Excellence in Compliance Testing

Certification Test Report

Frequency Hopping Spread Spectrum Transmitter

Test Report

FCC ID: P2SNTGECDR900Z
IC: 4171B-ECDR900Z

FCC Rule Part: 15.247
IC Radio Standards Specification: RSS-210

ACS Report Number: 07-0482

Manufacturer: Neptune Technology Group, Inc.
Model: E-Coder)R900i

Test Begin Date: November 28, 2007
Test End Date: December 3, 2007

Report Issue Date: December 13, 2007

FOR THE SCOPE OF ACCREDITATION UNDER LAB Code 200612-0

This report is not be used to claim certification, approval, or endorsement by NVLAP, NIST or any government agency.

Prepared by: Ken Rivers
Ken Rivers
Wireless Certifications Technician
ACS, Inc.

Reviewed by:
J. Kirby Munroe
Manager Wireless Certifications
ACS, Inc.

This report contains 18 pages

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Additional Exhibits Included In Filing

Internal Photographs
Test Setup Photographs
BOM (Parts List)
Schematics

1.0 GENERAL

1.1 Purpose

The purpose of this report is to demonstrate compliance with Part 15 Subpart C of the FCC's Code of Federal Regulations and Industry Canada's Radio Standards Specification RSS-210.

1.2 Product Description

1.2.1 General

The E-Coder)R900i is combination encoder register and transmitter which collects meter-usage data and transmits the data for collection by the meter reader. The E-Coder)R900i provides water utilities with a reliable and economical RF reading solution. Data transmitted by the E-Coder)R900i is received by the Neptune walk-by or drive-by data collection system and stored for downloading at the utility office. The E-Coder)R900i is a one-way communication device that transmits data using frequency-hopping spread-spectrum technology to ensure data security and improve meter reading accuracy.

Manufacturer Information:
Neptune Technology Group, Inc.
1600 Alabama Highway 229
Tallassee, AL 36078

Test Sample Condition:
The EUT sample was received in working order with no visible defects.

Detailed photographs of the EUT are filed separately with this filing.

1.2.2 Intended Use

The E-Coder)R900i's intended use is to transmit meter-usage data for collection by water utility companies.

1.3 Test Methodology and Considerations

Modifications to the originally certified device fall under the permissive change equipment authorization procedure. The devices were evaluated to those characteristics which could be affected by the changes. Characteristics evaluated include fundamental field strength, output power, bandwidth, band edge and intentional radiated emissions. Test results are provided in this report and indicate a Class II Permissive Change is appropriate.

Modifications to the originally certified device are described in a cover letter accompanying this report.

The E-Coder)R900i utilizes 3 antennas for different installation configurations. The installation configurations consist of a basement and below ground pit configuration. The basement transmitter antenna type is a monopole (Neptune Technology Group Inc. model 12641-001) which is sealed inside the enclosure. The PIT transmitter is designed for an external antenna. There are two antenna types. One is a patch antenna (Neptune Technology Group Inc. model number of 12527-000). The second is the WS51 series antenna from MMG (Manufactures Marketing Group Inc, Huntsville AL). It is a monopole antenna. The transmitter is placed into the water-utility PIT and the patch antenna is mounted on the PIT's lid. Both antennas connect to the transmitter with the same custom sealed structure with an F-type male connector. All antenna type where evaluated for intentional radiated emissions. The antennas presented in this filing are identical to the antennas presented in the original certification.

2.0 TEST FACILITIES

2.1 Location

The radiated and conducted emissions test sites are located at the following address:

Advanced Compliance Solutions
5015 B.U. Bowman Drive
Buford, GA 30518
Phone: (770) 831-8048
Fax: (770) 831-8598

2.2 Laboratory Accreditations/Recognitions/Certifications

The Semi-Anechoic Chamber Test Site, Open Area Test Site (OATS) and Conducted Emissions Site have been fully described, submitted to, and accepted by the FCC, Industry Canada and the Japanese Voluntary Control Council for Interference by information technology equipment. In addition, ACS is compliant to ISO 17025 as certified by the National Institute of Standards and Technology under their National Voluntary Laboratory Accreditation Program. The following certification numbers have been issued in recognition of these accreditations and certifications:

FCC Registration Number: 894540
Industry Canada Lab Code: IC 4175
VCCI Member Number: 1831

- VCCI OATS Registration Number R-1526
- VCCI Conducted Emissions Site Registration Number: C-1608

NVLAP Lab Code: 200612-0

2.3 Radiated Emissions Test Site Description

2.3.1 Semi-Anechoic Chamber Test Site

The Semi-Anechoic Chamber Test Site consists of a 20' x 30' x 18' shielded enclosure. The chamber is lined with Toyo Ferrite Grid Absorber, model number FFG-1000. The ferrite tile grid is 101 x 101 x 19mm thick and weighs approximately 550 grams. These tiles are mounted on steel panels and installed directly on the inner walls of the chamber.

The turntable is 150cm in diameter and is located 160cm from the back wall of the chamber. The chamber is grounded via 1 - 8' copper ground rod, installed at the center of the back wall, it is bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is all steel, flush mounted table installed in an all steel frame. The table is remotely operated from inside the control room located 25' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Behind the turntable is a 3' x 6' x 4' deep shielded pit used for support equipment if necessary. The pit is equipped with 1 - 4" PVC chases from the turntable to the pit that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit.

A diagram of the Semi-Anechoic Chamber Test Site is shown in Figure 2.3-1 below:

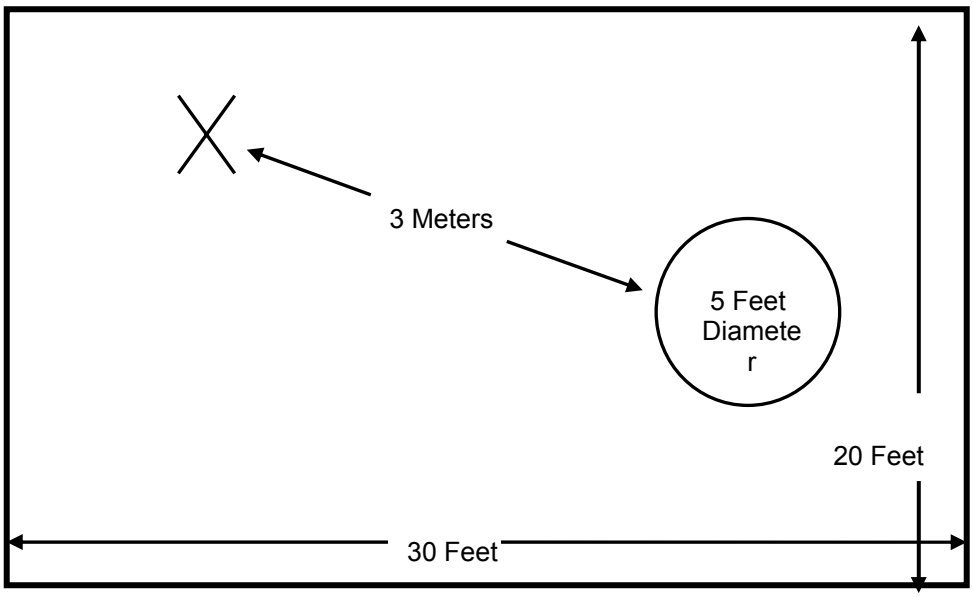

Figure 2.3-1: Semi-Anechoic Chamber Test Site

2.3.2 Open Area Tests Site (OATS)

The open area test site consists of a 40' x 66' concrete pad covered with a perforated electro-plated galvanized sheet metal. The perforations in the sheet metal are 1/8" holes that are staggered every 3/16". The individual sheets are placed to overlap each other by 1/4" and are riveted together to provide a continuous seam. Rivets are spaced every 3" in a 3 x 20 meter perimeter around the antenna mast and EUT area. Rivets in the remaining area are spaced as necessary to properly secure the ground plane and maintain the electrical continuity.

The entire ground plane extends 12' beyond the turntable edge and 16' beyond the antenna mast when set to a 10 meter measurement distance. The ground plane is grounded via 4 - 8' copper ground rods, each installed at a corner of the ground plane and bound to the ground plane using 3/4" stainless steel braided cable.

The turntable is an all aluminum 10' flush mounted table installed in an all aluminum frame. The table is remotely operated from inside the control room located 40' from the range. The turntable is electrically bonded to the surrounding ground plane via steel fingers installed on the edge of the turn table. The steel fingers make constant contact with the ground plane during operation.

Adjacent to the turntable is a 7' x 7' square and 4' deep concrete pit used for support equipment if necessary. The pit is equipped with 5 - 4" PVC chases from the pit to the control room that allow for cabling to the EUT if necessary. The underside of the turntable can be accessed from the pit so cables can be supplied to the EUT from the pit. The pit is covered with 2 sheets of 1/4" diamond style re-enforced steel sheets. The sheets are painted to match the perforated steel ground plane; however the underside edges have been masked off to maintain the electrical continuity of the ground plane. All reflecting objects are located outside of the ellipse defined in ANSI C63.4.

A diagram of the Open Area Test Site is shown in Figure 2.3-2 below:

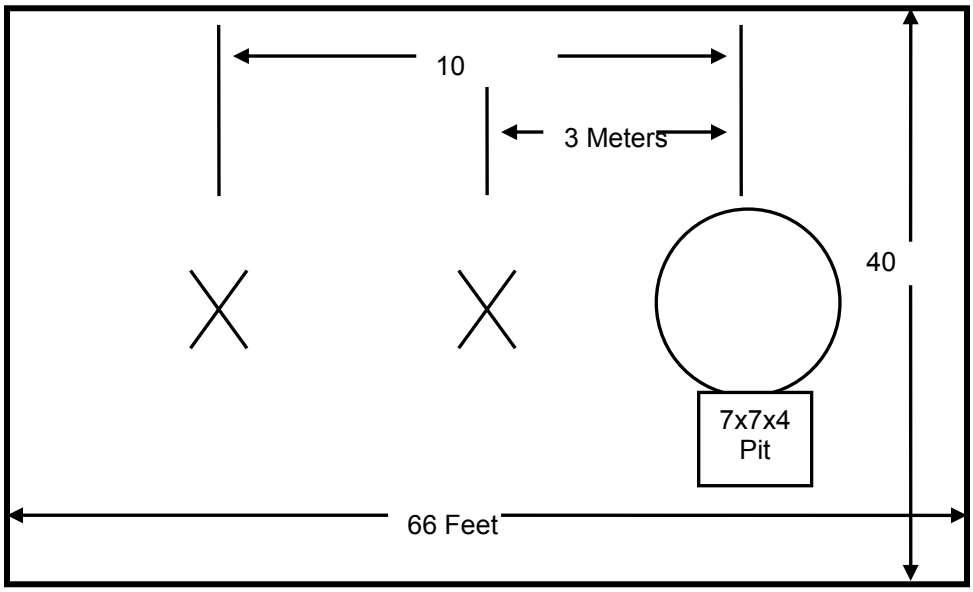

Figure 2.3-2: Open Area Test Site

2.4 Conducted Emissions Test Site Description

The AC mains conducted EMI site is located in the main EMC lab. It consists of an 8' x 8' solid aluminum horizontal group reference plane (GRP) bonded every 3" to an 8' X 8' vertical ground plane.

The site is of sufficient size to test table top and floor standing equipment in accordance with section 6.1.4 of ANSI C63.4.

A diagram of the room is shown below in figure 4.1.3-1:

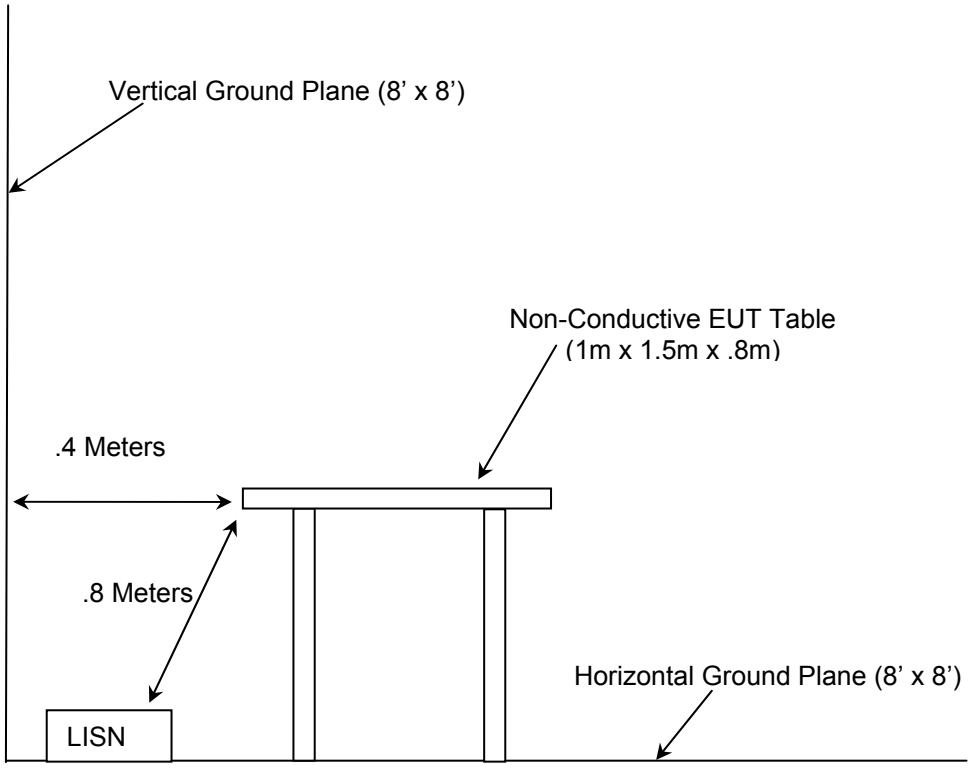

Figure 2.4-1: AC Mains Conducted EMI Site

3.0 APPLICABLE STANDARD REFERENCES

The following standards were used:

- ANSI C63.4-2003: Method of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the 9KHz to 40GHz
- US Code of Federal Regulations (CFR): Title 47, Part 2, Subpart J: Equipment Authorization Procedures, 2006
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2006
- FCC OET Bulletin 65 Appendix C - Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, 2001
- FCC Public Notice DA 00-705 - Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems, March 30, 2000
- Industry Canada Radio Standards Specification: RSS-210 - Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, Issue 7 June 2007

4.0 LIST OF TEST EQUIPMENT

All test equipment used for regulatory testing is calibrated yearly or according to manufacturer's specifications.

Table 4-1: Test Equipment

Equipment Calibration Information					
ACS#	**Mfg.**	**Eq. type**	**Model**	**S/N**	**Cal. Due**
22	Agilent	Amplifiers	8449B	3008A00526	04-10-2008
30	Spectrum Technologies	Antennas	DRH-0118	970102	05-10-2008
193	ACS	Cable Set	OATS cable Set	193	02-16-2008
277	Emco	Antennas	93146	9904-5199	06-18-2008
337	Microwave Circuits	Filters	H1G513G1	282706	08-28-2008
283	Rohde & Schwarz	Spectrum Analyzers	FSP40	1000033	11-09-2008
337	Microwave Circuits	Filters	H1G513G1	282706	08-28-2008
343	Florida RF Cables	Cables	SMRE-200W-12.0-SMRE	N/A	12-21-2007
396	Florida RF Cables	Cables	SMS-290AW-480.0-SMR	N/A	12-21-2007

5.0 SUPPORT EQUIPMENT

Table 5-3: Support Equipment

Manufacturer	Equipment Type	Model Number	Serial Number	FCC ID
	EUT Was Self Supporting			

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

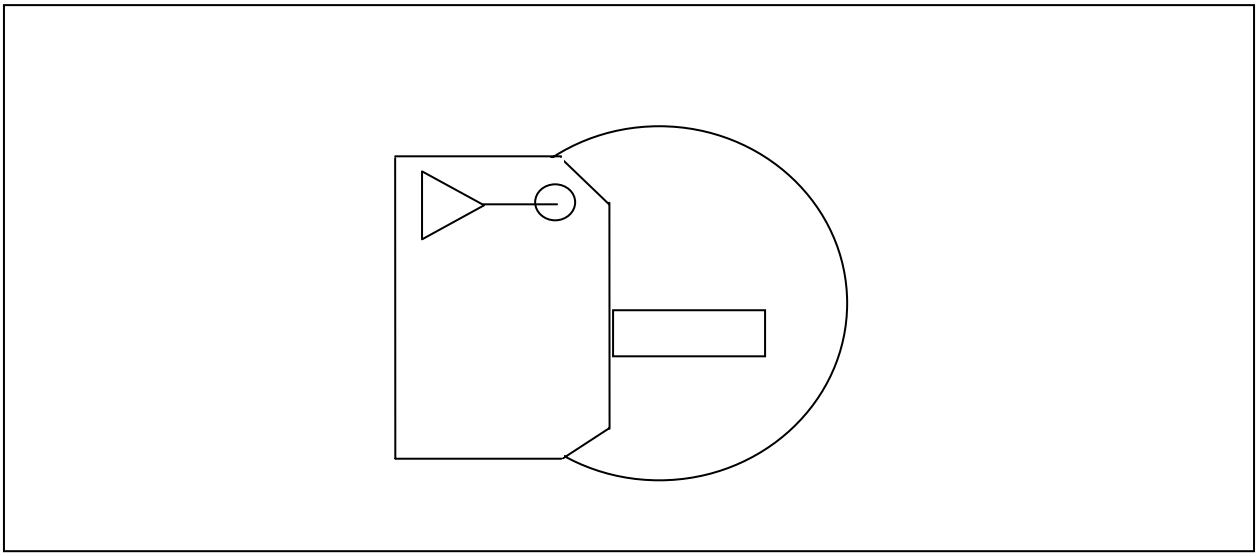

Figure 6-1: EUT Test Setup

*See Test Setup photographs for additional detail.

7.0 SUMMARY OF TESTS

Along with the tabular data shown below, plots were taken of all signals deemed important enough to document.

7.1 Antenna Requirement

The basement transmitter antenna type is a monopole (Neptune Technology Group Inc. model 12641-001) which sealed inside the enclosure. The PIT transmitter is designed for two external antennas which connect to the transmitter with the same custom sealed structure with an F-type male connector. All transmitter configurations are professionally installed. The antenna's the maximum gain is 0dBi.

7.2 Power Line Conducted Emissions

The E-Coder)R900i is battery powered therefore Power Line Conducted Emissions is not required.

7.3 Peak Output Power

7.3.1 Test Methodology

Radiated tests were performed to show compliance with the peak output power limit according to the alternative test methods in the FCC publication DA 00-705.

The procedures set forth in ANSI C63.4 were followed with respect to maximizing the peak emission. The resolution bandwidth of the spectrum analyzer was set to 1 MHz which was greater the 20 dB bandwidth measured in section 7.4.4. The video bandwidth was set to 3 MHz and a peak detector using the Max Hold function was utilized.

