Comment Letter to *QEX* on "Science in the News" - July/August 2000
...using electric power wiring to deliver high speed data

-Hi there,

I was just reading the Science in the News article in July/August 2000 QEX, and I would like to make a comment. Using electrical distribution wires for high speed data communications could really be a problem if the wires are above ground or in a structure. The wires are not designed as a transmission line ... they will radiate a signal. For instance, if one put in 2 volt p-p signals on a 500 ohm (effective) line, one might be talking about powers like 1 mw input to the line. This is spread over about 0-10 MHz at 10 MBPS. In a SSB bandwidth, one would have -35 dBm. A 40 m dipole about 50 feet from a house can hear about -105 dBm. So about -70 dB leakage of the wiring would be required to produce an audible noise floor rise in the receiver. Pushing data at a higher rate, like 1 GBPS, reduces the HF noise by 20 dB to -55 dBm in 3 kHz. But the frequencies used now extend to about 1 GHz, with leakage becoming a greater problem at VHF and UHF frequencies.

If there is just enough leakage to meet Part 15 requirements, which if I remember correctly is 30 uv/m at 30 meters at HF, one would expect to receive about 100 uv on 40 meters. If this is smeared over 10 MHz, there would be no problem. But as usual, the FCC rules are incomplete ... they do not specify a receiver bandwidth for the undesired emission. The rule was written at a time when most spurs were discrete frequencies or had a modulation bandwidth of a few kHz (e.g. AM radio). In those cases, it didn't matter. But what if the leakage is 100 uv measured over a 3 kHz bandwidth? Then it's an S-9 noise signal ... everywhere ... no matter where you tune your HF receiver ... in every house too. This would not be good.

You mentioned Part 15 Intentional Radiators sharing the ISM bands with Amateur Radio. "Sharing" can really occur only if Amateur Radio is "Secondary". One wideband (10 MHz wide) signal that "meets" Part 15 emission levels over an unspecified receiver bandwidth could render that section of band unusable. If we assume a 10 kHz bandwidth for the Part 15 emission at 915 MHz, (200 uv/m at 3 m), one could expect to pick up 10 uv at 50 feet away in 10 kHz. The receiver noise floor is degraded by some 30 dB ... at every house ... not very usable. If the amateur transmits with 100 watts, anywhere in that band, he's picked up on the wires and "jams" the modem receiver ... resulting in a very unhappy user. If Amateur Radio is Secondary, then he must stop transmitting. The same argument applies for "spread-spectrum". One could improve the degradation by 20 dB if 10 MBPS data is "spread" over a 1 GHz band. Of course, the electric wiring is even leakier at VHF/UHF, resulting in a rather poor received signal for the modem. But spread spectrum does not need a very good signal over a flat channel to work well ... but spread spectrum won't work through the 100 watt HF and VHF transmitters at my house. Now, 1 GBPS data ... spread to 10 GHz bandwidth? Maybe. I don't know.

I guess all I felt compelled to do was "raise the warning flag" for the use of electric power wiring for data distribution. It was tried and abandoned in Europe (I heard because the street

lights leaked too much!?). I like the Web. I like ham radio. They can coexist. I know that electric wiring data products are starting to be out there, and I would be interested in hearing of any interference cases that occur. Right now, I would recommend that high-speed data be put over "real" transmission lines, like twisted pair, coax cable, or fiber, to control unintentional leakage radiation.

Once the spectrum is polluted by countless consumer devices, it's too late. Hobby radio is gone.

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