Excellence in Compliance Testing

Certification Test Report

Test Report

FCC ID: P2SNTGECR900DL
IC: 4171B-ECR900DL

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

ACS Report Number: 08-0157-15C - DSS

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

Test Begin Date: April 24,2008
Test End Date: April 28, 2008

Report Issue Date: June 3, 2008

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.

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This report contains 21 pages

Table of Contents

1.0 General 3
1.1 Purpose 3
1.2 Product Description 3
1.2.1 General 3
1.2.2 Intended Use 3
1.3 Test Methodology and Considerations 3
2.0 Test Facilities 4
2.1 Location 4
2.2 Laboratory Accreditations/Recognitions/Certifications 4
2.3 Radiated Emissions Test Site Description 5
2.3.1 Semi-Anechoic Chamber Test Site 5
2.3.2 Open Area Tests Site (OATS) 6
2.4 Conducted Emissions Test Site Description 7
3.0 Applicable Standards and References 7
4.0 List of Test Equipment 8
5.0 Support Equipment 9
6.0 EUT Setup Block Diagram 9
7.0 Summary of Tests 10
7.1 Antenna Requirement 10
7.2 Power Line Conducted Emissions 10
7.3 Peak Output Power 10
7.3.1 Test Methodology 10
7.3.2 Test Results 10
7.4 Channel Usage 12
7.4.1 Carrier Frequency Separation 12
7.4.1.1 Test Methodology 12
7.4.1.2 Test Results 12
7.4.2 Number of Hopping Channels 12
7.4.3 Channel Dwell Time 13
7.4.3.1 Test Methodology 13
7.4.3.2 Test Results 13
7.4.4 20dB Bandwidth 13
7.4.4.1 Test Methodology 13
7.4.4.2 Test Results 13
7.5 Band-edge Compliance and Spurious Emissions 15
7.5.1 Band-edge Compliance of RF Conducted Emissions 15
7.5.1.1 Test Methodology 15
7.5.1.2 Test Results 15
7.5.2 RF Conducted Spurious Emissions 16
7.5.2.1 Test Methodology 16
7.5.2.2 Test Results 16
7.5.3 Radiated Spurious Emissions – Intentional Radiation (Restricted Bands) 19
7.5.3.1 Test Methodology 19
7.5.3.2 Duty Cycle Correction 19
7.5.3.3 Test Results 19
7.5.3.4 Sample Calculations 21
8.0 CONCLUSION 21

Additional Exhibits Included In Filing

Internal Photographs
External Photographs
Test Setup Photographs
Product Labeling
RF Exposure – MPE Calculations
Installation/Users Guide
Theory of Operation
BOM (Parts List)
System Block Diagram
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)R900iDL is combination encoder register and transmitter which collects meter-usage data and transmits the data for collection by the meter reader. The E-Coder)R900iDL provides water utilities with a reliable and economical RF reading solution. Data transmitted by the E-Coder)R900iDL is received by the Neptune walk-by or drive-by data collection system and stored for downloading at the utility office. The E-Coder)R900DLi is a one-way communication device that transmits data using frequency-hopping spread-spectrum technology to ensure data security and improve meter reading accuracy. The E-Coder)R900iDL also communicates using a single channel data logging mode.

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)R900iDL's intended use is to transmit meter-usage data for collection by water utility companies.

1.3 Test Methodology and Considerations

The device uses two modes of operations. There is a frequency hopping mode and a single channel data log mode. The frequency hopping mode is compliant to FCC 15.247 and is covered under this test report. A separate report covers the signal channel data mode under 15.249.

The E-Coder)R900iDL 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 Wire Inside Antenna (Neptune Technology Group, Inc. model number 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 (Lid Mount Pit Antenna (Neptune Technology Group, Inc. model number 12527-200)). The second is a Slip On Pit Antenna (Neptune Technology Group, Inc. model number 12690-001). It is a monopole antenna. Both antennas connect to the transmitter with the same custom sealed structure with an F-type male connector. All antenna type where evaluated and data presented in this report.

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:

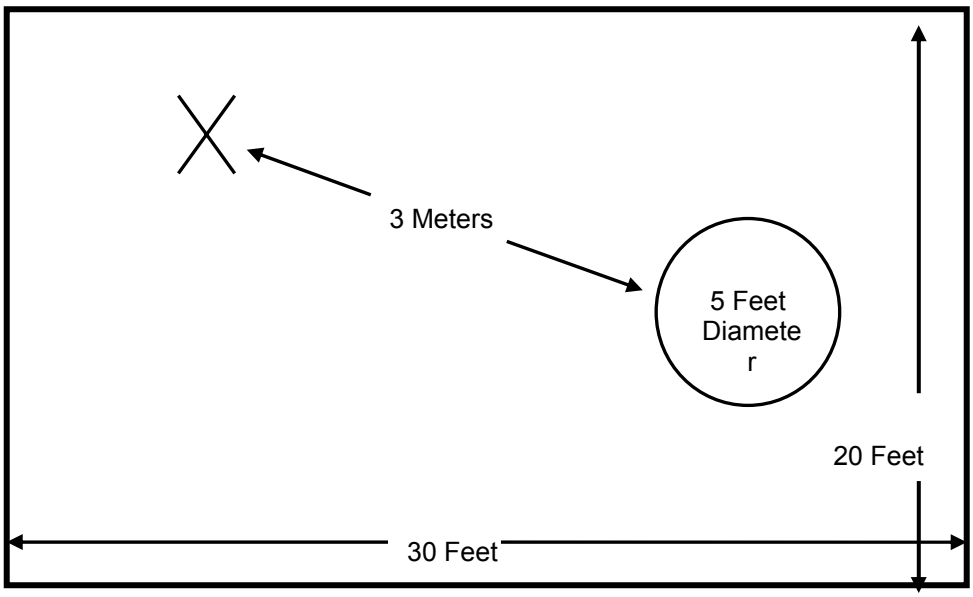

Figure 2.3-1: Semi-Anechoic Chamber Test Site

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:

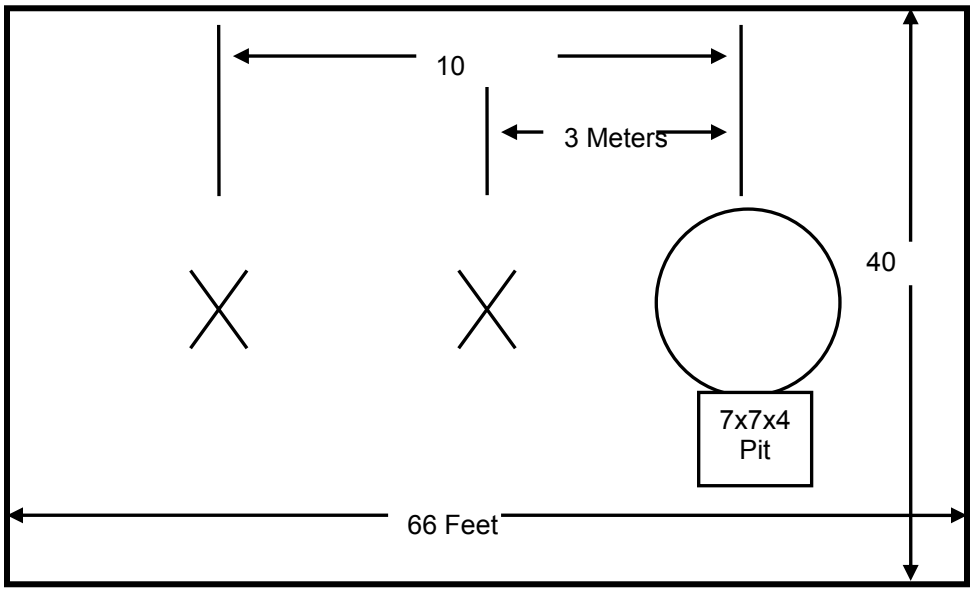

Figure 2.3-2: Open Area Test Site

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:

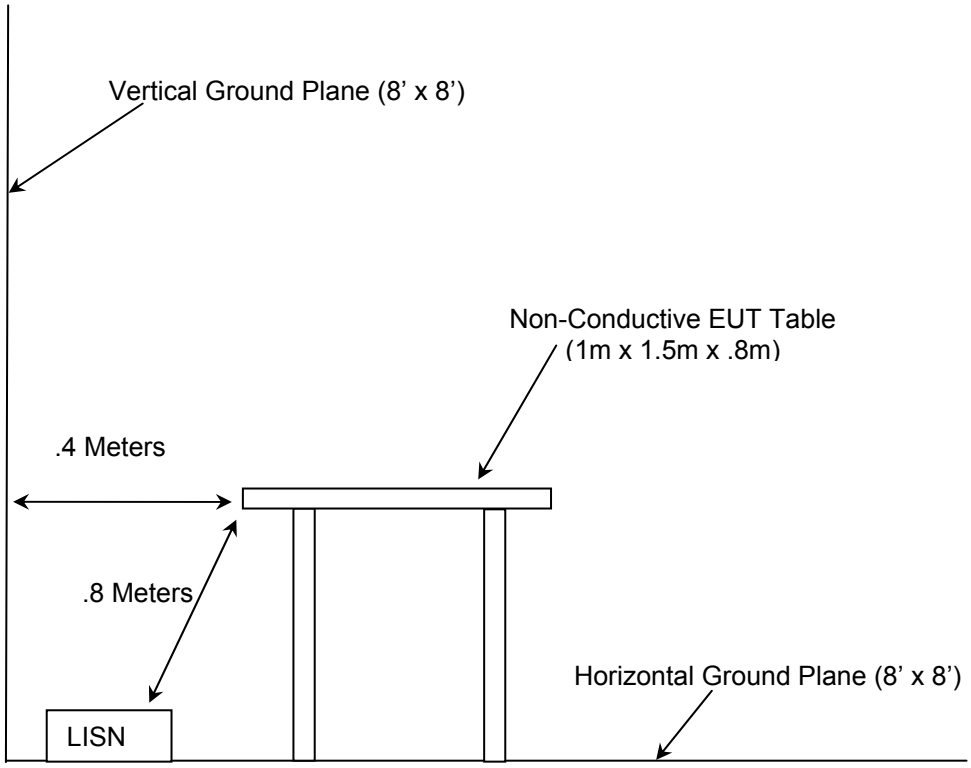

Figure 2.4-1: AC Mains Conducted EMI Site

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, 2007
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2007
- 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**
1	Rohde & Schwarz	Spectrum Analyzers	ESMI - Display	833771/007	10-26-2008
2	Rohde & Schwarz	Spectrum Analyzers	ESMI-Receiver	839587/003	10-26-2008
22	Agilent	Amplifiers	8449B	3008A00526	10-25-2008
25	Chase	Antennas	CBL6111	1043	06-06-2008
30	Spectrum Technologies	Antennas	DRH-0118	970102	05-10-2008
73	Agilent	Amplifiers	8447D	2727A05624	12-19-2008
167	ACS	Cable Set	Chamber EMI Cable Set	167	01-04-2009
283	Rohde & Schwarz	Spectrum Analyzers	FSP40	1000033	11-09-2008
291	Florida RF Cables	Cables	SMRE-200W-12.0-SMRE	None	11-21-2008
292	Florida RF Cables	Cables	SMR-290AW-480.0-SMR	None	11-21-2008
324	ACS	Cables	Belden	8214	07-10-2008
337	Microwave Circuits	Filters	H1G513G1	282706	08-28-2008
422	Florida RF	Cables	SMS-200AW-72.0-SMR	805	02-25-2009

5.0 SUPPORT EQUIPMENT

Table 5-3: Support Equipment

Manufacturer	Equipment Type	Model Number	Serial Number	FCC ID
EUT Was Stand-Alone and Self Supporting				

