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Amended Test Report

Company:	Greenfield Direct, LLC 14015 238th St. Greenwood, NE 68003
Contact:	Scott Miner
Product:	VIP
FCC ID: IC ID:	YBR-VP100 8924A-VP100
Test Report No:	R031510-01-03A
APPROVED BY:	Nic Johnson Test Engineer
DATE:	14 December 2010
Total Pages:	27

1.0 Summary of test results

1.1 Test Results

The EUT has been tested according to the following specifications:

APPLIED STANDARDS: 47 CFR Part 15 & RSS-210			
Standard Section	**Test Type and Limit**	**Result**	**Remark**
15.207 RSS-Gen	Conducted AC Mains Emissions	Pass	Meets the requirement of the limit.
15.209, 15.231 RSS-Gen	Radiated Emissions Peak Output Field Strength Limit: 80.83dBµV/m	Pass	Meets the requirement of the limit.
15.231 RSS-210 Issue 7	Bandwidth	Pass	Meets the requirement of the limit.

1.2 Test Results

The report was amended to make the addition of section 2.6 to show measurements of the EUTs duty cycle in alarm mode, which is the highest possible transmitting rate that the EUT can operate in. This report, R031510-01-03A is meant to amend and replace report R031510-01-03.

2.0 Description

2.1 Equipment under test

The VIP (Valve Interface Panel) is the heart of the Pipe Burst Pro system. This assembly maintains all setting and state information for itself as well as for the FloTrax and the FloodBug components in the system. The VIP receives and processes alarm and status messages from all other system components and also controls other system components including the FloTrax, the Ticker Valve, the Pressure Release Valve, and any attached alarm system. The VIP also can maintain a battery backup, keeping an SLA battery charged and periodically testing quality of the SLA battery and indicating when to replace it. The VIP also maintains system time through the use of an onboard real time clock chip.

The VIP is powered using an external 18 VDC power adapter. The 18 VDC input is connected to the to the main power buss thru a diode isolated battery backup switch circuit. The internal 12 VDC SLA battery is also connected to this circuit and will automatically power the main buss if the external 18 VDC power is lost.

The EUT is supplied with a 18VDC Tech Power Int. power supply, ETSA40-180222TI.

EUT Received Date: 4/21/2010
EUT Tested Date: 4/21/2010

MODEL	VIP
POWER SUPPLY	18VDC Ac-DC Adapter
MODULATION TYPE	FSK
FREQUENCY RANGE	433.92MHz
NUMBER OF CHANNELS	1
MAXIMUM OUTPUT POWER	77.04dBµV/m at 3m (Average over 2sec)
ANTENNA TYPE	Internal dipole
I/O PORTS	None
ASSOCIATED DEVICES	FloTrax, FloodBug

NOTE:
1. For more detailed features description, please refer to the manufacturer's specifications or User's Manual.

2.2 Laboratory description

All testing was performed at the NCEE Lincoln facility, which is a FCC and IC registered lab. This site has been fully described in previously submitted reports. Laboratory environmental conditions varied slightly throughout the tests:

Relative humidity of 45 ± 4%
Temperature of 20 ± 3° Celsius

2.3 Description of test modes

The EUT was modified by the manufacturer to transmit continuously for testing purposes. It was set to transmit one packet after another with 20ms in between transmissions

2.4 Applied standards

The EUT is a low-power transmitter device operating on one frequency at 433.92MHz. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15.207, 15.209 and 15.231 using ANSI/IEEE C63.4: 2003
Industry Canada, RSS 210, Issue 7, Category I Equipment

All test items have been performed and recorded as per the above standards.

2.5 Configuration of system under test

The EUT was set to transmit at a rate much higher than normal use for the purpose of testing. The EUT was also tested in a mode of operation in which it ran in its normal operating condition, waiting to receive data.

The EUT was tested with the 18VDC power supply.

2.6 Duty Cycle Calculation

A transmitter activated automatically shall cease transmission within 5 seconds after activation

The VIP is designed to have no regular transmissions. The only time the VIP transmits is in response to (acknowledgement of) alarm and control transmissions made by the FloodBugs and FloTrax.

