

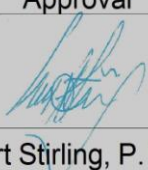
Gorko Systems WSNS Sensor

Record of Measurements

FCC CFR47 Part 15 Subpart C §15.247 & IC RSS-210

Revision 1.5

June 8, 2012

	Approval	
Checked By:	 Robert Stirling, P. Eng.	<i>June 8, 2012</i> Date

Protocol Data Systems Inc, EMC Lab, Abbotsford BC, Canada. SCC ISO/17025 (CAN-P-4E) Accredited Laboratory No. 631 FCC O.A.T.S. Registration Number 96437 Industry Canada O.A.T.S. Registration Number IC3384A-1

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Section I: Report of Measurements Testing Information

GENERAL INFORMATION:

Applicant Company Name	Gorko Systems
Address	132 Southbend Crescent
	Winnipeg, MB R3Y 1K7
	Phone: 204-228-5703
Contact Person	Mr. Gordon Boyechko
Email	gorko@mts.net
Product Name	WSNS Wireless Sensor
FRN	0021455464
Applicable Standard	FCC Part 15.247
Test Results	Pass
Statement of Compliance	This equipment has been tested in accordance with the standards identified in the referenced test report. To the best of our knowledge and belief, these tests were performed using the measurement procedures described in this report and demonstrate that the equipment complies with the appropriate standards. – Signature on Front Cover Page.

EQUIPMENT UNDER TEST SPECIFICATIONS:

Manufacturer	Gorko Systems
Product Description	Wireless Temperature Sensor
FCC ID	AUF-S1
IC Number	10170A-S1
Model Number	WSNS
Name	Wireless Temperature Sensor
Operating Frequency	2.405- 2.480 GHz
Emission Designator	760KK7D
EUT Power Source	3 V Coin Cell
Test Item	Production Unit
Type of Equipment	Fixed
Test Voltage	3 Vdc

TEST FACILITY:

Test Facility	Protocol Data Systems Inc.
	4741 Olund Rd.
	Abbotsford, BC V4X 1V6
	Phone: 604-504-0091
	Fax: 604-554-0091
	Email: info@protocol-emc.com
	Website: www.protocol-emc.com
Test Facility ID's	SCC ISO/17025 (CAN-P-4E) Accredited Laboratory No. 612
	FCC O.A.T.S. Registration Number 627740
	Industry Canada O.A.T.S. Registration Number IC3384
Dates Tested	February 23, 29, March 4, May 12, 2012
Tested By	Rob Stirling

TEST SET-UP:

Test Exercise E.g. software description, test signal, etc.	The EUT was set for continuous transmit mode of operation.
Deviation from Standard/s	No deviation from Standard
Modification to the EUT	No modifications were made.

TEST EQUIPMENT LIST

Manufacturer	Model	Equipment Description	Serial No.	Next Cal
HP	85650A	CDN Quasi-Peak Adapter	2811A01080	12/08/12
HP	85662A	Spectrum Analyzer Display	2152A03569	11/08/12
HP	8566B	Spectrum Analyzer RF Section	2241A02102	11/08/12
HP	85685A	RF-Preselector	3107A01222	11/08/12
EMCO	3146	Ant Log Periodic 200-1000MHZ	9611-4699	08/08/12
EMCO	3110B	Ant Biconical 20-300MHz	9401-1850	08/08/12
EMCO	3115	Horn Antenna 1-18GHz	9403-4251	20/08/12
EMCO	3825/2	LISN	2470	20/07/12
Rhientech	Custom	Antenna Mast	N/A	N/A
Protocol EMC	Custom	Turntable	N/A	N/A
HP	362	Controller	6452A40248	N/A
EMCO	6502	Loop Antenna 9kHz-30MHz	9002-2489	18/6/12
HP	11970K	Mixer	3003A0SSSA	N/A
MI Technologies		Horn Antenna 18-26.5 GHz		N/A
HP	11975A	Amplifier	2517A00440	

MEASUREMENT UNCERTAINTY

Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Total RF power, conducted	$\pm 1,5$ dB
RF power density, conducted	± 3 dB
Spurious emissions, conducted	± 3 dB
All emissions, radiated	± 3 dB
Temperature	$\pm 1^\circ\text{C}$
Humidity	± 5 %
DC and low frequency voltages	± 3 %

