TEST REPORT

Certification # 1367-01

Laboratory ID	Submitter ID
PRODUCT SAFETY ENGINEERING, INC.	Kaicom CO., Ltd
	109, Gayang Techno Town 1487
12955 Bellamy Brothers Boulevard	Gayang-dong, Kangso-Gu
Dade City, Florida 33525 USA	Seoul
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Report Issue Date: 08 Jan 2007	Test Report Number: 06F271B4
Sample S/N: NA	Model Designation: 2330
Sample Receipt Date: 07/27/06	Product Description: Access BPL
Sample Test Date: 08/15/06 -12/03/06	Marketing Approval ________

Description of non-standard test method or test practice: ***None***

Estimated Measurement Uncertainty: ***Not Applicable***

Special limitations of use: ***None***

Traceability: ***reference standards of measurement have been calibrated by a competent body using standards traceable to the NIST.***

According to testing performed at Product Safety Engineering, Inc., the above-mentioned unit is in compliance with the electromagnetic compatibility requirements defined in regulations indicated on page (3) of the test report. The test results contained herein relate only to the model(s) identified above. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics.

As the responsible EMC Project Engineer, I hereby declare that the equipment tested as specified above conforms to the requirements indicated on page (3) of the test report.

Signature ________________ Name David Foerstner

Title Engineering Group Leader Date 08 Jan 2007

Reviewed by:

Approved Signatory ________________ Date 08 Jan 2007

DIRECTORY - EMISSIONS

Product Safety Engineering, Inc 12955 Bellamy Brothers Blvd. Dade City, FL 33525
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EMISSIONS TEST REGULATIONS :

The emissions tests were performed according to following regulations:

□ - EN 61000-6-3:2001		
□ - EN 61000-6-4:2001		
□ - EN 55011 : 1998 / A1:1999	□ - Group 1	□ - Group 2
	□ - Class A	□ - Class B
□ - EN 55013 : 1990 / A12:1994 / A13:1996 / A14:1999		
□ - EN 55014 -1: 2001	□ - Household appliances and similar	
	□ - Portable tools	
	□ - Semiconductor devices	
□ - EN 55022 (1998) /A1:2001 /A2:2003	□ - Class A	□ - Class B
□ -AS/NZS 3548:1995	□ - Class A	□ - Class B
□ - ICES-003	□ - Class A	□ - Class B
□ - CNS 13438	□ - Class A	□ - Class B
□ - VCCI : 1999	□ - Class A	□ - Class B
■ - FCC Part 15 Sub Part G “General Technical Requirements”	□ - Class A	□ - Class B
	■ - Certification □ - Verification □ - Declaration of Conformity	
□ - FCC Part 18		

Environmental conditions during testing:

	LAB	OATS
Temperature: *	_________	: ________
Relative Humidity: **	_________	: ________

* The ambient temperature during the testing was within the range of (50° - 104° F) unless indicted above.
** The humidity levels during the testing was within the range of (10% - 90%) relative humidity unless indicated above.

Power supply system : 110 Volts 60 Hz SINGLE phase

Sign Explanations:

□ - not applicable
■ - applicable

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Emissions Test Conditions: CONDUCTED EMISSIONS (Interference Voltage)

The *CONDUCTED EMISSIONS (INTERFERENCE VOLTAGE)* measurements were performed at the following test location:

■ - Test not applicable

□ - Darby Test Site (Open Area Test Site)
□ - Darby Laboratory

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number
□ -	8028-50	Solar	50 Ω LISN	829012, 829022
□ -	3825/2	Solar	50 Ω LISN	924840
□ -	EMC-30	Electro-Metrics	EMI Receiver	191
□ -	8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
□ -	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
□ -	85662A	Hewlett Packard	Analyzer Display	2403A07352
□ -	8028-50	Solar	50 Ω LISN	903725, 903726
□ -	FCC-TLISN-T4	Fisher Custom Com.	Telecom ISN	20072

Emissions Test Conditions: RADIATED EMISSIONS (Magnetic Field)

The *RADIATED EMISSIONS (MAGNETIC FIELD)* measurements were performed at the following test location:

□ - Darby Test Site (Open Area Test Site)
■ - In-Situ Testing (Vernon, NY & Valrico, FL)
□ -

at a test distance of :

□ - 3 meters
■ - 10 meters

□ - Test not applicable

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number
□ -	96005	Eaton	Log Periodic Antenna	1099
□ -	BIA-25	Electro-Metrics	Biconical Antenna	4283
□ -	8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
□ -	85662A	Hewlett-Packard	Analyzer Display	2403A07352
□ -	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
■ -	ALR-30M	Electro-Metrics	Loop Antenna	824
■ -	E7402A	Hewlett Packard	Spectrum Analyzer	US39150137
□ -	EMC-30	Electro-Metrics	EMI Receiver	191
□ -	ALA-130/A	Antenna Research	Loop Antenna	106

Emissions Test Conditions: RADIATED EMISSIONS (Electric Field)

The *RADIATED EMISSIONS (ELECTRIC FIELD)* measurements, in the frequency range of 30 MHz - 1,000 MHz, were tested in a horizontal and vertical polarization at the following test location :

□ - Test not applicable

□ - Darby Site (Open Area Test Site)
□ - Darby Lab
■ - In-Situ Testing (Vernon, NY & Valrico, FL)

at a test distance of :

□ - 3 meters
■ - 10 meters
□ - 30 meters

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number
■ -	LPA30	Electro-Metrics	Log Periodic Antenna	2280
■ -	BIA-30	Electro-Metrics	Biconical Antenna	3852
□ -	8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
□ -	85662A	Hewlett-Packard	Analyzer Display	2403A07352
□ -	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
□ -	8447D	Hewlett-Packard	Preamplifier (26dB)	2944A06832
□ -	EMC-30	Electro-Metrics	EMI Receiver	191
■ -	E7402A	Hewlett Packard	Spectrum Analyzer	US39150137
□ -	85650A	Hewlett Packard	Quasi-Peak Adapter	2043A00358
□ -	85662A	Hewlett Packard	Analyzer Display	2340A05806
□ -	96005	Eaton	Log Periodic	1099
□ -	BIA 25	Electro-Metrics	Biconical Antenna	4283

Emissions Test Conditions): INTERFERENCE MITIGATION

The *INTERFERENCE MITIGATION* measurements were performed by a direct connection between the EUT and the spectrum analyzer at the following test location :

