OBSERVATIONS OF BPL EMISSIONS

FROM SP Ausnet TRIALS

AT MT BEAUTY, VICTORIA

12th NOVEMBER 2006

Peter Young

VK3MV

Observations on RF Emissions from the SP Ausnet BPL Trial at Mt Beauty – Victoria

Purpose

The purpose of these observations was to determine to what extent, if any, RF emissions from the BPL Trial at Mt Beauty, Victoria were present, and if so, what spectrum segments were affected and the indicative receiver levels.

BPL Equipment

Information obtained from the trial operators website (SP Ausnet) indicated that a trail of six months commencing in September 2006 is to take place in the surrounds of eight streets in the town of Mt Beauty. The equipment provider is Schneider-Electric, however no technical details were available at the time of the observations.

Observation Methodology

The equipment used was an *Icom R-75* high frequency communication receiver capable of receiving emissions in the HF range 1 MHz to 60 MHz. The receiver has a calibrated signal level meter capable of providing level readings in the range, -12 dBm down to –120 dBm. Prior to travelling to Mt Beauty, the accuracy and linearity of the level meter was cross-referenced using a *HP 8640A* signal generator. Linearity and accuracy was confirmed over the range –100dBm to –50 dBm.

A Kay model 437A stepped attenuator (50 ohm DC-1 GHz) was employed to determine incremental steps of 1 dB between calibration points.

A vertical HF "screwdriver" antenna with 3.5 meters of RG-58CU coaxial cable was used as the receiving antenna. This 2.9 meter centre loaded whip antenna was continuously tuneable over the range 5 MHz to 30 MHz with a 50-ohm impedance (Z) (SWR <1.3:1). Tuning the antenna to a frequency of interest was achieved using an *Autek Research VA1* Vector Analyst to obtain a Z of 50 ohms for matching into the receiver. The stepped attenuator was inserted in the coaxial line for confirming received levels.

To avoid any external influences to the observations, the laptop computer used to record data was turned off and data entered at once the observations were complete.

The unknown antenna factor and measurement uncertainty means that any observations are indicative, but does reflect the "real" world situation. As the levels observed are <u>not</u> definitive measurements, more accurate measurements are the responsibility of the Australian Communications and Media Authority (ACMA) or the trial equipment vendor to determine.

The equipment employed for these observations are fairly typical used in the Amateur Service, noting that, much larger more efficient antennae could in fact be utilised and therefore have increased levels or disturbances over greater distances.

Observations

Not knowing the exact location of the trial area required some driving through the general area listening for strong BPL like signals. Two locations were identified as being suitable for observations where the level of BPL emissions was strongest.

Location 1 was on the corner of Nelse Street and McKay Street across the roadway from the power reticulation lines, midway between two BPL coupling boxes. The levels of emissions are recorded at attachment 1.

Location 2 was near the corner of Fairway Avenue and Wermatong Avenue in Roper Street. The levels of emissions are recorded at attachment 3.

In order to determine the general background noise floor a third location was identified Kiewa Street between Park and Madison Streets. The levels recorded were in the range –105 dBm to –120 dBm, typical of urban environments.

At locations 1 and 2, after completing spectrum sweeps between 1 MHz and 35 MHz, a sweep between 35 MHz and 60 MHz revealed no sign of any BPL emissions or artefacts.

Summary

Based on the writers experience and the observations taken, the level of emissions observed at the Mt Beauty trial are in the worst case –53 dBm (S9+20dB). The observed levels, when extrapolated, are comparable to the levels definitively measured at the Country Energy trial in Queanbeyan and the Woomera Online trial in Moruya, which significantly exceeded the U.S. FCC Part 15 standard for BPL networks and devices. More information on the Queanbeyan and Moruya can be found at the ACMA website: http://www.acma.gov.au/ACMAINTER.1966346:STANDARD::pc=PC_2845

There is, however, potential interference to licensed users in Amateur Service in the spectrum bands 20, 17,15, 12, and 10 meters. There were no BPL emissions detected in the Amateur Service 160, 40 and 30 bands.

Notably, there is potential to cause interference to users in the Citizen Band Radio Service (CB) 27 MHz, and more concerning interference to consumer medical alert alarm devices permitted to operate around 27.5 MHz.