The power was calculated using the following equation:

$$P = (E * d)^2 / 30 * G$$

Where: G = Numeric Gain of the transmitting antenna with reference to an isotropic radiator
d = The distance in meters from which the field strength was measured
E = The measured maximum fundamental field strength in V/m

7.3.2 Test Results

Results are shown below in Tables 7.3-1 to 7.3-6.

Table 7.3-1: Fundamental Field Strength Basement Unit

Frequency (MHz)	Uncorrected Level (dBuV)	Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)
911.05	93.38	V	27.98	121.36
915.93	92.03	V	27.88	119.91
920.07	91.63	V	27.80	119.43

Table 7.3-2: Peak Output Power Basement Unit

Frequency (MHz)	Measurement Distance(m)	Antenna Gain (dBi)	Field Strength (V/m)	Antenna Gain Num	Power (mW)	Power (dBm)
911.05	3	2	1.17	1.58	258.83	24.13
915.93	3	2	0.99	1.58	185.48	22.68
920.07	3	2	0.94	1.58	166.03	22.20

Table 7.3-3: Fundamental Field Strength Pit Unit - Monopole Antenna

Frequency (MHz)	Uncorrected Level (dBuV)	Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)
911.05	91.45	V	27.98	119.43
915.93	89.44	V	27.88	117.32
920.07	89.65	V	27.80	117.45

Table 7.3-4: Peak Output Power Pit Unit - Monopole Antenna

Frequency (MHz)	Measurement Distance(m)	Antenna Gain (dBi)	Field Strength (V/m)	Antenna Gain Num	Power (mW)	Power (dBm)
911.05	3	2	0.94	1.58	165.97	22.20
915.93	3	2	0.73	1.58	102.16	20.09
920.07	3	2	0.75	1.58	105.24	20.22

Table 7.3-5: Fundamental Field Strength Pit Unit - Patch Antenna

Frequency (MHz)	Uncorrected Level (dBuV)	Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)
911.05	88.88	H	28.51	117.39
915.93	88.05	H	28.56	116.61
920.07	89.24	V	27.80	117.04

Table 7.3-6: Peak Output Power Low Channel Pit Unit - Patch Antenna

Frequency (MHz)	Measurement Distance(m)	Antenna Gain (dBi)	Field Strength (V/m)	Antenna Gain Num	Power (mW)	Power (dBm)
911.05	3	2	0.74	1.58	103.79	20.16
915.93	3	2	0.68	1.58	86.71	19.38
920.07	3	2	0.73	1.58	100.94	20.04

7.4 20dB Bandwidth

7.4.1 Test Methodology

The spectrum analyzer span was set to 2 to 3 times the estimated 20 dB bandwidth of the emission. The RBW was to ≥ 1% of the estimated 20 dB bandwidth. The trace was set to max hold with a peak detector active. The Delta function of the analyzer was utilized to determine the 20 dB bandwidth of the emission. The span and RBW were examined and re-adjusted if necessary to meet the requirements of 2 to 3 times the 20 bandwidth for the span and ≥ 1% of the 20 dB bandwidth for the RBW.

7.4.2 Test Results

The maximum 20dB bandwidth was found to be approximately 93kHz. Results are shown below in Table 7.4-1 and Figures 7.4-1 through 7.4-3.

