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Transmitter Certification

Direct Sequence Spread Spectrum Transmitter

Test Report

FCC ID: R7PER1R2S4

FCC Rule Part: 15.247

ACS Report Number: 07-0292-15C-2400

Manufacturer: Cellnet Technology, Inc.
Model: L+G Focus AX w/ Zigbee Utilinet Endpoint

Test Begin Date: June 27, 2007
Test End Date: July 10, 2007

Report Issue Date: July 12, 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.

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This report contains 23 pages

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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.

1.2 Product Description

1.2.1 General

The L+G Focus AX w/ Zigbee UtiliNet module was designed for integration into the L+G Focus electric meter. The Focus AX w/ ZigBee Utilinet endpoint module consists of a main board with the UtiliNet circuitry and a daughter board with the ZigBee circuitry. The Utilinet radio utilizes the 902-928 MHz unlicensed frequency band while the Zigbee utilizes the 2400-2485.5 MHz unlicensed band.

The ZigBee board is powered from the UtiliNet main board and is interfaced with the Main board processor through a LPP (LAN packet protocol) UART Port. UtiliNet acts as a pipeline to pass in and out the ZigBee information.

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

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

1.2.2 Intended Use

The L+G Focus AX w/ Zigbee Utilinet module was designed for integration into the L+G Focus electric meter to enable wireless data access.

1.3 Test Methodology and Considerations

The L+G Focus AX w/Zigbee Utilinet Endpoint is a module designed to be integrated into a host device therefore testing was performed on the module in a stand-alone configuration with the exception of AC power line conducted emissions. AC power line conducted emissions was performed with the module installed into a typical host device.

For RF conducted measurements, the L+G Focus AX w/ Zigbee Utilinet Endpoint was modified with an external RF connector to the PCB. The L+G Focus AX w/ Zigbee Utilinet Endpoint utilizes non-detachable antennas for normal operation but for RF conducted testing the antennas were disconnected and a 50-Ohm test cable soldered (with the appropriate ground connection) to the PCB.

This report only addresses the 2400-2483.5 MHz Zigbee operation under CFR 47 Part 15.247. The Utilinet 902-928 MHz radio is addressed in ACS report 07-0292-15C-900.

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: 89450
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:

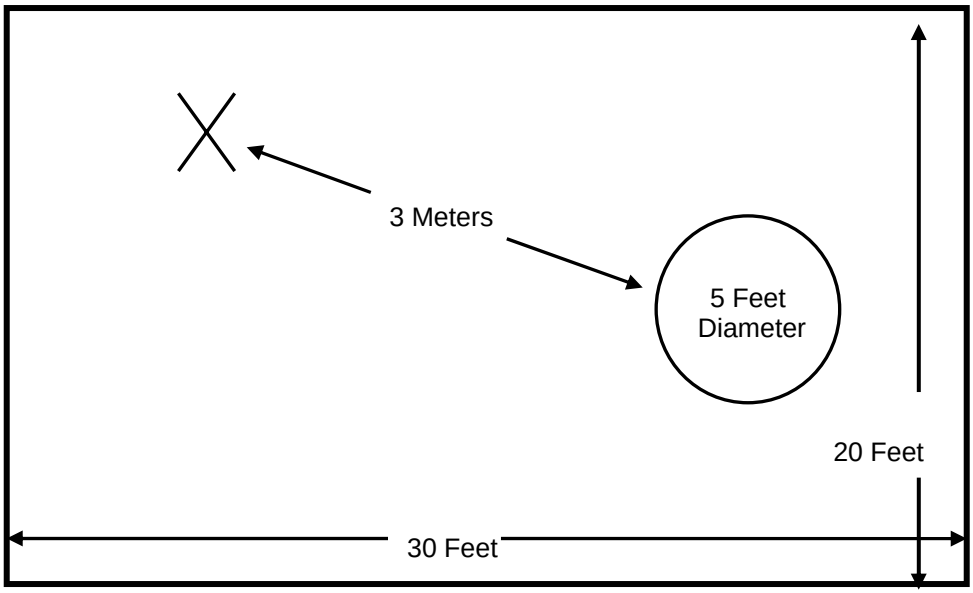

Figure 2.3-1: Semi-Anechoic Chamber Test Site

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:

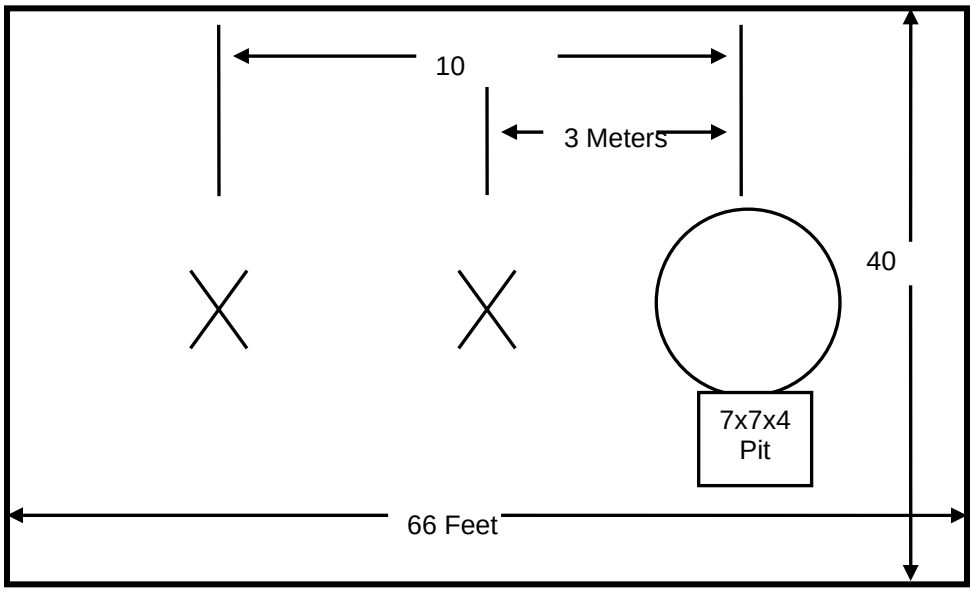

Figure 2.3-2: Open Area Test Site

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:

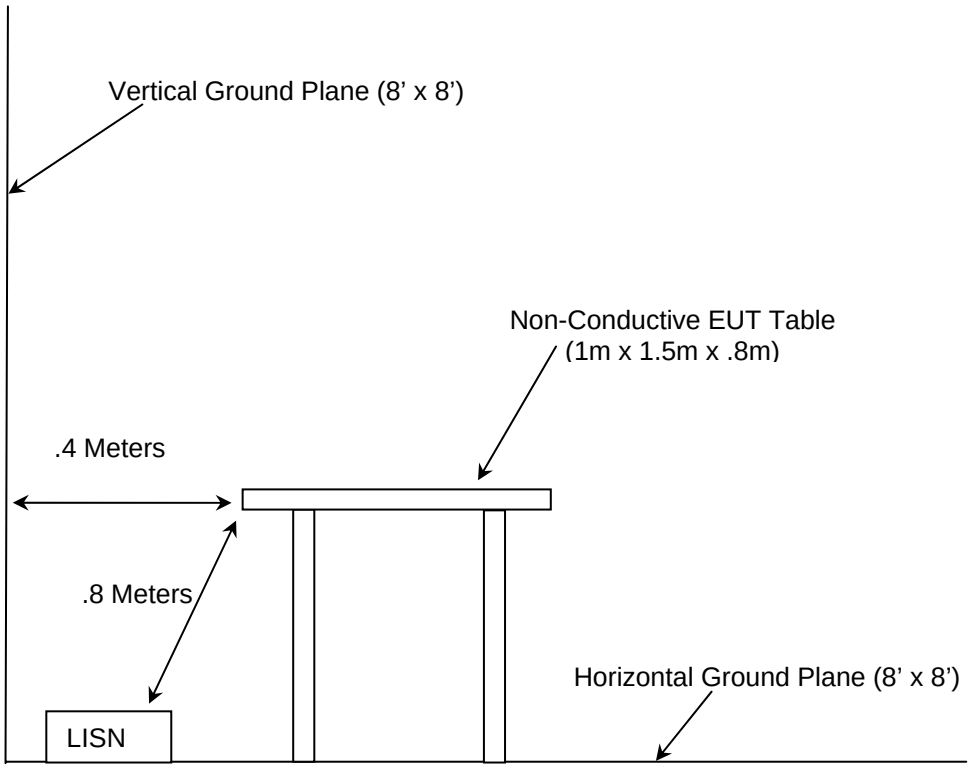

Figure 2.4-1: AC Mains Conducted EMI Site

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, 20056
- 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 KDB Publication No. 558074 - Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247), March 2005

4.0 LIST OF TEST EQUIPMENT

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

Table 4.0-1: Test Equipment

Equipment Calibration Information					
ACS#	**Mfg.**	**Eq. type**	**Model**	**S/N**	**Cal. Due**
☒ 152	EMCO	LISN	3825/2	9111-1905	2/16/08
☒ 168	Hewlett Packard	Pulse Limiter	11947A	3107A02268	3/13/08
☒ 167	ACS	Chamber EMI Cable Set	RG6	167	1/5/08
☒ 16	ACS	Conducted Emission Cable	Cable	16	5/21/08
☒ 25	Chase	Bi-Log Antenna	CBL6111	1043	6/6/08
☒ 22	Agilent	Pre-Amplifier	8449B	3008A00526	4/10/08
☒ 73	Agilent	Pre-Amplifier	8447D	272A05624	5/9/08
☒ 30	Spectrum Technologies	Horn Antenna	DRH-0118	970102	5/10/08
☒ 331	Microwave Circuits	High Pass Filter	H1G513G1	31417 DC0633	8/29/07
☒ 283	Rohde & Schwarz	Spectrum Analyzer	FSP	100033	11/9/08
☒ 1	Rohde & Schwarz	Receiver Display	804.8932.52	833771/007	3/5/08
☒ 2	Rohde & Schwarz	ESMI Receiver	1032.5640.53	839587/003	3/5/08
☒ 290	Florida RF Labs	HF RF Cable	SMSE-200-72.0-SMRE	NA	5/15/08
☒ 291	Florida RF Labs	HF RF Cable	SMRE-200W-12.0-SMRE	NA	5/15/08
☒ 292	Florida RF Labs	HF RF Cable	SMR-280AW-480.0-SMR	NA	5/24/08

5.0 SUPPORT EQUIPMENT

Table 5-1: Support Equipment

Item	Equipment Type	Manufacturer	Model Number	Serial Number	FCC ID
The EUT was tested as a stand alone device and no support equipment was utilized.					

6.0 EQUIPMENT UNDER TEST SETUP BLOCK DIAGRAM

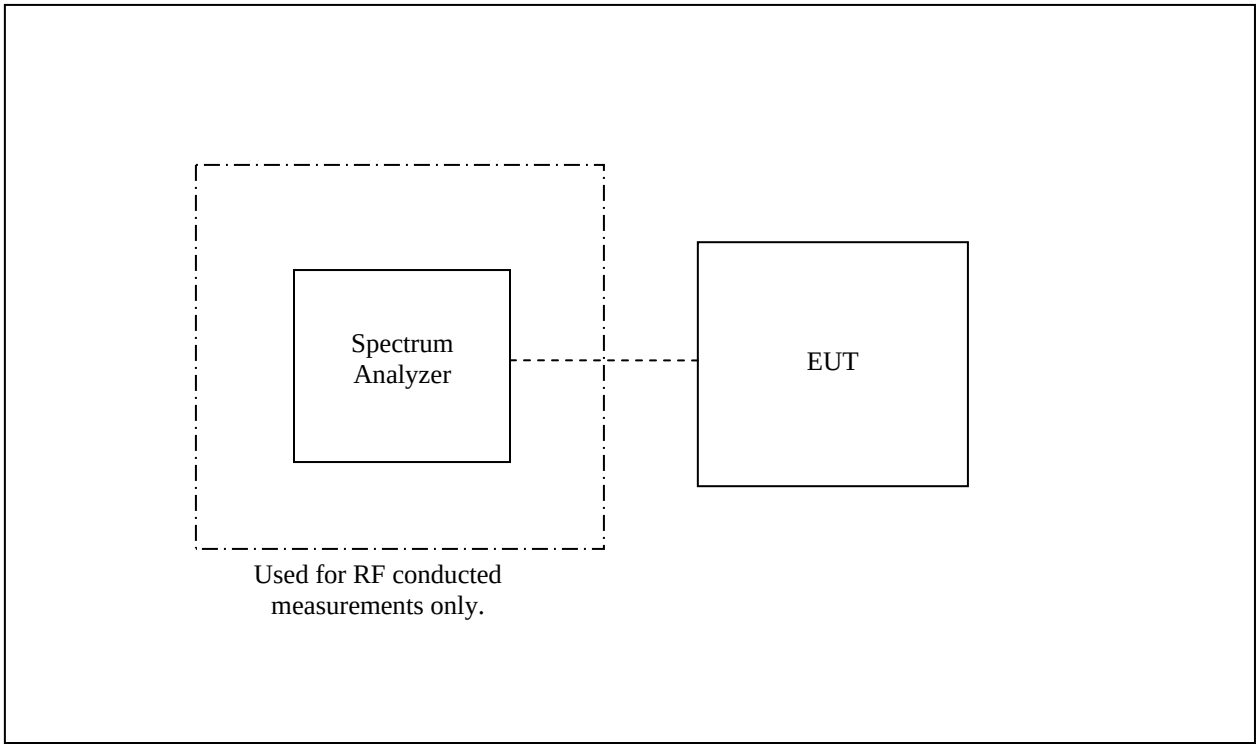

Figure 6-1: EUT Test Setup

The EUT was integrated into a typical host for the purpose of AC power line conducted emissions.

