

Power Line Telecomm QRM

By G8MNY

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(8 Bit ASCII graphics use code page 437 or 850, Terminal Font)

After a recent club talk by Colin Wooff G3SPJ on PLT, I decided to write what we found during his talk & demonstration.

POLITICS

He described the work he had done for the UK Radio Agency in the field, & how his specification MPT1750 was dropped when UK Ofcom took over, & much of the technical engineering arm was disbanded. Ofcom has a conflict of interest, as it is responsible for both the protection of the RF spectrum & also the promotion of broadband in the telecomms industry.

It turns out that the PLT trials were allowed as "competition frightners" for the national private telecomms firm BT, to encourage more broadband development.

I asked Colin why the emission specification was allowed to be so much worse than for Cable TV, he said that low level would be unusable for power cables!

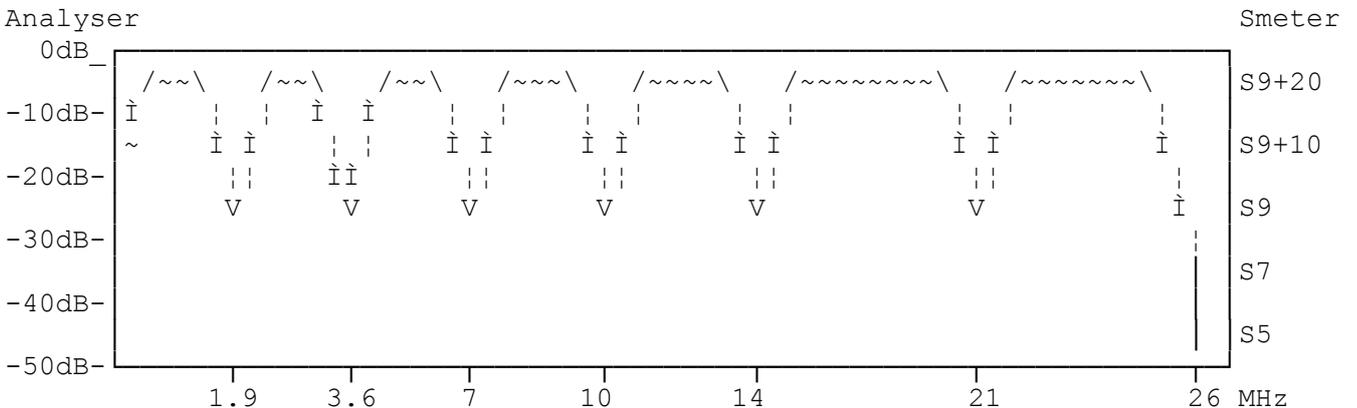
UK TRIALS

The original system trialled in Manchester used multi carrier phase modems (OFDM) at power levels of -40dBm/Hz that equates to 2.5W of broadband noise power over 25MHz. This system was to send broadband down the 3 phase mains cables from the substation to 100s of customers a few hundred meters on those cables. The signal was sent from one of the 3 lives to earth/neutral, & capacitively coupled in the cable to the other 2 lives. This power level was needed to over come the high noise & high RF losses on mains cables.

Later a 11kV over head lines system was trialled in Scotland to fed broadband to remote community/areas. The signals were magnetically induced, but it was found they needed repeating every 2000 meters (radiation loss?), so not very practical.

SPECTRUM

Unlike the initial trial, later systems notch out (don't generate carriers on those frequencies) most of their signals on ham bands by at least 20dB. But with mains rectifier mixing etc. it may be end up being much worse in practice!



Using a magnetic pick up around a mains cable plugged into the same mains as the BT plug top (free) Ethernet link, my 50kKz wide spectrum analyser showed something like this, with the signal pulsing all the time with data or not.

Colin's plug top units used the same power level as the substation units! Tests by Colin showed they worked between adjacent houses on different phases & also across the street on different substation 200m cables! This is despite the makers claims that the signal stop at the customer's meter. (security issue!)

At the demo I put in a good quality plug top mains filter (Old BT type) before a unit & the pair of units then struggled to work. but they did re-train & lock up eventually.

With a Comms Rx with panoramic display, we were able to hear & see the signal, with the wider IF of AM mode a changing 2kHz tone is very apparent anywhere you tuned, as the 1000s of data carriers are about that apart.



With an external small aerial outside, the ham band QRM was very noticeable. Away from the partly protected ham bands, it made many quite strong broadcast stations unusable!

STREET CABLE RADIATION

Cable leak test done by Colin for the RA @ 5MHz showed a random length of cable on the ground radiated about 20dB weaker than a resonate dipole 1/4 wave above the ground. However the same length of buried cable 1m below ground was measured approximately -24dBd. According to the system designers there would be next to no radiation on a buried cable!

With simulated street lamp connected to the 3 phase cable, radiation was worse, the system designers were thinking about filtering the cable each time it came above ground, but the costs would have been silly!

I did hear that a QRP CW demo was done on one buried test cable, & a good DX QSO was achieved!

HOUSE RADIATION

With the house plug top ethernet system, radiation occurs from at least 2 places (nodes) in the wiring. For ham QRM purposes this looks like 2 aerials in a neighbours house. So QRM nulling with a noise aerial system will not be as effective, as the deep nulls in QRM are only obtainable with single QRM source.

ADDITIVE EFFECTS

With more & more noise sources like these. there is an additive effect, & the general background of man made mush makes urban & eventually rural LW/MW/HF unusable.

INTERNATIONALLY

Although Colin's work was abandoned by Ofcom, internationally the findings have been used to stop PLT systems dead in some countries. In the UK the RSGB & broadcasters are still trying to get Ofcom to apply the exiting laws to ban such interference generating devices, but with no success so far!

VHF PLT

A new high speed version has been launced but it jammed band 3 DAB radio for 10s of metres around, & the BBC were not amused!

See my Tech bul "Clip on QRM Probe"
Why don't U send an interesting bul?

73 De John, G8MNY @ GB7CIP

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