronautical radio service. If even an appropriately designed distribution system is problematic, we can only assume that crude (by RF transmission standards) AC power distribution will be even worse.

Conclusions. There are many technical concerns with the Access BPL service, as represented in this NOI. The Commission appropriately asks for much more detailed data to support a decision. From my experience, I am doubtful that an acceptably low level of interference can be reliably assured for large-scale deployment. The only way to credibly clarify the issues is to require a detailed pilot installation with analysis involving financially disinterested expert evaluators. I suggest the American Radio Relay League (ARRL), the IEEE, and possibly the National Astronomy Observatory (Charlottesville, VA) as appropriate sources of expertise.

While the comments of several Commissioners seem to point toward a consumer-friendly increase in competition for home broadband services provided by the BPL initiative, I am skeptical. The broadband access market (at current signaling rates) is fairly well served by at least 3 independent access technologies: ADSL (telephone), CATV cable modem, and direct satellite services. The next advances with wide consumer impact are spread-spectrum RF access (such as WiFi) and future fiber-optic home access. Direct fiber connections promise order of magnitude increase in bandwidth.

In contrast, note that the BPL technology has essentially no technological future. The RF signaling in Access BPL is capped at around 80 MHz, maximum. If the Commission wishes to spark major technology developments in broadband, I suggest it should focus on fiber-to-the-home. For rural areas not served by CATV (a small population segment), I believe that satellite access is a good solution, perhaps with a modest cross-subsidy as seen in the telephone market.

Enabling Access BPL is opening Pandora's Box. Once a large investment is made, it will be hard to control the industry. After the fact, market forces will not repair the damage to public service, amateur, government and other radio services.

This is a key example of why the Commission's careful and conservative management of the radio spectrum is needed now as much as ever -- to defend the public interest.

Respectfully submitted,

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