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

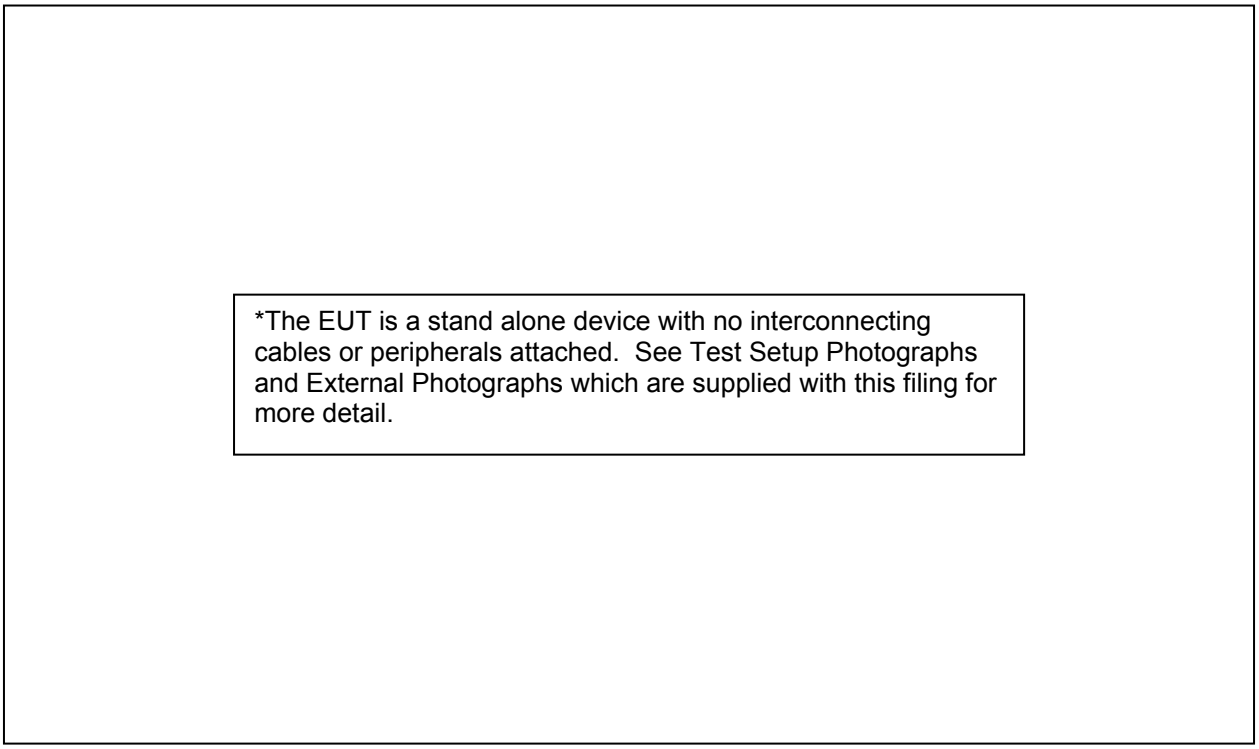

Figure 6-1: EUT Test Setup

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 EUT is professionally installed.

7.2 Power Line Conducted Emissions

The EUT is powered by an internal battery and is therefore not designed to be connected to the public utility (AC) power line. No Power line conducted emissions testing was performed.

7.3 Peak Output Power

7.3.1 Test Methodology (Conducted Method)

The 20dB bandwidth of the EUT was within the resolution bandwidth of spectrum analyzer, therefore the power measurement was made using the spectrum analyzer method. The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The resolution and video bandwidth were set to > 20 dB bandwidth of the emission measured. The device employs ≥50 channels therefore the power is limited to 1 Watt.

7.3.2 Test Results

Results are shown below in table 7.3-1 and figure 7.3-1 to 7.3-3:

Table 7.3-1: RF Output Power

Frequency [MHz]	Level [dBm]
911.0815	16.13
915.2758	16.69
919.0779	16.86

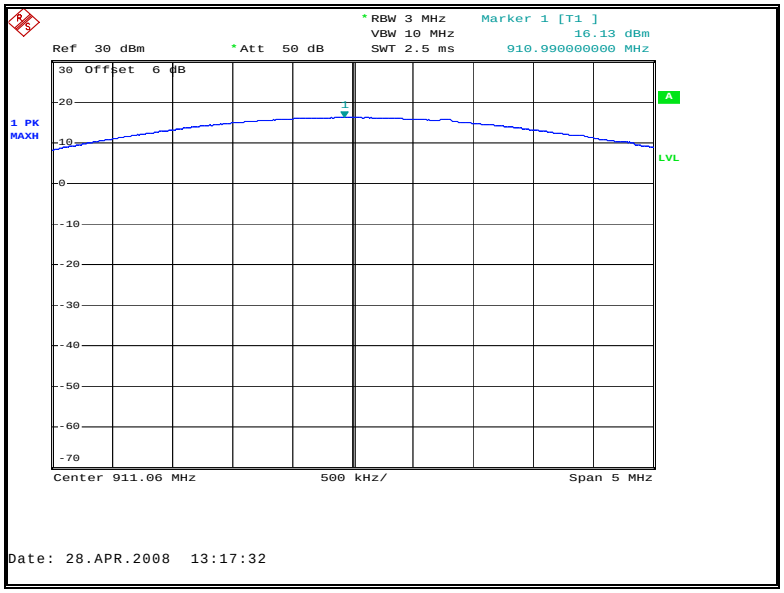

Figure 7.3-1: Output power – Low Channel

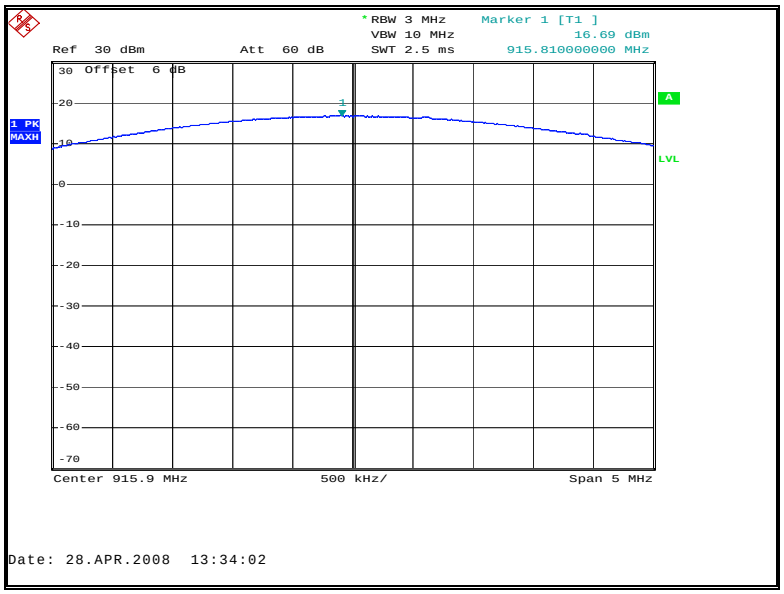

Figure 7.3-2: Output power – Mid Channel

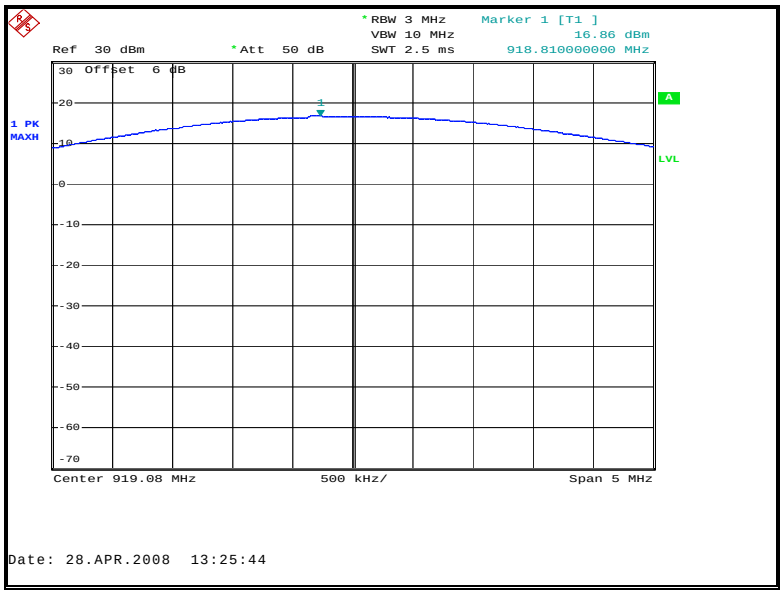

Figure 7.3-3: Output power – High Channel

7.4 Channel Usage Requirements

7.4.1 Carrier Frequency Separation

7.4.1.1 Test Methodology

The span of the spectrum analyzer was set wide enough to capture two adjacent peaks and the RBW and VBW were set to ≥ 1% of the span.