For RF conducted measurements, the L+G Focus AX w/ Zigbee Utilinet Endpoint was modified with an external RF connector to the PCB. The L+G Focus AX w/ Zigbee Utilinet Endpoint utilizes non-detachable antennas for normal operation but for RF conducted testing the antennas were disconnected and a 50-Ohm test cable soldered (with the appropriate ground connection) to the PCB.

*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 - FCC Section 15.203

The L+G Focus AX w/Zigbee Utilinet Endpoint PCB includes an integrated Inverted F Antenna, located on the Zigbee PCB surface layer. This antenna has a typical gain of 4dBi and is for the Zigbee 2400-2483.5 MHz operation only.

A separate antenna (integrated Slot) is used for the 900 MHz Utilinet radio. Refer to ACS Test Report 07-0292-15C-900.

7.2 Power Line Conducted Emissions - FCC Section 15.207

7.2.1 Test Methodology

The L+G Focus AX w/ Zigbee Utilinet Endpoint PCB was integrated into a typical host device for testing. 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 Table 7.2-1.

Table 7.2-1: Line 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									
1.36	10.8	0.2	9.80	20.60	10.00	56.00	46.00	35.4	36.0
1.56	13.1	1.4	9.80	22.90	11.20	56.00	46.00	33.1	34.8
5.56	4.8	-1.8	9.81	14.61	8.01	60.00	50.00	45.4	42.0
22.58	18.7	15.6	10.21	28.91	25.81	60.00	50.00	31.1	24.2
23.13	23.1	18.7	10.20	33.30	28.90	60.00	50.00	26.7	21.1
25.42	20.6	10.3	10.20	30.80	20.50	60.00	50.00	29.2	29.5
Line 2									
1.34	10.5	0.2	9.80	20.30	10.00	56.00	46.00	35.7	36.0
1.57	12.2	1.1	9.80	22.00	10.90	56.00	46.00	34.0	35.1
5.56	4.2	-1.6	9.81	14.01	8.21	60.00	50.00	46.0	41.8
22.58	19.1	15.7	10.21	29.31	25.91	60.00	50.00	30.7	24.1
23.13	23.6	20.3	10.20	33.80	30.50	60.00	50.00	26.2	19.5
24.35	16.6	12.4	10.20	26.80	22.60	60.00	50.00	33.2	27.4

7.3 Radiated Emissions - FCC Section 15.109(Unintentional Radiation)

7.3.1 Test Methodology

Radiated emissions tests were performed over the frequency range of 30MHz to 12.5 GHz. 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 were made with the Spectrum Analyzer's resolution bandwidth set to 120 KHz for measurements above 30MHz. Average measurements are taken with the RBW and VBW were set to 1MHz and 10 Hz respectively for measurements above 1000MHz.

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)	Polarization (H/V)	Height (cm)	Azimuth (deg)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)
167.995	H	172	99	24.67	43.5	18.83
191.997	H	130	119	23.13	43.5	20.37
216.003	V	100	198	31.13	46.0	14.87
239.999	H	100	112	28.74	46.0	17.26
264.003	H	100	124	25.06	46.0	20.94
288.01	H	100	226	22.79	46.0	23.21
471.88	H	100	0	16.77	46.0	29.23
700.44	H	100	0	21.50	46.0	24.50
950.422	H	100	0	23.88	46.0	22.12

* Note: All emissions above 950.422 MHz were attenuated below the permissible limit.

7.4 6dB Bandwidth – FCC Section 15.247(a)

7.4.1 Test Methodology

The 6dB bandwidth was measured in accordance with the FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)". The RBW of the spectrum analyzer was set to 100 kHz and VBW 300 kHz. Span was set large enough to capture the entire emissions and >> RBW.

7.4.2 Test Results

Results are shown below in table 7.4.2-1 and figure 7.4.2-1 to 7.4.2-3:

Table 7.4.2-1: 6dB Bandwidth

Frequency [MHz]	Bandwidth [MHz]
2405	1.57
2450	1.62
2480	1.58

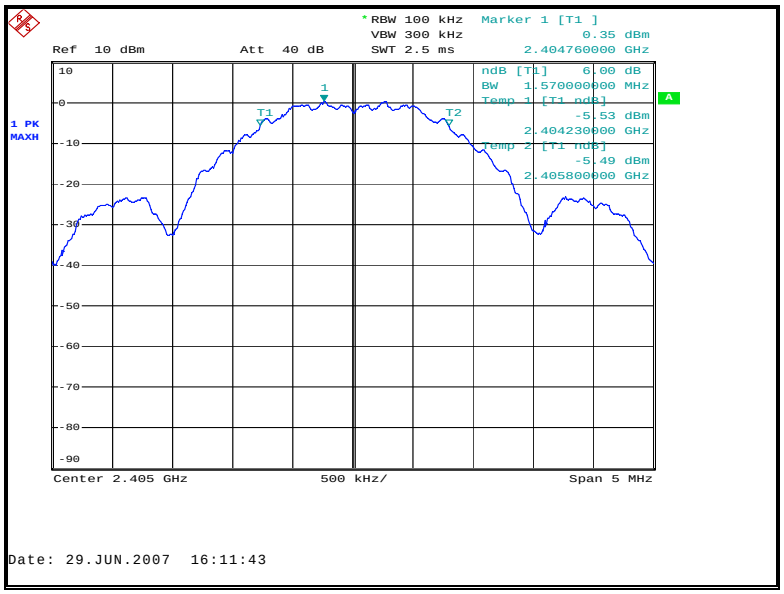

Figure 7.4.2-1: 6dB Bandwidth Plot – Low Channel

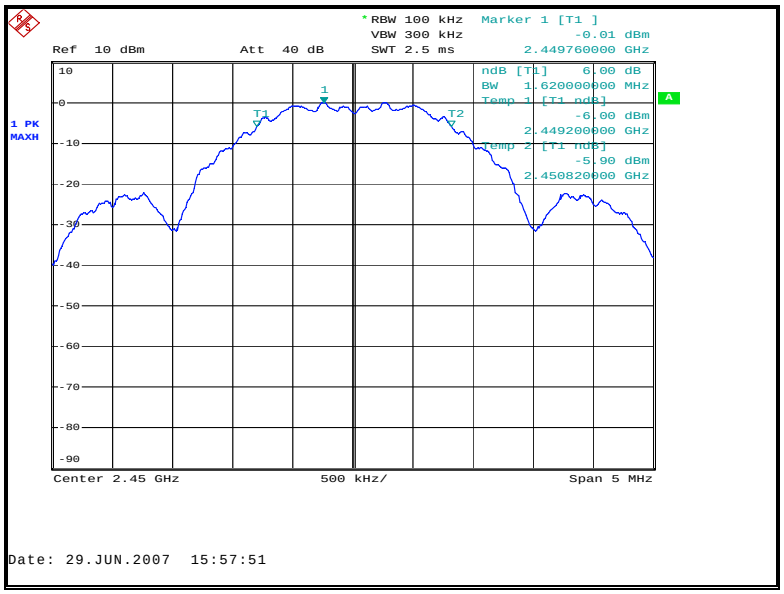

Figure 7.4.2-2: 6dB Bandwidth Plot – Mid Channel

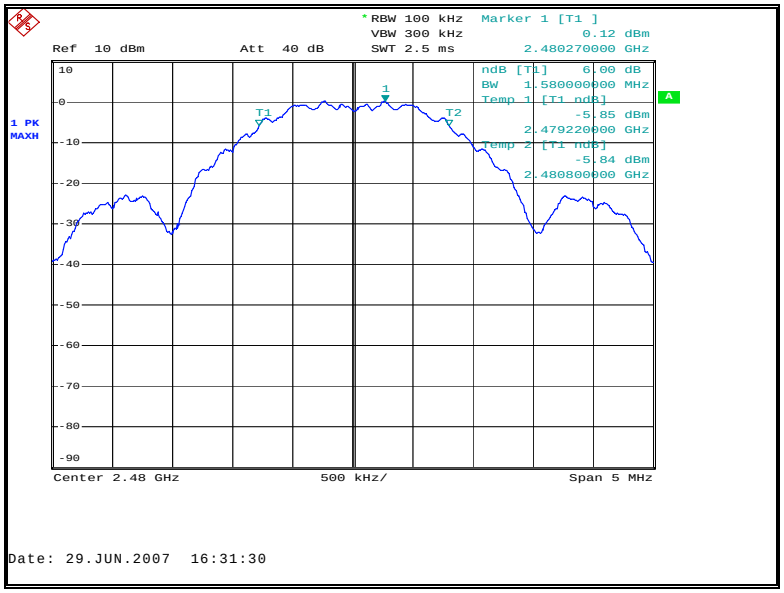

Figure 7.4.2-3: 6dB Bandwidth Plot – High Channel

7.5 Peak Output Power Requirement - FCC Section 15.247(b)

7.5.1 Test Methodology

The Peak Output Power was measured in accordance with the FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)" Power Option 1. The RF output of the equipment under test was directly connected to the input of the Spectrum Analyzer.

Data was collected with the EUT operating at maximum power.

7.5.2 Test Results

Results are shown below in Table 7.5.2-1 and Figures 7.5.2-1 to 7.5.2-3.