□ - Test not applicable

■ - Bench Test
□ -

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number
□ -	MDS-21	Rhode&Schwarz	Absorbing Clamp	8608447020
■ -	E7402A	Hewlett-Packard	Spectrum Analyzer	US39150137
□ -	85662A	Hewlett-Packard	Analyzer Display	2403A07352
□ -	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
□ -	8447D	Hewlett-Packard	Amplifier (26 dB)	2944A06832
□ -	EMC-30	Electro-Metrics	EMI Receiver	191

The *EQUIVALENT RADIATED EMISSIONS* measurements in the frequency range GHz - GHz were performed in a horizontal and vertical polarization at the following test location :

□ - Darby Test Site (Open Area Test Site)
□ -
□ -
□ -

at a test distance of:

□ - 1 meters
□ - 3 meters
□ - 10 meters

■ - Test not applicable

Test equipment used :

	Model Number	Manufacturer	Description	Serial Number
□ -	8566B	Hewlett-Packard	Spectrum Analyzer	2421A00526
□ -	85662A	Hewlett-Packard	Analyzer Display	2403A07352
□ -	85650A	Hewlett-Packard	Quasi-Peak Adapter	2043A00209
□ -	8449B	Hewlett-Packard	Preamplifier	3008A00320
□ -	3115	Electro-Mechanics	Double Ridge Guide Horn	3810

The *ANTENNA TERMINAL DISTURBANCE VOLTAGE* in the frequency range 30 MHz - 1,000 MHz were performed.

□ - Darby Test Site (Open Area Test Site)
□ - Laboratory
□ -
□ -

■ - Test not applicable

	Model Number	Manufacturer	Description	Serial Number
□ -	2F9-3C4-3C5	Wavecom	UHF PAL TV Modulator	185879
□ -	2F1-3C4-3C5	Wavecom	VHF PAL TV Modulator	157728
□ -	A-8000	IFR	Spectrum Analyzer	1306
□ -	8648B	Hewlett-Packard	Signal Generator	3623A01433
□ -	8648B	Hewlett-Packard	Signal Generator	3623A01477
□ -	LMV-182A	Leader	RMS Milli-Voltmeter	8010091
□ -	3202	Krhon-Hite	Active filter	5899
□-	FMT115	Leaming	FM Modulator	NONE
□ -	371	UDT	Optical power meter	06657
□ -	TSG95	Tektronix	PAL video / Audio generator	B028883
□-				

Equipment Under Test (EUT) Test Operation Mode - Emission tests :

The device under test was operated under the following conditions during emissions testing:

□ - Standby

□ - Test program (H - Pattern)

□ - Test program (color bar)

■ - Test program (customer specific)

□ - Practice operation

□ - Normal Operating Mode

□ -

Configuration of the device under test:

□ - See System Under Test Information in Appendix B

Rationale for EUT setup / configuration:

(1 Testing performed was made in accordance with the Guidelines for Access BPL systems specified by the Commission.

(2) Compliance with 15.611(c) (1) (i) were made on the bench per OET recommendations

Emission Test Results:

Conducted emissions 150 kHz - 30 MHz				
The requirements are	**□ - MET**		**□ - NOT MET**	
Minimum limit margin	dB	at	MHz	
Remarks: **Not Applicable**				

Radiated emissions (magnetic field) 10 kHz - 30 MHz				
The requirements are	**▪ - MET**		**□ - NOT MET**	
Minimum limit margin	**0.1** dB	at	**18.7** MHz	
Remarks: See Page A12				

Radiated emissions (electric field) 30 MHz - 1,000 MHz				
The requirements are	**▪ - MET**		**□ - NOT MET**	
Minimum limit margin	**0.1** dB	at	**80** MHz	
Remarks: See Page A15				

Interference Mitigation / Excluded Bands				
The requirements are	**▪ - MET**		**□ - NOT MET**	
Minimum limit margin	**>20** dB	at	MHz	
Remarks: See Excluded Bands Plots Exhibit				

Radiated emissions GHz - GHz				
The requirements are	**□ - MET**		**□ - NOT MET**	
Minimum limit margin	dB	at	GHz	
Remarks: **Not Applicable**				

Antenna Terminal Disturbance Voltage 30 MHz - 1,000 MHz				
The requirements are	**□ - MET**		**□ - NOT MET**	
Minimum limit margin	dB	at	MHz	
Remarks: **Not Applicable**				

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GENERAL REMARKS:

SUMMARY:

The requirements according to the technical regulations are

■ - met

□ - **not** met.

The device under test does

■ - fulfill the general approval requirements mentioned on page 3.

□ - **not** fulfill the general approval requirements mentioned on page 3.

Testing Start Date **08/15/2006**

Testing End Date: **12/03/2006**

- PRODUCT SAFETY ENGINEERING INC -

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APPENDIX

A

Test Equipment Calibration Information

&

Test Data Sheets

TEST EQUIPMENT CALIBRATION INFORMATION

Manufacturer	Model	Description	Serial Number	Cal Due
Hewlett Packard	8566B	Spectrum Analyzer	2421A00526	07/18/06
Hewlett Packard	85662A	Display	2403A07352	07/18/06
Hewlett Packard	85650A	Quasi-Peak Adapter	2043A00209	07/18/06
Hewlett Packard	8447D	Preamp 0.1 - 1,000 MHz	2944A06832	12/08/06
Hewlett Packard	8568B	Spectrum Analyzer	2407A03213	08/03/06
Hewlett Packard	85662A	Display	2340A05806	08/03/06
Hewlett Packard	85650A	Quasi-Peak Adapter	2043A00358	08/03/06
Hewlett Packard	8447D	Preamp 0.1 - 1,000 MHz	2944A06901	08/03/06
Hewlett Packard	8447D	Preamp 0.1 - 1,000 MHz	1937A03247	08/03/06
Hewlett Packard	8449B	Preamp 1 - 26.5 GHz	3008A00320	12/08/06
Hewlett Packard	8648B	Signal Generator	3443U00312	05/26/06
Hewlett Packard	E7402A	Spectrum Analyzer	US39150137	12/08/06
EMCO	3148	Log Periodic Antenna	00044783	03/24/07
Electro-Metrics	LPA 30	Log Periodic Antenna	2280	12/14/06
Electro-Metrics	BIA 30	Biconical Antenna	3852	12/12/06
Electro-Metrics	BIA 25	Biconical Antenna	4283	04/10/07
Electro-Mechanics	3115	Double Ridge Guide Ant.	3810	11/28/07
Electro-Metrics	ALR30M	Magnetic Loop Antenna	824	12/12/06
Solar	8012	LISN	924840	04/06/07
Solar	8028	LISN	829012/809022	12/12/06
Solar	8028	LISN	903725/903726	11/22/06
Schwartzbeck	MDS-21	Absorbing Clamp	02581	04/27/07
Leader	LFG1310	Function Generator	8060233	05/26/06
Electro-Metrics	EMC-30	EMI Receiver	191	05/26/06
Antenna Research	ALA-130/A	Loop Antenna	106	06/02/06
Cole-Palmer	9970-00	Digital Barometer	61493735	03/13/07

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Description of Testing

1.0 Objective

The purpose of the testing was to demonstrate that the system under test, operating below (30) MHz, is in compliance with 47 CFR Part 15, subpart G.