Other consumer devices that can be affected include, the handset receivers in CT1 cordless telephones that are permitted to operate in spectrum 31/39 MHz, remote control devices, such as garage door openers, model aircraft that are permitted to operate in spectrum around 27 MHz. The degree of degradation will depend on the wanted to un-wanted signal ratio.

This report on my observations at the SP Ausnet BPL trial in Mt Beauty is for interested parties.

Peter Young
VK3MV

16th November 2006

Attachment 1

Date/Time: 12th November 2006/ 1225pm

Location: Cnr Nelse Street and McKay Street
(Between two coupling boxes)

Distant: 7 meters

Equipment: Receiver Icom R75
Step Attenuator Kay 437A 0-100 dB 0.5 dB steps
HF Antenna – vertical screwdriver adjustable whip 5 – 30 MHz (<1.5:1 SWR) (Note 1)

Detector Mode/Bandwidth: AM 6kHz
SSB 2.1 kHz

Detected BPL Emissions and Receiver Input Levels

Frequency kHz	Attenuation	PreAmp +10dB	Receiver Input Level dBm	Remarks
2960 – 3270	Nil	On	-110	S3, (note 2), Mode AM
4050 – 6800	Nil	Off	-90 to –73	Worst case 6080 kHz ~ S9, AM
7400 – 10000	Nil	Off	-102 to –97	Worst case 7580 kHz ~ S5, AM/SSB
10310 – 12500	Nil	Off	-97 to –73	Worst case 10400 kHz ~ S9, AM/SSB
13300 – 23480	Nil	Off	-73 to –63	Worst case 17700 kHz ~ S9+10dB, AM/SSB. Pulse bursts (note 3)
24060 – 27730	Nil	Off	-102 to –73	Across band, AM/SSB, S5 to S9. Pulse bursts
28100 – 34080	Nil	Off	-102 to –73	Across band, AM/SSB, S5 to S9. Pulse bursts

Note 1. Adjustable 2 to 2.9 meter centre loaded whip (electrically <¼ wave).

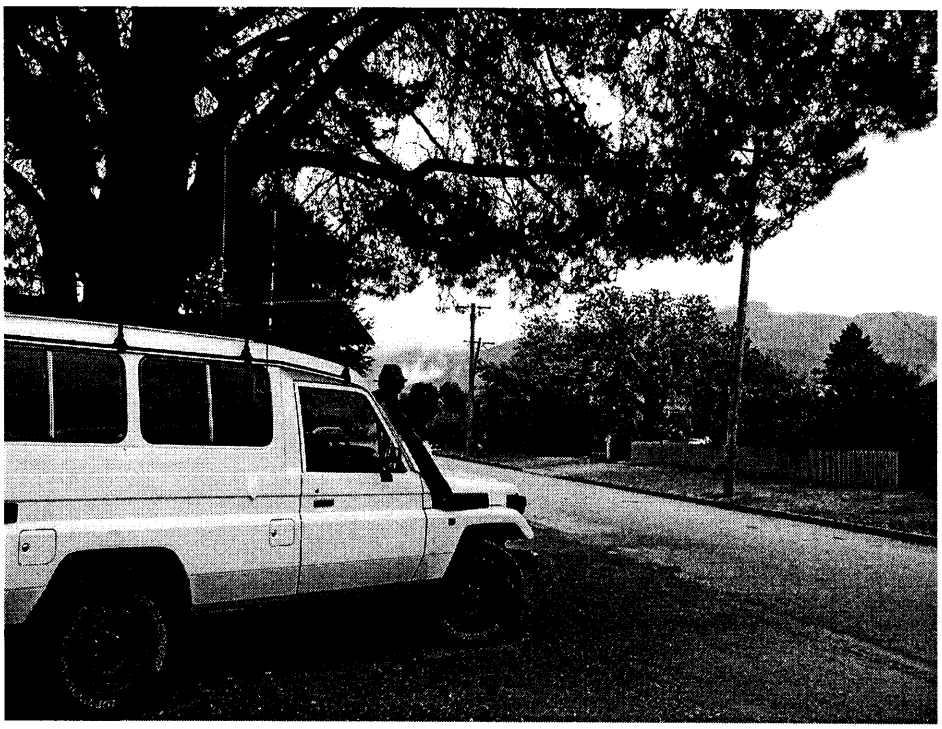
Note 2. The measure antenna used not optimised for this frequency band, which may account for the reduced receiver input levels.

