Excellence in Compliance Testing

Certification Test Report

FCC ID: P2SNTR900GM
IC: 4171B-NTR900GM

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

ACS Report Number: 09- 0096 - 15C

Manufacturer: Neptune Technology Group, Inc.
Model: R900GM

Test Begin Date: March 30, 2009
Test End Date: March 31, 2009

Report Issue Date: April 6, 2009

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 13 pages

Table of Contents

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 for a class II permissive change. This permissive change is to address the addition of a host device used on National/Lancaster model 175/250 meters.

1.2 Product Description

1.2.1 General

The R900GM is a one-way RF module that operates in the unlicensed 902-928MHz bandwidth. The data is transmitted via a high power signal to an enhanced data collection device, boosting range and meter reading success rates, while reducing meter reading time.

The R900GM will attach to new or existing meters via meter interface units (MIUs), and encodes consumption and tamper information from the meter to a handheld, mobile, or a targeted fixed network reading device.

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

Test Sample Serial Number(s):
2000066559 (R900GM Module)

Test Sample Condition:
The test samples were provided in good working order with no visible defects.

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

1.2.2 Intended Use

The R900GM will be a transmit-only meter module that collects and transmits metering data utilizing the 902 - 928 MHz frequency band for collection by Gas utility companies.

1.3 Test Methodology and Considerations

The R900GM was designed a modular device. A single limited modular approach was followed for determining the appropriate test requirements which included testing the R900GM integrated into specific host enclosures. Those host enclosures are meter interface units (MIU's) and include the following Neptune model for this permissive change:

R900G Endpoint for National/Lancaster

The R900G Endpoint for National/Lancaster with integrated R900GM module was tested as typically installed on a meter. See test setup photographs for additional details.

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:

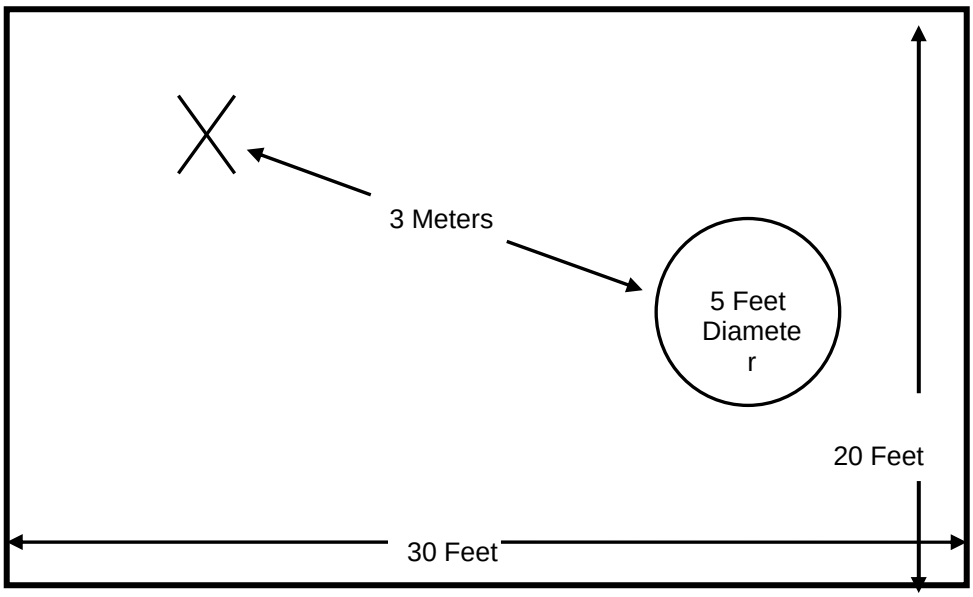

Figure 2.3-1: Semi-Anechoic Chamber Test Site

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:

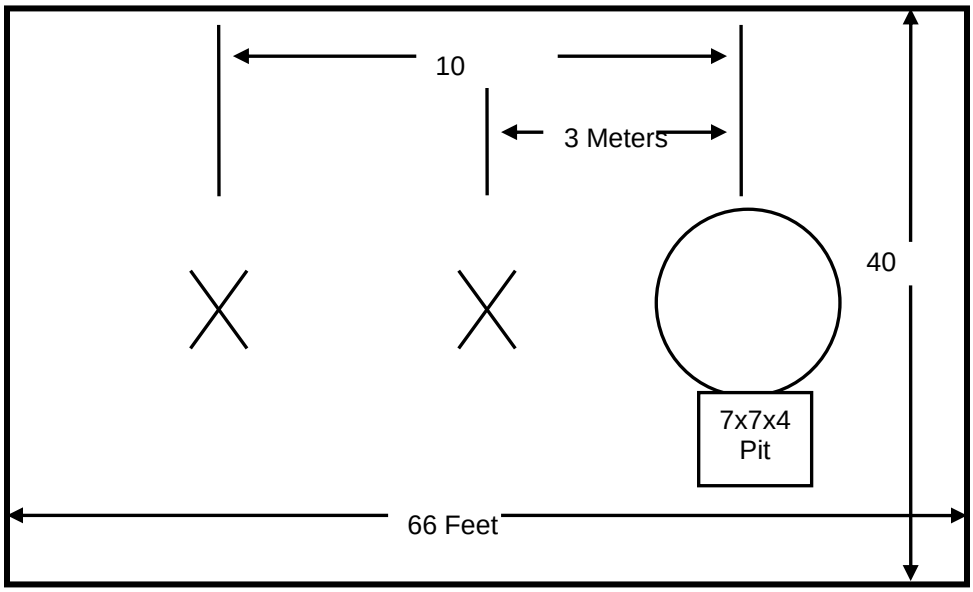

Figure 2.3-2: Open Area Test Site

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:

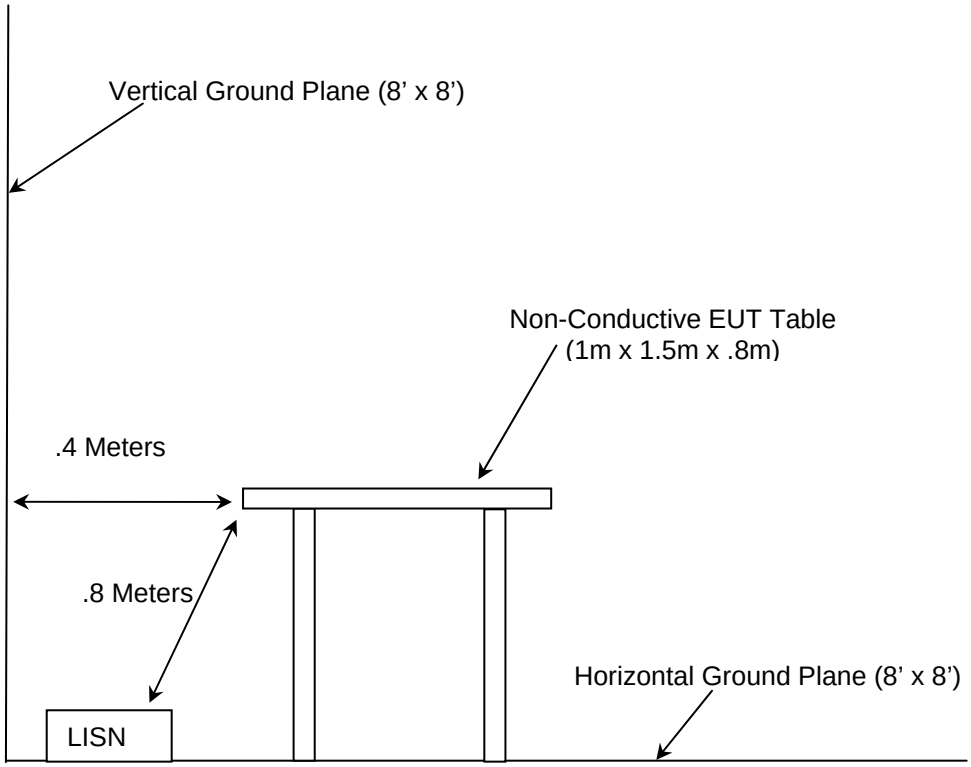

Figure 2.4-1: AC Mains Conducted EMI Site

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, 2008
- US Code of Federal Regulations (CFR): Title 47, Part 15, Subpart C: Radio Frequency Devices, Intentional Radiators, 2008
- 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
- Industry Canada Radio Standards Specification: RSS-GEN – General Requirements and Information for the Certification of Radiocommunication Equipment, Issue2, June 2007.

4.0 LIST OF TEST EQUIPMENT

The calibration interval of test equipment is annually or the manufacturer's recommendations. Where the calibration interval deviates from the annual cycle based on the instrument manufacturer's recommendations, it shall be stated below.