2.0 Applicable Rules and Limits

2.1 General Rules

15.605 Cross reference.

(a) The provisions of Subparts A and B of this part apply to Access BPL devices, except where specifically noted. The provisions of Subparts C through F of this part do not apply to Access BPL devices except where specifically noted.

(b) The requirements of this subpart apply only to the radio circuitry that is used to provide carrier current operation for the Access BPL device. Other aspects of the operation of an Access BPL device may be subject to requirements contained elsewhere in this chapter. In particular, an Access BPL device that includes digital circuitry that is not used solely to enable the operation of the radio frequency circuitry used to provide carrier current operation also is subject to the requirements for unintentional radiators in Subpart B of this part.

15.611 General Technical Requirements

(a) Conducted emission limits.

Access BPL is not subject to the conducted emission limits of §15.107

(b) Radiated emission limits.

(1) Medium voltage power lines.

(i) Access BPL systems that operate in the frequency range of 1.705 kHz to 30 MHz over medium voltage power lines shall comply with the radiated emission limits for intentional radiators provided in §15.209.

(ii) Access BPL systems that operate in the frequency range above 30 MHz over medium voltage power lines shall comply with the radiated emission limits provided in §15.109(b).

(2) Low voltage power lines.

Access BPL systems that operate over low-voltage power lines, including those that operate over low-voltage lines that are connected to the in-building wiring, shall comply with the radiated emission limits provided in §15.109(a) and (e).

(c) Interference Mitigation and Avoidance.

(1) Access BPL systems shall incorporate adaptive interference mitigation techniques to remotely reduce power and adjust operating frequencies, in order to avoid site-specific, local use of the same spectrum by licensed services. These techniques may include adaptive or "notch" filtering, or complete avoidance of frequencies, or bands of frequencies, locally used by licensed radio operations.

(i) For frequencies below 30 MHz, when a notch filter is used to avoid interference to a specific frequency band, the Access BPL system shall be capable of attenuating emissions within that band to a level at least 20 dB below the applicable Part 15 limits.

(ii) For frequencies above 30 MHz, when a notch filter is used to avoid interference to a specific frequency band, the Access BPL system shall be capable of attenuating emissions within that band to a level at least 10 dB below the applicable Part 15 limits.

15.613 Measurement procedures.

Compliance measurements for Access BPL shall be made in accordance with the Guidelines for Access BPL systems specified by the Commission.

2.2 - Rules for Equipment operating under (30) MHz

(a) Conducted emission limits.

Access BPL is not subject to the conducted emission limits of §15.107

(b) Radiated emission limits.

(1) Medium voltage power lines.

(i) Access BPL systems that operate in the frequency range of 1.705 kHz to 30 MHz over medium voltage power lines shall comply with the radiated emission limits for intentional radiators provided in §15.209.

(2) Low voltage power lines.

Access BPL systems that operate over low-voltage power lines, including those that operate over low-voltage lines that are connected to the in-building wiring, shall comply with the radiated emission limits provided in §15.109(a) and (e).

(c) Interference Mitigation and Avoidance.

(1) Access BPL systems shall incorporate adaptive interference mitigation techniques to remotely reduce power and adjust operating frequencies, in order to avoid site-specific, local use of the same spectrum by licensed services. These techniques may include adaptive or "notch" filtering, or complete avoidance of frequencies, or bands of frequencies, locally used by licensed radio operations.

(i) For frequencies below 30 MHz, when a notch filter is used to avoid interference to a specific frequency band, the Access BPL system shall be capable of attenuating emissions within that band to a level at least 20 dB below the applicable Part 15 limits.

15.613 Measurement procedures.

Compliance measurements for Access BPL shall be made in accordance with the Guidelines for Access BPL systems specified by the Commission.

2.3 Limits

15.209 Radiated emission limits, general requirements.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
1.705-30.0	30	30

15.109 Radiated emission limits.

(a) Except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency of Emission (MHz)	Field Strength (microvolts/meter)
30 - 88	100
88 - 216	150
216 - 960	200

(b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:

Frequency of Emission (MHz)	Field Strength (microvolts/meter)
30 - 88	90
88 - 216	150
216 - 960	210

(e) Carrier current systems used as unintentional radiators or other unintentional radiators that are designed to conduct their radio frequency emissions via connecting wires or cables and that operate in the frequency range of 9 kHz to 30 MHz, including devices that deliver the radio frequency energy to transducers, such as ultrasonic devices not covered under Part 18 of this chapter, shall comply with the radiated emission limits for intentional radiators provided in §15.209 for the frequency range of 9 kHz to 30 MHz. As an alternative, carrier current systems used as unintentional radiators and operating in the frequency range of 525 kHz to 1705 kHz may comply with the radiated emission limits provided in §15.221(a). At frequencies above 30 MHz, the limits in paragraphs (a), (b) or (g) of this section, as appropriate, continue to apply.

3.0 Testing Methodologies

3.1 - General Guidelines

1) Testing shall be performed with the power settings of the Equipment Under Test (EUT) set at the maximum level.

The power level of the equipment under test is by default set to maximum. This maximum level was attenuated in overhead installations by applying a specific power mask as described in the operational description exhibit. All in-situ testing was performed with notches activated in the excluded bands.

2) Testing shall be performed using the maximum RF injection duty factor (burst rate). Test modes or test software may be used for uplink and downlink transmissions.

Throughout the emissions testing, the BPL signal injected into the network by the test software was set to simulate "peak traffic" as would be experienced by the network during the hour of peak usage. The burst rate of this test signal was verified to be greater than (100) bursts per second. We typically observed throughput between (5 - 20) Mbps.

3) Measurements should be made at a test site where the ambient signal level is 6 dB below the applicable limit. (See ANSI C63.4-2003, section 5.1.2 for alternatives, if this test condition cannot be achieved.)