7.4.1.2 Test Results

The maximum 20dB bandwidth of the hopping channel was measured to be 76.8 kHz (See figure 7.4.4-1 to 7.4.4-3 below). The adjacent channel separation was measured to be 131.58 kHz. Results are shown in figure 7.4.1-1 below:

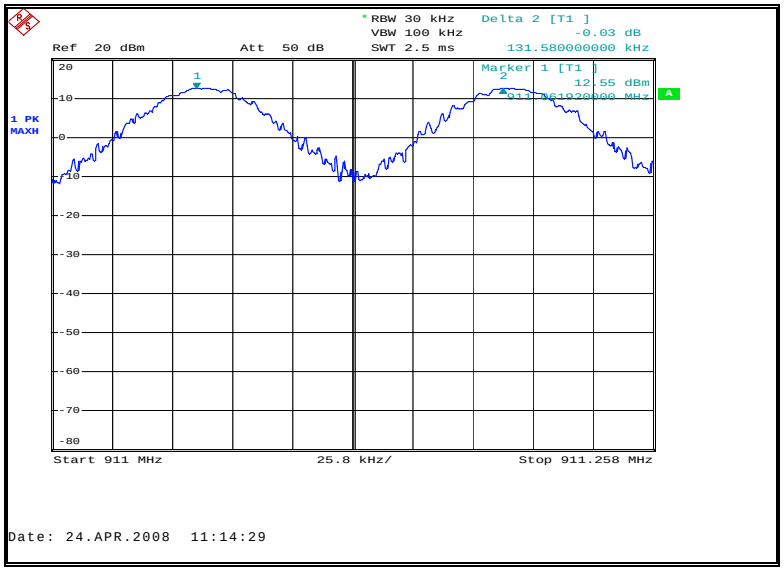

Figure 7.4.1-1: Carrier Frequency Separation

7.4.2 Number of Hopping Channels

The 20dB bandwidth of the device is less than 250 kHz. The device employs 50 hopping channels as required. Results are shown in Figure 7.4.2-1 below:

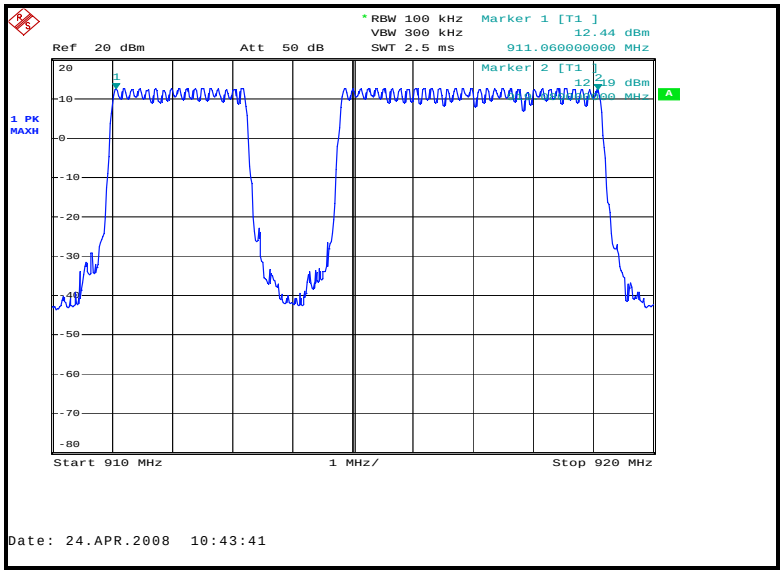

Figure 7.4.2-1: Number of Hopping Channels

7.4.3 Channel Dwell Time

7.4.3.1 Test Methodology

The emission measured centered on the analyzer and the span set to 0 Hz. The RBW was set to 1 MHz and the VBW to 3MHz. Sweep time was set to 10 ms to capture the burst duration of the emission. The marker – delta function of the analyzer was employed to measure the burst duration.

7.4.3.2 Test Results

The duration of the RF transmission is 7.08 ms. There is a minimum 10 second rest period in which the device hops to another channel according to the pseudorandom frequency table before transmitting another 7.08 ms burst. Therefore the average time of occupancy on any channel in a 20 second period is 7.048ms. A single transmission is shown in figure 7.4.3-1 below:

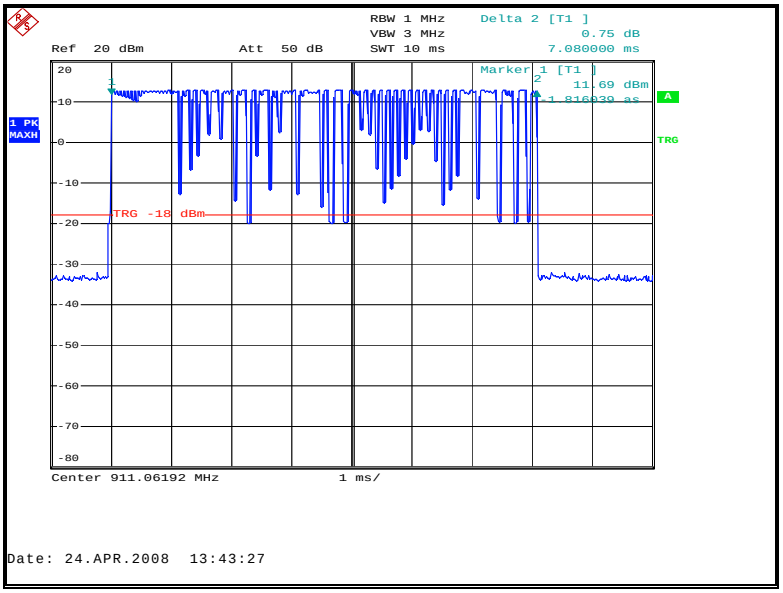

Figure 7.4.3-1: Channel Dwell Time

7.4.4 20dB Bandwidth

7.4.4.1 Test Methodology

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. 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.