When the FloTrax sends the VIP control signals in response to changes in operating parameters initiated by the consumer or when the FloodBug sends alarm transmissions the VIP responds by sending new status information to the FloTrax. The ID (serial number) of the FloTrax is sent with all transmissions and the length of the transmission to a single FloTrax is approximately 245 milliseconds. Time between transmissions depends upon the consumer input via the FloTrax or alarms sent by FloodBugs. There is no facility in the user interface that would allow the VIP to send a continuous transmission, but in an alarm condition where many FloodBugs were reporting alarms each 30 seconds the duty

cycle may approach 100%. The following screen shot shows a typical VIP status report transmission:

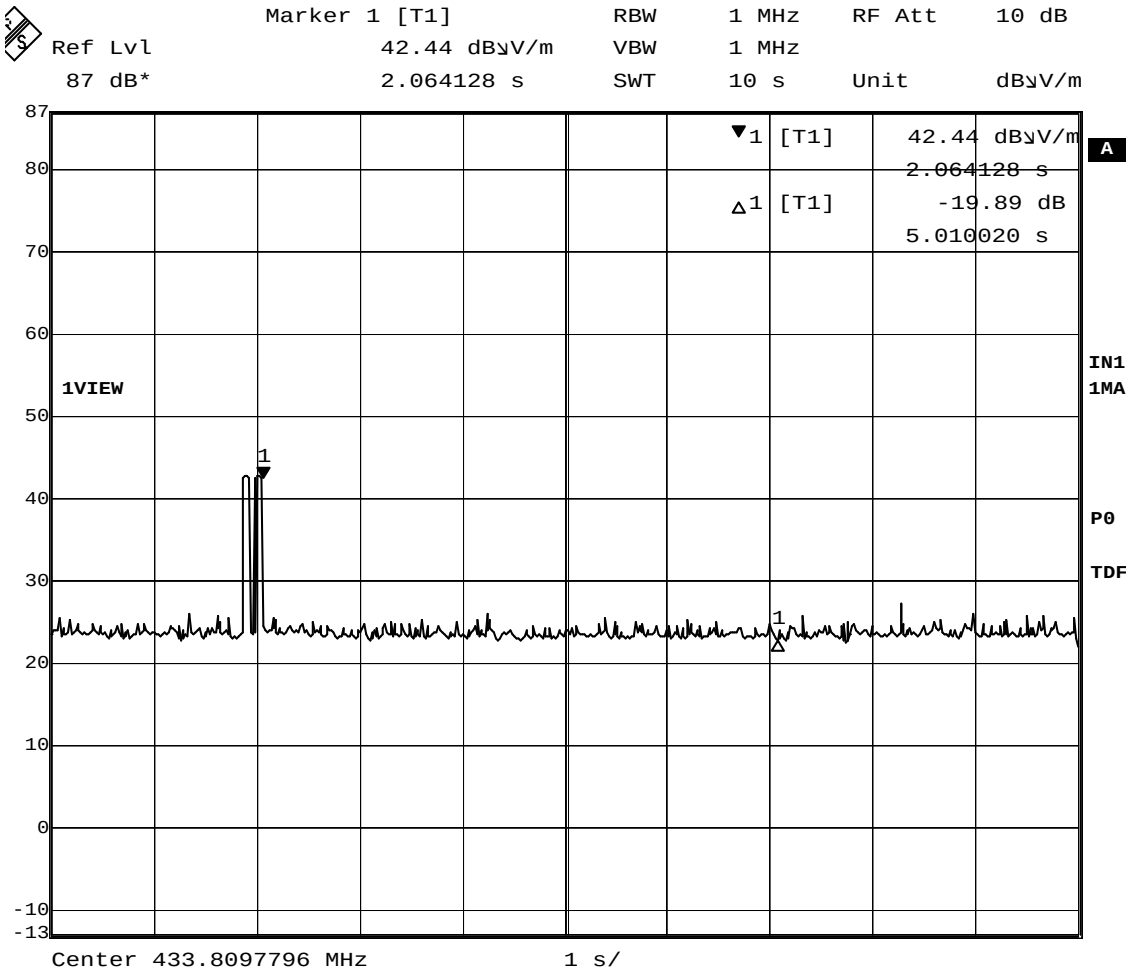


Figure 1 – Transmitter Alarm Triggered.

Transmissions ceases in less than 5sec after activation.

3.0 Test equipment used

DESCRIPTION AND MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CALIBRATION DATE
*Rohde & Schwarz Test Receiver	ESIB26	100037	06/09/2009
Rohde & Schwarz Test Receiver	ESI7	100007	06/09/2009
EMCO Biconilog Antenna	3142B	1647	02/10/2010
EMCO Horn Antenna	3115	6416	02/06/2009
Rohde & Schwarz Preamplifier	TS-PR18	082001/003	12/15/2009*
Rohde & Schwarz LISN	ESH3-Z5	836679/010	2/10/2010

*Internal characterization

4.0 Detailed results

4.1 15.209 Conducted AC emissions

4.1.1 Limits for conducted emissions measurements

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

NOTE: 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.
3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 Test Procedures

a. The EUT was placed 0.8m above a ground reference plane and 0.4 meters from the conducting wall of a shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). The LISN provides 50 ohm/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked form maximum conducted interference as well as the ground. The EUT was powered by an 18VDC power supply.

c. The frequency range from 150 kHz to 30 MHz was searched.