Equipment Under Test

THE TEST SYSTEM:

EUT:Manufacturer:
Serial Number:
Part NumberWireless Remote Temperature Sensor
Gorko
Test1
WSNS

WSNS

Section II: Report of Measurements Test Procedure

RADIATION INTERFERENCE:

The measurement was made per ANSI C63.4-2003 using an Agilent model 8566B spectrum analyzer, a model 85685A Preselector, a model 85650A quasi-peak adapter, and the appropriate antenna. The analyzer was calibrated in dB above a microvolt at the output of the antenna. The resolution bandwidth was 100kHz with an appropriate sweep speed and the video bandwidth was 300kHz up to 1GHz and 1MHz with a VBW greater than or equal to the RBW above 1GHz. When an emission was found, the table was rotated to produce the maximum, signal strength. The antenna was placed in both the horizontal and vertical planes and the worse case emissions were reported. The EUT was re-positioned to produce the highest emission level. The spectrum was searched to at least the tenth (10) harmonic of the fundamental.

Formula of Conversion Factors:

The field strength at 3m was established by adding the meter reading of the spectrum analyzer (which is set to read in units of dBμV) to the antenna correction factor supplied by the antenna manufacturer. The antenna correction factors are stated in terms of dB. The gain of the Preselector was accounted for in the spectrum analyzer meter reading, but any external amplifier gain and distance correction*

$$\text{Eg.: Freq (MHz) Meter Reading} + \text{ACF} + \text{Cable Loss} - \text{Amp Gain} - \text{Distance Factor} = \text{Field Strength}$$

$$330 \quad 52.5 \text{ dB}\mu\text{V @ 1m} \quad +5.0 \text{ dB} \quad +0.5 \text{ dB} \quad -18.5 \text{ dB} \quad -9.5 \text{ dB} = 50 \text{ dB}\mu\text{V/m @ 3m}$$

* Where the field strength was too low to get an accurate reading at the required distance of 3 meters, the Antenna was moved closer to 1 meter. The resulting measurement was distance corrected for 3 meters by using the formula: (closer distance result) – (20Log(measured distance/required distance)) = (required distance result)

$$\text{Eg.: 1M reading (dB}\mu\text{V/m)} - (20\text{Log}[1/3]) \text{ dB} = 3\text{M reading (dB}\mu\text{V/m)}$$

$$55.42 \text{ dB}\mu\text{V @ 1m} \quad - \quad 9.54 \text{ dB} \quad = \quad 45.88 \text{ dB}\mu\text{V @ 1m}$$

Power Line Conducted Interference:

The procedure used was ANSI C63.4-2003 using a 50μH LISN. Both lines were observed. The bandwidth of the spectrum analyzer was 10kHz with an appropriate sweep speed. The spectrum was scanned from 0.15 to 30MHz. The measurement was performed on an Open Air Test Site at 0.8meters above the horizontal groundplane.

OCCUPIED BANDWIDTH:

A sample of the transmitter output detected by an antenna was fed into the spectrum analyzer and the attached plot was printed. The vertical scale is set to 10dB per division.

ANSI C63.4-2003 MEASUREMENT PROCEDURES:

The EUT was placed in a horizontal orientation, lying flat, on top of a table 80 cm high and with dimensions of 1m by 1.5m. The EUT was placed in the center of the table (1.1m side). The table used for radiated measurements is capable of continuous rotation.

When an emission was found, the table was rotated to produce the maximum signal strength. At this point, the antenna was raised and lowered from 1m to 4m. The antenna was placed in both the horizontal and vertical planes.

Due to the construction of the EUT, the EUT was also placed in a vertical orientation and rotated on its axis and the emissions were maximized again to identify the highest emission level.