7.4.4.2 Test Results

The maximum 20dB bandwidth was found to be approximately 76.8 kHz. Results are shown below in Table 7.4.4-1 and Figures 7.4.4-1 through 7.4.4-3.

Table 7.4.4-1: 20dB Bandwidth

Frequency	20dB Bandwidth
911.0815	72.4 kHz
915.2758	73.6 kHz
919.0779	76.8 kHz

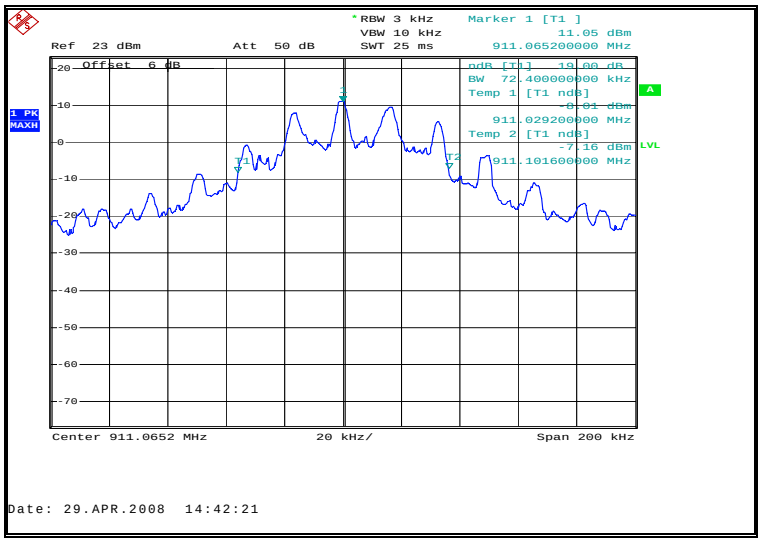

Figure 7.4.4-1: 20dB Bandwidth Low Channel

Figure 7.4.4-2: 20dB Bandwidth Mid Channel

Figure 7.4.4-3: 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 RF output port of the EUT was directly connected to the input of the spectrum analyzer. The EUT was investigated at the lowest and highest channel available to determine band-edge compliance. 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 300kHz.

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 to 7.5.1-4

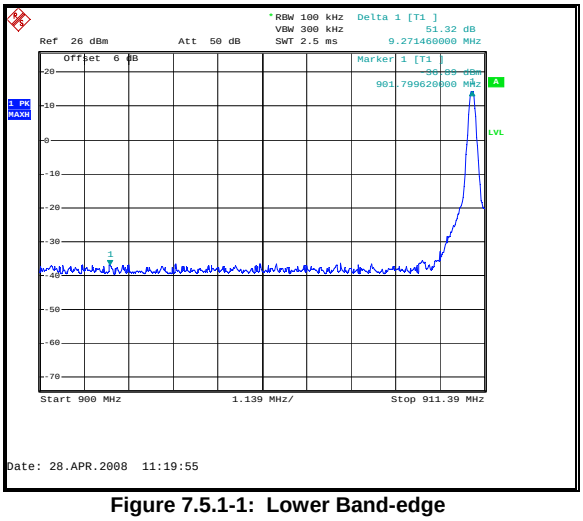

Figure 7.5.1-1: Lower Band-edge

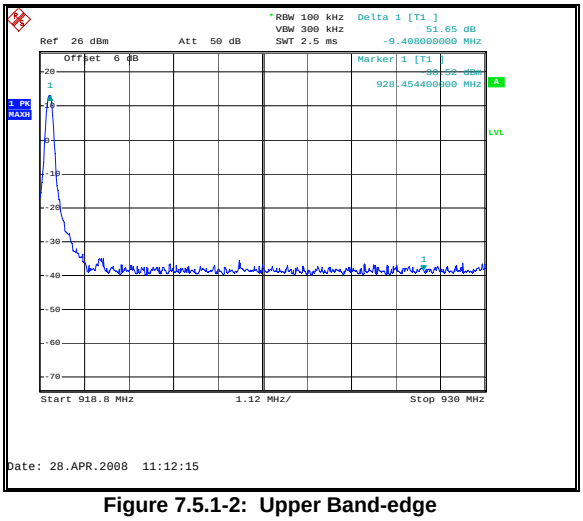

Figure 7.5.1-2: Upper Band-edge

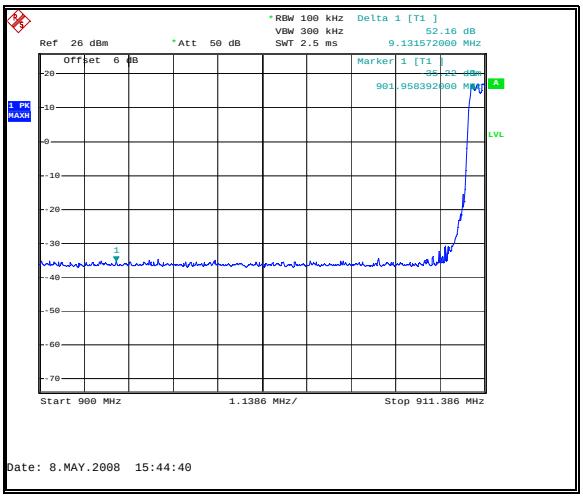

Figure 7.5.1-3: Lower Band-edge (Hopping Enabled)

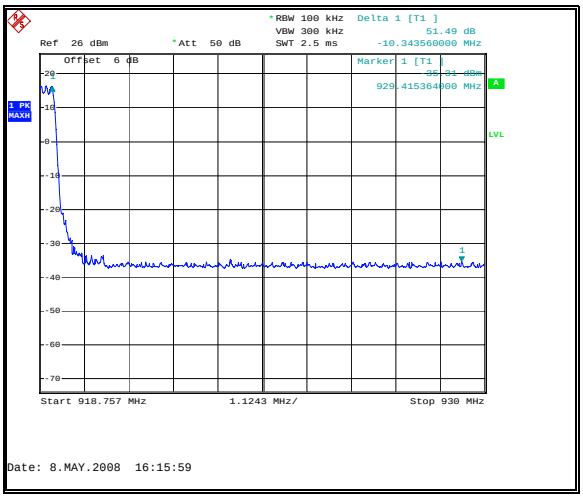

Figure 7.5.1-4: Upper Band-edge (Hopping Enabled)

7.5.2 RF Conducted Spurious Emissions

7.5.2.1 Test Methodology

The RF output port of the EUT was directly connected to the input of the spectrum analyzer. The EUT was investigated for conducted spurious emissions from 30MHz to 10GHz, 10 times the highest fundamental frequency. Measurements were made at the low, center and high channels of the EUT. For each measurement, the spectrum analyzer's RBW was set to 100kHz. A peak detector function was used with the trace set to max hold.

7.5.2.1 Test Results

All emission found were greater than 20dB down from the fundamental carrier. Results are shown below in Figure 7.5.2-1 through 7.5.2-6.

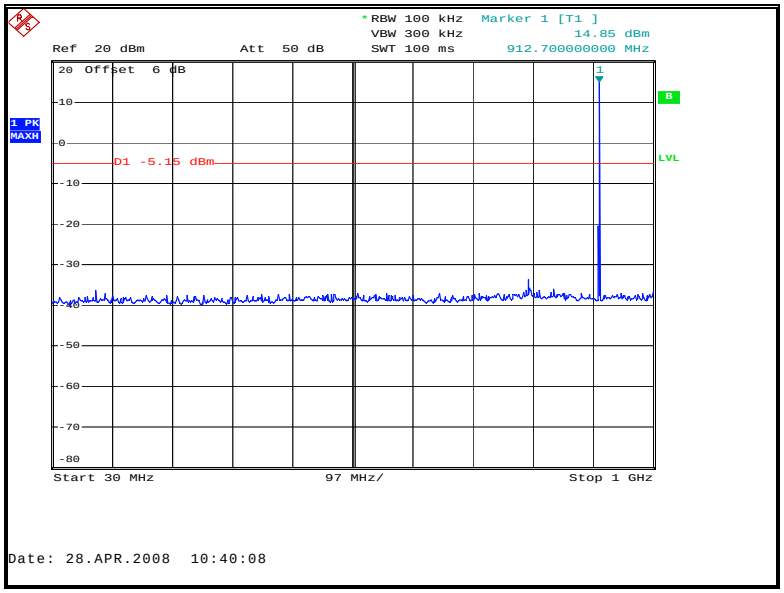

Figure 7.5.2-1 RF Conducted Spurious Emissions – Low Channel

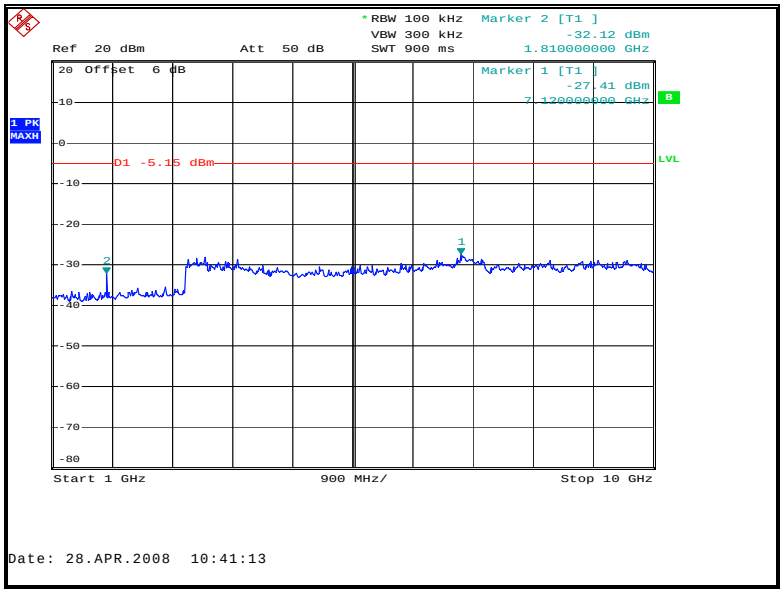

Figure 7.5.2-2 RF Conducted Spurious Emissions – Low Channel

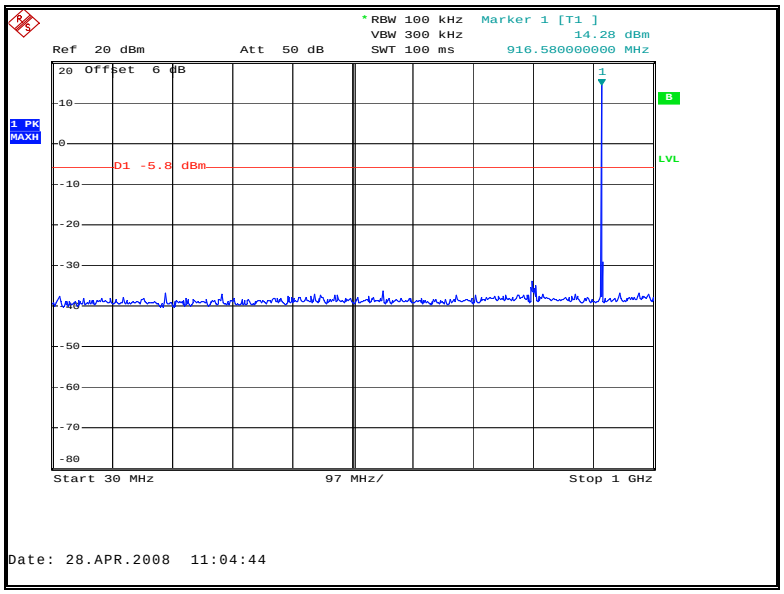

Figure 7.5.2-3 RF Conducted Spurious Emissions – Mid Channel

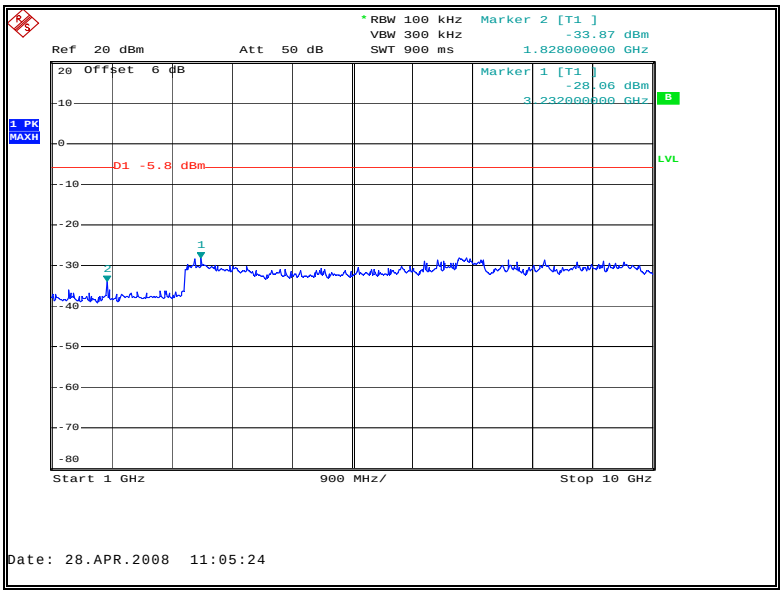

Figure 7.5.2-4 RF Conducted Spurious Emissions – Mid Channel

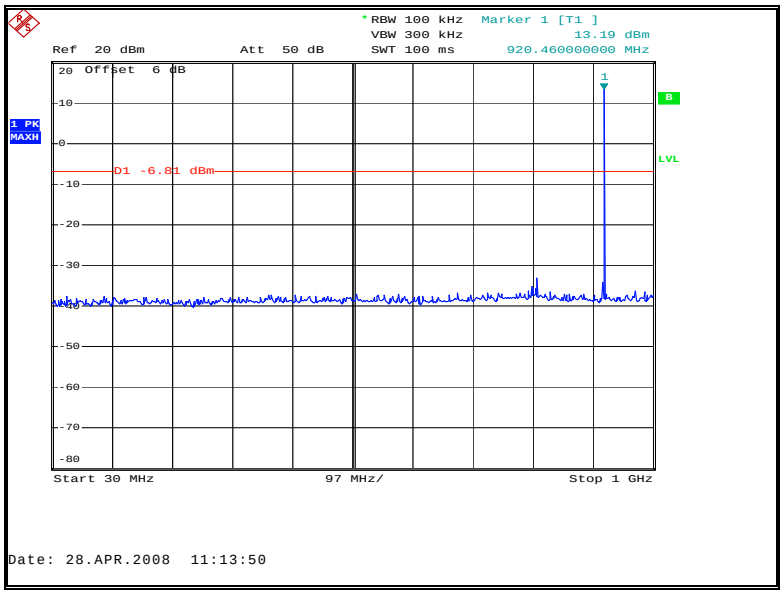

Figure 7.5.2-5 RF Conducted Spurious Emissions – High Channel

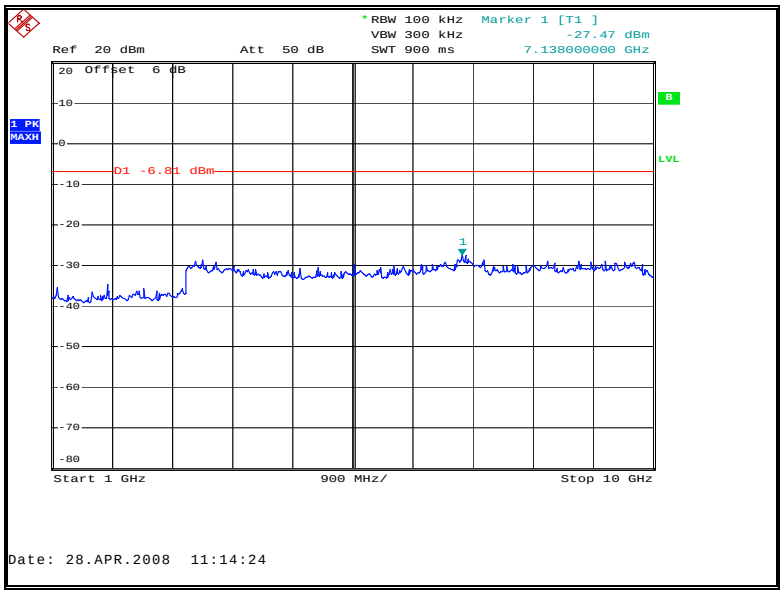

Figure 7.5.2-6 RF Conducted Spurious Emissions – High Channel

7.5.3 Radiated Spurious Emissions – Intentional Radiation

7.5.3.1 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, average measurements were made using an RBW of 1 MHz and a VBW of 10 Hz and peak measurements were made with RBW of 1 MHz and a VBW of 1 MHz.

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

7.5.3.2 Duty Cycle Correction

For average radiated measurements in restricted bands, the measured level was reduced by a factor 23 dB to account for the duty cycle of the EUT. The EUT transmits for 7.048mS 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%. The duty cycle correction factor is determined using the formula: 20log (7.08/100) = 23dB. See Section 7.4.3 for details.

7.5.3.3 Test Results

Results are shown below in Figure 7.5.3.3-1 through 7.5.3.3-3.

7.5.3.3.1 Test Results - Wire Inside Antenna (model number 12641-001)

Table 7.5.3.3-1: Radiated Spurious Emissions - Wire Inside Antenna (model number 12641-001)

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										
2733.18	65.62	52.74	H	0.63	66.25	30.37	74.0	54.0	7.75	23.63
2733.18	70.34	60.03	V	0.38	70.72	37.41	74.0	54.0	3.28	16.59
3644.24	63.99	48.66	H	3.61	67.60	29.27	74.0	54.0	6.40	24.73
3644.24	56.45	42.46	V	3.64	60.09	23.10	74.0	54.0	13.91	30.90
4555.3	57.09	47.21	H	5.88	62.97	30.09	74.0	54.0	11.03	23.91
4555.3	54.45	40.26	V	5.81	60.26	23.06	74.0	54.0	13.74	30.94
7288.48	50.26	33.11	H	12.39	62.65	22.50	74.0	54.0	11.35	31.50
7288.48	51.50	33.67	V	12.45	63.95	23.12	74.0	54.0	10.05	30.88
8199.54	50.18	33.93	H	12.55	62.73	23.48	74.0	54.0	11.27	30.52
8199.54	50.74	34.56	V	12.61	63.35	24.17	74.0	54.0	10.65	29.83
Middle Channel										
2747.79	69.07	55.87	H	0.68	69.75	33.55	74.0	54.0	4.25	20.45
2747.79	66.61	56.35	V	0.43	67.04	33.78	74.0	54.0	6.96	20.22
3663.72	61.23	49.27	H	3.69	64.92	29.97	74.0	54.0	9.08	24.03
3663.72	55.44	42.76	V	3.73	59.17	23.49	74.0	54.0	14.83	30.51
4579.65	54.12	47.46	H	5.94	60.06	30.40	74.0	54.0	13.94	23.60
4579.65	48.91	39.26	V	5.87	54.78	22.13	74.0	54.0	19.22	31.87
7327.44	46.16	31.11	H	12.42	58.58	20.53	74.0	54.0	15.42	33.47
7327.44	47.84	32.10	V	12.49	60.33	21.59	74.0	54.0	13.67	32.41
9159.3	46.72	32.12	H	13.13	59.85	22.25	74.0	54.0	14.15	31.75
9159.3	48.58	33.19	V	13.26	61.84	23.45	74.0	54.0	12.16	30.55
High Channel										
2757.168	64.65	52.49	H	0.72	65.37	30.21	74.0	54.0	8.63	23.79
2757.168	66.96	59.12	V	0.47	67.43	36.59	74.0	54.0	6.57	17.41
3676.224	60.34	48.35	H	3.75	64.09	29.10	74.0	54.0	9.91	24.90
3676.224	54.72	43.15	V	3.79	58.51	23.94	74.0	54.0	15.49	30.06
4595.28	52.57	41.67	H	5.97	58.54	24.65	74.0	54.0	15.46	29.35
4595.28	52.11	39.89	V	5.91	58.02	22.80	74.0	54.0	15.98	31.20
8271.504	50.59	33.44	V	12.69	63.28	23.13	74.0	54.0	10.72	30.87