Note 3. The recovered BPL signal had an additional pulse burst on top of the OFDM emission increasing the level by +10dB. The levels recorded above are the peak values.

Attachment 2

Location #1 Looking toward McKay Street

Location #1 Looking down Nelse Street



Attachment 3

Date/Time: 12th November 2006/ 1330pm

Location: Cnr Fairway Avenue / Wermantong Avenue in Roper Street.
(50 meters from a coupling box)

Distant: 5 meters

Equipment: Receiver Icom R75
Step Attenuator Kay 437A 0-100 dB 0.5 dB steps
HF Antenna – vertical screwdriver adjustable whip 5 – 30 MHz (<1.5:1 SWR) (Note 1)

Detector Mode/Bandwidth: AM 6kHz
SSB 2.1 kHz

Detected BPL Emissions and Receiver Input Levels

Frequency kHz	Attenuation	PreAmp +10dB	Receiver Input Level dBm	Remarks
2950 – 3370	Nil	Off	-98 to –92	Worst case 3050 kHz ~ S6, (note 2), Mode AM
3850 – 6940	Nil	Off	-63	Across band ~ S9+10dB, AM/SSB
7280 – 10000	Nil	Off	-73 to –63	Worst case 9620 kHz ~ S9+10, AM/SSB
10180 – 12980	Nil	Off	-73 to –53	Worst case 10510 kHz ~ S9+20, AM/SSB
13440 – 23480	Nil	Off	-97 to –63	Worst case 23410 kHz ~ S9+10dB, AM/SSB. Pulse bursts (note 3)
24940 – 34200	Nil	Off	-73 to –63	Worst case 27950 kHz, AM/SSB, S9+10dB. Pulse bursts

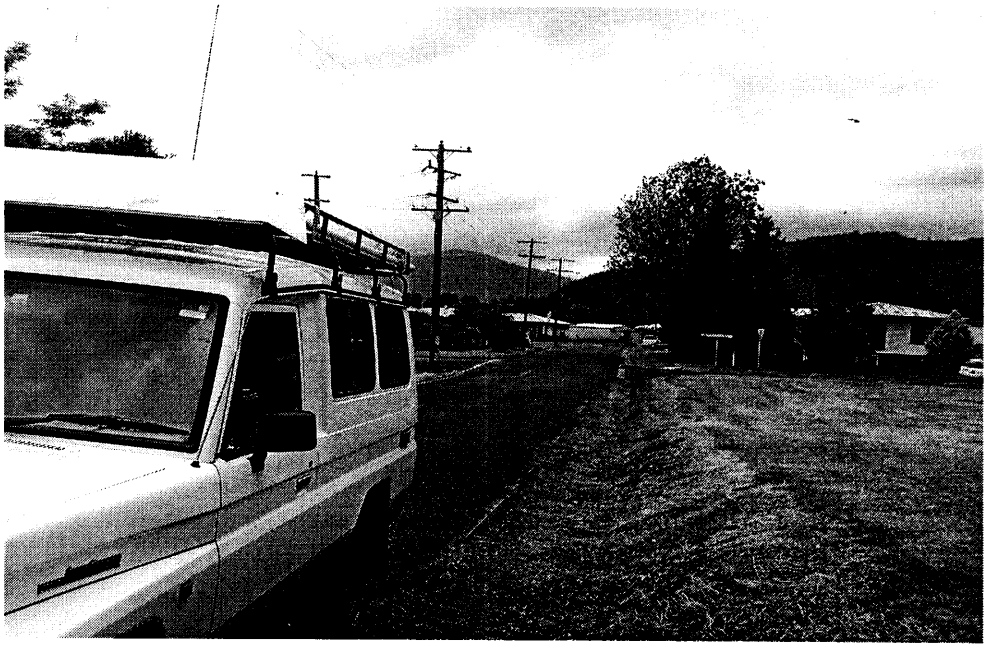
Note 1. Adjustable 2 to 2.9 meter centre loaded whip (electrically <¼ wave).

Note 2. The measure antenna used not optimised for this frequency band, which may account for the reduced receiver input levels.

Note 3. The recovered BPL signal had an additional pulse burst on top of the OFDM emission increasing the level by +10dB. The levels recorded above are the peak values.

Attachment 4

Location #2 Cnr Fairway Avenue / Wermantong Avenue



Test Equipment Arrangements