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	09-19-2009
2	Rohde & Schwarz	Spectrum Analyzers	ESMI-Receiver	839587/003	09-19-2009
22	Agilent	Amplifiers	8449B	3008A00526	10-22-2009
25	Chase	Antennas	CBL6111	1043	08-22-2009
30	Spectrum Technologies	Antennas	DRH-0118	970102	05-07-2009
167	ACS	Cable Set	Chamber EMI Cable Set	167	02-06-2010 (See Note1)
291	Florida RF Cables	Cables	SMRE-200W-12.0-SMRE	None	11-24-2009 (See Note1)
292	Florida RF Cables	Cables	SMR-290AW-480.0-SMR	None	11-24-2009 (See Note1)
321	Hewlett Packard	Amplifiers	HPC 8447D	1937A02809	10-08-2009
331	Microwave Circuits	Filters	H1G513G1	31417	07-28-2009 (See Note1)
338	Hewlett Packard	Amplifiers	8449B	3008A01111	10-22-2009
422	Florida RF	Cables	SMS-200AW-72.0-SMR	805	02-05-2010 (See Note1)

Note1: Items characterized on an annual cycle. The date shown indicates the next characterization due date.

5.0 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Manufacturer	Equipment Type	Model Number	Serial Number
1	Neptune	EUT	R900GM	2000066559
2	Neptune Technology Group, Inc.	Meter Interface Unit	R900G Endpoint for National/Lancaster	107
3	Lancaster	Gas Meter	175	02843767

The support equipment listed above includes all host devices tested with the R900GM module.

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

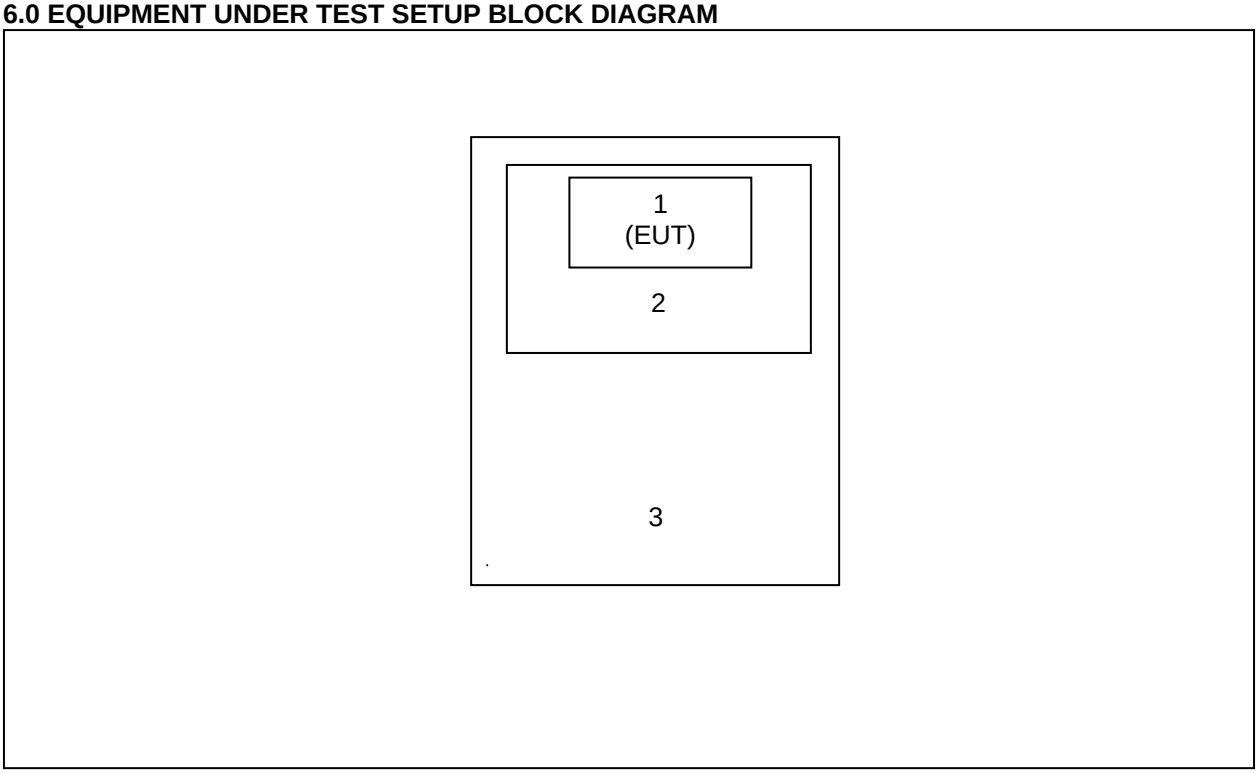

Figure 6-1: EUT Test Setup

*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 Peak Output Power

7.1.1 Test Methodology

Antenna conducted measurements could not be performed on this device, therefore 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 7.5.4. 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:

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

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

7.1.2 Test Results

Results are shown below in Tables 7.1.2-1 to 7.1.2.2 for the channel with the maximum fundamental field strength reading.