Table 7.4-1

Frequency (MHz)	20dB Bandwidth (kHz)
911.05	71.4
915.93	79.8
920.07	93.0

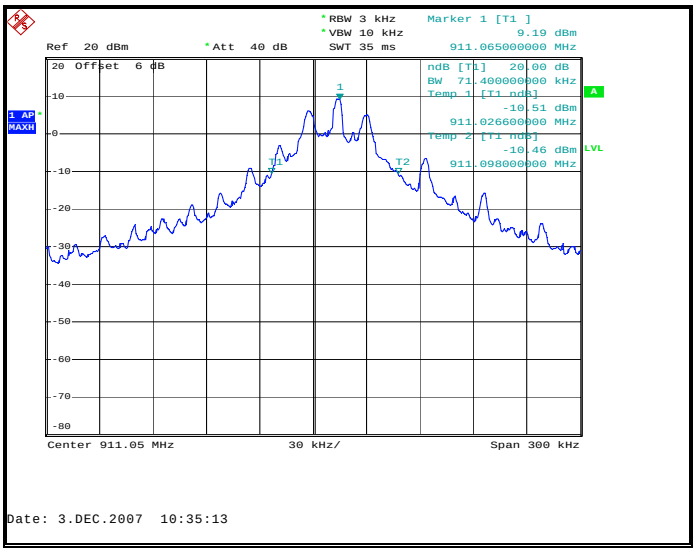

Figure 7.4-1: 20dB Bandwidth Low Channel

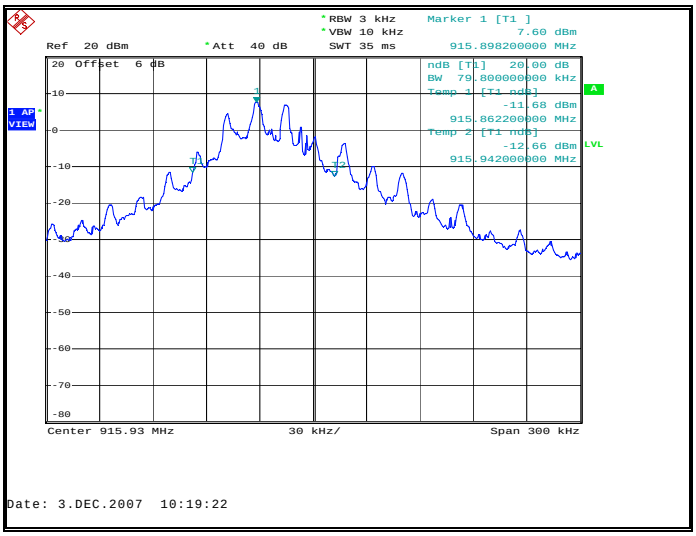

Figure 7.4-2: 20dB Bandwidth Mid Channel

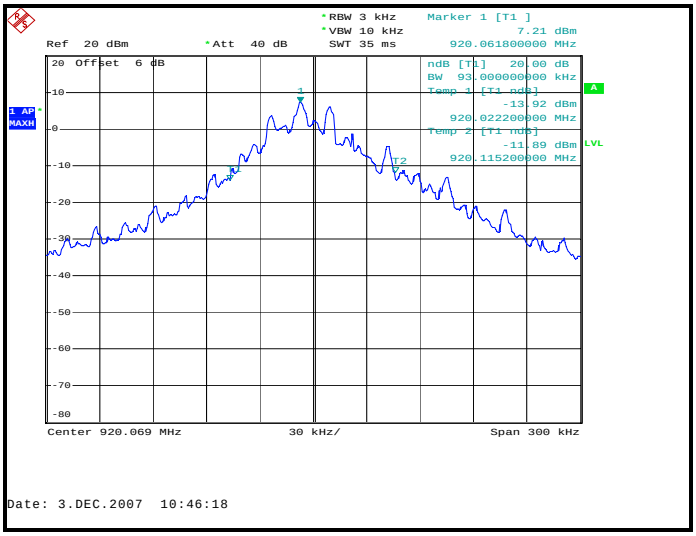

Figure 7.4-3: 20dB Bandwidth High Channel

7.5 Band-Edge Compliance and Spurious Emissions

7.5.1 Band-Edge Compliance of RF Emissions

7.5.1.1 Test Methodology

The EUT was investigated at the lowest and highest channel available to determine band-edge compliance.

The procedures set forth in ANSI C63.4 were followed with respect to maximizing the peak fundamental emission For each measurement the spectrum analyzer's RBW was set to 100 kHz, which is ≥ 1% of the span, and the VBW was set to 100kHz. A peak detector using the Max Hold function was utilized.

7.5.1.2 Test Results

In a 100 kHz bandwidth at the lower and upper band-edge, the radio frequency power that was produced by the EUT is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power. Band-edge compliance is displayed in Figures 7.5.1-1 and 7.5.2-2

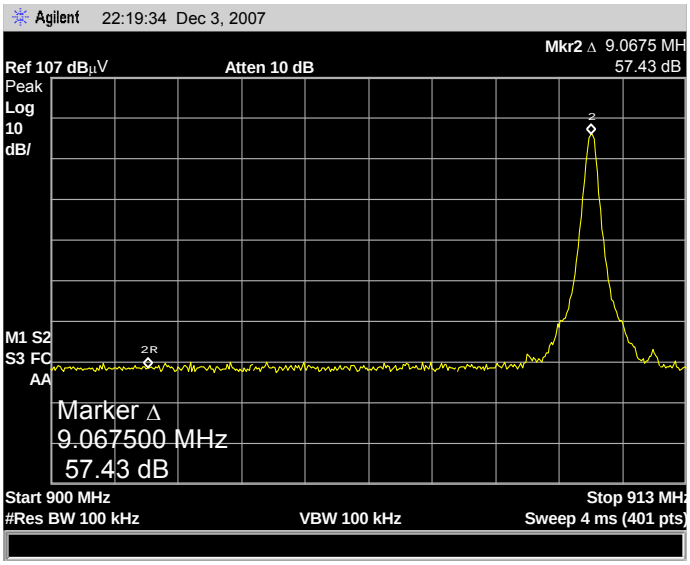

Figure 7.5.1-1: Lower Band-edge

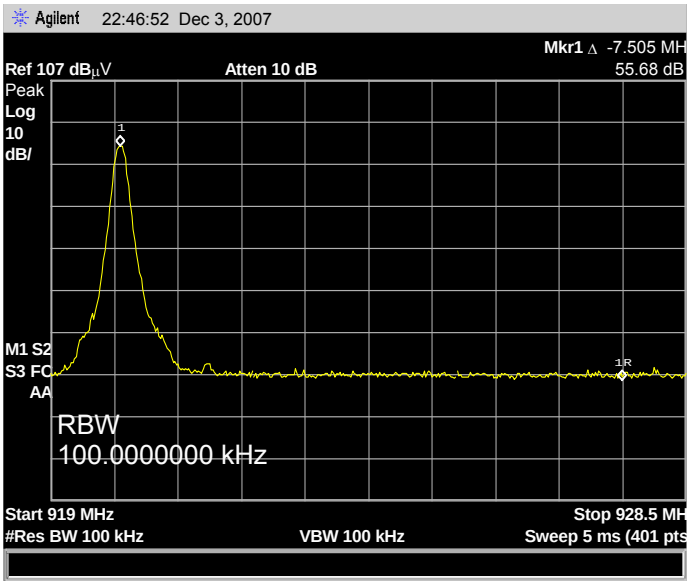

Figure 7.5.1-2: Upper Band-edge

7.5.2 Radiated Spurious Emissions – Intentional Radiation

7.5.2.1 Test Methodology

Radiated emissions tests were made over the frequency range of 30MHz to 10GHz, 10 times the highest fundamental frequency.

The EUT was rotated through 360° and the receive antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. For frequencies below 1000MHz, quasi-peak measurements were made using a resolution bandwidth (RBW) of 120 kHz and a video bandwidth (VBW) of 300 kHz. For frequencies above 1000MHz, peak measurements were made using an RBW of 1 MHz and a VBW of 3 MHz and for the average emissions a VBW of 10Hz. For those frequencies that fell outside the restricted bands, the alternative test methods in the FCC publication DA 00-705 was followed using a RBW of 100kHz and VBW of 300kHz and peak detector.

The EUT was caused to generate a continuous carrier signal on the hopping channel.

7.5.2.2 Duty Cycle Correction

For average radiated measurements, the measured level was reduced by a factor 23.04dB to account for the duty cycle of the EUT. The EUT transmits for 7.05mS on a channel followed by a minimum 10 second rest period before hopping to the next channel. The EUT does not return to the same channel for over 500 seconds. Therefore the duty cycle is 7.05%. The duty cycle correction factor is determined using the formula: 20log (.0705)=-23.04dB. A plot of the duty cycle is provided in figure 7.5.2-1