4.1.3 Deviation from the test standard

No deviation

4.1.4 Test setup

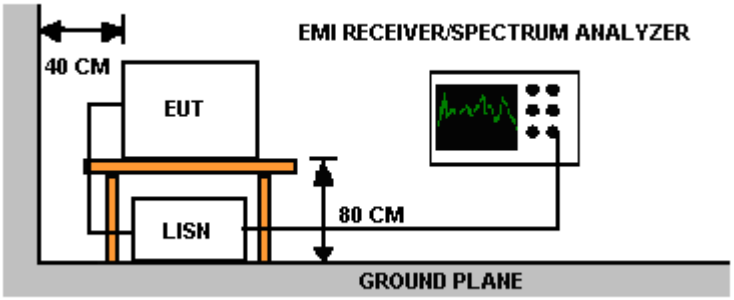


Figure 2 - Conducted Emissions Test Setup

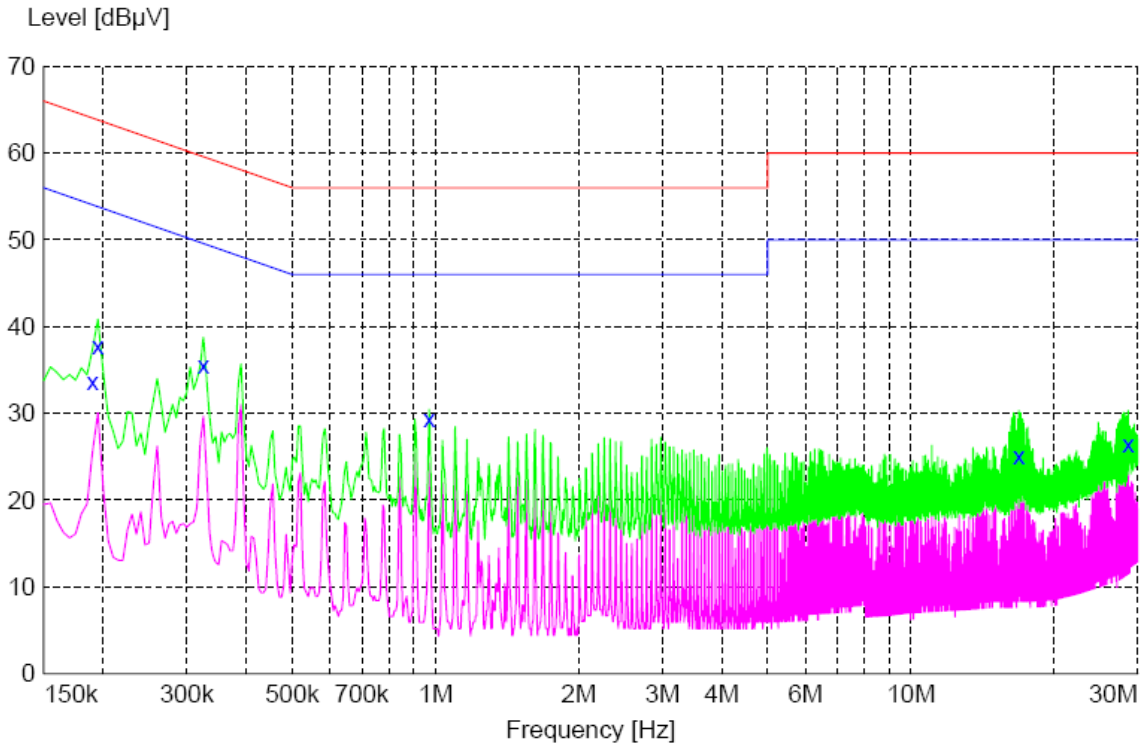
For actual test configuration, see photographs in Appendix A

4.1.5 EUT operating conditions

See section 2.5 for details.

4.3.6 Test Results

EUT	V.I.P.	MODE	Cont. Transmit
INPUT POWER	18VDC	FREQUENCY RANGE	150kHz – 30MHz
ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC	TECHNICIAN	NJohnson



REMARKS:
1. Q.P. and AV. are abbreviations for quasi-peak and average respectively.
2. All emission levels were more than 20dB below the limit.
3. The red line indicates the quasi-peak/peak limits, and the green line the peak measurements.
3. The blue line indicates the average limits, and the violet the peak measurements.

Table 1 - Conducted Emissions Quasi-peak Measurements

Average limits are shown

Frequency	Level	Limit	Margin	Line	PE
MHz	dBµV/m	dBµV/m	dB		
0.19	33.60	54.04	20.44	N	GND
0.20	37.80	53.82	16.02	N	GND
0.33	35.50	49.58	14.09	L1	FLO
0.97	29.30	40.50	11.20	L1	GND
16.89	25.10	40.00	14.90	L1	FLO
28.67	26.40	50.00	23.60	N	FLO

4.2 15.209, 15.231 Radiated emissions

4.2.1 Limits for radiated emissions measurements

Emissions radiated outside of the specified bands shall be applied to the limits in 15.209 as followed:

FREQUENCIES (MHz)	FIELD STRENGTH (μV/m)	MEASUREMENT DISTANCE (m)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	3
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

NOTE:
1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 * log * Emission level (uV/m).
3. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits by more than 20dB under any condition of modulation.
4. The the radiated emissions limit according to FCC Part 15.249(a) is 93.98dBμV/m at a 3m test distance. These are marked with an asterisk on the tables below.