The measured levels of ambient plus the EUT radio noise were not above the limit.

4) If the data communications burst rate is at least 20 burst per second, quasi-peak measurements shall be employed, as specified in Section 15.35(a). If the data communications burst rate is 20 bursts per second or less, measurements shall be made using a peak detector.

The burst rate was measured and found to be greater than (20) burst per second.

5) For frequencies above 30 MHz, an electric field sensing antenna, such as a biconical antenna is used. The signal shall be maximized for antenna heights from 1 to 4 meters, for both horizontal and vertical polarizations, in accordance to ANSI C63.4-2003 procedures. For Access BPL measurements only, as an alternative to varying antenna height from 1 to 4 meters, these measurements may be made at a height of 1 meter provided that the measured field strength values are increased by a factor of 5 dB to account for height effects.

Measurements made between (30-200) MHz were made with a biconical antenna. Measurements made between (200 - 1,000) MHz were made with a log periodic antenna. The antenna height was maintained at (1) meter, both vertical and horizontal polarities were observed and the values of measured emissions were increased by a factor of (5) dB.

6) For frequencies below 30 MHz, an active or passive magnetic loop is used. The magnetic loop antenna should be at 1 meter height with its plane oriented vertically and the emission maximized by rotating the antenna 180 degrees about its vertical axis. When using active magnetic loops, care should be taken to prevent ambient signals from overloading the spectrum analyzer or antenna pre-amplifier.

All measurements made below (30) MHz were performed with a passive magnetic loop antenna at a (1) meter height with its plane oriented vertically and the emission maximized by rotating the antenna 180 degrees about its vertical axis.

7) The six highest radiated emissions relative to the limit and independent of antenna polarization shall be reported as stated in ANSI C63.4-2003, section 10.1.8.2.

The six highest emissions relative to the limit and independent of antenna polarization are included in Appendix "A" of the test report.

8) All operational modes should be tested including all frequency bands of operation, as required by 47 CFR §15.31(i).

The system operates in various frequency modes. The entire frequency range of operation is (2-30) MHz. We tested the product in mode (13) which operates between (2-30) MHz. Each test mode of operation was controlled by simulation software to simulate a normal operational mode**.**

9) The Equipment Under Test (EUT) includes all BPL electronic devices e.g., couplers, injectors, extractors, repeaters, boosters, concentrators, and electric utility overhead or underground medium voltage lines.

The EUT included all BPL electronic devices. There is one model with (1) associated overhead couplers and (2) unique couplers for underground installations. Both medium voltage and low voltage lines were independently tested.

10) In-situ testing shall be performed on three typical installations for overhead line(s) and three typical installations for underground line(s).

The in-situ testing was performed on three typical installations for overhead line(s) and three typical installations for underground line(s).

3.2 - Medium Voltage Overhead Lines

1) Measurements should normally be performed at a horizontal separation distance of 10 meters from the overhead line.

Measurements were performed at a horizontal separation distance of 10 meters from the overhead line.

2) Testing shall be performed at distances of 0, ¼, ½, —, and 1 wavelength down the line from the BPL injection point on the power line. Wavelength spacing is based on the mid-band frequency used by the EUT. In addition, if the mid-band frequency exceeds the lowest frequency injected onto the power line by more than a factor of two, testing shall be extended in steps of ½ wavelength of the mid-band frequency until the distance equals or exceeds ½ wavelength of the lowest frequency injected.

The equipment under test operates between (2 - 30) MHz. The midband frequency is (16) MHz. Measurements were performed at distances of (0, 4.7, 9.4, 14.1, 18.8, 28.1, 37.5, 46.9, 56.3, 65.6 & 75) meters down the line. The testing was extended in steps of ½ wavelength of the mid-band frequency until the distance exceeded ½ wavelength of the lowest frequency injected.

3) Testing shall be repeated for each Access BPL component (injector, extractor, repeater, booster, concentrator, etc.)

There is only (1) model under test.

4) The distance correction for the overhead-line measurements shall be based on the slant range distance, which is the line-of-sight distance from the measurement antenna to the overhead line. Slant range distance corrections are to be made in accordance with Section 15.31(f) of the Rules.

Slant range distance corrections were calculated for each measurement location based on the height above ground of the utility company phase line used for coupling. For frequencies below (30) MHz, the calculations were based on (40 log 30/distance). This correction factor was then added to the limit of (30) uV/m or (29.5) dBuV/m stated at (30) meters. For frequencies above (30) MHz, the calculations were based on (20 log (10/distance). This correction factor was then added to the appropriate limit.

3.3 - Medium Voltage Underground Lines

1) Underground line installations are those in which the BPL device is mounted in, or attached to, a pad-mounted transformer housing or a ground-mounted junction box and couples directly only to underground cables.

BPL devices were mounted in pad-mounted transformer housing.

2) Measurements should normally be performed at a separation distance of 10 meters from the in-ground power transformer that contains the BPL device(s). If necessary, due to ambient emissions, measurements may be performed a distance of 3 meters. Distance corrections are to be made in accordance with Section 15.31(f) of the Rules.

Measurements were performed at a distance of (10) meters.

3) Measurements shall be made at positions around the perimeter of the in-ground power transformer where the maximum emissions occur. ANSI C63.4-2003, section 8.1, specifies a minimum of 16 radial angles surrounding the EUT (In-ground transformer that contains the BPL device(s)). If directional radiation patterns are suspected, additional azimuth angles shall be examined.

Measurements were performed at (16) equidistant radials around the BPL device.

3.4 - Low Voltage Lines

In cases where Access BPL devices are coupled to low-voltage power lines (i.e., Home-Plug or modem boosters), apply the overhead-line procedures as stated above along the low-voltage lines.

Measurements were performed at a horizontal separation distance of 10 meters from the low voltage lines. Measurements were performed at distances of (0, 4.7, 9.4, 14.1, 18.8, 28.1, 37.5, 46.9, 56.3, 65.6 & 75) meters down the line unless the measuring antenna would have been positioned within (10) meters of the associated building.

There were a total of (3) underground locations and (3) overhead locations where the low voltage lines were tested which meets the requirements.

3.5 - Interference Mitigation / Excluded Bands

No in-situ measurements are required. The preferred methodology is to perform bench measurements showing the attenuation characteristics of any notching filters.

We connected the BPL output directly to the input of the spectrum analyzer. The power level of the EUT was set at maximum power. We set the EUT into an un-notched condition and measured each frequency band of interest. We recorded the peak amplitude of any signal found within that band. We then set the EUT into a notched state and recorded the peak amplitude of any signal found within the same band. We compared the two results and recorded the difference as the minimum attenuation achieved by the notch activation.