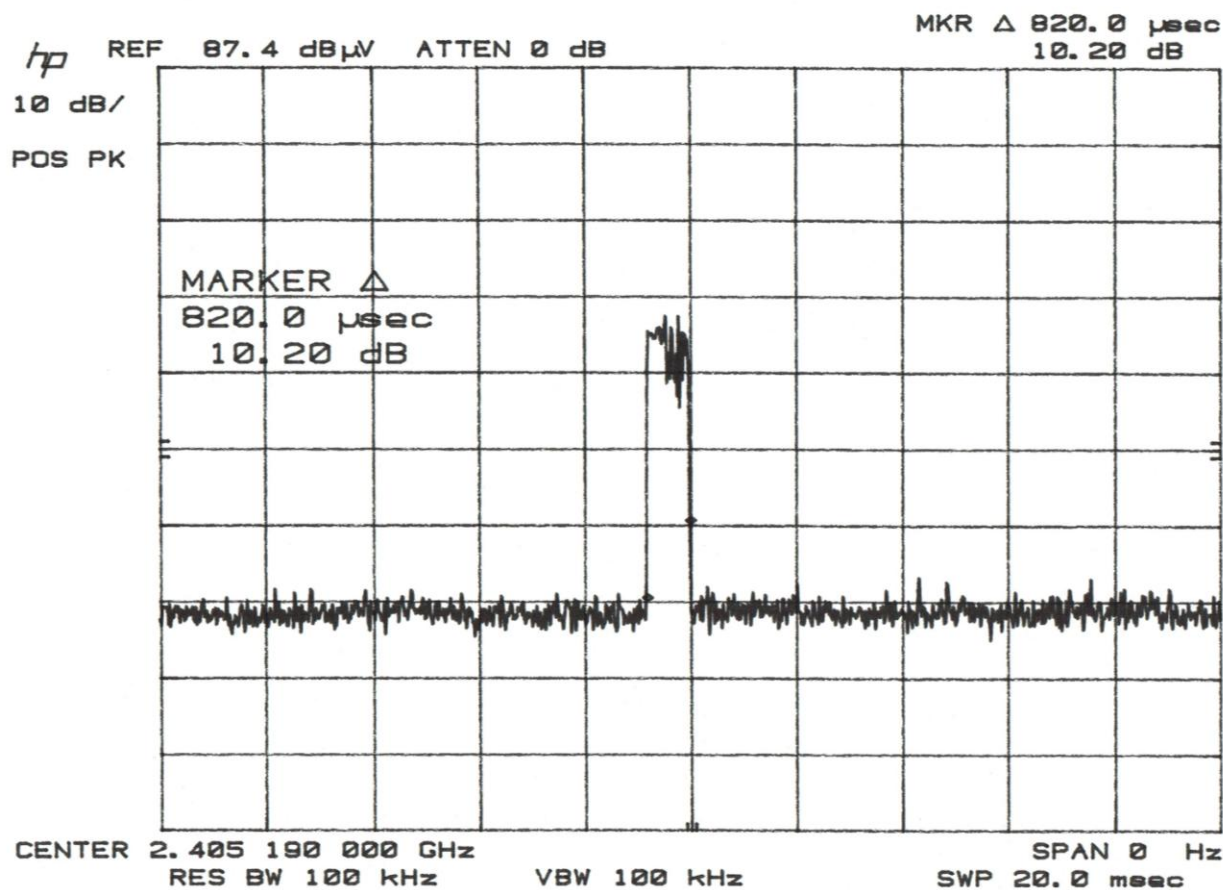
Frequencies less than 1GHz were measured using the Quasi-Peak receiver. Frequencies equal to and greater than 1GHz were measured using the Average receiver

Duty Cycle Correction Factor for Pulsed Transmissions

On a change of state, 6 identical packets are transmitted at random intervals. The time interval between each packet is no less than 100mS and S. Each packet is complete

Thus, for every 100 ms, we are transmitting for 8aprox 1 ms of that time period. Therefore our duty cycle correction factor (in the worst case 100mSec period) is:

$$\text{DUTY CYCLE CORRECTION FACTOR (dB)} = 20 \cdot \text{Log}(0.0082) = -41.7 \text{ dB}$$



Typical On-Time of Packet, ~ 1ms and Packet Spacing .> 100ms

Section III: Maximum Conducted Output Power

TEST DATE: May 12, 2012

TEST STANDARD: FCC publication KDB558074 Measurement of Digital Transmission Systems Operating under Section 15.247 March 23, 2005 and IC RSS-210 Annex 8: A8.4 (4).

REQUIREMENTS: For systems using digital modulation operating in the 2400 - 2 483.5 MHz band, maximum power shall not exceed 1 watt (30 dBm).