Table 7.5.2-1: Peak Output Power

Frequency (MHz)	Output Power (dBm)
2405	3.55
2450	3.44
2480	3.38

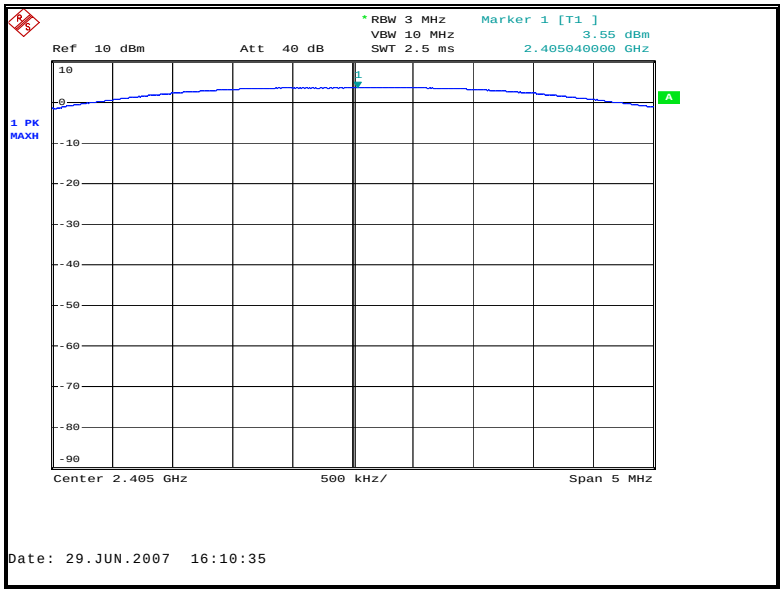

Figure 7.5.2-1: Output power – Low Channel

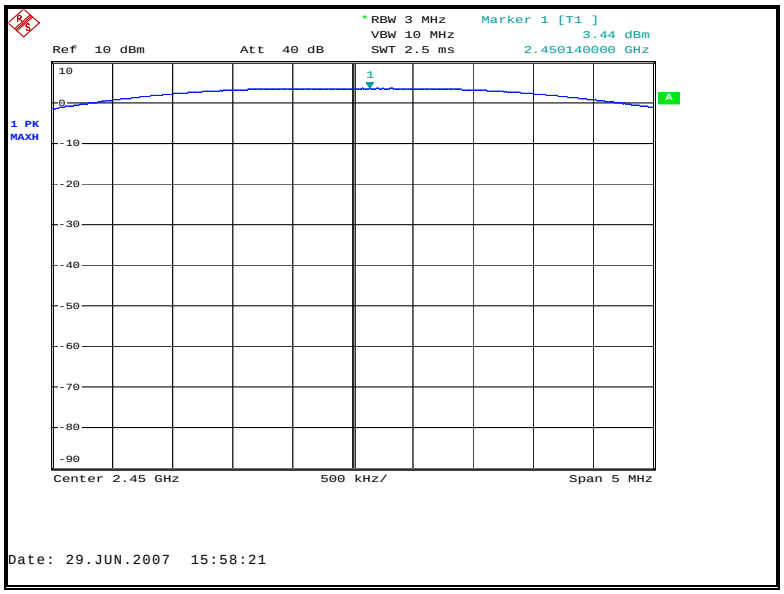

Figure 7.5.2-2: Output power – Mid Channel

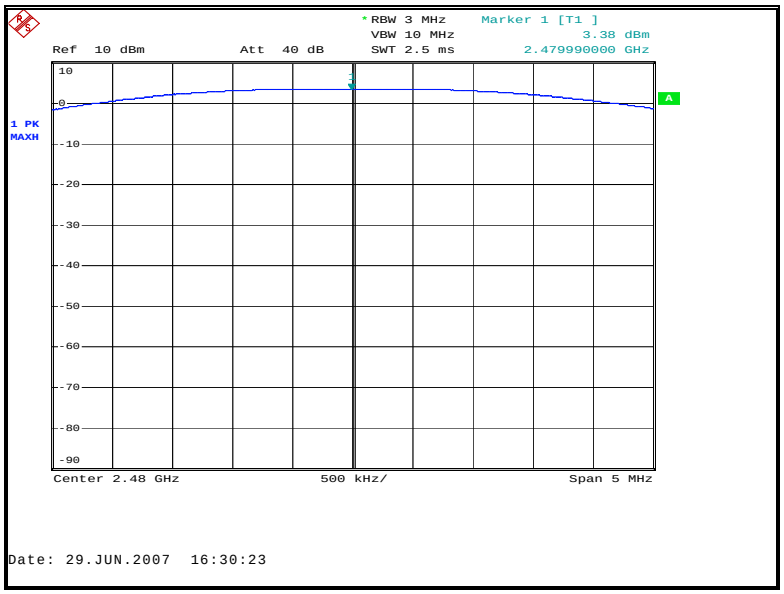

Figure 7.5.2-3: Output power – High Channel

7.6 Band-Edge Compliance and Spurious Emissions - FCC Section 15.247(d)

7.6.1 Band-Edge Compliance of RF Emissions

7.6.1.1 Test Methodology

The EUT was investigated at the low and high channels of operation to determine band-edge compliance. Because the upper band-edge coincides with a restricted band, band-edge compliance for the upper band-edge was determined using the radiated mark-delta method as outlined in FCC DA 00-705. The radiated field strength of the fundamental emission was first determined and then the mark-delta method was used to determine the field strength of the band-edge emissions.

The lower band-edge compliance was determined using the marker-delta method in which the radio frequency power that is 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.

7.6.1.2 Test Results

Band-edge compliance is displayed in Table 7.6.1.2-1 and Figure 7.6.1.2-1 – 7.6.1.2-3.

Table 7.6.1.2-1: Upper Band-edge Marker Delta Method

Frequency (MHz)	Level (dBuV)		Antenna Polarity	Correction Factors	Fundamental Field Strength (dBuV/m)		Delta-Marker (dB)	Band-edge Field Strength (dBuV/m)		Margin to Limit (dBuV/m) 74 / 54	
	pk	avg	(H/V)	(dB)	pk	avg		pk	avg	pk	avg
Fundamental Frequency											
2480	108.53	105.90	H	-6.16	102.37	88.36	33.48	68.89	43.51	5.11	10.49
2480	103.44	100.73	V	-6.17	97.27	83.19	34.53	63.79	37.29	10.21	16.71

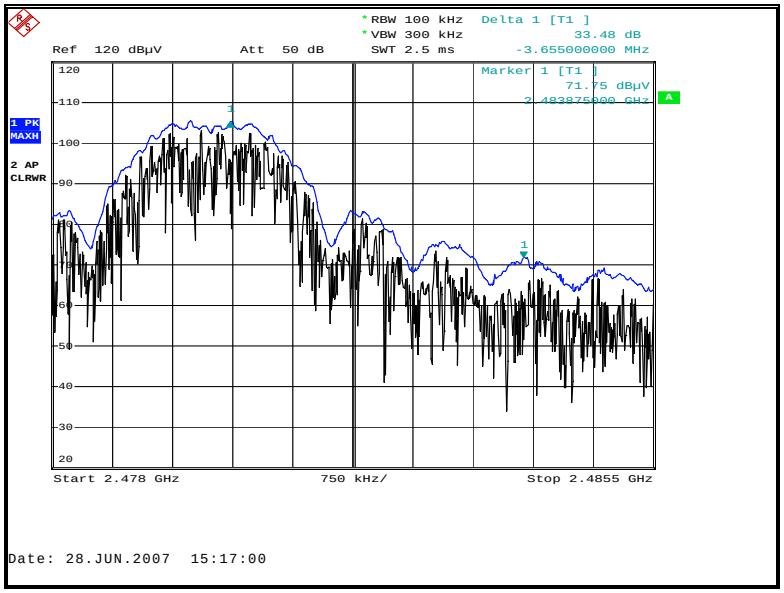

Figure 7.6.1.2-1: Upper Band-edge (Radiated - Horizontal)

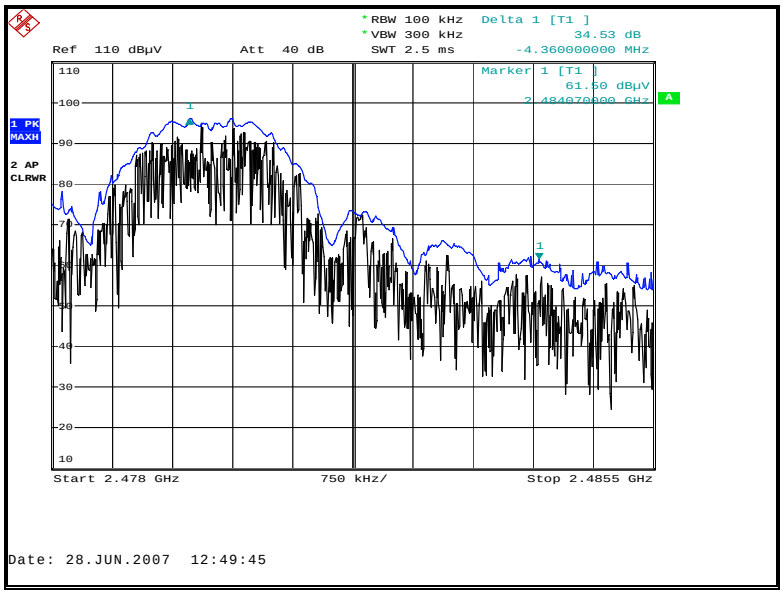

Figure 7.6.1.2-2: Upper Band-edge (Radiated - Vertical)

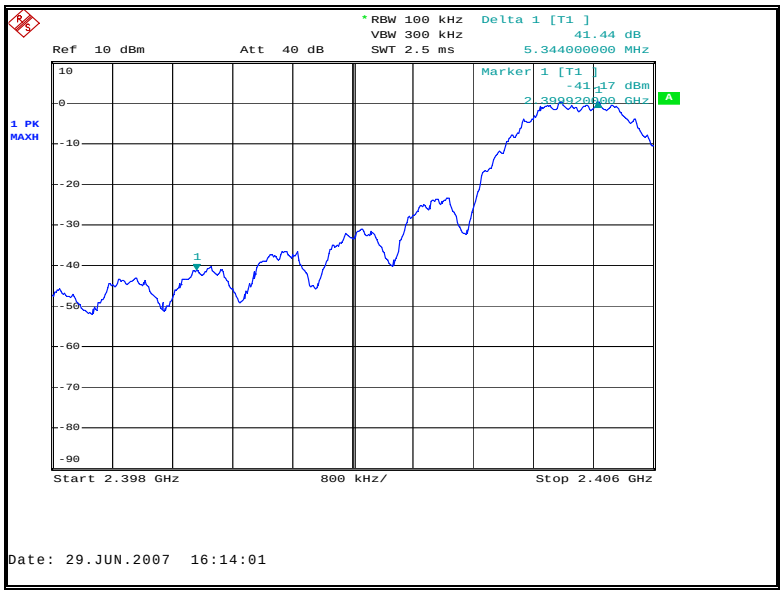

Figure 7.6.1.2-3: Lower Band-edge (Conducted)

7.6.2 RF Conducted Spurious Emissions

7.6.2.1 Test Methodology

The EUT was investigated for conducted spurious emissions from 30MHz to 26GHz, > 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.

7.6.2.2 Test Results

All emission found were greater than 20dB down from the fundamental carrier. Results are shown below in Figures 7.6.2-1 through 7.6.2-6.

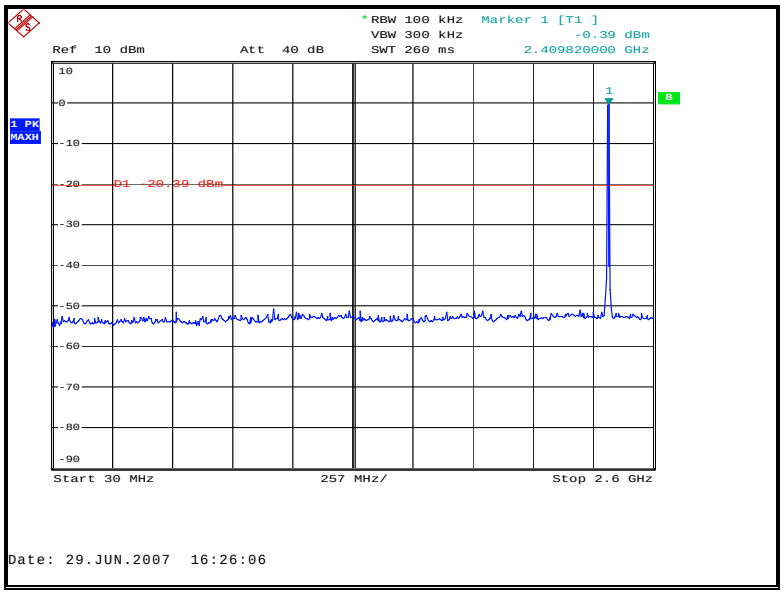

Figure 7.6.2.2-1: 30 MHz – 2.6 GHz – Low Channel

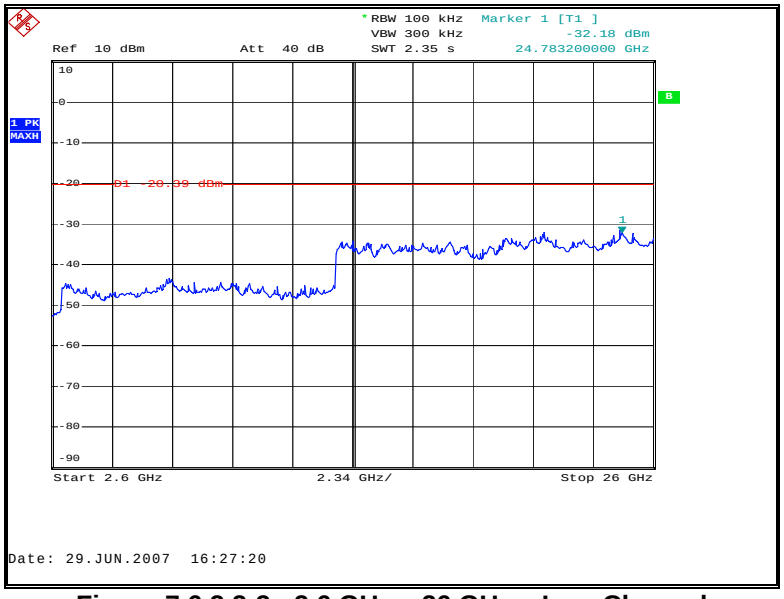

Figure 7.6.2.2-2: 2.6 GHz – 26 GHz – Low Channel

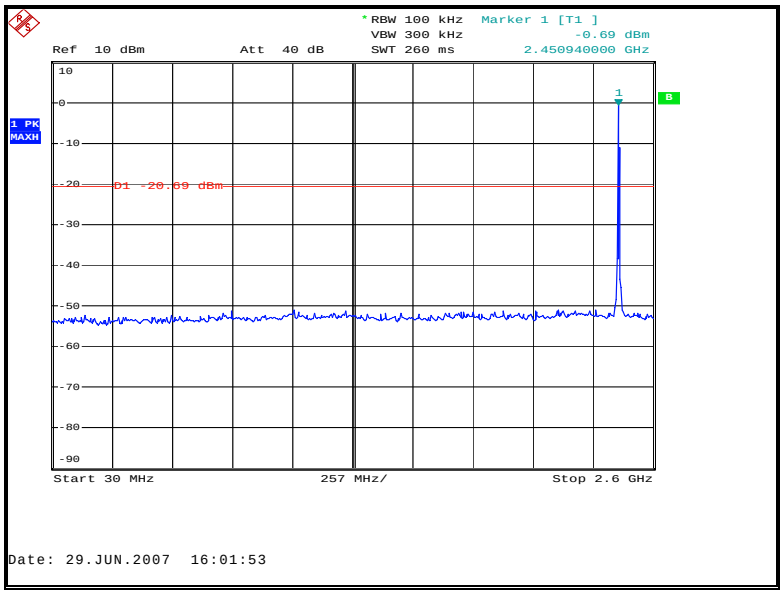

Figure 7.6.2.2-3: 30 MHz – 2.6 GHz –Mid Channel

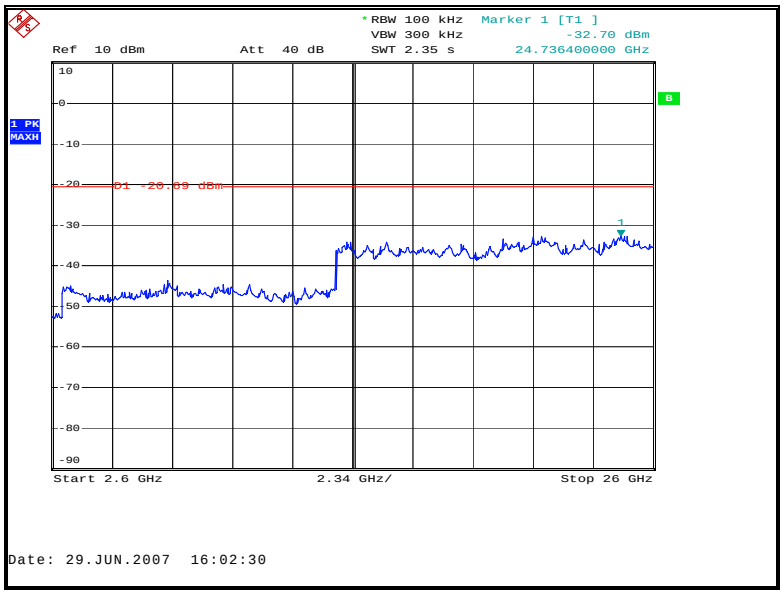

Figure 7.6.2.2-4: 2.6 GHz – 26 GHz – Mid Channel

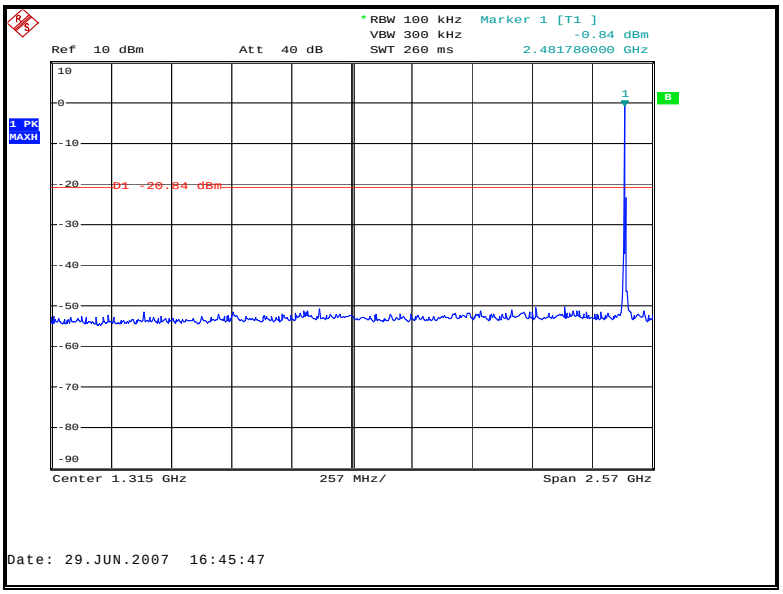

Figure 7.6.2.2-5: 30 MHz – 2.6 GHz – High Channel

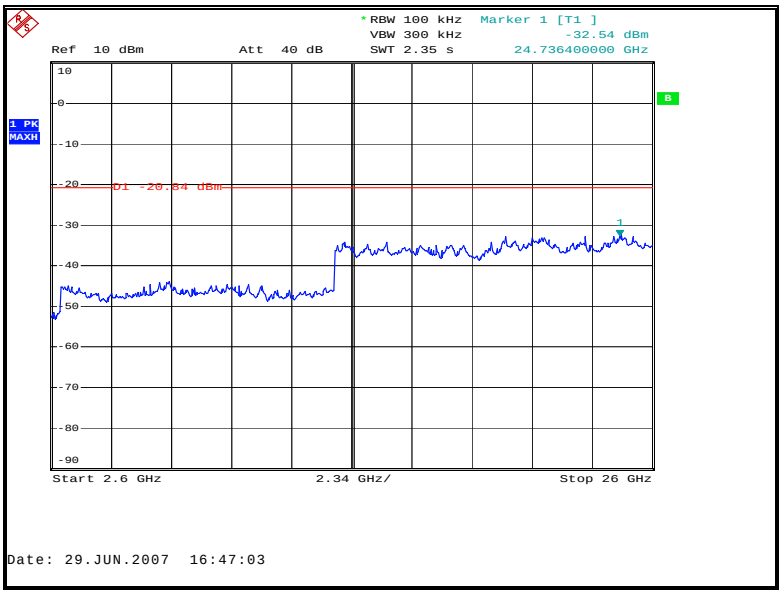

Figure 7.6.2.2-6: 2.6 GHz – 26 GHz –High Channel

7.6.3 Radiated Spurious Emissions (Restricted Bands) - FCC Section 15.205

7.6.3.1 Test Methodology

Radiated emissions tests were made over the frequency range of 30MHz to 26GHz, > 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 made with RBW and VBW of 1 MHz. Average measurements were made with RBW of 1MHz and a VBW of 10Hz. The average emissions were further corrected by applying the duty cycle correction of the EUT to the average measurements for comparison to the average limit.

7.6.3.2 Duty Cycle Correction

For average radiated measurements, the measured level was reduced by a factor 11.38dB to account for the duty cycle of the EUT. The duty cycle correction factor is determined using the formula: 20log (27/100) = -11.38dB.

A detailed analysis of the duty cycle timing is provided in Theory of Operation.

7.6.3.3 Test Results

Using the procedures set forth in the FCC KDB Publication No. 558074 “Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)”, radiated spurious emissions found in the band of 30MHz to 26GHz are reported in Table 7.6.3.3-1 to 7.6.3.3-3. Each emission found to be in a restricted band as defined by section 15.205, was compared to the radiated emission limits as defined in section 15.209.