4.0 Description of Test Locations

The measurement guidelines require a total of (3) overhead medium voltage locations and (3) underground medium voltage locations. The (3) overhead test locations were located in Vernon, NY and the underground test locations were located in Valrico, FL. The overhead locations were separated by a minimum (700) meters which represents twice the typical operational separation between any two nodes.

5.0 Test Results Summary

5.1 - Radiated Emissions

The worst case results of the total (6) locations was observed at the location on Indiantown road in Vernon, NY at (18.7) MHz having a margin of (0.1) dB.

5.2 - Excluded Bands

The minimum measured notch attenuation for excluded bands was a minimum of (20) dB as shown in the plots of exhibit excluded bands plots.pdf.

TEST DATA

Type: Overhead Location #1 with IBEC Coupler
Location: Indiantown Road
Test Description: Medium Voltage Emissions below 30 MHz

Frequency MHz	Antenna Position	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 30m	Margin dB
24.2	0 m	10 m	43.0	14.8	0	28.2	29.5	1.3
24.2	4.7 m	10 m	43.7	14.8	0	28.9	29.5	0.6
18.7	9.4 m	10 m	44.2	14.8	0	29.4	29.5	0.1
17.5	14.1 m	10 m	44.0	14.8	0	29.2	29.5	0.3
18.6	18.8 m	10 m	43.9	14.8	0	29.1	29.5	0.4
18.6	28.1 m	10 m	41.4	14.8	0	26.6	29.5	2.9
15.0	37.5 m	10 m	39.6	14.8	0	24.8	29.5	4.7
15.0	46.9 m	10 m	40.5	14.8	0	25.7	29.5	3.8
15.0	56.3 m	10 m	37.5	14.8	0	22.7	29.5	6.8
16.3	65.6 m	10 m	36.2	14.8	0	21.4	29.5	8.1
10.6	75.0 m	10 m	37.1	14.8	0	22.3	29.5	7.2

1 (wire height above antenna height = 8.0 m) (slant distance = 12.8 m) (distance correction = (40 log 30/12.8))

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Overhead Location # 1 with IBEC Coupler
Location: Indiantown Road
Test Description: Low Voltage Emissions below 30 MHz

Frequency MHz	Antenna Position	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 30m	Margin dB
18.9	0 m	10 m	41.8	15.7	0	26.1	29.5	3.4
7.9	4.7 m	10 m	42.6	15.7	0	26.9	29.5	2.6
7.8	9.4 m	10 m	40.9	15.7	0	25.2	29.5	4.3
6.1	14.1 m	10 m	44.1	15.7	0	28.4	29.5	1.1

1 (wire height above antenna height = 6.9 m) (slant distance = 12.15 m) (distance correction = (40 log 30/12.15))

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Overhead Location # 1 with IBEC Coupler
Location: Indiantown Road
Test Description: Medium Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position Worst Case	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 10m	Margin dB
80	*	10 m	28.4	-2.1	5	35.5	39.1	3.6
160	*	10 m	27.9	-2.1	5	35.0	43.5	8.5
240	*	10 m	30.7	-2.1	5	37.8	46.4	8.6
400	*	10 m	31.9	-2.1	5	39.0	46.4	7.4
440	*	10 m	30.7	-2.1	5	37.8	46.4	8.6
480	*	10 m	29.6	-2.1	5	36.7	46.4	6.8
800	*	10 m	30.0	-2.1	5	37.1	46.4	9.3
900	*	10 m	29.3	-2.1	5	36.4	46.4	10.0
1,000	*	10 m	28.9	-2.1	5	36.0	49.5	13.5

1 (wire height above antenna height = 8.0 m) (slant distance = 12.8 m) (distance correction = (20 log 10/12.8))

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Overhead Location # 1 with IBEC Coupler
Location: Indiantown Road
Test Description: Low Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position Worst Case	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 3m	Margin dB
80	*	10 m	29.6	-1.7	5	36.3	39.1	2.8
100	*	10 m	27.5	-1.7	5	34.2	43.5	9.3
160	*	10 m	30.0	-1.7	5	36.7	43.5	6.8
240	*	10 m	28.6	-1.7	5	35.3	46.4	11.1
400	*	10 m	33.2	-1.7	5	39.9	46.4	6.5
440	*	10 m	32.8	-1.7	5	39.5	46.4	6.9
480	*	10 m	31.4	-1.7	5	38.1	46.4	8.3
800	*	10 m	30.0	-1.7	5	36.7	46.4	9.7
900	*	10 m	32.5	-1.7	5	39.2	46.4	7.2
1,000	*	10 m	29.9	-1.7	5	36.6	49.5	12.9

1 (wire height above antenna height = 6.9 m) (slant distance = 12.15 m) (distance correction = (20 log 3/12.15))

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Overhead Location # 2 with IBEC Coupler
Location: Willow Road
Test Description: Medium Voltage Emissions below 30 MHz

Frequency MHz	Antenna Position	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB 1	Fixed Height Correction dB	Corrected Amplitude dBuV/m 2	Limit dBuV/m 30m	Margin dB
19.4	0 m	10 m	42.3	13.0	0	29.3	29.5	0.2
19.4	4.7 m	10 m	42.4	13.0	0	29.4	29.5	0.1
19.4	9.4 m	10 m	41.6	13.0	0	28.6	29.5	0.9
23.5	14.1 m	10 m	40.7	13.0	0	27.7	29.5	1.8
12.0	18.8 m	10 m	40.3	13.0	0	27.3	29.5	2.2
8.3	28.1 m	10 m	36.9	13.0	0	23.9	29.5	5.6
18.5	37.5 m	10 m	39.9	13.0	0	26.9	29.5	2.6
18.4	46.9 m	10 m	40.0	13.0	0	27.0	29.5	2.5
21.7	56.3 m	10 m	39.1	13.0	0	26.1	29.5	3.4
12.3	65.6 m	10 m	39.3	13.0	0	26.3	29.5	3.2
12.3	75.0 m	10 m	38.1	13.0	0	25.1	29.5	4.4

1 (wire height above antenna height = 10.1 m) (slant distance = 14.2 m) (distance correction = (40 log 30/14.2))

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Overhead Location # 2 with IBEC Coupler
Location: Willow Road
Test Description: Low Voltage Emissions below 30 MHz