TEST DATA:

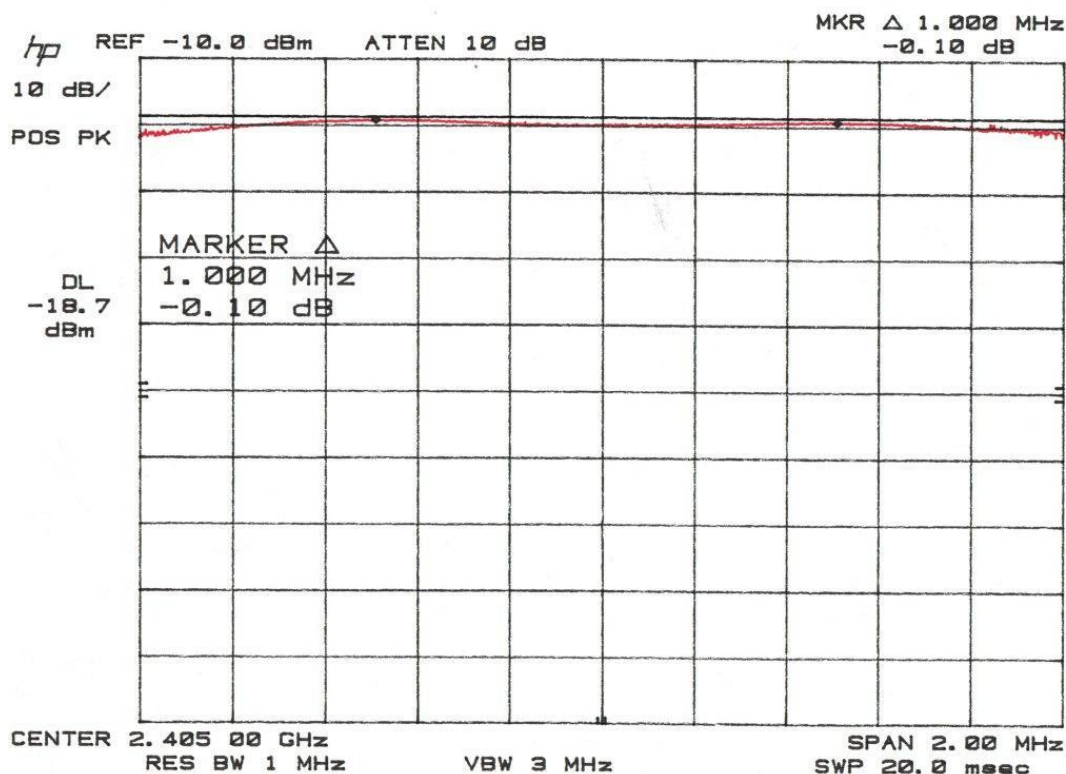
Channel	Frequency (MHz)	Output Power (dBm)	Linear Power(mW)	Total Output Power (dBm)
Low	2405	1.3/1.2	$1.4 + 1.3 = 2.7$	4.3
Mid	2450	0.2/0.2	$1.0 + 1.0 = 2.0$	3.0
High	2480	1.1/0.9	$1.3 + 1.2 = 2.5$	4.0

TEST SETUP: Refer to PR12-055 Gorko test setup photos.

MODIFICATIONS: No modifications were made to pass this test.

PERFORMANCE: Maximum conducted output power for Low, Mid and High channels complies with standard requirement since the output power is less than 1 watt (30dBm)

TYPICAL MEASUREMENT PLOT:



Channel 0 maximum power, 20 dB Atten.

Section IV: Measurements of Power Spectral Density

TEST DATE: Feb 24, 2012

TEST STANDARD: FCC Part 15.247(e) and IC RSS-210 Annex 8: A8.2 (2)