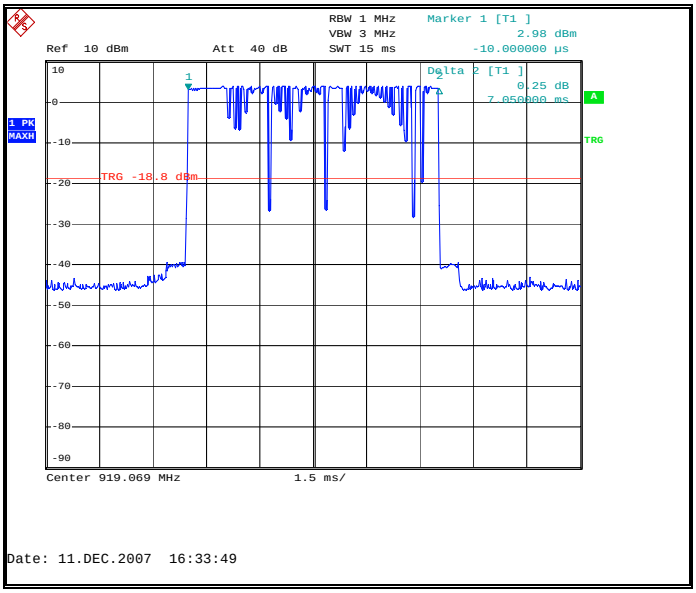

Figure 7.5.2-1: Channel Dwell Time

7.5.2.3 Test Results

Radiated spurious emissions and conducted spurious emissions found in the band of 30MHz to 10GHz are reported in Tables 7.5.2-1 to 7.5.2-3. Each emission found to be in a restricted band, was compared to the radiated emission limits. Those spurious emissions outside the restricted bands were compared to the limits of 20 dB below the fundamental frequency field strength.

Table 7.5.2-1: Radiated Spurious Emissions Basement Unit

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
911.05	89.58	88.44	H	28.51	118.09	116.95	--------	--------	---------	---------
911.05	93.38	92.66	V	27.98	121.36	120.64	--------	--------	---------	---------
1822.1	79.26	64.91	H	-3.84	75.42	---------	101.4	---------	25.94	---------
1822.1	78.38	67.70	V	-3.83	74.55	---------	101.4	---------	26.81	---------
2733.15	66.67	65.31	H	-0.32	66.35	41.90	74.0	54.0	7.65	12.10
2733.15	64.89	62.21	V	-0.57	64.32	38.54	74.0	54.0	9.68	15.46
3644.2	60.52	50.09	H	2.63	63.15	29.62	74.0	54.0	10.85	24.38
3644.2	61.34	47.81	V	2.66	64.00	27.37	74.0	54.0	10.00	26.63
4555.25	57.76	46.21	H	4.34	62.10	27.45	74.0	54.0	11.90	26.55
4555.25	56.13	47.59	V	4.26	60.39	28.75	74.0	54.0	13.61	25.25
5466.3	59.51	44.83	H	6.11	65.62	---------	101.4	---------	35.74	---------
5466.3	60.97	46.25	V	6.30	67.27	---------	101.4	---------	34.09	---------
6377.35	52.49	38.58	H	8.01	60.50	---------	101.4	---------	40.86	---------
6377.35	55.49	41.03	V	7.94	63.43	---------	101.4	---------	37.93	---------
7288.4	52.04	38.63	H	9.93	61.97	25.46	74.0	54.0	12.03	28.54
7288.4	52.56	38.14	V	9.99	62.55	25.03	74.0	54.0	11.45	28.97
8199.45	51.32	37.11	H	10.55	61.87	24.56	74.0	54.0	12.13	29.44
8199.45	52.27	38.17	V	10.61	62.88	25.68	74.0	54.0	11.12	28.32
9110.5	48.64	34.24	H	11.01	59.65	22.16	74.0	54.0	14.35	31.84
9110.5	50.02	36.07	V	11.17	61.19	24.14	74.0	54.0	12.81	29.86
Middle Channel										
915.913	86.72	86.29	H	28.56	115.28	114.85	--------	--------	---------	---------
915.913	91.72	91.33	V	27.88	119.60	119.21	--------	--------	---------	---------
1831.826	75.84	66.37	H	-3.81	72.03	---------	99.6	---------	27.57	---------
1831.826	76.62	65.76	V	-3.81	72.81	---------	99.6	---------	26.79	---------
2747.739	65.52	63.04	H	-0.28	65.24	39.66	74.0	54.0	8.76	14.34
2747.739	65.01	62.55	V	-0.53	64.48	38.92	74.0	54.0	9.52	15.08
3663.652	61.17	47.21	H	2.70	63.87	26.81	74.0	54.0	10.13	27.19
3663.652	58.39	47.15	V	2.73	61.12	26.79	74.0	54.0	12.88	27.21
4579.565	53.65	39.31	H	4.38	58.03	20.59	74.0	54.0	15.97	33.41
4579.565	54.20	43.63	V	4.31	58.51	24.84	74.0	54.0	15.49	29.16
5495.478	58.34	42.71	H	6.17	64.51	---------	99.6	---------	35.09	---------
5495.478	61.30	44.66	V	6.37	67.67	---------	99.6	---------	31.93	---------
6411.391	51.50	37.43	H	8.10	59.60	---------	99.6	---------	40.00	---------
6411.391	53.96	38.97	V	8.02	61.98	---------	99.6	---------	37.62	---------
7327.304	51.94	37.72	H	9.97	61.91	24.59	74.0	54.0	12.09	29.41
7327.304	52.40	37.23	V	10.03	62.43	24.16	74.0	54.0	11.57	29.84
8243.217	50.46	36.56	H	10.59	61.05	24.05	74.0	54.0	12.95	29.95
8243.217	50.15	36.21	V	10.64	60.79	23.75	74.0	54.0	13.21	30.25
9159.13	48.08	34.18	V	11.20	59.28	22.29	74.0	54.0	14.72	31.71
High Channel										
920.07	87.75	87.28	H	28.60	116.35	115.88	--------	--------	---------	---------
920.07	91.60	90.80	V	27.80	119.40	118.60	--------	--------	---------	---------
1840.14	80.45	66.77	H	-3.79	76.66	---------	99.4	---------	22.74	---------
1840.14	78.17	69.26	V	-3.79	74.38	---------	99.4	---------	25.02	---------
2760.21	60.93	57.44	H	-0.25	60.68	34.10	74.0	54.0	13.32	19.90
2760.21	65.49	63.73	V	-0.49	65.00	40.14	74.0	54.0	9.00	13.86
3680.28	63.72	49.08	H	2.76	66.48	28.74	74.0	54.0	7.52	25.26
3680.28	60.24	47.35	V	2.80	63.04	27.05	74.0	54.0	10.96	26.95
4600.35	57.56	45.53	H	4.42	61.98	26.85	74.0	54.0	12.02	27.15
4600.35	56.53	47.36	V	4.36	60.89	28.62	74.0	54.0	13.11	25.38
5520.42	61.39	45.24	H	6.21	67.60	---------	99.4	---------	31.80	---------
5520.42	64.67	46.92	V	6.41	71.08	---------	99.4	---------	28.32	---------
6440.49	53.40	38.56	H	8.18	61.58	---------	99.4	---------	37.82	---------
6440.49	57.61	42.18	V	8.09	65.70	---------	99.4	---------	33.70	---------
7360.56	52.82	38.50	H	10.00	62.82	25.40	74.0	54.0	11.18	28.60
7360.56	52.59	38.10	V	10.07	62.66	25.07	74.0	54.0	11.34	28.93
8280.63	50.86	36.57	H	10.62	61.48	24.09	74.0	54.0	12.52	29.91
8280.63	50.90	36.98	V	10.66	61.56	24.54	74.0	54.0	12.44	29.46
9200.7	49.37	34.51	H	11.11	60.48	---------	99.4	---------	38.92	---------
9200.7	50.53	36.43	V	11.23	61.76	---------	99.4	---------	37.64	---------