Frequency MHz	Antenna Position	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB 1	Fixed Height Correction dB	Corrected Amplitude dBuV/m 2	Limit dBuV/m 30m	Margin dB
7.8	0 m	10 m	42.6	13.9	0	28.7	29.5	0.8
20.8	4.7 m	10 m	41.3	13.9	0	27.4	29.5	2.1
6.3	9.4 m	10 m	41.2	13.9	0	27.3	29.5	2.2

1 (wire height above antenna height = 9.1m) (slant distance = 13.5 m) (distance correction = (40 log 30/13.5))

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Overhead Location # 2 with IBEC Coupler
Location: Willow Road
Test Description: Medium Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position Worst Case	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB 1	Fixed Height Correction dB	Corrected Amplitude dBuV/m 2	Limit dBuV/m 10m	Margin dB
80	*	10 m	31.0	-3.0	5	39.0	39.1	0.1
120	*	10 m	31.0	-3.0	5	39.0	43.5	4.5
160	*	10 m	29.9	-3.0	5	37.9	43.5	5.6
240	*	10 m	34.2	-3.0	5	42.2	46.4	4.2
400	*	10 m	34.0	-3.0	5	42.0	46.4	4.4
440	*	10 m	32.9	-3.0	5	40.9	46.4	5.5
480	*	10 m	32.0	-3.0	5	40.0	46.4	6.4
600	*	10 m	31.5	-3.0	5	39.5	46.4	6.9
800	*	10 m	29.6	-3.0	5	37.6	46.4	8.8
900	*	10 m	30.0	-3.0	5	38.0	46.4	8.4

1 (wire height above antenna height = 10.1 m) (slant distance = 14.2 m) (distance correction = (20 log 10/14.2))

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Overhead Location # 2 with IBEC Coupler
Location: Willow Road
Test Description: Low Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position Worst Case	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB 1	Fixed Height Correction dB	Corrected Amplitude dBuV/m 2	Limit dBuV/m 3m	Margin dB
80	*	10 m	31.0	-2.6	5	38.6	39.1	0.5
160	*	10 m	31.3	-2.6	5	38.9	43.5	4.6
240	*	10 m	34.2	-2.6	5	41.8	46.4	4.6
360	*	10 m	29.8	-2.6	5	37.4	46.4	9.0
400	*	10 m	35.3	-2.6	5	42.9	46.4	3.5
440	*	10 m	31.7	-2.6	5	39.3	46.4	7.1
480	*	10 m	30.0	-2.6	5	37.6	46.4	8.8
600	*	10 m	31.8	-2.6	5	39.4	46.4	7.0
800	*	10 m	29.6	-2.6	5	37.2	46.4	9.2
900	*	10 m	28.5	-2.6	5	36.1	46.4	10.3

1 (wire height above antenna height = 9.1m) (slant distance = 13.5 m) (distance correction = (20 log 10/13.5)))

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Overhead Location #3 with IBEC Coupler
Location: Marble Road
Test Description: Medium Voltage Emissions below 30 MHz

Frequency MHz	Antenna Position	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 30m	Margin dB
17.5	0 m	10 m	43.7	14.4	0	29.3	29.5	0.2
19.7	4.7 m	10 m	43.5	14.4	0	29.1	29.5	0.4
24.1	9.4 m	10 m	43.8	14.4	0	29.4	29.5	0.1
19.4	14.1 m	10 m	43.6	14.4	0	29.2	29.5	0.3
20.4	18.8 m	10 m	43.8	14.4	0	29.4	29.5	0.1
17.3	28.1 m	10 m	43.7	14.4	0	29.3	29.5	0.2
17.5	37.5 m	10 m	43.5	14.4	0	29.1	29.5	0.4
17.5	46.9 m	10 m	41.6	14.4	0	27.2	29.5	2.3
17.3	56.3 m	10 m	39.9	14.4	0	25.5	29.5	4.0
9.7	65.6 m	10 m	39.8	14.4	0	25.4	29.5	4.1
10.5	75.0 m	10 m	38.7	14.4	0	24.3	29.5	5.2

1 (wire height above antenna height = 8.5 m) (slant distance = 13.1 m) (distance correction = (40 log 30/13.1))

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Overhead Location #3 with IBEC Coupler
Location: Marble Road
Test Description: Low Voltage Emissions below 30 MHz

Frequency MHz	Antenna Position	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 30m	Margin dB
2.3	0 m	10 m	42.0	15.2	0	26.8	29.5	2.7
2.4	4.7 m	10 m	41.8	15.2	0	26.6	29.5	2.9
5.9	9.4 m	10 m	43.3	15.2	0	28.1	29.5	1.4
2.3	14.1 m	10 m	42.7	15.2	0	27.5	29.5	2.0
5.9	18.8 m	10 m	41.9	15.2	0	26.7	29.5	2.8
16.1	28.1 m	10 m	41.0	15.2	0	25.8	29.5	3.7
16.1	37.5 m	10 m	39.2	15.2	0	24.0	29.5	5.5
2.3	46.9 m	10 m	37.5	15.2	0	22.3	29.5	7.2

1 (wire height above antenna height =7.5 m) (slant distance = 12.5 m) (distance correction = (40 log 30/12.5))

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Overhead Location #3 with IBEC Coupler
Location: Marble Road
Test Description: Medium Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 10m	Margin dB
80	*	10 m	28.4	-2.3	5	35.7	39.1	3.4
160	*	10 m	30.7	-2.3	5	38.0	43.5	5.5
240	*	10 m	30.0	-2.3	5	37.3	46.4	9.1
400	*	10 m	34.2	-2.3	5	41.5	46.4	4.9
440	*	10 m	28.0	-2.3	5	35.3	46.4	11.1
480	*	10 m	31.7	-2.3	5	39.0	46.4	7.4
600	*	10 m	33.0	-2.3	5	40.3	46.4	6.1
800	*	10 m	32.8	-2.3	5	40.1	46.4	6.3
900	*	10 m	30.0	-2.3	5	37.3	46.4	9.1
1,000	*	10 m	28.6	-2.3	5	35.9	49.1	13.6

1 (wire height above antenna height = 8.5 m) (slant distance = 13.1 m) (distance correction = (20 log 10/13.1))