Table 7.1.2-1: Fundamental Field Strength

Frequency (MHz)	Uncorrected Level (dBuV)	Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)
911.0815	111.04	H	0.93	111.97
915.9311	109.01	H	1.08	110.09
919.0769	107.56	H	1.17	108.73

Table 7.3.2-2: Peak Output Power

Frequency (MHz)	Measurement Distance (m)	Antenna Gain (dBi)	Field Strength (V/m)	Antenna Gain (Num)	Power (mW)	Power (dBm)
911.0815	3	0	0.40	1.00	47.25	16.74
915.9311	3	0	0.32	1.00	30.61	14.86
919.0769	3	0	0.27	1.00	22.41	13.50

7.2 Radiated Spurious Emissions - FCC Section 15.205 IC: RSS-210 2.6

7.2.1 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. Average measurements could not be make therefore peak emissions where compared to the average emission limits.

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.

7.2.2 Duty Cycle Correction

For average radiated measurements in restricted bands, the peak measured level was reduced by a factor 23.1dB to account for the duty cycle of the EUT. The EUT transmits for 7ms 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 (0.07) = 23.1dB.

7.2.3 Test Results

Radiated spurious emissions found in the band of 30MHz to 10GHz are reported in Tables 7.2.3-1 to 7.2.3-3. 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 7.2.3-1: Radiated Spurious Emissions – Low Channel

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
Fundamental Frequency										
911.0815	110.63	110.63	H	0.93	111.56	111.56	--------	--------	---------	---------
911.0815	101.74	101.74	V	0.86	102.60	102.60	--------	--------	---------	---------
Spurious Emissions										
1822.163	59.10	59.10	H	-3.03	56.07	---------	91.6	---------	35.49	---------
1822.163	58.14	58.14	V	-3.05	55.09	---------	91.6	---------	36.48	---------
2733.2445	60.55	60.55	H	0.93	61.48	38.39	74.0	54.0	12.52	15.61
2733.2445	58.26	58.26	V	0.73	58.99	35.90	74.0	54.0	15.01	18.10
3644.326	56.72	56.72	H	4.18	60.90	37.80	74.0	54.0	13.10	16.20
3644.326	55.22	55.22	V	4.21	59.43	36.33	74.0	54.0	14.57	17.67
4555.4075	57.12	57.12	H	6.10	63.22	40.12	74.0	54.0	10.78	13.88
4555.4075	55.12	55.12	V	6.20	61.32	38.22	74.0	54.0	12.68	15.78
5466.489	47.65	47.65	H	8.71	56.36	---------	91.6	---------	35.21	---------
5466.489	46.05	46.05	V	8.71	54.76	---------	91.6	---------	36.80	---------
6377.5705	47.80	47.80	H	10.34	58.14	---------	91.6	---------	33.42	---------
6377.5705	49.02	49.02	V	10.39	59.41	---------	91.6	---------	32.15	---------
7288.652	47.04	47.04	H	11.99	59.03	35.93	74.0	54.0	14.97	18.07
7288.652	45.82	45.82	V	12.05	57.87	34.77	74.0	54.0	16.13	19.23
8199.7335	50.49	50.49	H	13.02	63.51	40.41	74.0	54.0	10.49	13.59
8199.7335	54.61	54.61	V	13.02	67.63	44.53	74.0	54.0	6.37	9.47
9110.815	47.95	47.95	H	13.99	61.94	38.85	74.0	54.0	12.06	15.15
9110.815	46.53	46.53	V	14.07	60.60	37.50	74.0	54.0	13.40	16.50

