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Certification Test Report

FCC ID: R7PTOP04
IC: 5294A-TOP04

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

ACS Report Number 07-0514 - 15C

Manufacturer: Cellnet Technology, Inc.
Model(s): Take Out Point (TOP04)

Test Begin Date: December 13,2007
Test End Date: December 19,2007

Report Issue Date: October 6, 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 12 pages

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Additional Exhibits Included In Filing

Internal Photographs
External Photographs

Test Setup Photographs

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 Permissive Change.

This permissive change report is to address the modifications to the Take Out Point (TOP04) enclosure including internal layout with the addition of several non-RF components. The list of modifications is as follows:

- RF filters (4) relocated
- Ethernet surge protector added
- Reed sensor switch for internal lights added
- Battery relocated
- Dual-receptacle AC outlet added
- Wiring harnesses redesigned and rerouted
- Plastic enclosure vents added
- DC/DC converter relocated to interface board and heat sink added
- Interface board added (power distribution, interior lights, DC/DC converter)
- Power supply relocated
- Magnet for reed switch added
- Enclosure redesigned (slightly larger)

1.2 Product Description

1.2.1 General

The Take Out Point (TOP) is a data radio used in the Utility industry for controls and automatic meter reading. It is sold to utility companies for the purpose of automating the control of remote devices (relays, capacitor banks, etc.) and for collecting data from remote devices such as meters.

The TOP can be mounted on a variety of structures typically within a secure area such as a utility substation. All components are housed in a single enclosure suitable for outdoor environments and easy, straightforward installation. The Take Out Point (TOP) contains (4) DCIWR radio modules.

Manufacturer Information:
Cellnet
30000 Mill Creek Avenue
Suite 100
Alpharetta, GA 30022
USA

Test Sample Condition:

The EUT was received in good working condition with no visible defects.

1.2.2 Intended Use

The intended use is in the Utility industry for controls and automatic meter reading.

1.3 Test Methodology and Considerations

Based on the description of changes from the originally certified device, it was determined that unintentional radiated emissions, power line conducted emissions and intentional radiated emissions were to be evaluated for the purpose of demonstrating compliance to the Certification equipment authorization procedure.

1.4 Equipment Modifications

Modifications listed below were made to pass unintentional radiated emissions tests.

<u>Modification Type</u>	<u>Component/Material Description</u>	<u>Placement</u>
1. Ferrite	Steward P/N 28A0593-0A2	Around Micro-Processor Power Cable
2. Ferrite	Steward P/N 28A0593-0A2	Around Internal Ethernet Cable
3. Ferrite	Steward P/N 28A0593-0A2	Around Internal 12 VDC Power Cable

*See Equipment Modifications photographs for additional detail.

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:

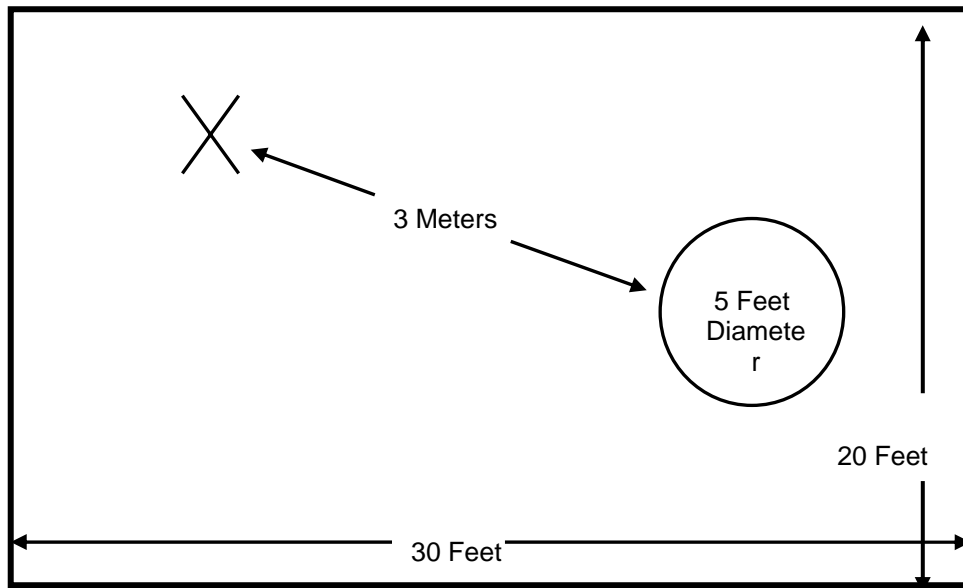


Figure 2.3-1: Semi-Anechoic Chamber Test Site

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:

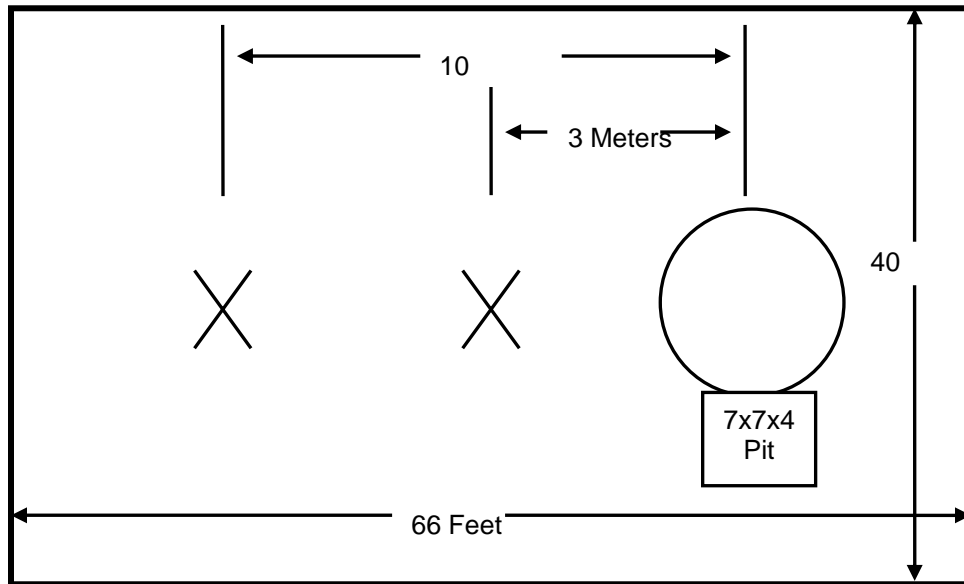


Figure 2.3-2: Open Area Test Site

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:

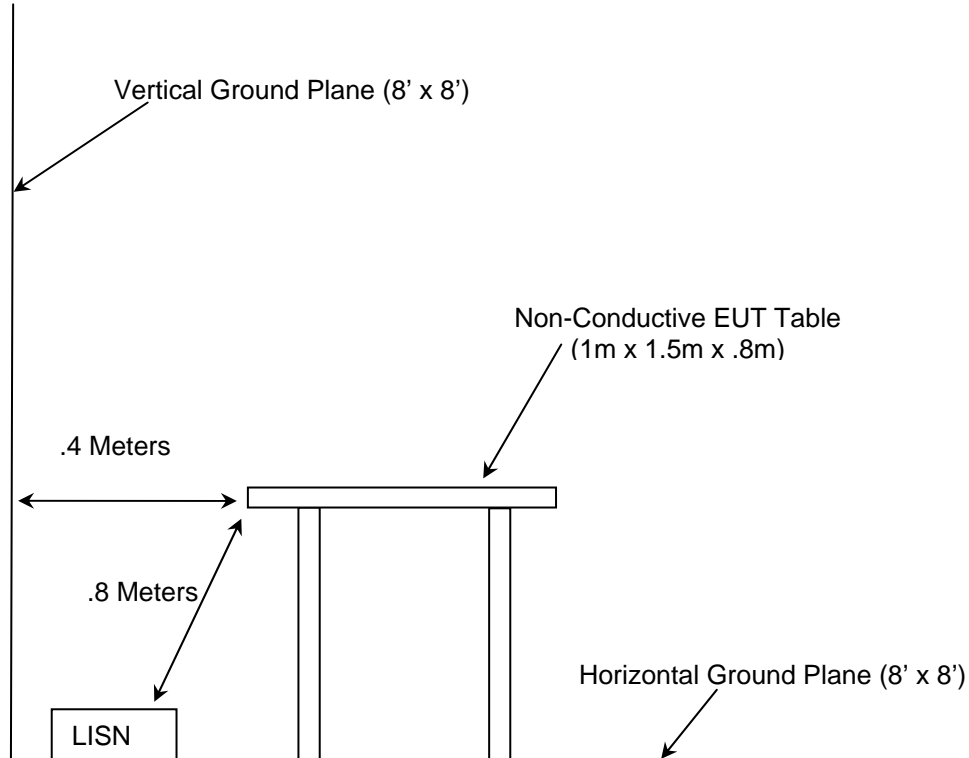


Figure 2.4-1: AC Mains Conducted EMI Site

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 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
25	Chase	Antennas	CBL6111	1043	06-06-2008
30	Spectrum Technologies	Antennas	DRH-0118	970102	05-10-2008
70	Rohde & Schwarz	Spectrum Analyzers	ESH-3	879676/050	10-24-2008
144	Omega	Climate Monitoring Equipment	RH4111	H0103373	11-29-2008
152	EMCO	LISN	Feb-25	9111-1905	02-20-2008
153	EMCO	LISN	Feb-25	9411-2268	11-27-2008
167	ACS	Cables	Chamber EMI Cable Set	167	01-05-2008
168	Hewlett Packard	Attenuators	11947A	44829	03-13-2008
193	ACS	Cable Set	OATS cable Set	193	02-16-2008
211	Eagle	Filters	C7RFM3NFNM	HLC-700	01-08-2008
283	Rohde & Schwarz	Spectrum Analyzers	FSP40	1000033	11-09-2008
290	Florida RF Cables	Cables	SMSE-200-72.0-SMRE	None	11-21-2008
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
321	Hewlett Packard	Amplifiers	HPC 8447D	1937A02809	07-17-2008
337	Microwave Circuits	Filters	H1G513G1	282706	08-28-2008
338	Hewlett Packard	Amplifiers	8449B	3008A01111	10-24-2008
343	Florida RF Cables	Cables	SMRE-200W-12.0-SMRE	N/A	11-21-2008
344	Florida RF Cables	Cables	SMS-290AW-480.0-SMR	N/A	11-21-2008

5.0 SUPPORT EQUIPMENT

Table 5-3: Support Equipment

Manufacturer	Equipment Type	Model Number	Serial Number	FCC ID
The EUT was tested and operates stand-alone. No Support equipment utilized.				

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

For radiated emissions the EUT was tested with the four antennas evenly spaced apart across a 1.5 meter span. It was determined that this would produce worst case emissions for inter-modulation products based on the configuration required during normal operation.

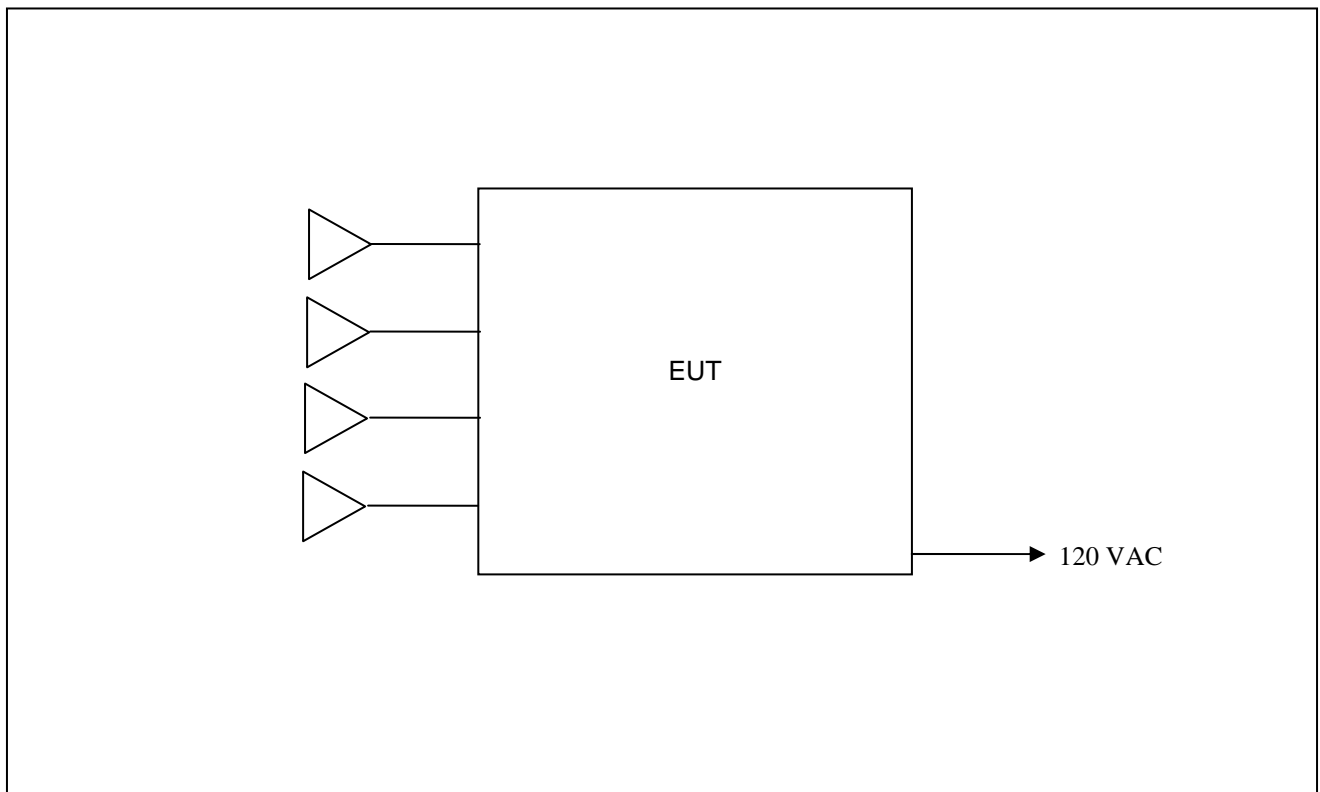


Figure 6-1: EUT Test Setup

*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 EUT employs Standard N-Type Connectors. This equipment is designed for use by the utility industry and is not marketed to the general public and must be professionally installed. The standard connectors allow for antenna replacement by qualified service personnel.

7.2 Power Line Conducted Emissions

7.2.1 Test Methodology

ANSI C63.4 sections 6 and 7 were the guiding documents for this evaluation. Conducted emissions were performed from 150kHz to 30MHz with the spectrum analyzer’s resolution bandwidth set to 9kHz and the video bandwidth set to 30kHz. The calculation for the conducted emissions is as follows:

Corrected Reading = Analyzer Reading + LISN Loss + Cable Loss

Margin = Applicable Limit - Corrected Reading

7.2.2 Test Results

Results of the test are shown below in and Table 7.2-1.

Table 7.2-1: Conducted EMI Results

Frequency (MHz)	Uncorrected Reading (dBuV)		Total Correction Factor (dB)	Corrected Level (dBuV)		Limit (dBuV)		Margin (dB)	
	Quasi-Peak	Average		Quasi-Peak	Average	Quasi-Peak	Average	Quasi-Peak	Average
Line 1									
0.15	41.7	7.7	9.80	51.50	17.50	66.00	56.00	14.5	38.5
0.1933	37.7	12.6	9.80	47.50	22.40	63.89	53.89	16.4	31.5
0.8	26.83	3.7	9.80	36.63	13.50	56.00	46.00	19.4	32.5
1.3175	16.2	0.6	9.80	26.00	10.40	56.00	46.00	30.0	35.6
11.8931	27.9	24.3	10.00	37.90	34.30	60.00	50.00	22.1	15.7
26.6105	23.4	20.6	10.11	33.51	30.71	60.00	50.00	26.5	19.3
Line 2									
0.15	41.5	9.1	9.80	51.30	18.90	66.00	56.00	14.7	37.1
0.4307	29.8	4	9.80	39.60	13.80	57.24	47.24	17.6	33.4
0.92	28.6	13.9	9.80	38.40	23.70	56.00	46.00	17.6	22.3
1.53	41.3	7.9	9.80	51.10	17.70	56.00	46.00	4.9	28.3
13.3588	36.9	32.5	10.01	46.91	42.51	60.00	50.00	13.1	7.5
26.6105	22.5	20	10.11	32.61	30.11	60.00	50.00	27.4	19.9