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Overhead Location #3 with IBEC Coupler
Location: Marble Road
Test Description: Low Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 3m	Margin dB
80	*	10 m	28.4	-1.9	5	35.3	39.1	3.8
160	*	10 m	30.3	-1.9	5	37.2	43.5	6.3
240	*	10 m	30.1	-1.9	5	37.0	46.4	9.4
400	*	10 m	29.6	-1.9	5	36.5	46.4	9.9
440	*	10 m	29.4	-1.9	5	36.3	46.4	10.1
480	*	10 m	32.4	-1.9	5	39.3	46.4	7.1
600	*	10 m	29.9	-1.9	5	36.8	46.4	9.6
800	*	10 m	29.5	-1.9	5	36.4	46.4	10.0
900	*	10 m	30.1	-1.9	5	37.0	46.4	9.4
1,000	*	10 m	28.3	-1.9	5	35.2	49.1	14.3

1 (wire height above antenna height = 7.5 m) (slant distance = 12.5 m) (distance correction = (20 log 10/12.5))

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #1 with Kaicom Coupler
Location: Summerlyn Drive #1
Test Description: Medium Voltage Emissions below 30 MHz

Frequency MHz	Antenna Position	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB 1	Fixed Height Correction dB	Corrected Amplitude dBuV/m 2	Limit dBuV/m 30m	Margin dB
16.3	5	10 m	41.9	19.1	0	22.8	29.5	6.7
20.0	5	10 m	42.7	19.1	0	23.6	29.5	5.9
5.2	5	10 m	45.2	19.1	0	26.1	29.5	3.4
7.6	5	10 m	46.5	19.1	0	27.4	29.5	2.1
5.2	15	10 m	44.0	19.1	0	24.9	29.5	4.6
7.6	15	10 m	42.6	19.1	0	23.5	29.5	6.0
27.5	15	10 m	41.7	19.1	0	22.6	29.5	6.9

1 (distance correction = (40 log 30/10.0)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #1 with Kaicom Coupler
Location: Summerlyn Drive #1
Test Description: Low Voltage Emissions below 30 MHz

Frequency MHz	Antenna Distance From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB 1	Fixed Height Correction dB	Corrected Amplitude dBuV/m 2	Limit dBuV/m 30m	Margin dB
14.7	1	10 m	46.1	19.1	0	27.0	29.5	2.5
15.9	2	10 m	43.8	19.1	0	24.7	29.5	4.8
16.8	3	10 m	44.0	19.1	0	24.9	29.5	4.6
26.4	4	10 m	42.3	19.1	0	23.2	29.5	6.3

1 (distance correction = (40 log 30/10.0)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #1 with Kaicom Coupler
Location: Summerlyn Drive #1
Test Description: Medium Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 10m	Margin dB
160	10 m	10 m	24.8	0	5	29.8	43.5	13.7
240	10 m	10 m	23.1	0	5	28.1	46.4	18.3

1 (distance correction = NA)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #1 with Kaicom Coupler
Location: Summerlyn Drive #1
Test Description: Low Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 10m	Margin dB
160	10 m	10 m	23.0	0	5	28.0	43.5	15.5
240	10 m	10 m	23.6	0	5	28.6	46.4	17.8

1 (distance correction = NA)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #2 with Kaicom Coupler
Location: Summerlyn Drive #2
Test Description: Medium Voltage Emissions below 30 MHz

Frequency MHz	Antenna Position	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 30m	Margin dB
26.1	1	10 m	48.0	19.1	0	28.9	29.5	0.6
27.5	1	10 m	48.4	19.1	0	29.3	29.5	0.2
26.7	2	10 m	48.3	19.1	0	29.2	29.5	0.3
26.8	3	10 m	48.3	19.1	0	29.2	29.5	0.3
26.1	4	10 m	48.5	19.1	0	29.4	29.5	0.1
26.8	4	10 m	48.1	19.1	0	29.0	29.5	0.5
24.6	12	10 m	48.5	19.1	0	29.4	29.5	0.1

1 (distance correction = (40 log 30/10.0)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #2 with Kaicom Coupler
Location: Summerlyn Drive #2
Test Description: Low Voltage Emissions below 30 MHz

Frequency MHz	Antenna Distance From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 30m	Margin dB
15.9	1	10 m	44.7	19.1	0	25.6	29.5	3.9
16.0	2	10 m	43.4	19.1	0	24.3	29.5	5.2
15.5	3	10 m	45.0	19.1	0	25.9	29.5	3.6
16.9	4	10 m	42.6	19.1	0	23.5	29.5	6.0

1 (distance correction = (40 log 30/10.0)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #2 with Kaicom Coupler
Location: Summerlyn Drive #2
Test Description: Medium Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 10m	Margin dB
160	10 m	10 m	24.1	0	5	29.1	43.5	14.4
240	10 m	10 m	27.8	0	5	32.8	46.4	13.6

1 (distance correction = NA)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #2 with Kaicom Coupler
Location: Summerlyn Drive #2
Test Description: Low Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 10m	Margin dB
160	10 m	10 m	22.5	0	5	27.5	43.5	16.0
240	10 m	10 m	24.1	0	5	29.1	46.4	17.3

1 (distance correction = NA)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #3 with Kaicom Coupler
Location: Dunaway Drive
Test Description: Medium Voltage Emissions below 30 MHz

Frequency MHz	Antenna Position	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 30m	Margin dB
27.0	1	10 m	43.4	19.1	0	24.3	29.5	5.2
27.2	2	10 m	44.4	19.1	0	25.3	29.5	4.2
26.1	4	10 m	43.8	19.1	0	24.7	29.5	4.8
6.0	5	10 m	45.2	19.1	0	26.1	29.5	3.4
26.1	13	10 m	46.4	19.1	0	27.3	29.5	2.2
5.2	13	10 m	46.2	19.1	0	27.1	29.5	2.4
6.0	13	10 m	46.1	19.1	0	27.0	29.5	2.5

1 (distance correction = (40 log 30/10.0)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #3 with Kaicom Coupler
Location: Dunaway Drive
Test Description: Low Voltage Emissions below 30 MHz

Frequency MHz	Antenna Distance From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 30m	Margin dB
25.4	1	10 m	47.8	19.1	0	28.7	29.5	0.8
16.3	2	10 m	46.1	19.1	0	27.0	29.5	2.5
25.5	3	10 m	44.7	19.1	0	25.6	29.5	3.9
24.2	4	10 m	42.2	19.1	0	23.1	29.5	6.4

1 (distance correction = (40 log 30/10.0)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #3 with Kaicom Coupler
Location: Dunaway Drive
Test Description: Medium Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 10m	Margin dB
160	10 m	10 m	25.5	0	5	30.5	43.5	13.0
240	10 m	10 m	26.3	0	5	31.3	46.4	15.1