REQUIREMENTS: For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

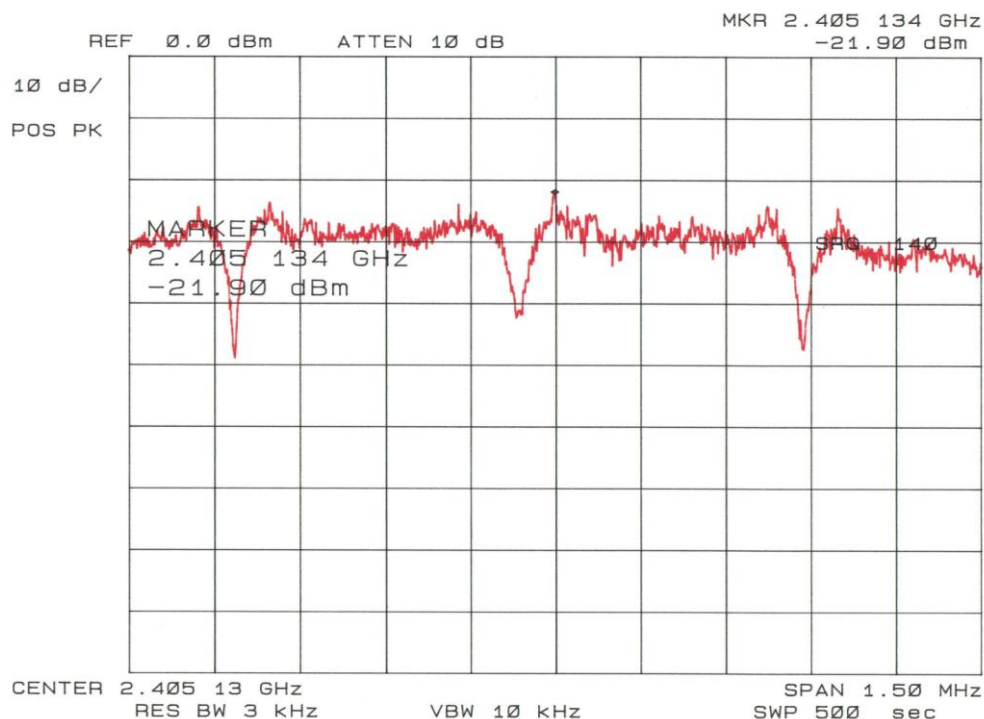
TEST DATA:

Channel	Frequency (MHz)	PSD (dBm)	Limit
Low	2405	-11.9	8 dBm
Mid	2450	-10.5	
High	2480	-9.3	

MODIFICATIONS: No modifications were made to the EUT to pass this test.

PERFORMANCE: Power Spectral Density of Low, Mid and High channel complies with the requirement as per FCC Part 15.247(e) and IC RSS-210 Annex 8: A8.2 (2).

TYPICAL MEASUREMENT PLOT



Ch 0 Power Spectral Density with 10 dB attenuator.

Section V: Measurement of 6dB Bandwidth

TEST DATE: Feb 23, 2012

TEST STANDARD: FCC Part 15.247(a)(2) and IC RSS-210 Annex 8: A8.2 (1)

REQUIREMENTS: Maximum 6 dB bandwidth for systems using digital modulation operating in the 2 400 - 2 483.5 MHz band: shall be at least 500 kHz.

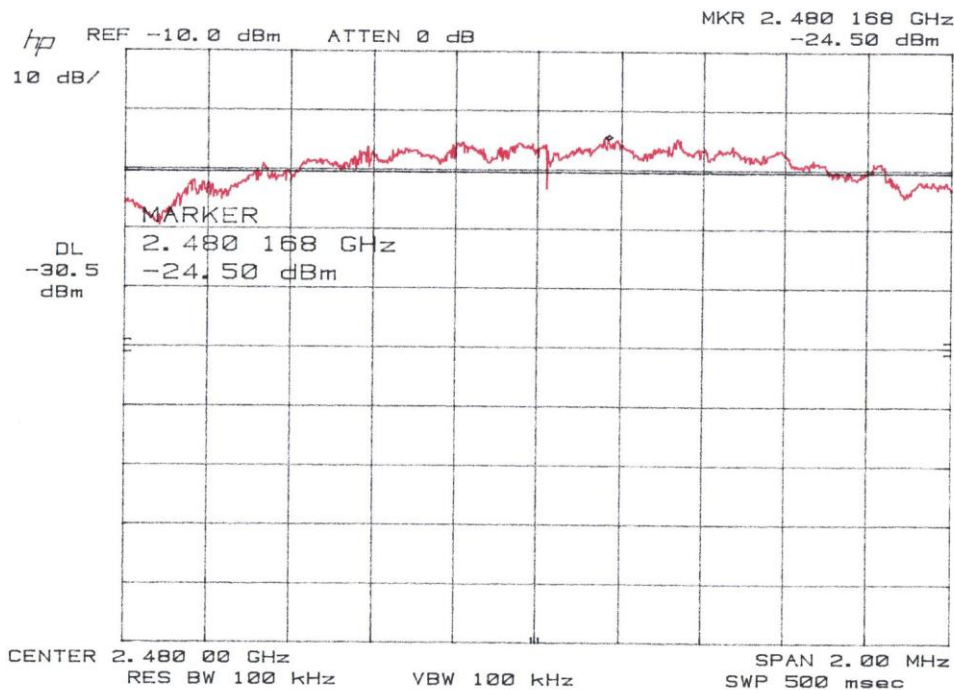
TEST DATA:

Channel	Frequency (MHz)	6dB Bandwidth (kHz)	Limit
Low	2405	1.51 MHz	> 500 kHz
Mid	2450	1.53 MHz	
High	2480	1.52 MHz	

MODIFICATIONS: No modifications were made to the EUT to pass this test.