7.3 Radiated Emissions - Unintentional Radiation

7.3.1 Test Methodology

Radiated emissions tests were performed over the frequency range of 30MHz to 1GHz. Measurements of the radiated field strength were made at a distance of 3m from the boundary of the equipment under test (EUT) and the receiving antenna. The antenna height was varied from 1m to 4m so that the maximum radiated emissions level would be detected. Radiated measurements above 30MHz and below 1GHz were made with the Spectrum Analyzer's resolution bandwidth set to 120 KHz using a Quasi-peak detector. Above 1GHz, average measurements are taken with the RBW and VBW were set to 1MHz and 10 Hz respectively.

7.3.2 Test Results

Results of the test are given in Table 7.3-1 below:

Table 7.3-1: Radiated Emissions Tabulated Data

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
33.091	-----	46.60	V	-10.65	-----	35.95	-----	40.0	-----	4.05
39.437	-----	49.49	V	-13.64	-----	35.85	-----	40.0	-----	4.15
50.325	-----	55.16	V	-18.70	-----	36.46	-----	40.0	-----	3.54
100.665	-----	52.49	V	-14.53	-----	37.96	-----	43.5	-----	5.54
166.505	-----	54.31	V	-14.76	-----	39.55	-----	43.5	-----	3.95
299.884	-----	51.37	H	-10.60	-----	40.77	-----	46.0	-----	5.23
399.831	-----	50.75	H	-7.91	-----	42.84	-----	46.0	-----	3.16
499.995	-----	45.78	H	-6.30	-----	39.48	-----	46.0	-----	6.52
699.793	-----	44.79	H	-2.41	-----	42.38	-----	46.0	-----	3.62
833.455	-----	34.41	H	0.10	-----	34.51	-----	46.0	-----	11.49

* Note: All emissions above 833.455 MHz were attenuated below the permissible limit.

7.4 Radiated Spurious Emissions – Intentional Radiation (Restricted Bands)

7.4.1 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.

7.4.2 Test Results

Radiated spurious emissions found in the band of 30MHz to 10GHz are reported in Table 7.4-1.

Table 7.4-1: Radiated Spurious Emissions

Frequency (MHz)	Level (dBuV)		Antenna Polarity (H/V)	Correction Factors (dB)	Corrected Level (dBuV/m)		Limit (dBuV/m)		Margin (dB)	
	pk	Qpk/Avg			pk	Qpk/Avg	pk	Qpk/Avg	pk	Qpk/Avg
2781	47.76	37.82	H	-0.47	47.29	37.35	74.0	54.0	26.71	16.65
2781	48.54	40.44	V	-0.71	47.83	39.73	74.0	54.0	26.17	14.27

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

7.4.3 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: $47.76 - .47 = 47.29\text{dBuV}$

Margin: $74\text{dBuV} - 47.29\text{dBuV} = 26.71\text{dB}$

AVERAGE:

Corrected Level: $37.82 - .47 = 37.35\text{dBuV}$

Margin: $54\text{dBuV} - 37.35\text{dBuV} = 16.65\text{dB}$

8.0 CONCLUSION

In the opinion of ACS, Inc. the Take Out Point (TOP04) , manufactured by Cellnet Technology, Inc., meets the requirements of FCC Part 15 subpart C and Industry Canada's Radio Standards Specification RSS-210.

END REPORT