4.2.2 Test procedures

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground plane in a 10 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

c. The receive antenna was a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are used to make the measurement.

d. For each suspected emission, the EUT was arranged to maximize its emissions and then the antenna height was varied from 1 meter to 4 meters and the rotating table was turned from 0 degrees to 360 degrees to find the maximum emission reading.

e. The test-receiver system was set to use a peak detector with a specified resolution bandwidth. For spectrum analyzer measurements, the composite maximum of several analyzer sweeps was used for final measurements.

NOTE:
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequencies below 1GHz.

2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for peak and average detectors at frequencies above 1GHz.

4.2.3 Deviations from test standard

No deviation.

4.2.4 Test setup

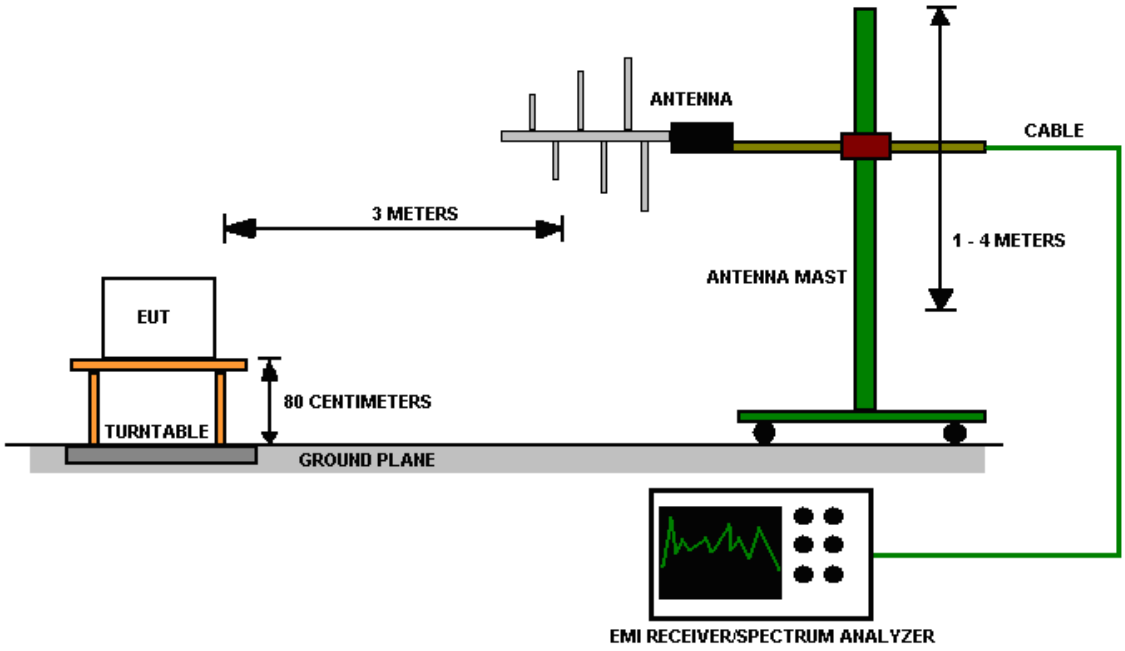


Figure 3 - Radiated Emissions Test Setup

For the actual test configuration, please refer to Appendix A for photographs of the test configuration.

4.2.5 EUT operating conditions

See section 2.5 for details.

4.2.6 Test results

EUT	V.I.P.	DATE	21 April 2010
MODE	Transmit Continuously Receive/Standby	FREQUENCY RANGE	30MHz – 5GHz
INPUT POWER (SYSTEM)	18VDC	ORIENTATION	Vertical/Horizontal
ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC	TECHNICIAN	NJohnson

REMARKS:
1. Emission level (dBuV/m) = Raw Value (dBuV) + Correction Factor (dB)
2. Correction Factor (dB/m) = Antenna Factor (dB/m) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. The radiated emissions limit according to FCC Part 15.231(a) is 80.83dBµV/m for 433.92MHz at a 3m test distance. This applies to an average measurement. See calculations after the chart.