Table 7.2.3-2: Radiated Spurious Emissions – Mid Channel

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
Fundamental Frequency										
915.931	108.63	108.63	H	1.08	109.71	109.71	--------	--------	---------	---------
915.931	98.52	98.52	V	1.16	99.68	99.68	--------	--------	---------	---------
Spurious Emissions										
1831.862	60.35	60.35	H	-3.00	57.35	---------	89.7	---------	32.36	---------
1831.862	59.61	59.61	V	-3.03	56.58	---------	89.7	---------	33.13	---------
2747.793	61.16	61.16	H	0.99	62.15	39.05	74.0	54.0	11.85	14.95
2747.793	57.45	57.45	V	0.79	58.24	35.14	74.0	54.0	15.76	18.86
3663.724	59.84	59.84	H	4.24	64.08	40.98	74.0	54.0	9.92	13.02
3663.724	53.69	53.69	V	4.27	57.96	34.86	74.0	54.0	16.04	19.14
4579.655	60.19	60.19	H	6.17	66.36	43.26	74.0	54.0	7.64	10.74
4579.655	54.02	54.02	V	6.27	60.29	37.19	74.0	54.0	13.71	16.81
5495.586	44.58	44.58	H	8.79	53.37	---------	89.7	---------	36.34	---------
5495.586	43.82	43.82	V	8.79	52.61	---------	89.7	---------	37.10	---------
6411.517	49.38	49.38	H	10.44	59.82	---------	89.7	---------	29.89	---------
6411.517	48.61	48.61	V	10.48	59.09	---------	89.7	---------	30.62	---------
7327.448	47.24	47.24	H	12.03	59.27	36.17	74.0	54.0	14.73	17.83
7327.448	46.05	46.05	V	12.09	58.14	35.04	74.0	54.0	15.86	18.96
8243.379	50.77	50.77	H	13.08	63.85	40.75	74.0	54.0	10.15	13.25
8243.379	54.02	54.02	V	13.08	67.10	44.00	74.0	54.0	6.90	10.00

Table 7.2.3-3: Radiated Spurious Emissions – High channel

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
Fundamental Frequency										
919.0769	107.20	107.20	H	1.17	108.37	108.37	--------	--------	---------	---------
919.0769	98.62	98.62	V	1.34	99.96	99.96	--------	--------	---------	---------
Spurious Emissions										
1838.1538	60.52	60.52	H	-2.99	57.53	---------	88.4	---------	30.84	---------
1838.1538	62.51	62.51	V	-3.02	59.49	---------	88.4	---------	28.88	---------
2757.2307	61.64	61.64	H	1.02	62.66	39.57	74.0	54.0	11.34	14.43
2757.2307	58.67	58.67	V	0.82	59.49	36.40	74.0	54.0	14.51	17.60
3676.3076	58.42	58.42	H	4.28	62.70	39.60	74.0	54.0	11.30	14.40
3676.3076	54.68	54.68	V	4.32	59.00	35.90	74.0	54.0	15.00	18.10
4595.3845	58.70	58.70	H	6.22	64.92	41.82	74.0	54.0	9.08	12.18
4595.3845	56.13	56.13	V	6.32	62.45	39.35	74.0	54.0	11.55	14.65
5514.4614	47.62	47.62	H	8.81	56.43	---------	88.4	---------	31.94	---------
5514.4614	49.50	49.50	V	8.82	58.32	---------	88.4	---------	30.05	---------
6433.5383	46.18	46.18	H	10.51	56.69	---------	88.4	---------	31.69	---------
6433.5383	49.88	49.88	V	10.53	60.41	---------	88.4	---------	27.96	---------
7352.6152	47.88	47.88	H	12.05	59.93	36.83	74.0	54.0	14.07	17.17
7352.6152	47.45	47.45	V	12.12	59.57	36.47	74.0	54.0	14.43	17.53
8271.6921	48.01	48.01	H	13.11	61.12	38.02	74.0	54.0	12.88	15.98
8271.6921	50.47	50.47	V	13.11	63.58	40.48	74.0	54.0	10.42	13.52
9190.769	45.75	45.75	H	14.05	59.80	36.70	74.0	54.0	14.20	17.30
9190.769	45.21	45.21	V	14.11	59.32	36.22	74.0	54.0	14.68	17.78

7.2.4 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: 60.55+ 0.93 = 61.48dBuV/m
Margin: 74dBuV/m – 61.48dBuV/m = 12.52dB

Example Calculation: Average
Corrected Level: 60.55+ 0.93 – 23.1= 38.39dBuV
Margin: 54dBuV – 38.38dBuV = 15.62dB

8.0 CONCLUSION
In the opinion of ACS, Inc. the R900GM, 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