***** *The magnitude of all emissions not reported were below the noise floor of the measurement system.*

Table 7.5.2-2: Radiated Spurious Emissions Pit Unit - Monopole Antenna

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
911.05	86.91	86.29	H	28.51	115.42	114.80	--------	--------	---------	---------
911.05	91.32	90.81	V	27.98	119.30	118.79	--------	--------	---------	---------
1822.1	84.77	69.76	H	-3.84	80.93	---------	99.3	---------	18.37	---------
1822.1	82.43	68.84	V	-3.83	78.60	---------	99.3	---------	20.70	---------
2733.15	70.75	61.42	H	-0.32	70.43	38.01	74.0	54.0	3.57	15.99
2733.15	70.20	63.26	V	-0.57	69.63	39.59	74.0	54.0	4.37	14.41
3644.2	68.65	50.40	H	2.63	71.28	29.93	74.0	54.0	2.72	24.07
3644.2	61.54	43.58	V	2.66	64.20	23.14	74.0	54.0	9.80	30.86
4555.25	53.31	41.46	H	4.34	57.65	22.70	74.0	54.0	16.35	31.30
4555.25	57.14	44.09	V	4.26	61.40	25.25	74.0	54.0	12.60	28.75
5466.3	60.19	42.69	H	6.11	66.30	---------	99.3	---------	33.00	---------
5466.3	67.50	46.64	V	6.30	73.80	---------	99.3	---------	25.50	---------
6377.35	51.41	36.55	H	8.01	59.42	---------	99.3	---------	39.88	---------
6377.35	57.45	41.04	V	7.94	65.39	---------	99.3	---------	33.91	---------
7288.4	50.79	36.30	V	9.99	60.78	23.19	74.0	54.0	13.22	30.81
8199.45	50.19	35.68	H	10.55	60.74	23.13	74.0	54.0	13.26	30.87
8199.45	51.96	37.33	V	10.61	62.57	24.84	74.0	54.0	11.43	29.16
9110.5	49.12	35.08	V	11.17	60.29	23.15	74.0	54.0	13.71	30.85
Middle Channel										
915.93	85.52	85.01	H	28.56	114.08	113.57	--------	--------	---------	---------
915.93	89.10	88.46	V	27.88	116.98	116.34	--------	--------	---------	---------
1831.86	81.41	64.42	H	-3.81	77.60	---------	97.0	---------	19.38	---------
1831.86	84.39	71.35	V	-3.81	80.58	---------	97.0	---------	16.40	---------
2747.79	71.19	60.57	H	-0.28	70.91	37.19	74.0	54.0	3.09	16.81
2747.79	69.18	59.71	V	-0.53	68.65	36.08	74.0	54.0	5.35	17.92
3663.72	68.07	50.59	H	2.70	70.77	30.19	74.0	54.0	3.23	23.81
3663.72	60.84	43.83	V	2.73	63.57	23.47	74.0	54.0	10.43	30.53
4579.65	53.15	39.85	H	4.38	57.53	21.13	74.0	54.0	16.47	32.87
4579.65	56.59	42.55	V	4.31	60.90	23.76	74.0	54.0	13.10	30.24
5495.58	58.29	41.37	H	6.17	64.46	---------	97.0	---------	32.52	---------
5495.58	65.76	45.77	V	6.37	72.13	---------	97.0	---------	24.85	---------
6411.51	51.94	37.25	H	8.10	60.04	---------	97.0	---------	36.94	---------
6411.51	57.91	40.92	V	8.02	65.93	---------	97.0	---------	31.05	---------
7327.44	49.79	34.52	V	10.03	59.82	21.45	74.0	54.0	14.18	32.55
8243.37	49.00	33.96	H	10.59	59.59	21.45	74.0	54.0	14.41	32.55
8243.37	50.55	35.66	V	10.64	61.19	23.20	74.0	54.0	12.81	30.80
9159.3	49.04	34.83	V	11.20	60.24	22.94	74.0	54.0	13.76	31.06
High Channel										
920.07	86.69	85.95	H	28.60	115.29	114.55	--------	--------	---------	---------
920.07	89.53	88.87	V	27.80	117.33	116.67	--------	--------	---------	---------
1840.14	86.86	71.11	H	-3.79	83.07	---------	97.3	---------	14.26	---------
1840.14	84.66	69.70	V	-3.79	80.87	---------	97.3	---------	16.46	---------
2760.21	70.96	61.73	H	-0.25	70.71	38.39	74.0	54.0	3.29	15.61
2760.21	70.30	63.56	V	-0.49	69.81	39.97	74.0	54.0	4.19	14.03
3680.28	65.95	49.92	H	2.76	68.71	29.58	74.0	54.0	5.29	24.42
3680.28	62.06	45.55	V	2.80	64.86	25.25	74.0	54.0	9.14	28.75
4600.35	55.94	44.35	H	4.42	60.36	25.67	74.0	54.0	13.64	28.33
4600.35	56.80	44.17	V	4.36	61.16	25.43	74.0	54.0	12.84	28.57
5520.42	58.27	41.26	H	6.21	64.48	---------	97.3	---------	32.85	---------
5520.42	67.48	46.32	V	6.41	73.89	---------	97.3	---------	23.44	---------
6440.49	51.64	37.03	H	8.18	59.82	---------	97.3	---------	37.51	---------
6440.49	57.40	40.81	V	8.09	65.49	---------	97.3	---------	31.84	---------
7360.56	51.12	36.40	V	10.07	61.19	23.37	74.0	54.0	12.81	30.63
8280.63	50.31	35.51	H	10.62	60.93	23.03	74.0	54.0	13.07	30.97
8280.63	49.95	35.75	V	10.66	60.61	23.31	74.0	54.0	13.39	30.69