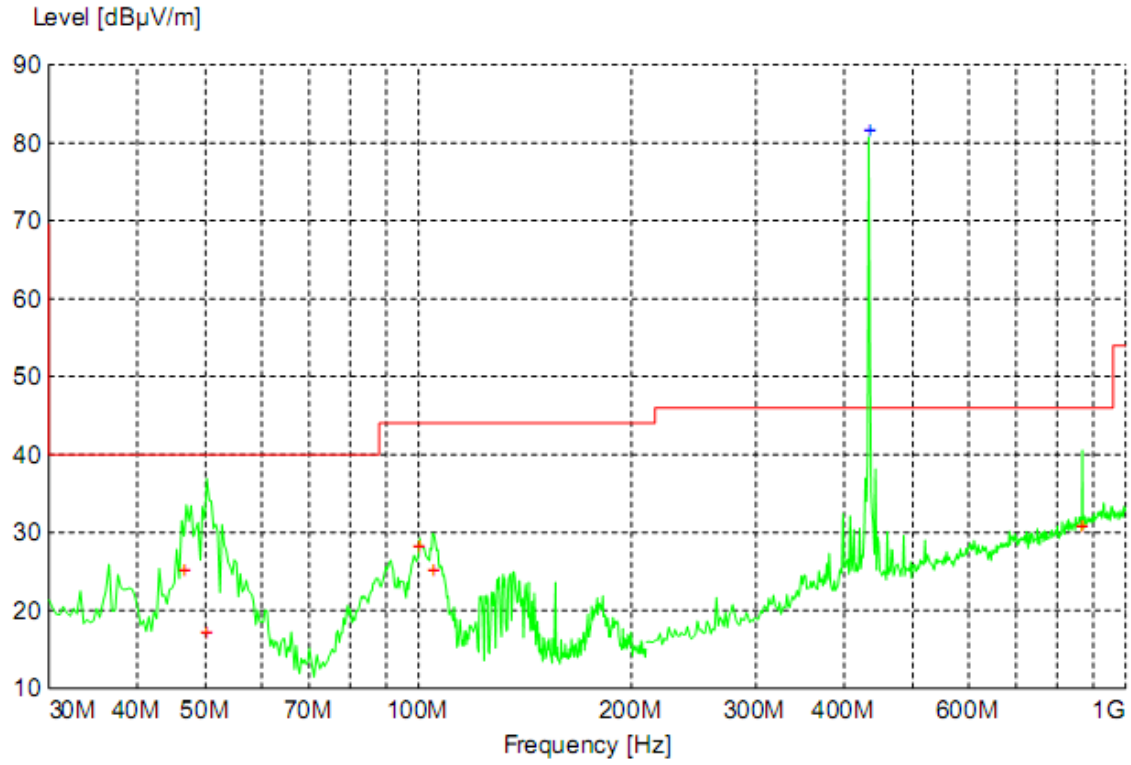


Figure 4- Radiated Emissions Plot, 30MHz - 1GHz, Transmit Mode

Table 2 - Radiated Emissions Measurements, 30MHz – 1GHz, Transmit Mode

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB			
47.46	20.02	40.00	20.00	100	180	VERT
47.82	19.26	40.00	20.70	394	175	VERT
50.22	28.56	40.00	11.40	99	161	VERT
50.28	24.98	40.00	15.00	100	317	VERT
105.60	27.54	44.00	16.50	101	0	VERT
222.00	10.75	46.00	35.20	262	209	VERT
433.92	80.64*	80.84**	0.20	100	335	VERT
867.84	37.94	46.00	8.10	137	321	VERT

*Peak Measurement

**Limit = 80.8398.78dBµV/m from FCC Part 15.231

Table 3 - Radiated Emissions Quasi-peak Measurements, 30MHz – 1GHz, Receive Mode

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB			
51.42	31.74	40.00	15.00	100	40	8.3
105.00	30.56	44.00	16.50	101	44	13.4
942.90	27.36	46.00	35.20	262	46	18.6