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

7.5.3.3.2 Test Results - Lid Mount Pit Antenna (model number 12527-200)

Table 7.5.3.3-2: Radiated Spurious Emissions - Lid Mount Pit Antenna (model number 12527-200)

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										
2733.18	67.88	55.59	H	0.63	68.51	33.22	74.0	54.0	5.49	20.78
2733.18	63.82	56.07	V	0.38	64.20	33.45	74.0	54.0	9.80	20.55
3644.24	62.67	51.58	H	3.61	66.28	32.19	74.0	54.0	7.72	21.81
3644.24	55.26	44.29	V	3.64	58.90	24.93	74.0	54.0	15.10	29.07
4555.3	51.42	41.42	H	5.88	57.30	24.30	74.0	54.0	16.70	29.70
4555.3	51.55	38.80	V	5.81	57.36	21.61	74.0	54.0	16.64	32.39
8199.54	50.08	33.14	V	12.61	62.69	22.75	74.0	54.0	11.31	31.25
9110.6	47.64	31.90	V	13.22	60.86	22.12	74.0	54.0	13.14	31.88
Middle Channel										
2747.79	68.92	56.17	H	0.68	69.60	33.85	74.0	54.0	4.40	20.15
2747.79	65.52	59.14	V	0.43	65.95	36.57	74.0	54.0	8.05	17.43
3663.72	63.36	50.81	H	3.69	67.05	31.51	74.0	54.0	6.95	22.49
3663.72	56.76	45.35	V	3.73	60.49	26.08	74.0	54.0	13.51	27.92
4579.65	51.40	42.87	H	5.94	57.34	25.81	74.0	54.0	16.66	28.19
4579.65	49.49	38.88	V	5.87	55.36	21.75	74.0	54.0	18.64	32.25
8243.37	48.88	32.71	V	12.66	61.54	22.37	74.0	54.0	12.46	31.63
9159.3	46.99	31.03	V	13.26	60.25	21.29	74.0	54.0	13.75	32.71
High Channel										
2757.168	68.39	58.91	H	0.72	69.11	36.63	74.0	54.0	4.89	17.37
2757.168	68.13	60.51	V	0.47	68.60	37.98	74.0	54.0	5.40	16.02
3676.224	63.03	50.33	H	3.75	66.78	31.08	74.0	54.0	7.22	22.92
3676.224	55.05	41.82	V	3.79	58.84	22.61	74.0	54.0	15.16	31.39
4595.28	50.89	44.08	H	5.97	56.86	27.06	74.0	54.0	17.14	26.94
4595.28	51.07	40.20	V	5.91	56.98	23.11	74.0	54.0	17.02	30.89
8271.504	48.45	32.00	V	12.69	61.14	21.69	74.0	54.0	12.86	32.31
9190.56	45.96	30.86	H	13.16	59.12	21.03	74.0	54.0	14.88	32.97
9190.56	48.02	31.46	V	13.29	61.31	21.75	74.0	54.0	12.69	32.25

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

7.5.3.3.3 Test Results - Slip On Pit Antenna (model number 12690-001)

Table 7.5.3.3-3: Radiated Spurious Emissions - Slip On Pit Antenna (model number 12690-001)

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										
2733.18	55.94	46.29	H	0.63	56.57	23.92	74.0	54.0	17.43	30.08
2733.18	57.01	52.62	V	0.38	57.39	30.00	74.0	54.0	16.61	24.00
3644.24	54.45	44.67	H	3.61	58.06	25.28	74.0	54.0	15.94	28.72
3644.24	50.48	38.55	V	3.64	54.12	19.19	74.0	54.0	19.88	34.81
4555.3	50.20	40.73	H	5.88	56.08	23.61	74.0	54.0	17.92	30.39
4555.3	50.23	41.24	V	5.81	56.04	24.05	74.0	54.0	17.96	29.95
8199.54	46.07	31.32	V	12.61	58.68	20.93	74.0	54.0	15.32	33.07
9110.6	47.23	31.29	V	13.22	60.45	21.51	74.0	54.0	13.55	32.49
Middle Channel										
2747.79	58.80	51.60	H	0.68	59.48	29.28	74.0	54.0	14.52	24.72
2747.79	58.00	53.63	V	0.43	58.43	31.06	74.0	54.0	15.57	22.94
3663.72	55.56	44.36	H	3.69	59.25	25.06	74.0	54.0	14.75	28.94
3663.72	50.58	38.22	V	3.73	54.31	18.95	74.0	54.0	19.69	35.05
4579.65	49.95	41.87	H	5.94	55.89	24.81	74.0	54.0	18.11	29.19
4579.65	49.59	37.91	V	5.87	55.46	20.78	74.0	54.0	18.54	33.22
High Channel										
2757.168	58.76	50.99	H	0.72	59.48	28.71	74.0	54.0	14.52	25.29
2757.168	62.01	52.26	V	0.47	62.48	29.73	74.0	54.0	11.52	24.27
3676.224	57.09	44.52	H	3.75	60.84	25.27	74.0	54.0	13.16	28.73
3676.224	52.41	39.56	V	3.79	56.20	20.35	74.0	54.0	17.80	33.65
4595.28	51.86	40.02	H	5.97	57.83	23.00	74.0	54.0	16.17	31.00
4595.28	52.85	42.15	V	5.91	58.76	25.06	74.0	54.0	15.24	28.94
7352.448	49.54	32.71	H	12.45	61.99	22.16	74.0	54.0	12.01	31.84
7352.448	50.03	33.44	V	12.52	62.55	22.96	74.0	54.0	11.45	31.04
9190.56	49.87	33.27	H	13.16	63.03	23.44	74.0	54.0	10.97	30.56
9190.56	51.96	35.78	V	13.29	65.25	26.07	74.0	54.0	8.75	27.93

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

7.5.3.4 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: 65.62 + 0.63= 66.25dBuV Margin: 74dBuV – 66.25dBuV = 7.75dB

AVERAGE:
Corrected Level: 52.74 + 0.63 - 23 = 30.37dBuV Margin: 54dBuV – 30.37dBuV = 23.63dB

8.0 CONCLUSION

In the opinion of ACS, Inc. the E-Coder)R900i DL, 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