PERFORMANCE: 6dB bandwidth of Low, Mid and High channel complies with the requirement as per FCC Part 15.247(e) and IC RSS-210 Annex 8: A8.2 (1).

TYPICAL MEASUREMENT PLOT:



Ch 15 6dB Bandwidth with 20 dB atten

Section VI: Measurement of Band Edges

TEST DATE: Feb 23, 2012

TEST STANDARD: FCC Part 15.247(d) and IC RSS-210 Annex 8: A8.5

REQUIREMENTS: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

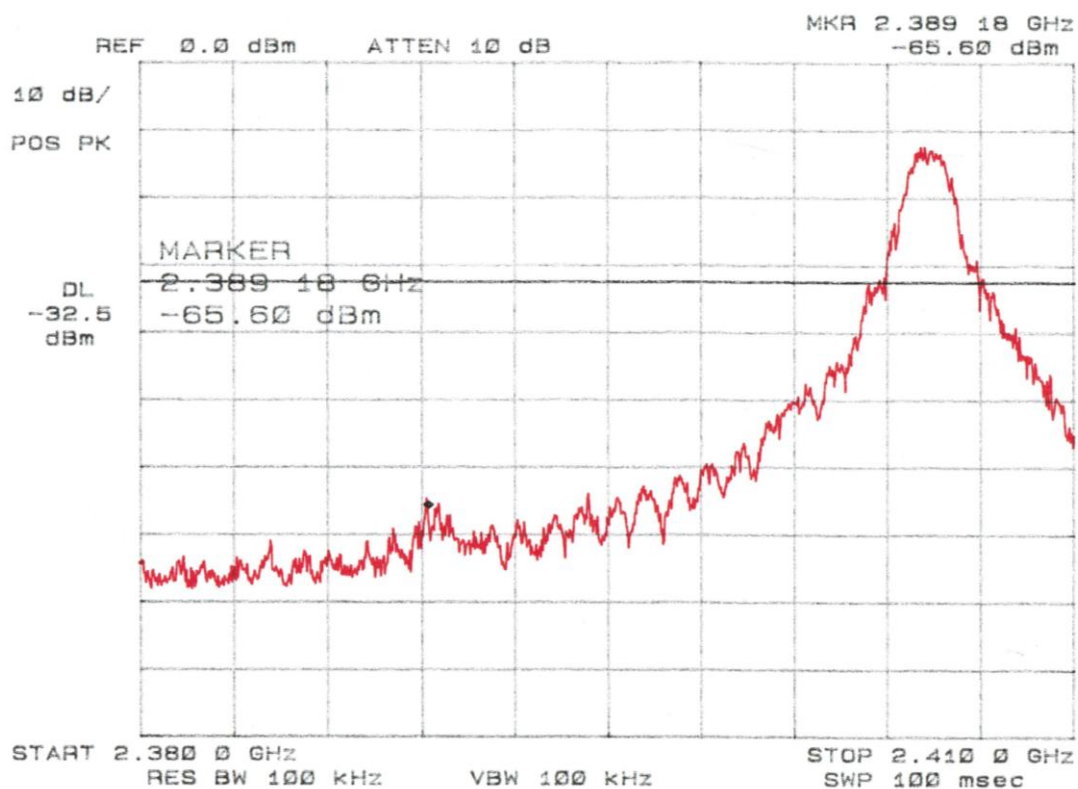
TEST DATA:

MODIFICATIONS: No modifications were made to the EUT to pass this test.

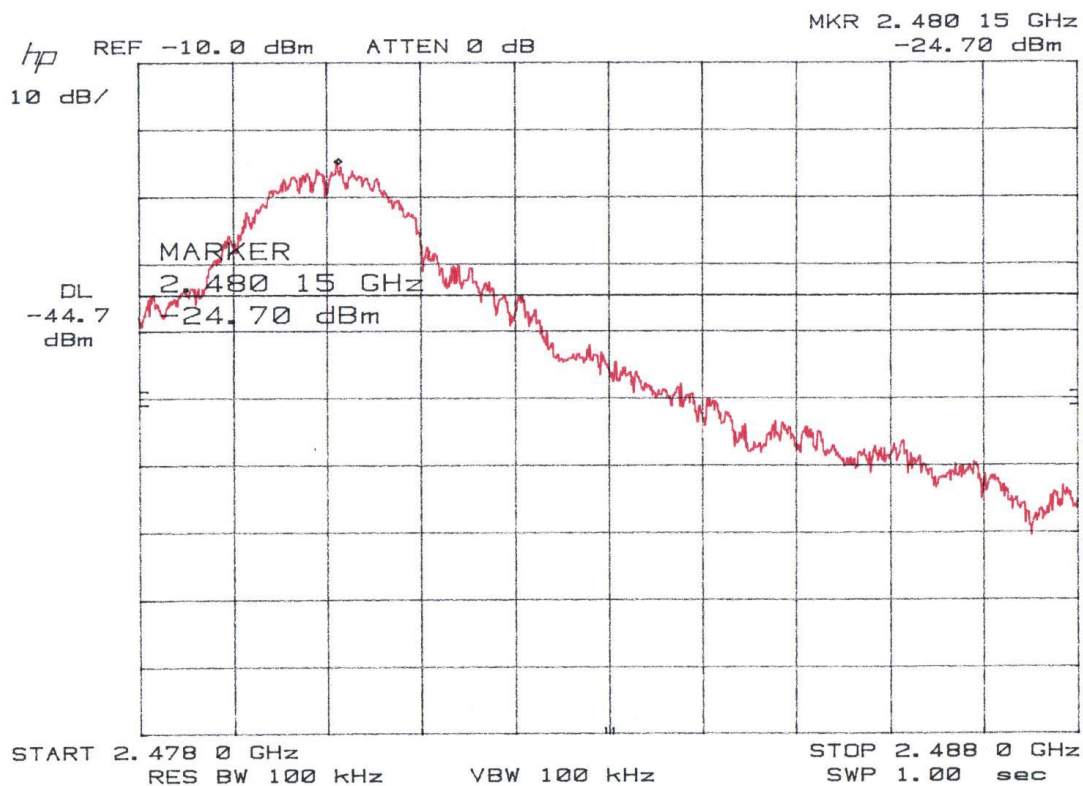
PERFORMANCE: Complies with the requirement as per FCC Part 15.247(e) and IC RSS-210 Annex 8: A8.5. and radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), also complies with the radiated emission limits specified in Section 15.209(a). The maximum radiated emission measured at or below 2390 MHz is 21.6 dBuV/m @ 1m. The maximum radiated emission measured at or above 2483.5 MHz is 21.6 dBuV/m @ 1m.

Frequency Range	
Low Channel	High Frequency
2405 MHz Center	2480 MHz
20 db lower band edge: 2402.5 MHz	20 db upper band edge: 2482.1 MHz
Limit $f_L > 2,4 \text{ GHz}$ and $f_H < 2,4835 \text{ GHz}$	

MEASUREMENT PLOTS



Ch 0 Low Occupied BW 20 dB attn



Ch 15 High Occupied BW 20 dB attn

Section VII: Restricted Bands of Operation

TEST DATE: Feb 29, 2012

TEST STANDARD: FCC Part 15 Subpart C, §15.205 and IC RSS-210

REQUIREMENTS: §15.205 Restricted Bands of Operation

(a) Except as shown in paragraph (d) of this section, only spurious emission are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)
13.36 - 13.41			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

² Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

MODIFICATIONS: No modifications were made to the EUT to pass this test.

PERFORMANCE: The radiated emissions for the EUT meet the requirements for FCC 15.205 restricted bands of operation. There were no measurable emissions in the restricted bands other than those recorded in this report. Other emissions were present with amplitudes at least 20 dB below the required limits. 15.205(a), also complies with the radiated emission limits specified in Section 15.209(a). The maximum radiated emission measured in the restricted band 2310 - 2390 MHz is 21.6 dBuV/m @ 1m. The maximum radiated emission measured in the restricted band 2483.5 - 2500 MHz is 21.6 dBuV/m @ 1m.

TEST DATA:

Radiated Emissions Falling in Restricted Bands (Transmit Mode)

Spurious In Restricted Bands

Frequency (GHz)	Pol.	Total Correction Factor	Averageing Corection	Measured peak Value (dBuV/m)	Corrected Value (dBuV/m)	Average Limit	Peak Margin	Average Margin
4.81006	V	4.5	40	52.8	52.8	54	1.2	41.2
7.21509	V	7.8	40	46	46	54	8	48
7.21509	H	7.8	40	45.9	45.9	54	8.1	48.1
12.02515	V	8.8	40	39.8	39.8	54	14.2	54.2
4.90106	V	4.6	40	45.9	45.9	54	8.1	48.1
7.35159	V	7.8	40	47.9	47.9	54	6.1	46.1
7.35159	H	7.8	40	49.8	49.8	54	4.2	44.2
12.25265	V	8.9	40	48.2	48.2	54	5.8	45.8
4.96132	V	4.7	40	48.2	48.2	54	5.8	45.8
7.44198	V	7.9	40	49.1	49.1	54	4.9	44.9
9.92264	H	7.9	40	50.8	50.8	54	3.2	43.2
12.4033	V	8.9	40	43.9	43.9	54	10.1	50.1

Section VIII: Measurements of Transmitter Spurious Emissions

TEST DATE: Feb 23, 2012, Feb 29, 2012, March 4, 2012

TEST STANDARD: FCC Part 15.247(d) and IC RSS-210

REQUIREMENTS: (d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

Frequency	Field Strength of Fundamental ($\mu\text{V/m}$)	Measurement Distance (meters)
9 to 490 kHz	2400/F(kHz)	300
490 to 1705 kHz	24000/F(kHz)	30
1705 to 30 MHz	30	30
30 – 88 MHz	100	3
80 – 216 MHz	150	3
216 – 960 MHz	200	3
Above 960 MHz	500	3

MODIFICATIONS: No modifications were made to the EUT to pass this test.

PERFORMANCE: Complies with the requirement as per FCC Part 15.247(e) and IC RSS-210.

TEST DATA: Spurious Radiated Emissions measurable readings between 0.009 MHz and 26GHz including all spurious emission readings within 20dB of the limit.

Low Channel 2405 MHz

Frequency (GHz)	Pol.	Total Correction Factor	Measured peak Value (dBuV/m)	Corrected Value (dBuV/m)	Average Limit	Peak Margin	Average Margin
4.81006	V	4.5	49	53.5	54	0.5	40.5
7.21509	V	7.8	38.2	46	54	8	48
7.21509	H	7.8	38.1	45.9	54	8.1	4.1
9.62012	V	8.7	37.3	46	54	8	48
12.02515	V	8.8	31	39.8	54	14.2	54.2
14.43018	V	11	35	46	54	8	448
16.83521	V	11.2	35	46.2	54	7.8	47.8

Mid Channel 2450 MHz

Frequency (GHz)	Pol.	Total Correction Factor	Measured peak Value (dBuV/m)	Corrected Value (dBuV/m)	Average Limit	Peak Margin	Average Margin
4.90106	V	4.6	47.8	52.4	54	1.6	41.6
7.35159	V	7.8	40.1	47.9	54	6.1	46.1
7.35159	H	7.8	42	49.8	54	4.2	44.2
9.80212	V	8.8	42.3	51.1	54	2.9	42.9
12.25265	V	8.9	39.3	48.2	54	5.8	45.8
14.70318	V	11.1	35	46.1	54	7.9	47.9
17.15371	V	11.2	35	46.2	54	7.8	47.8

High Channel 2480 MHz:

Frquency (GHz)	Pol.	Total Correction Factor	Measured peak Value (dBuV/m)	Corrected Value (dBuV/m)	Average Limit	Peak Margin	Peak Margin
4.96132	V	4.7	47.6	52.3	54	1.7	41.7
7.44198	V	7.9	41.2	49.1	54	4.9	44.9
9.92264	H	7.9	42.9	50.8	54	3.2	43.2
12.4033	V	8.9	35	43.9	54	10.1	50.1
14.88396	V	9	35	44	54	10	50
17.36462	V	11.1	35	46.1	54	7.9	47.9
19.84528	V	11.3	35	46.3	54	7.7	47.7