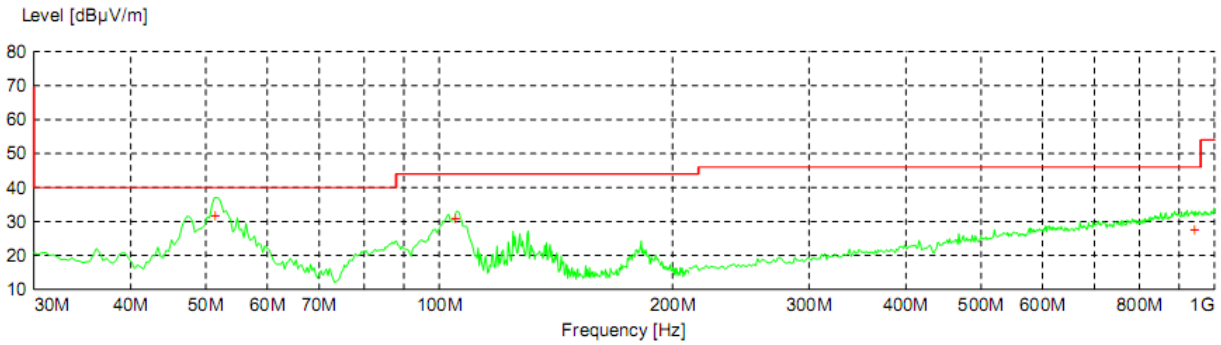


Figure 5 - Radiated Emissions Measurements, 30MHz – 1GHz, Receive Mode

Table 4 - Radiated Emissions Average Detector Measurements, 1-5GHz, Receive Mode

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB			
2461.00	37.85	53.90	16.10	99	19	HORI
2827.00	39.37	53.90	14.50	298	15	VERT
2934.00	39.84	53.90	14.10	243	287	VERT
2954.50	39.94	53.90	14.00	244	53	VERT
2971.00	39.90	53.90	14.00	99	340	HORI
2974.00	40.09	53.90	13.80	174	67	VERT

Table 5 – Radiated Emissions Peak Detector Measurements, 1-5GHz, Receive Mode

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB			
2461.00	42.32	73.90	31.58	99	19	HORI
2827.00	42.45	73.90	11.45	298	15	VERT
2934.00	43.09	73.90	10.81	243	287	VERT
2954.50	42.95	73.90	10.95	244	53	VERT
2971.00	43.17	73.90	10.73	99	340	HORI
2974.00	43.32	73.90	10.58	174	67	VERT

Table 6 - Radiated Emissions Peak Detector Measurements, 1-5GHz, Transmit Mode

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB			
2461.00	47.85	79.90	12.05	359	150	HORI
2463.00	46.10	79.90	13.80	153	287	HORI
2918.00	42.84	79.90	17.06	138	224	HORI
2963.50	42.59	79.90	17.31	298	355	HORI
2985.50	43.11	79.90	16.79	399	121	HORI
2989.50	44.70	79.90	15.20	383	72	HORI

Table 7 - Radiated Emissions Average Detector Measurements, 1-5GHz, Transmit Mode

Frequency	Level	Limit	Margin	Height	Angle	Pol
MHz	dBµV/m	dBµV/m	dB			
2461.00	37.85	53.90	16.05	359	150	HORI
2463.00	39.37	53.90	14.53	153	287	HORI
2918.00	39.84	53.90	14.06	138	224	HORI
2963.50	39.94	53.90	13.96	298	355	HORI
2985.50	39.90	53.90	14.00	399	121	HORI
2989.50	40.09	53.90	13.81	383	72	HORI

4.3 15.241, Bandwidth

4.3.1 Limits of bandwidth measurements

FCC Part 15.231 (c):
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

4.3.2 Test procedures

The EUT was tested in the same method as described in section *4.2 - Radiated emissions*. The EUT was oriented as to produce the maximum emission levels. The resolution bandwidth was set to 100kHz.

4.3.3 Deviations from test standard

No deviation.

4.3.4 Test setup

See section 2.5 for details.

4.3.5 EUT operating conditions

4.7.6 Test results

EUT	V.I.P.	DATE	21 April 2010
MODE	Cont. Transmit	INPUT POWER (SYSTEM)	18VDC
ENVIRONMENTAL CONDITIONS	45% ± 5% RH 20 ± 3ºC	TECHNICIAN	NJohnson

Highest Out of Band Emissions

CHANNEL	Bandwidth (kHz)	Limit (Max, kHz)
1	336.67	1084.80

NOTE:
All values listed include all transducer and cable loss

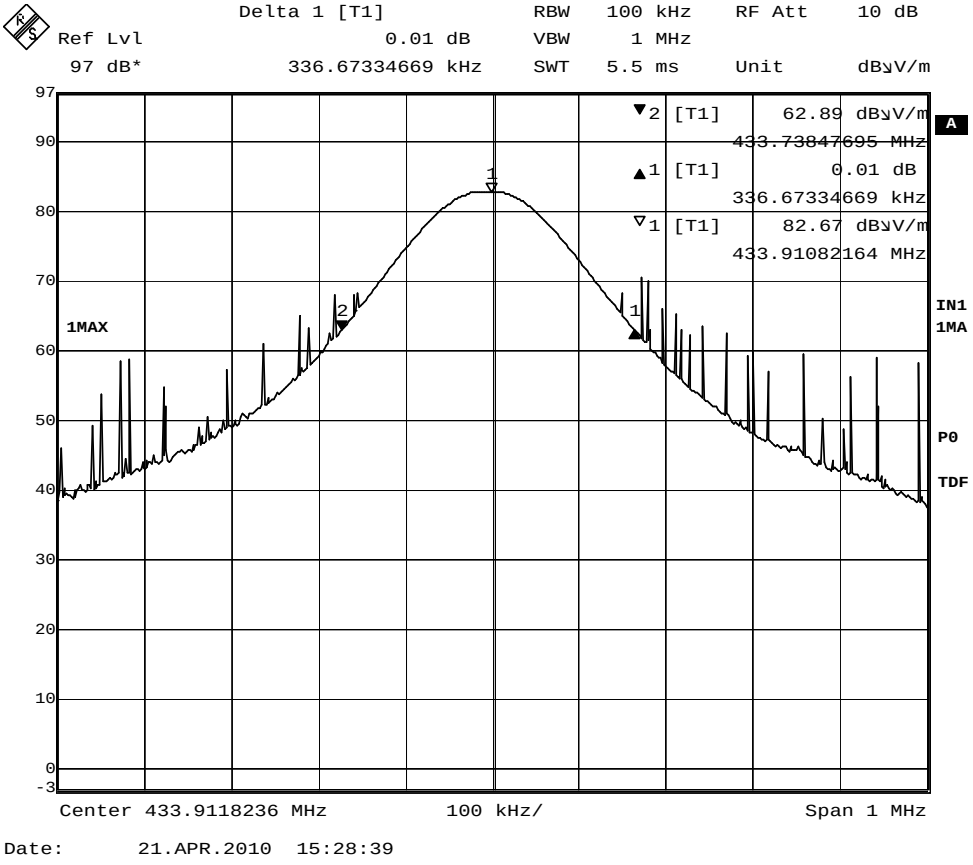


Figure 6 - Bandwidth Measurement

Appendix A: Test Photos

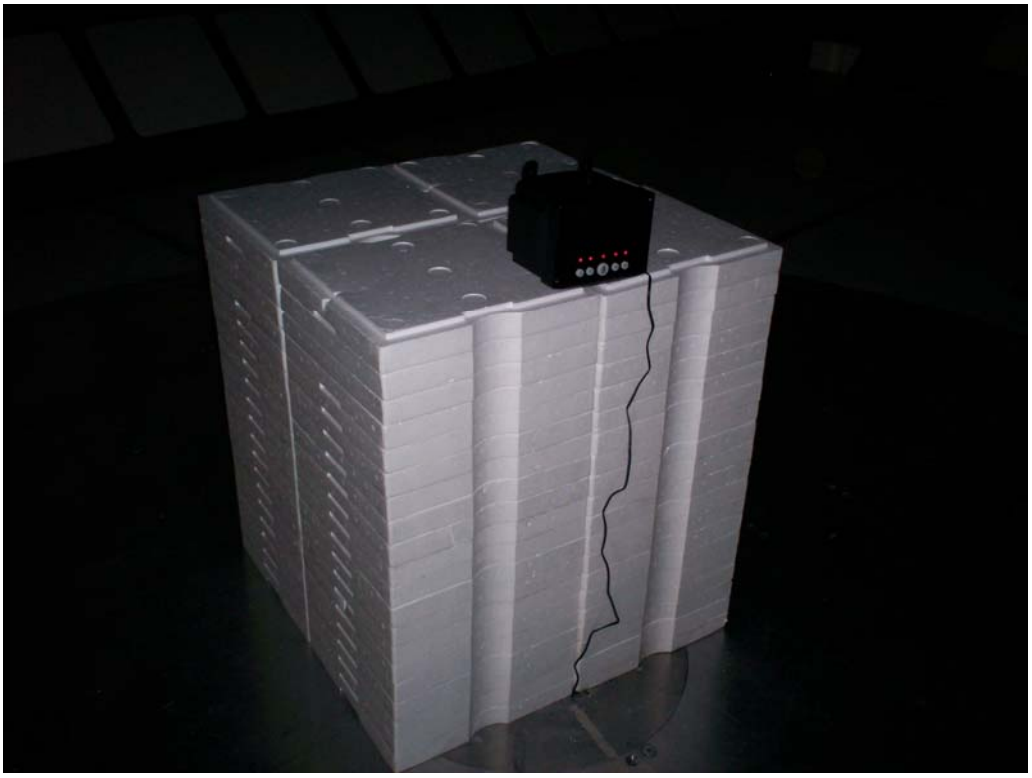


Figure 7 - Radiated Emissions Test Setup

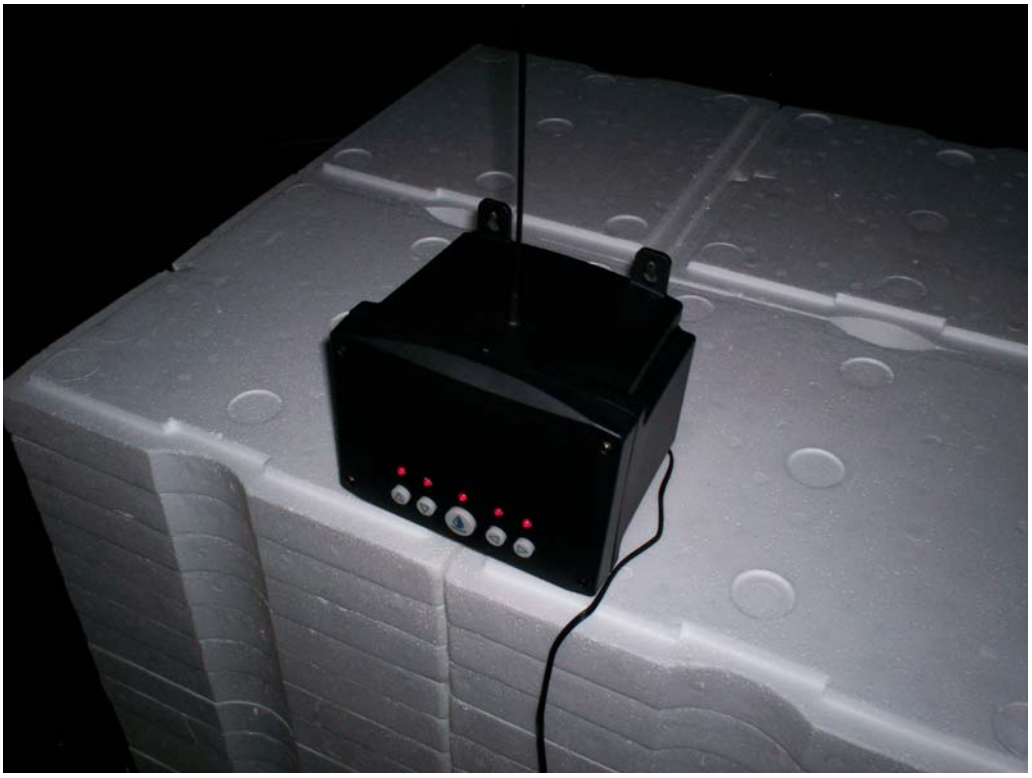


Figure 8 - Radiated Emissions Test Setup

Figure 9 - Conducted Emissions Test Setup

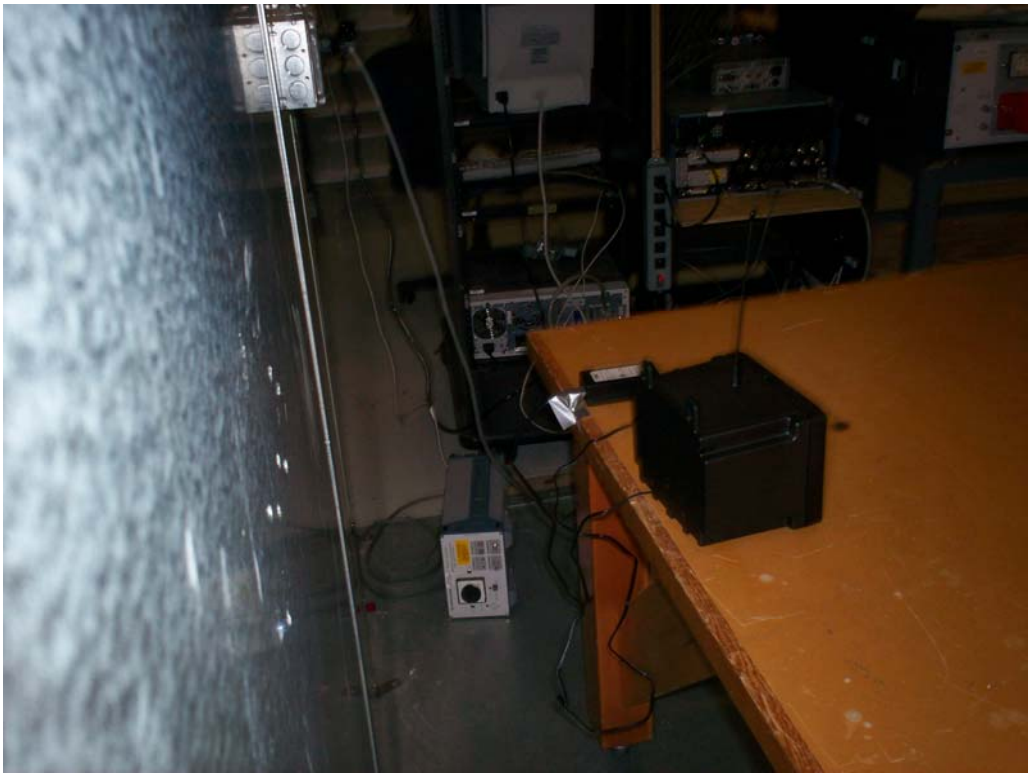


Figure 10 - Conducted Emissions Test Setup

Appendix B: Table of Figures

Figure **Page Number**

Table **Page Number**