Table 7.6.3.3-1: Radiated Spurious Emissions

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
4810	60.14	58.68	H	-0.16	59.98	47.15	74.0	54.0	14.02	6.85
4810	61.61	60.14	V	0.14	61.75	48.91	74.0	54.0	12.25	5.09
12025	49.17	38.12	H	8.44	57.61	35.19	74.0	54.0	16.39	18.81
12025	48.84	37.21	V	8.44	57.28	34.28	74.0	54.0	16.72	19.72

*Note: Frequencies not reported were below the noise floor.

Table 7.6.3.3-2: Radiated Spurious Emissions

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
4900	55.36	52.16	H	0.21	55.57	41.00	74.0	54.0	18.43	13.00
4900	56.74	53.91	V	0.51	57.25	43.05	74.0	54.0	16.75	10.95
7350	50.24	41.11	H	4.26	54.50	34.00	74.0	54.0	19.50	20.00
7350	51.92	44.74	V	4.13	56.05	37.50	74.0	54.0	17.95	16.50
12250	48.35	32.73	H	9.14	57.49	30.50	74.0	54.0	16.51	23.50
12250	48.35	32.74	V	9.09	57.44	30.46	74.0	54.0	16.56	23.54

*Note: Frequencies not reported were below the noise floor.

Table 7.6.3.3-3: Radiated Spurious Emissions

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
4960	52.34	48.43	H	0.45	52.79	37.51	74.0	54.0	21.21	16.49
4960	50.85	44.21	V	0.75	51.60	33.59	74.0	54.0	22.40	20.41
7440	48.74	34.61	H	4.25	52.99	27.49	74.0	54.0	21.01	26.51
7440	49.18	34.83	V	4.14	53.32	27.60	74.0	54.0	20.68	26.40
12400	46.87	33.11	H	9.60	56.47	31.34	74.0	54.0	17.53	22.66
12400	47.39	33.41	V	9.52	56.91	31.56	74.0	54.0	17.09	22.44

*Note: Frequencies not reported were below the noise floor.

7.6.3.4 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: 60.14+ -0.16= 59.98dBuV/m

Margin: 74dBuV/m – 59.98dBuV/m = 14.02dB

Example Calculation: Average

Corrected Level: 58.68+ -0.16-11.38= 47.14dBuV

Margin: 54dBuV – 47.14dBuV = 6.85dB

7.7 Peak Power Spectral Density- FCC Section 15.247(d)

7.7.1 Test Methodology

The power spectral density was measured in accordance with the FCC KDB Publication No. 558074 "Guidance on Measurements for Digital Transmission Systems (47 CFR 15.247)". The emission peaks within the pass band were located and zoomed in on. The spectrum analyzer RBW was set to 3 kHz and VBW 10 kHz. Span was adjusted to 100 kHz and the sweep time was calculated to be 34s (Span/3 kHz).

7.7.2 Test Results

Results are shown below in table 7.7.2-1 and figures 7.7.2-1 – 7.7.2-3:

Table 7.7.2-1: Peak Power Spectral Density

Frequency [MHz]	Level [dBm]	Limit [dBm]
2405	-10.74	8
2450	-10.84	8
2480	-10.93	8

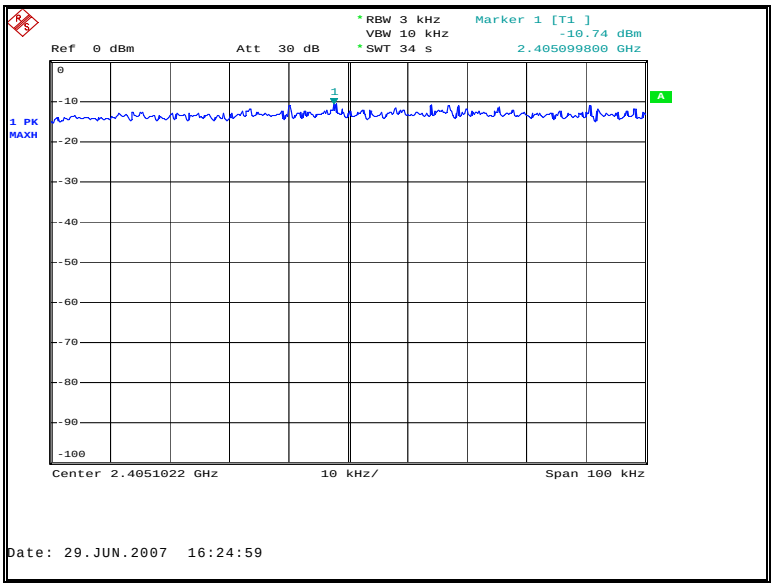

Figure 7.7.2-1: Power Spectral Density Plot – Low Channel

Figure 7.7.2-2: Power Spectral Density Plot – Mid Channel

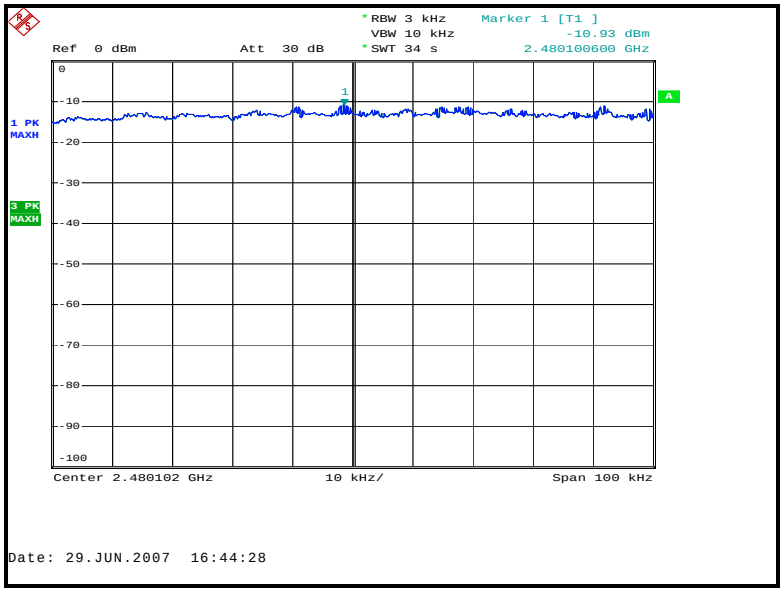

Figure 7.7.2-3: Power Spectral Density Plot – High Channel

8.0 CONCLUSION

In the opinion of ACS, Inc. the L+G Focus AX w/ Zigbee Utilinet Endpoint, manufactured by Cellnet Technology, Inc. meets the requirements of FCC Part 15 subpart C.

END REPORT