1 (distance correction = NA)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #3 with Kaicom Coupler
Location: Dunaway Drive
Test Description: Low Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 10m	Margin dB
160	10 m	10 m	27.1	0	5	32.1	43.5	11.4
240	10 m	10 m	27.7	0	5	32.7	46.4	13.7

1 (distance correction = NA)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #1 with IBEC Coupler
Location: Summerlyn Drive #1
Test Description: Medium Voltage Emissions below 30 MHz

Frequency MHz	Antenna Position	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 30m	Margin dB
20.6	3	10 m	45.3	19.1	0	26.2	29.5	3.3
22.5	4	10 m	47.2	19.1	0	28.1	29.5	1.4
24.2	4	10 m	48.4	19.1	0	29.3	29.5	0.2
4.9	5	10 m	47.7	19.1	0	28.6	29.5	0.9
5.9	5	10 m	48.3	19.1	0	29.2	29.5	0.3
2.3	15	10 m	48.1	19.1	0	29.0	29.5	0.5
4.9	15	10 m	48.4	19.1	0	29.3	29.5	0.2

1 (distance correction = (40 log 30/10.0)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #1 with IBEC Coupler
Location: Summerlyn Drive #1
Test Description: Low Voltage Emissions below 30 MHz

Frequency MHz	Antenna Distance From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 30m	Margin dB
14.7	1	10 m	46.1	19.1	0	27.0	29.5	2.5
15.9	2	10 m	43.8	19.1	0	24.7	29.5	4.8
16.8	3	10 m	44.0	19.1	0	24.9	29.5	4.6
26.4	4	10 m	42.3	19.1	0	23.2	29.5	6.3

1 (distance correction = (40 log 30/10.0)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #1 with IBEC Coupler
Location: Summerlyn Drive #1
Test Description: Medium Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 10m	Margin dB
160	10 m	10 m	24.8	0	5	29.8	43.5	13.7
240	10 m	10 m	23.1	0	5	28.1	46.4	18.3

1 (distance correction = NA)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #1 with IBEC Coupler
Location: Summerlyn Drive #1
Test Description: Low Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 10m	Margin dB
160	10 m	10 m	23.0	0	5	28.0	43.5	15.5
240	10 m	10 m	23.6	0	5	28.6	46.4	17.8

1 (distance correction = NA)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #2 with IBEC Coupler
Location: Summerlyn Drive #2
Test Description: Medium Voltage Emissions below 30 MHz

Frequency MHz	Antenna Position	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 30m	Margin dB
2.3	5	10 m	46.9	19.1	0	27.8	29.5	1.7
4.4	5	10 m	48.4	19.1	0	29.3	29.5	0.2
8.2	5	10 m	47.0	19.1	0	27.9	29.5	1.6
18.8	6	10 m	45.5	19.1	0	26.4	29.5	3.1
2.2	13	10 m	48.1	19.1	0	29.0	29.5	0.5
5.2	13	10 m	48.0	19.1	0	28.9	29.5	0.6
5.3	14	10 m	47.7	19.1	0	28.6	29.5	0.9

1 (distance correction = (40 log 30/10.0)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #2 with IBEC Coupler
Location: Summerlyn Drive #2
Test Description: Low Voltage Emissions below 30 MHz

Frequency MHz	Antenna Distance From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 30m	Margin dB
15.9	1	10 m	44.7	19.1	0	25.6	29.5	3.9
16.0	2	10 m	43.4	19.1	0	24.3	29.5	5.2
15.5	3	10 m	45.0	19.1	0	25.9	29.5	3.6
16.9	4	10 m	42.6	19.1	0	23.5	29.5	6.0

1 (distance correction = (40 log 30/10.0)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #2 with IBEC Coupler
Location: Summerlyn Drive #2
Test Description: Medium Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 10m	Margin dB
160	10 m	10 m	24.1	0	5	29.1	43.5	14.4
240	10 m	10 m	27.8	0	5	32.8	46.4	13.6

1 (distance correction = NA)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #2 with IBEC Coupler
Location: Summerlyn Drive #2
Test Description: Low Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 10m	Margin dB
160	10 m	10 m	22.5	0	5	27.5	43.5	16.0
240	10 m	10 m	24.1	0	5	29.1	46.4	17.3

1 (distance correction = NA)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #3 with IBEC Coupler
Location: Dunaway Drive
Test Description: Medium Voltage Emissions below 30 MHz

Frequency MHz	Antenna Position	Antenna Distance	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 30m	Margin dB
22.7	4	10 m	46.2	19.1	0	27.1	29.5	2.4
27.0	5	10 m	45.2	19.1	0	26.1	29.5	3.4
22.3	6	10 m	46.6	19.1	0	27.5	29.5	2.0
22.7	6	10 m	47.6	19.1	0	28.5	29.5	1.0
5.9	13	10 m	47.8	19.1	0	28.7	29.5	0.8
22.4	13	10 m	48.2	19.1	0	29.1	29.5	0.4
22.8	13	10 m	48.4	19.1	0	29.3	29.5	0.2

1 (distance correction = (40 log 30/10.0)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #3 with IBEC Coupler
Location: Dunaway Drive
Test Description: Low Voltage Emissions below 30 MHz

Frequency MHz	Antenna Distance From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 30m	Margin dB
25.4	1	10 m	47.8	19.1	0	28.7	29.5	0.8
16.3	2	10 m	46.1	19.1	0	27.0	29.5	2.5
25.5	3	10 m	44.7	19.1	0	25.6	29.5	3.9
24.2	4	10 m	42.2	19.1	0	23.1	29.5	6.4

1 (distance correction = (40 log 30/10.0)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #3 with IBEC Coupler
Location: Dunaway Drive
Test Description: Medium Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 10m	Margin dB
160	10 m	10 m	25.5	0	5	30.5	43.5	13.0
240	10 m	10 m	26.3	0	5	31.3	46.4	15.1

1 (distance correction = NA)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)

Type: Underground Location #3 with IBEC Coupler
Location: Dunaway Drive
Test Description: Low Voltage Emissions above 30 MHz

Frequency MHz	Antenna Position From vault	Antenna Distance From wire	Measured Amplitude dBuV/m	Distance Correction dB [1]	Fixed Height Correction dB	Corrected Amplitude dBuV/m [2]	Limit dBuV/m 10m	Margin dB
160	10 m	10 m	27.1	0	5	32.1	43.5	11.4
240	10 m	10 m	27.7	0	5	32.7	46.4	13.7

1 (distance correction = NA)

2 (Corrected amplitude = measured amplitude – distance correction + fixed height correction)