***** *The magnitude of all emissions not reported were below the noise floor of the measurement system.*

Table 7.5.2-3: Radiated Spurious Emissions Pit Unit - Patch Antenna

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg	(H/V)	(dB)	pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
Low Channel										
911.05	88.65	88.03	H	28.51	117.16	116.54	--------	--------	---------	---------
911.05	88.06	87.28	V	27.98	116.04	115.26	--------	--------	---------	---------
1822.1	83.14	68.58	H	-3.84	79.30	---------	97.2	---------	17.86	---------
1822.1	83.55	65.81	V	-3.83	79.72	---------	97.2	---------	17.44	---------
2733.15	65.80	58.43	H	-0.32	65.48	35.02	74.0	54.0	8.52	18.98
2733.15	62.25	56.40	V	-0.57	61.68	32.73	74.0	54.0	12.32	21.27
3644.2	63.00	48.04	H	2.63	65.63	27.57	74.0	54.0	8.37	26.43
3644.2	56.16	42.42	V	2.66	58.82	21.98	74.0	54.0	15.18	32.02
4555.25	56.70	43.19	H	4.34	61.04	24.43	74.0	54.0	12.96	29.57
4555.25	56.87	44.82	V	4.26	61.13	25.98	74.0	54.0	12.87	28.02
5466.3	53.84	39.84	H	6.11	59.95	---------	97.2	---------	37.21	---------
5466.3	60.35	44.37	V	6.30	66.65	---------	97.2	---------	30.51	---------
6377.35	50.37	35.72	H	8.01	58.38	---------	97.2	---------	38.78	---------
6377.35	57.40	40.77	V	7.94	65.34	---------	97.2	---------	31.82	---------
7288.4	50.19	35.88	V	9.99	60.18	22.77	74.0	54.0	13.82	31.23
8199.45	49.64	34.90	V	10.61	60.25	22.41	74.0	54.0	13.75	31.59
9110.5	51.81	37.13	V	11.17	62.98	25.20	74.0	54.0	11.02	28.80
Middle Channel										
915.93	87.97	87.21	H	28.56	116.53	115.77	--------	--------	---------	---------
915.93	86.59	86.07	V	27.88	114.47	113.95	--------	--------	---------	---------
1831.86	82.05	68.26	H	-3.81	78.24	---------	96.5	---------	18.29	---------
1831.86	80.80	63.66	V	-3.81	76.99	---------	96.5	---------	19.54	---------
2747.79	66.34	56.20	H	-0.28	66.06	32.82	74.0	54.0	7.94	21.18
2747.79	65.12	52.27	V	-0.53	64.59	28.64	74.0	54.0	9.41	25.36
3663.72	56.53	44.32	H	2.70	59.23	23.92	74.0	54.0	14.77	30.08
3663.72	55.19	42.31	V	2.73	57.92	21.95	74.0	54.0	16.08	32.05
4579.65	55.24	42.55	H	4.38	59.62	23.83	74.0	54.0	14.38	30.17
4579.65	56.08	42.63	V	4.31	60.39	23.84	74.0	54.0	13.61	30.16
5495.58	51.45	38.74	H	6.17	57.62	---------	96.5	---------	38.91	---------
5495.58	59.31	44.44	V	6.37	65.68	---------	96.5	---------	30.85	---------
6411.51	49.28	34.57	H	8.10	57.38	---------	96.5	---------	39.15	---------
6411.51	54.76	39.47	V	8.02	62.78	---------	96.5	---------	33.75	---------
7327.44	50.38	35.70	V	10.03	60.41	22.63	74.0	54.0	13.59	31.37
9159.3	50.08	35.55	V	11.20	61.28	23.66	74.0	54.0	12.72	30.34
High Channel										
920.07	88.66	88.06	H	28.60	117.26	116.66	--------	--------	---------	---------
920.07	89.09	88.40	V	27.80	116.89	116.20	--------	--------	---------	---------
1840.14	82.38	66.83	H	-3.79	78.59	---------	97.3	---------	18.67	---------
1840.14	82.58	67.71	V	-3.79	78.79	---------	97.3	---------	18.47	---------
2760.21	66.47	57.90	H	-0.25	66.22	34.56	74.0	54.0	7.78	19.44
2760.21	60.71	54.31	V	-0.49	60.22	30.72	74.0	54.0	13.78	23.28
3680.28	57.56	40.79	H	2.76	60.32	20.45	74.0	54.0	13.68	33.55
3680.28	56.22	39.10	V	2.80	59.02	18.80	74.0	54.0	14.98	35.20
4600.35	53.75	41.38	H	4.42	58.17	22.70	74.0	54.0	15.83	31.30
4600.35	54.43	41.40	V	4.36	58.79	22.66	74.0	54.0	15.21	31.34
5520.42	51.28	38.18	H	6.21	57.49	---------	97.3	---------	39.76	---------
5520.42	58.23	43.44	V	6.41	64.64	---------	97.3	---------	32.62	---------
6440.49	52.27	38.17	V	8.09	60.36	---------	97.3	---------	36.90	---------
7360.56	50.85	35.98	V	10.07	60.92	22.95	74.0	54.0	13.08	31.05
9200.7	49.99	34.53	V	11.23	61.22	---------	97.3	---------	36.03	---------

***** *The magnitude of all emissions not reported were below the noise floor of the measurement system.*

7.5.2.4 Sample Calculation:

$R_C = R_U + CF_T$

Where:

CF_T	=	Total Correction Factor (AF+CA+AG)-DC (Average Measurements Only)
R_U	=	Uncorrected Reading
R_C	=	Corrected Level
AF	=	Antenna Factor
CA	=	Cable Attenuation
AG	=	Amplifier Gain
DC	=	Duty Cycle Correction Factor

Example Calculation

PEAK:
Corrected Level: 66.47- .25= 66.22dBuV
Margin: 74dBuV – 66.22dBuV = 7.78dB

AVERAGE:
Corrected Level: 57.90- .25-23.04= 34.56dBuV
Margin: 54dBuV – 34.56dBuV = 19.44dB

8.0 CONCLUSION
In the opinion of ACS, Inc. the E-Coder)R900i, manufactured by Neptune Technology Group, Inc. meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT