FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

PID WITH ZIGBEE (802.15.4) 2.4GHz

MODEL NUMBER: TP-PID

FCC ID: NSNTPPID

REPORT NUMBER: 10U13497-1

ISSUE DATE: DECEMBER 13, 2010

Prepared for
G4S JUSTICE SERVICES CANADA, INC.
103# - 6592, 176 STREET
SURREY, BRITISH COLUMBIA
CANADA

Prepared by
COMPLIANCE CERTIFICATION SERVICES
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	12/13/10	Initial Issue	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: G4S JUSTICE SERVICES CANADA, INC.
#103 – 6592, 176 STREET
SURREY, BRITISH COLUMBIA
V3S 4G5 CANADA

EUT DESCRIPTION: PID With Zigbee (802.15.4) 2.4GHz

MODEL: TP-PID

SERIAL NUMBER: 500011, v 63

DATE TESTED: DECEMBER 13, 2010

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For CCS By:

FRANK IBRAHIM
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

THANH NGUYEN
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, and FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a PID with Zigbee (802.15.4) 2.4GHz manufactured by G4S Justice Services Canada, Inc.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum Peak conducted output power as follows:

Frequency Range (MHz)	Mode	Peak Power (dBm)	Peak Power (mW)
2405-2480	802.15.4	3.276	2.13

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes an Integrated SMD antenna, with a maximum gain of 1.8 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was V63

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power. The worst-case position was determined to be in the Y Orientation (Upward).

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Officer Key Fob(OKF)	G4S	OKF	751278	N/A

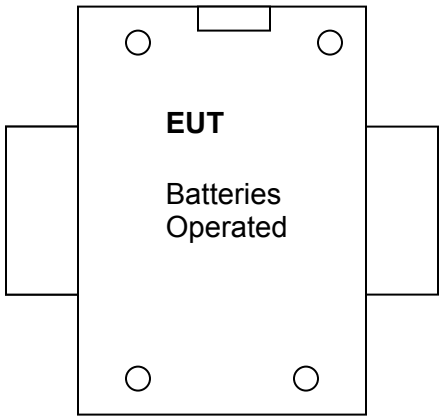
I/O CABLES

Not Applicable; EUT is stand–alone device.

TEST SETUP

The EUT is a stand-alone device, activated for testing by the OKF (Officer Key Fob), the remote key controller.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	08/10/11
Peak Power Sensor	Boonton	57006	C01203	07/28/11
Peak Power Meter	Boonton	4541	C01186	05/01/11
Antenna, Horn, 18 GHz	EMCO	3115	C00945	07/29/11
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	07/14/11
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	07/06/11
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	08/04/11

7. ANTENNA PORT TEST RESULTS (802.15.4 MODE IN THE 2.4 GHz BAND)

7.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

The minimum 6 dB bandwidth shall be at least 500 kHz.

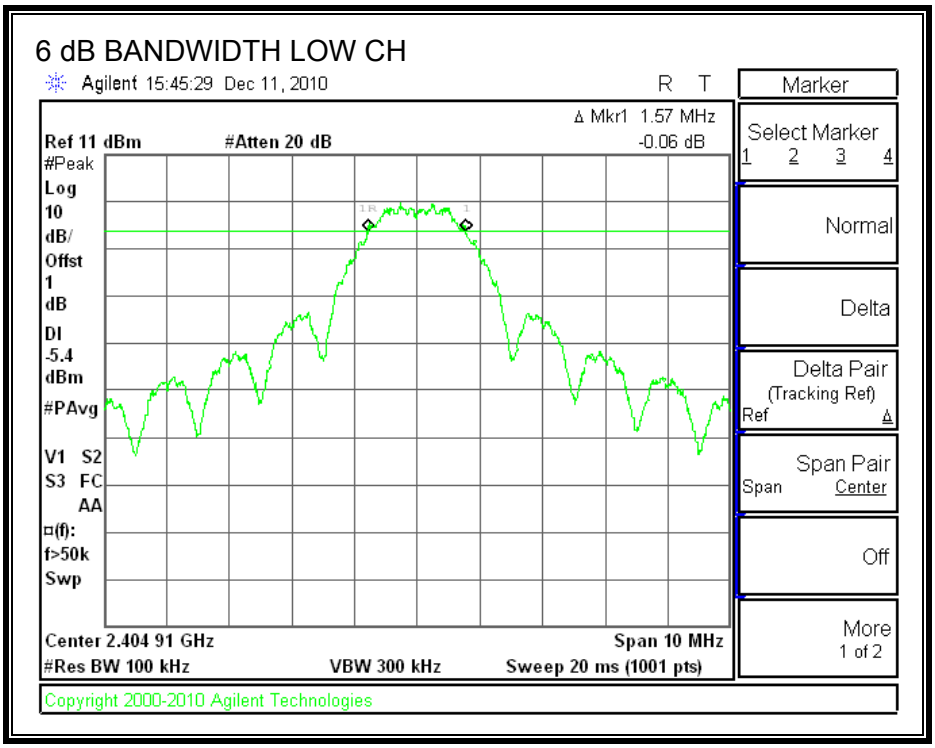
TEST PROCEDURE

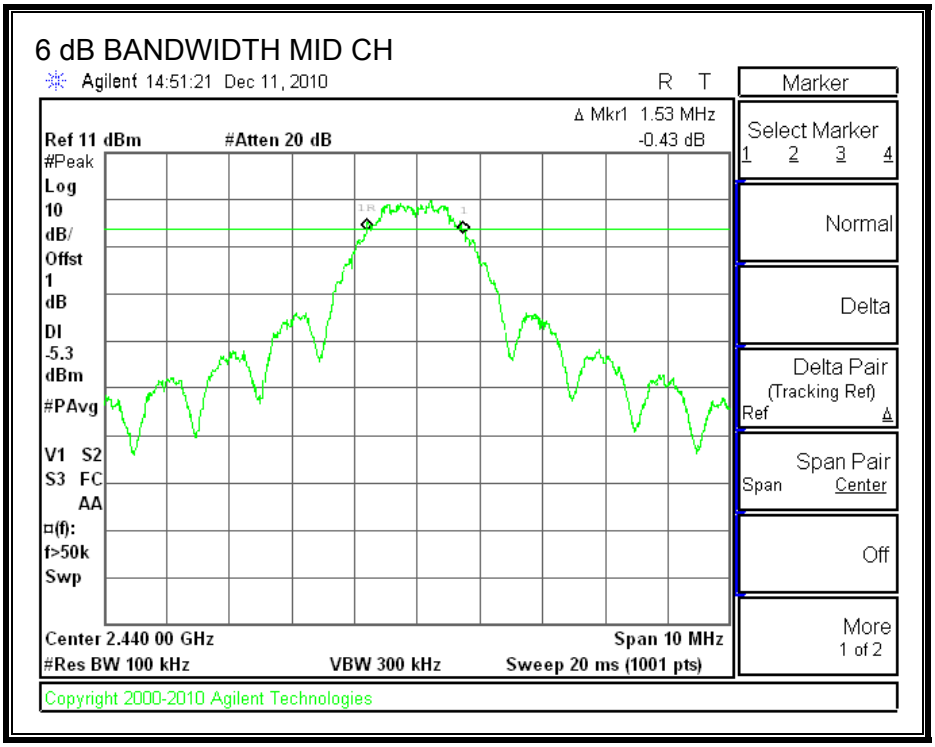
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

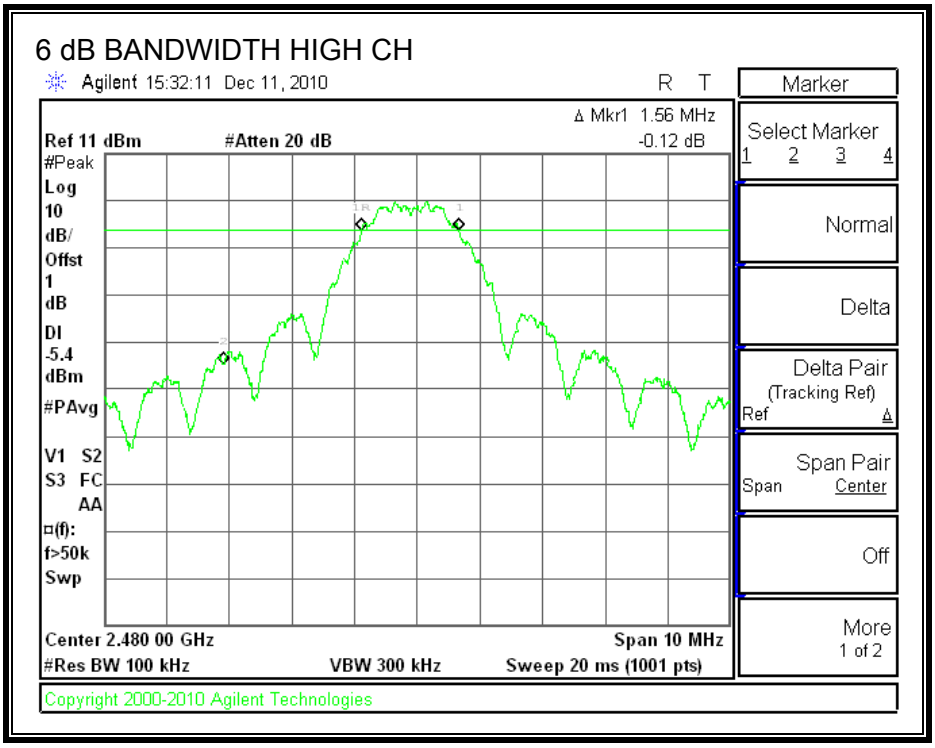
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2405	1.57	0.5
Middle	2440	1.53	0.5
High	2480	1.56	0.5

6 dB BANDWIDTH







7.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

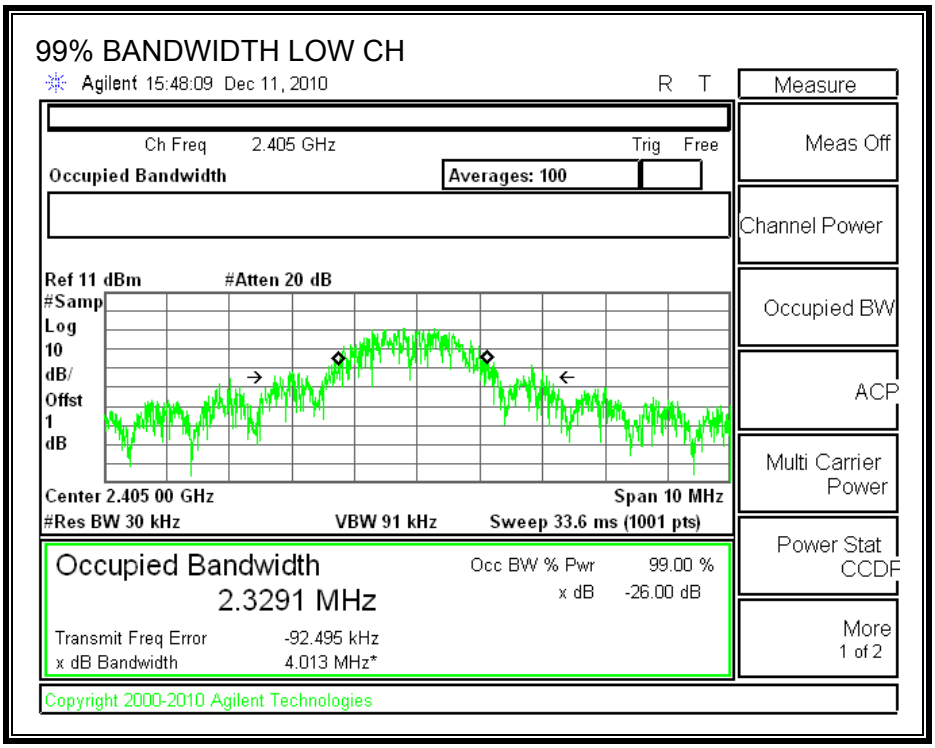
TEST PROCEDURE

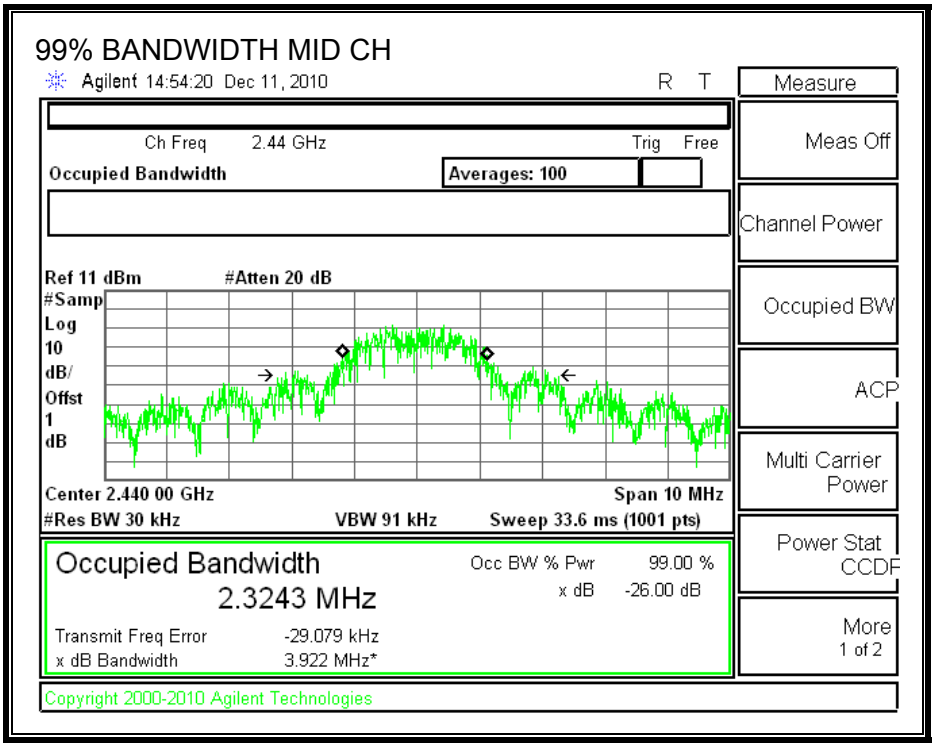
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

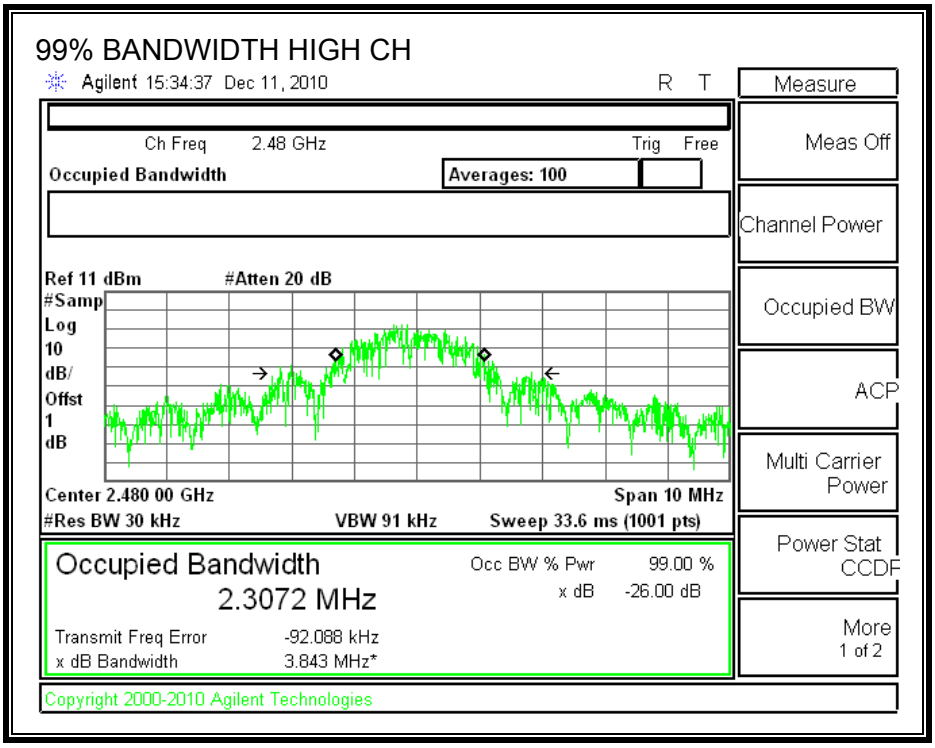
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2405	2.3291
Middle	2440	2.3243
High	2480	2.3072

99% BANDWIDTH







7.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 0.675dB was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2405	3.276	30	-26.72
Middle	2440	3.23	30	-26.77
High	2480	3.202	30	-26.80

7.4. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 0.675 dB was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2405	-10.362
Middle	2440	-9.153
High	2480	-9.205

7.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

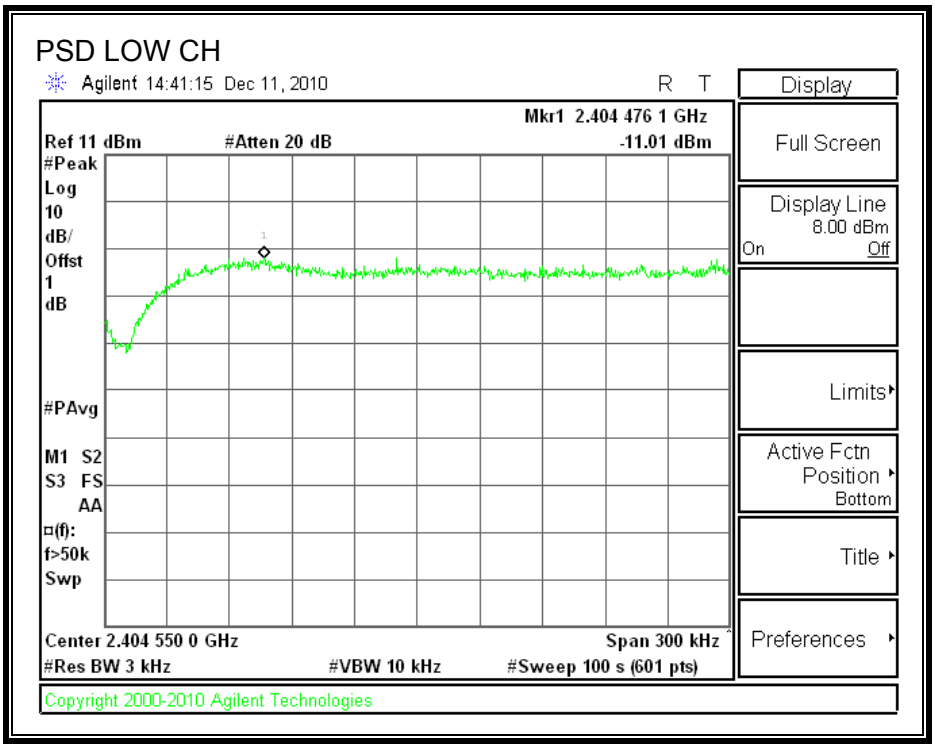
TEST PROCEDURE

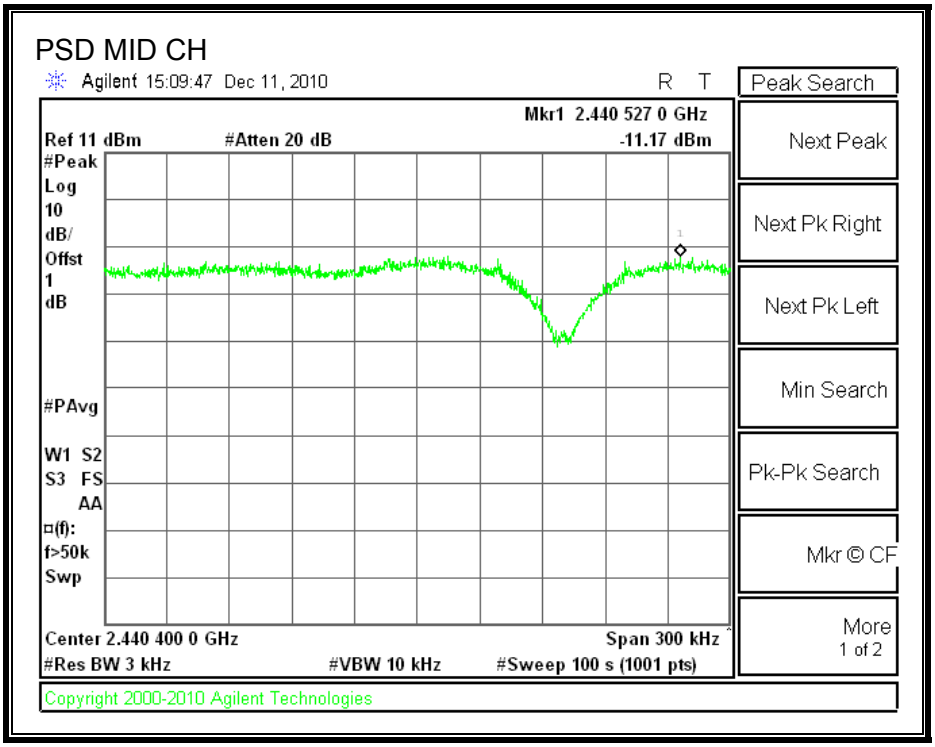
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

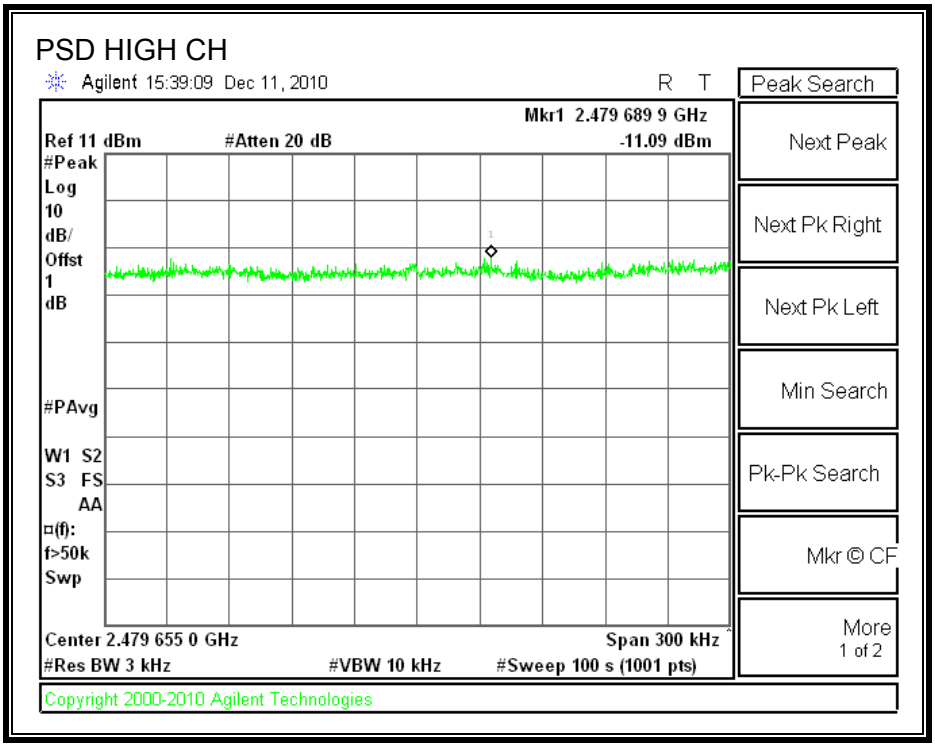
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2405	-11.01	8	-19.01
Middle	2440	-11.17	8	-19.17
High	2480	-11.09	8	-19.09

POWER SPECTRAL DENSITY







7.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

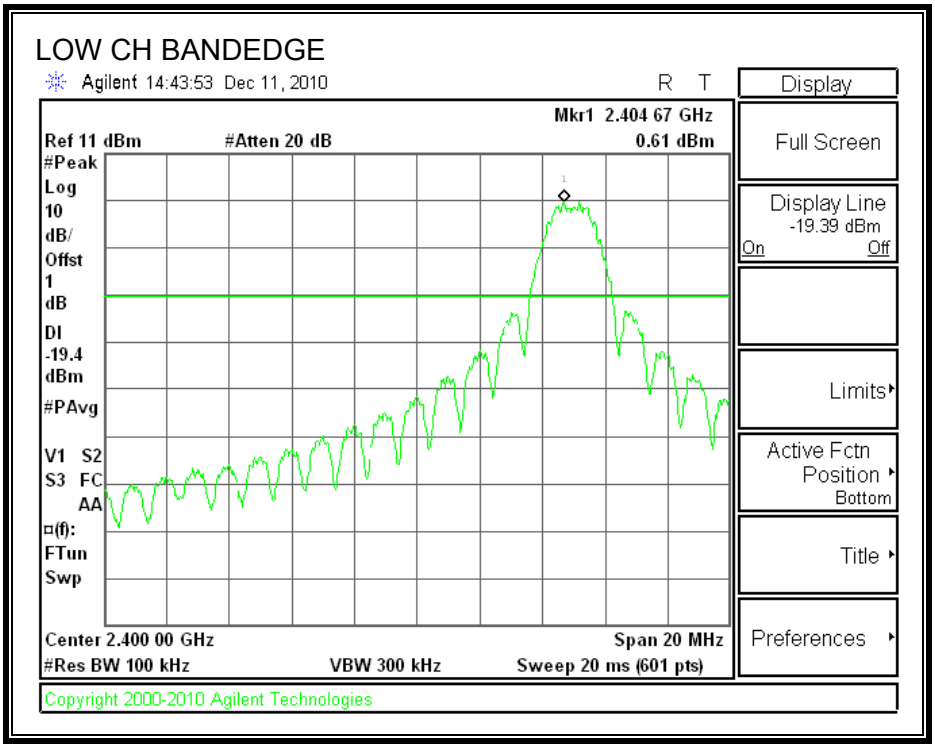
TEST PROCEDURE

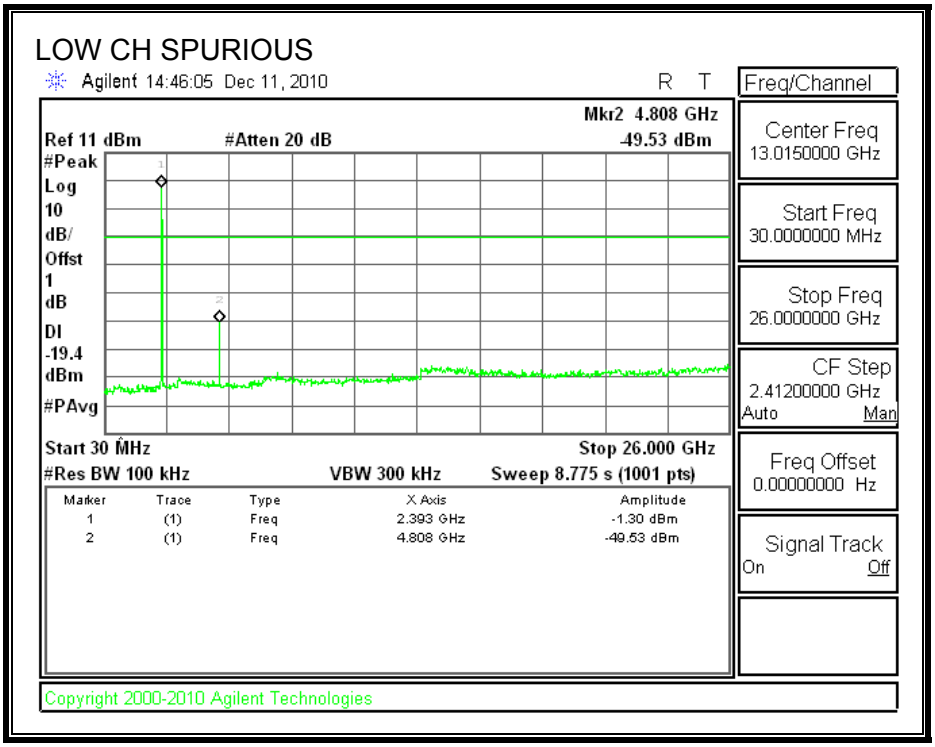
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

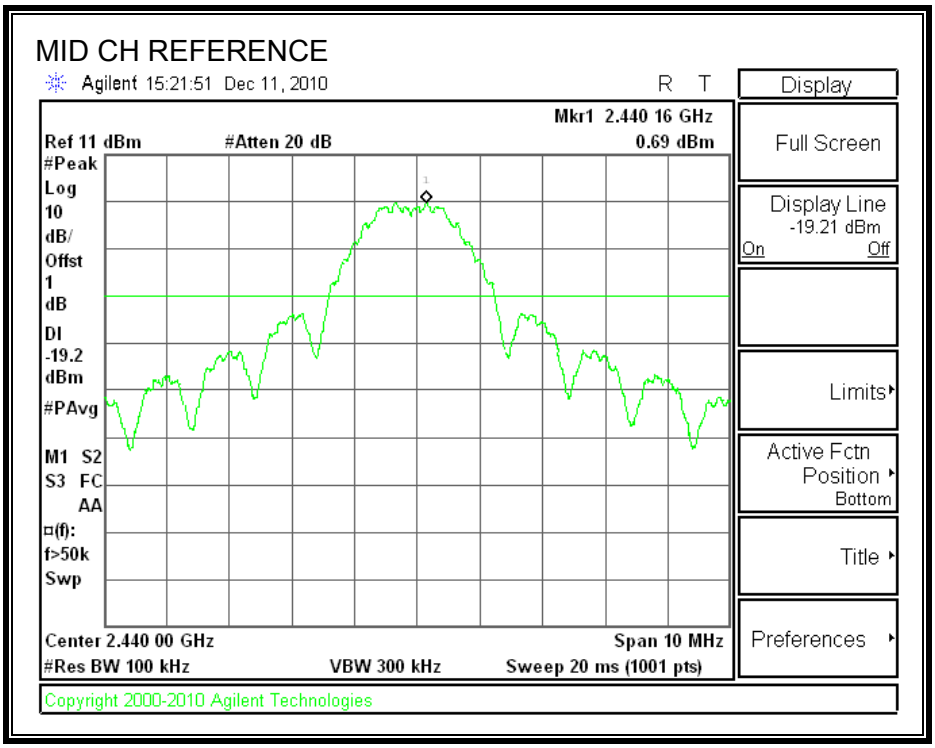
RESULTS

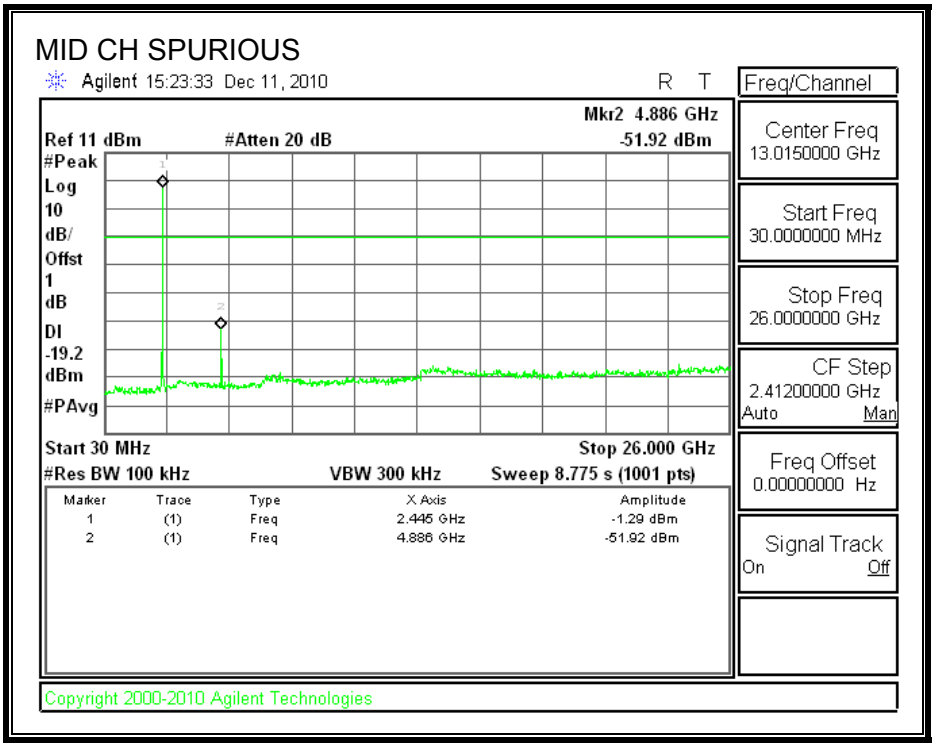
SPURIOUS EMISSIONS, LOW CHANNEL



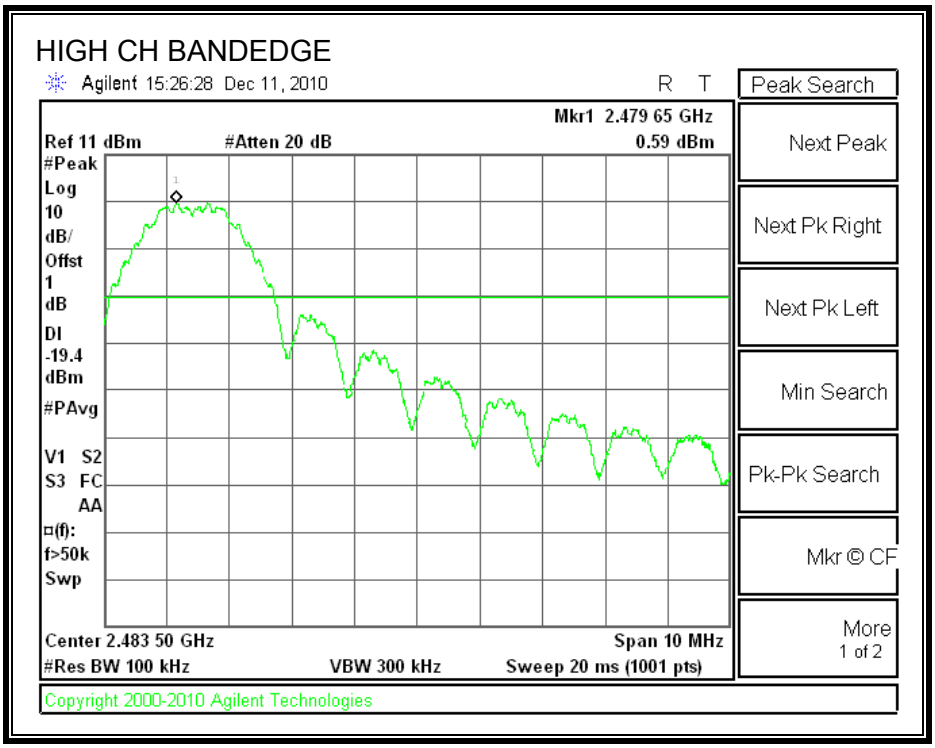


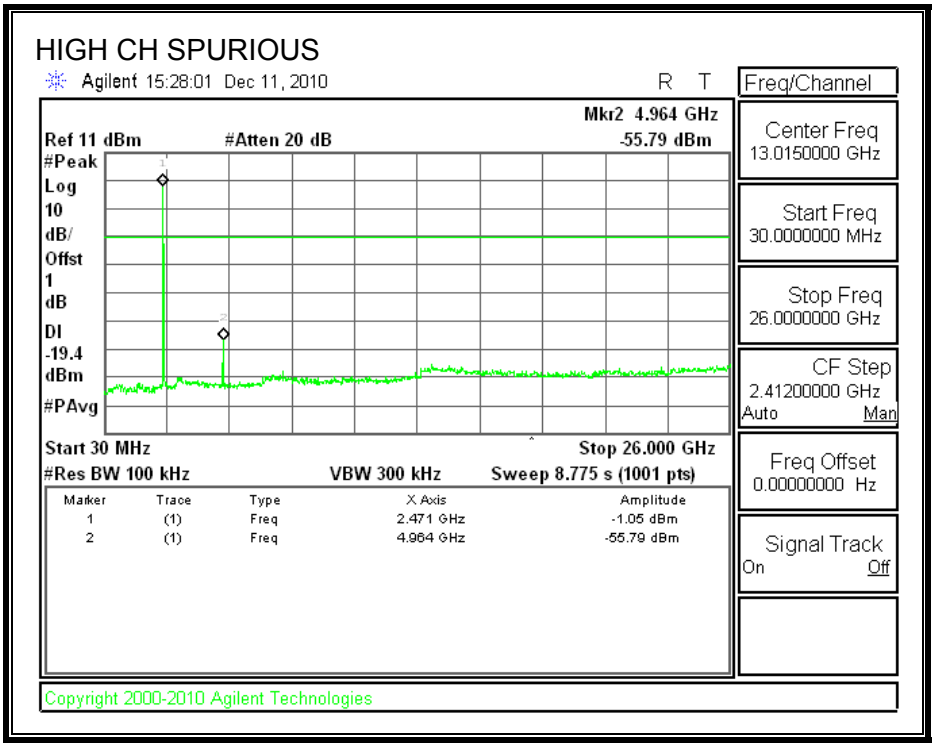
SPURIOUS EMISSIONS, MID CHANNEL





PURIOUS EMISSIONS, HIGH CHANNEL





8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

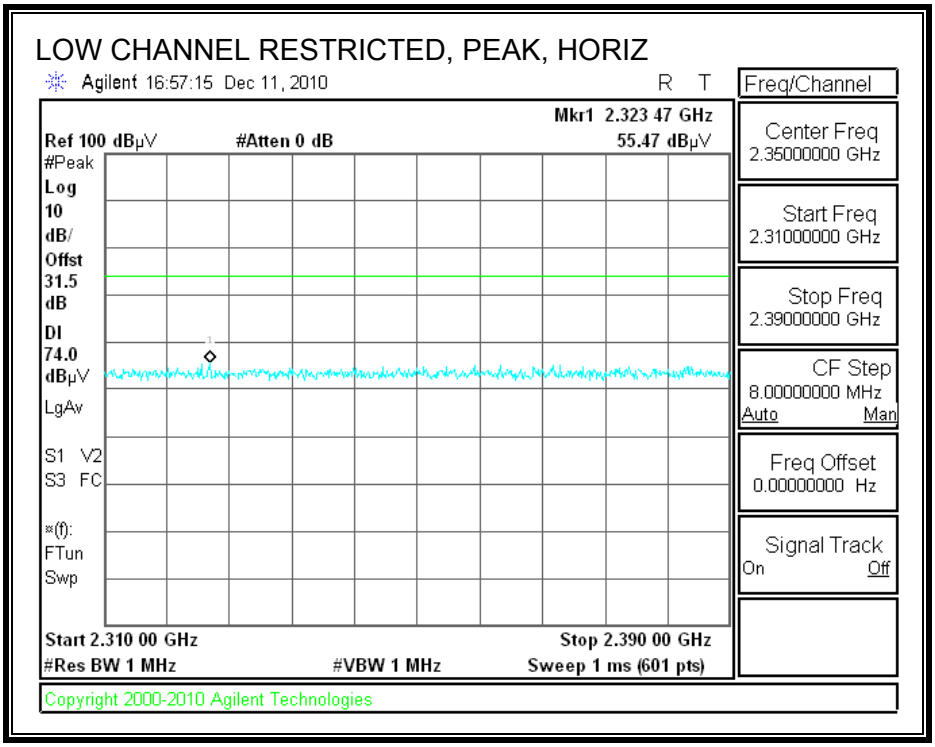
For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

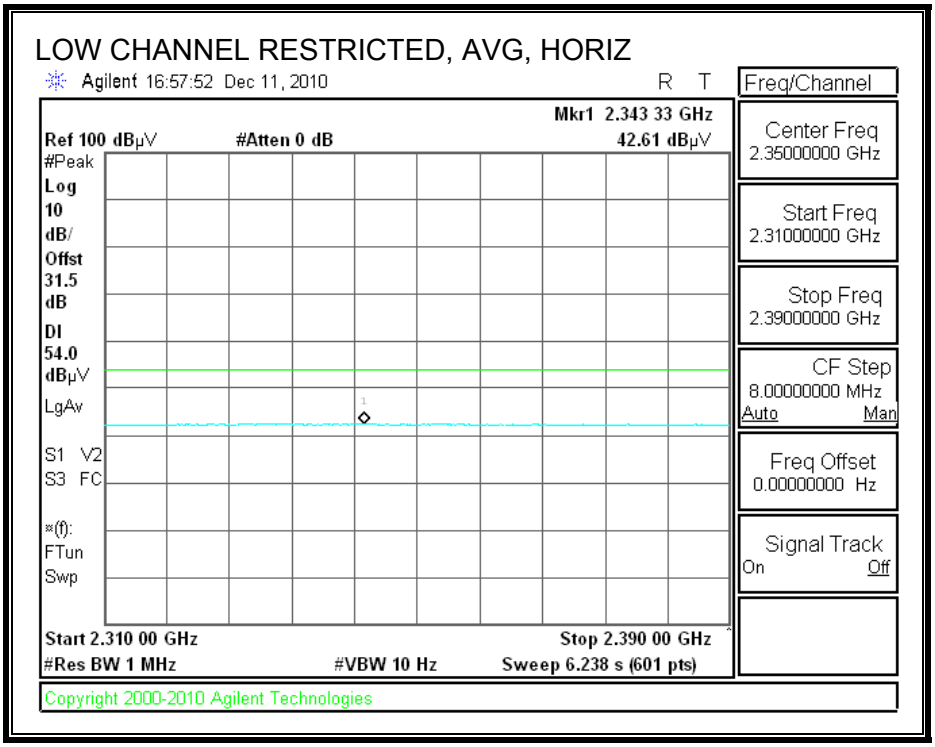
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

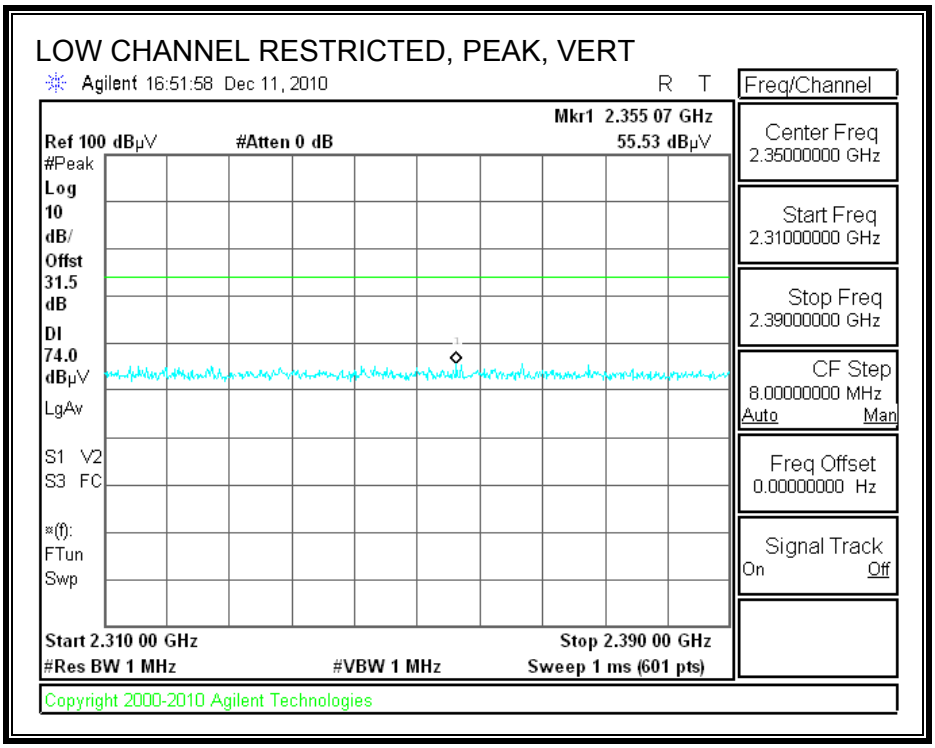
8.2. TRANSMITTER ABOVE 1 GHz

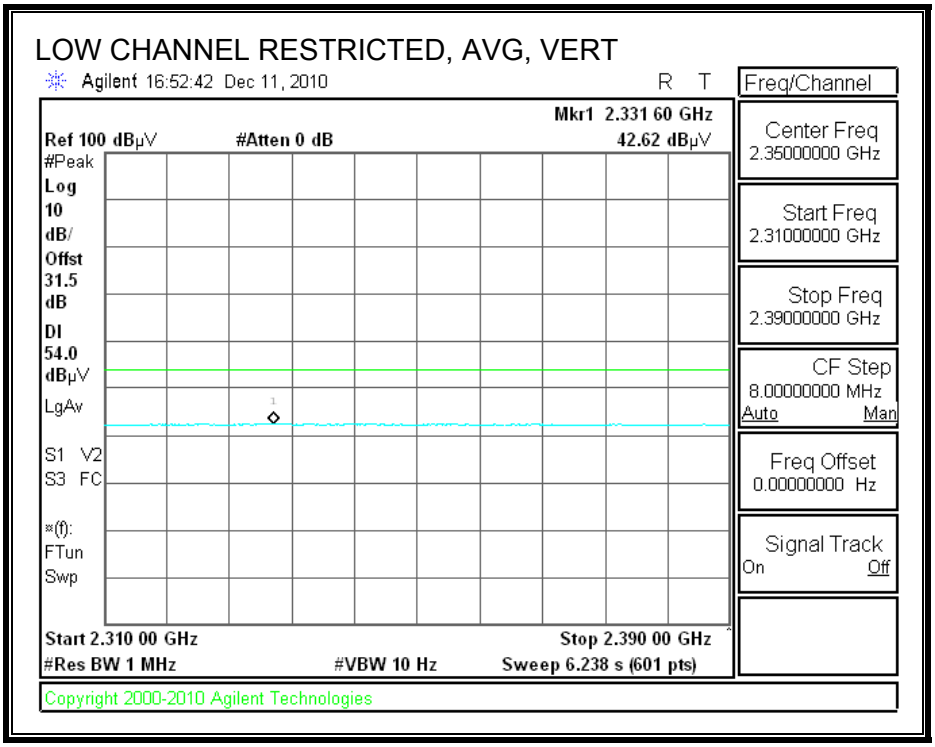
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



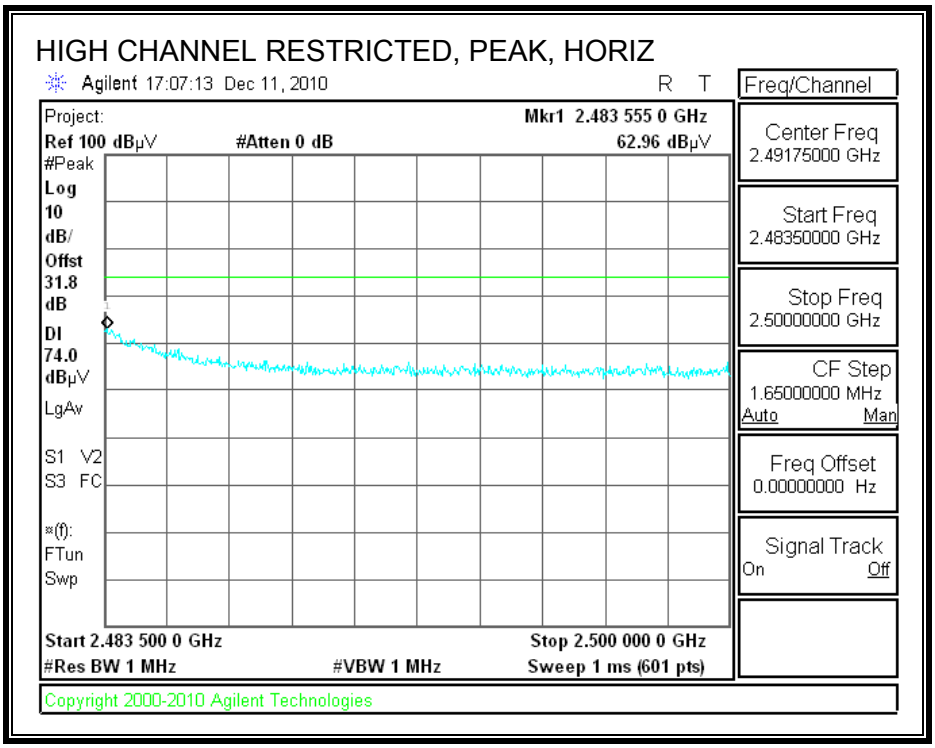


RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)

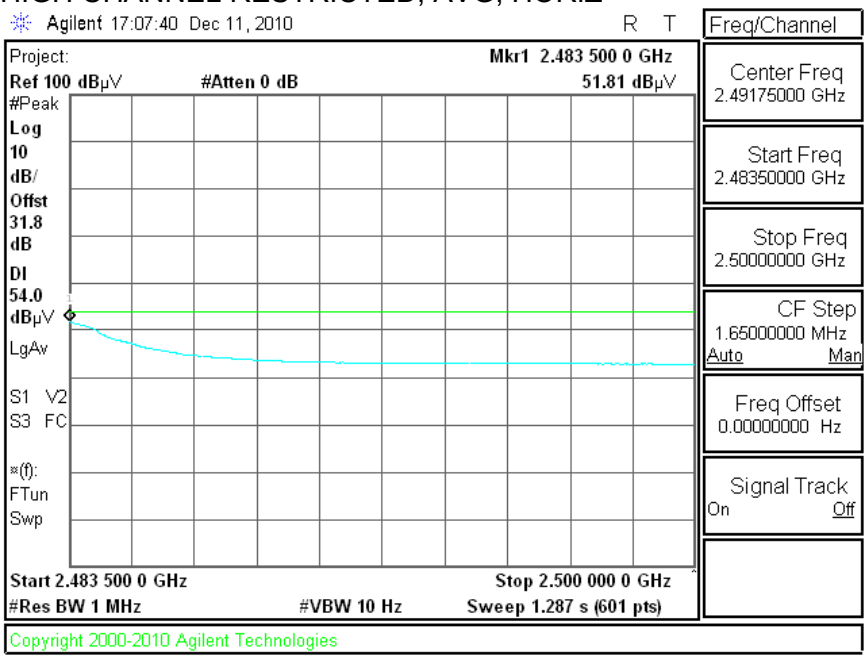




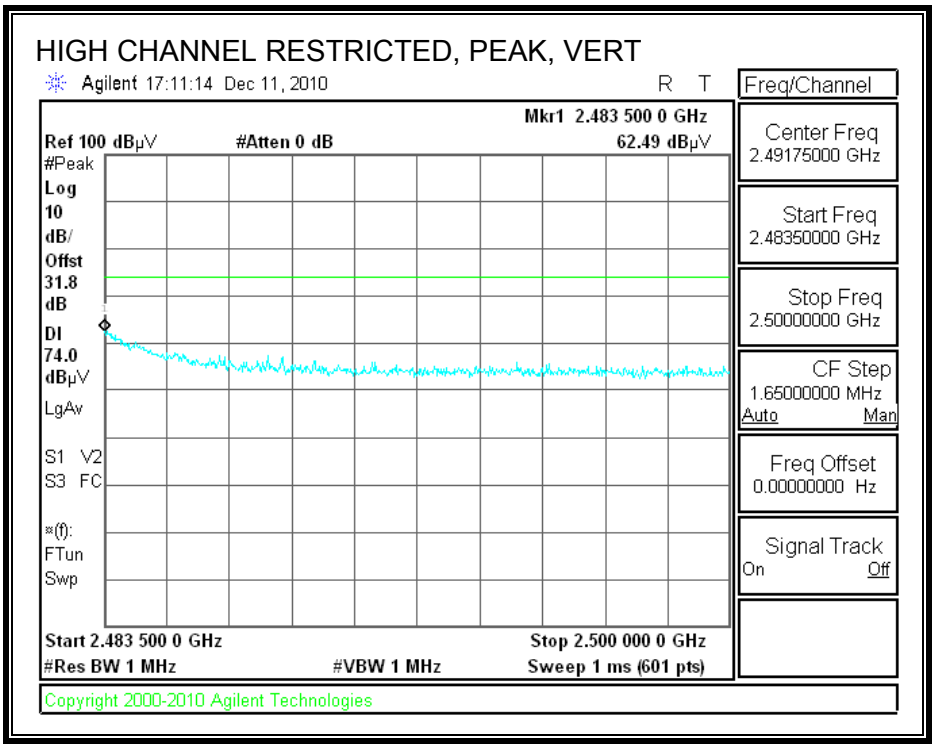
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



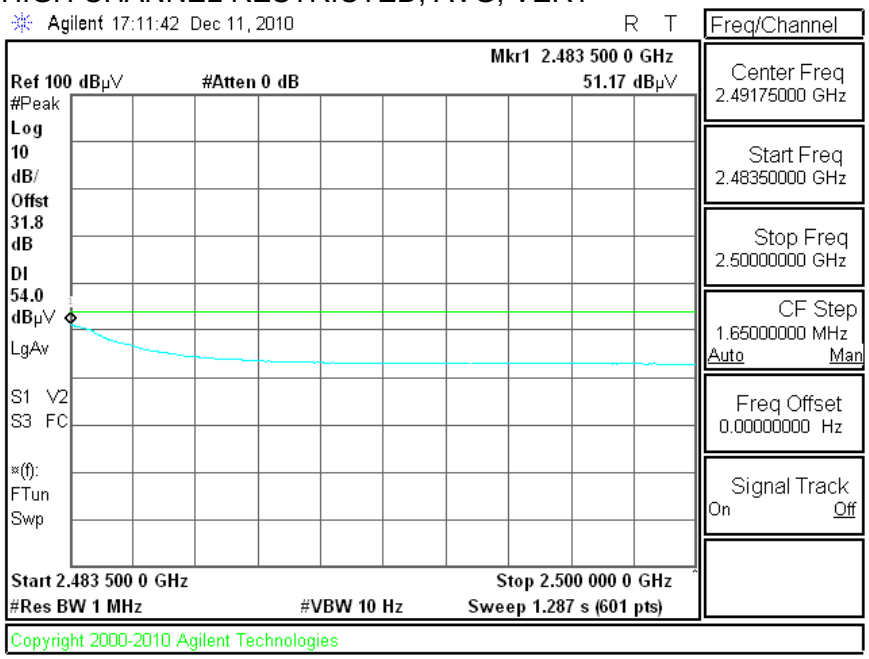
HIGH CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: G4S JUSTICE SERVICES CANADA, INC.
Project #: 10U13497
Date: 12/11/2010
Test Engineer: Thanh Nguyen
Configuration: EUT stand alone
Mode: Transmit

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T34 HP 8449B			FCC 15.209

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
Low Ch (CH 11) 2405MHz															
4.810	3.0	43.9	32.8	32.7	5.8	-34.8	0.0	0.0	47.5	36.4	74	54	-26.5	-17.6	V
7.215	3.0	38.6	26.5	35.4	7.2	-34.1	0.0	0.0	47.0	34.9	74	54	-27.0	-19.1	Noise floor
4.810	3.0	47.9	38.4	32.7	5.8	-34.8	0.0	0.0	51.5	42.0	74	54	-22.5	-12.0	H
7.215	3.0	40.0	26.7	35.4	7.2	-34.1	0.0	0.0	48.4	35.2	74	54	-25.6	-18.8	Noise floor
Mid ch (CH 18) 2440MHz															
4.880	3.0	43.8	33.5	32.7	5.8	-34.8	0.0	0.0	47.5	37.2	74	54	-26.5	-16.8	H
7.320	3.0	39.6	27.2	35.5	7.3	-34.1	0.0	0.0	48.3	35.9	74	54	-25.7	-18.1	Noise floor
4.880	3.0	41.3	30.3	32.7	5.8	-34.8	0.0	0.0	45.0	34.0	74	54	-29.0	-20.0	H
7.320	3.0	39.5	27.0	35.5	7.3	-34.1	0.0	0.0	48.2	35.7	74	54	-25.8	-18.3	Noise floor
High Ch (CH 26) 2480MHz															
4.960	3.0	40.9	29.8	32.8	5.9	-34.8	0.0	0.0	44.7	33.7	74	54	-29.3	-20.3	V
7.440	3.0	38.8	27.0	35.6	7.3	-34.1	0.0	0.0	47.7	35.8	74	54	-26.3	-18.2	Noise Floor
4.960	3.0	44.8	34.8	32.8	5.9	-34.8	0.0	0.0	48.7	38.7	74	54	-25.3	-15.3	H
7.440	3.0	38.8	26.6	35.6	7.3	-34.1	0.0	0.0	47.7	35.4	74	54	-26.3	-18.6	Noise Floor

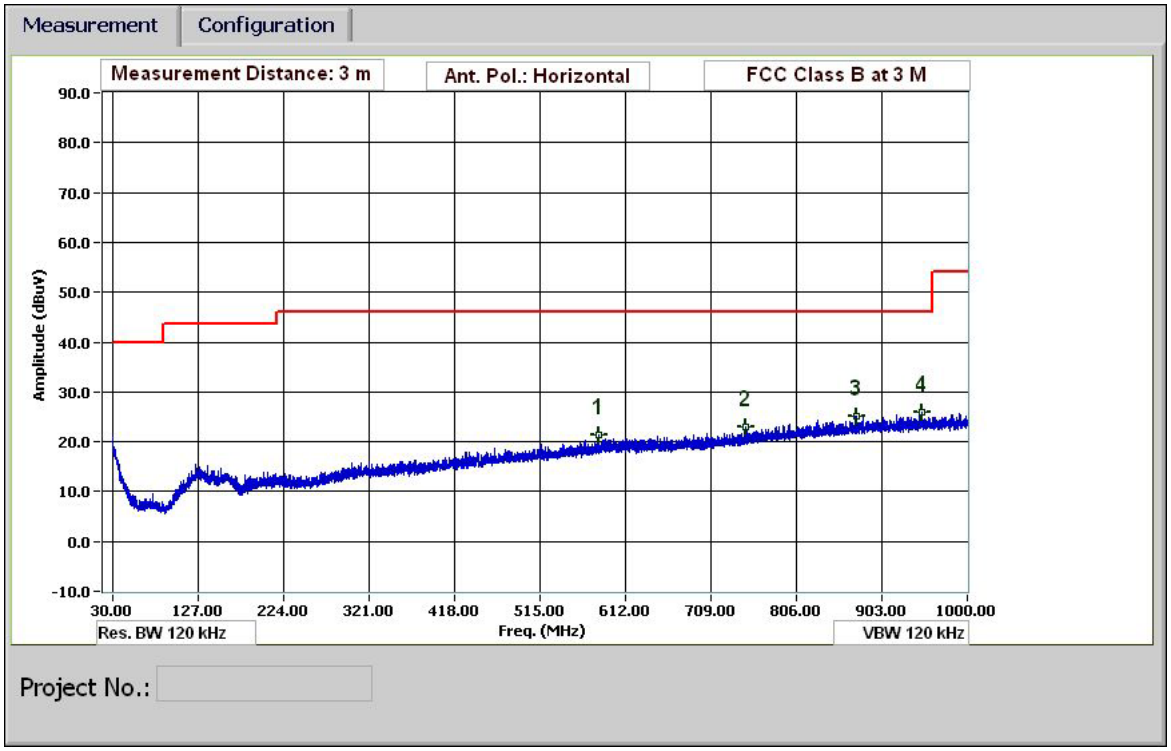
Rev. 07.22.09

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

8.3. WORST-CASE BELOW 1 GHz

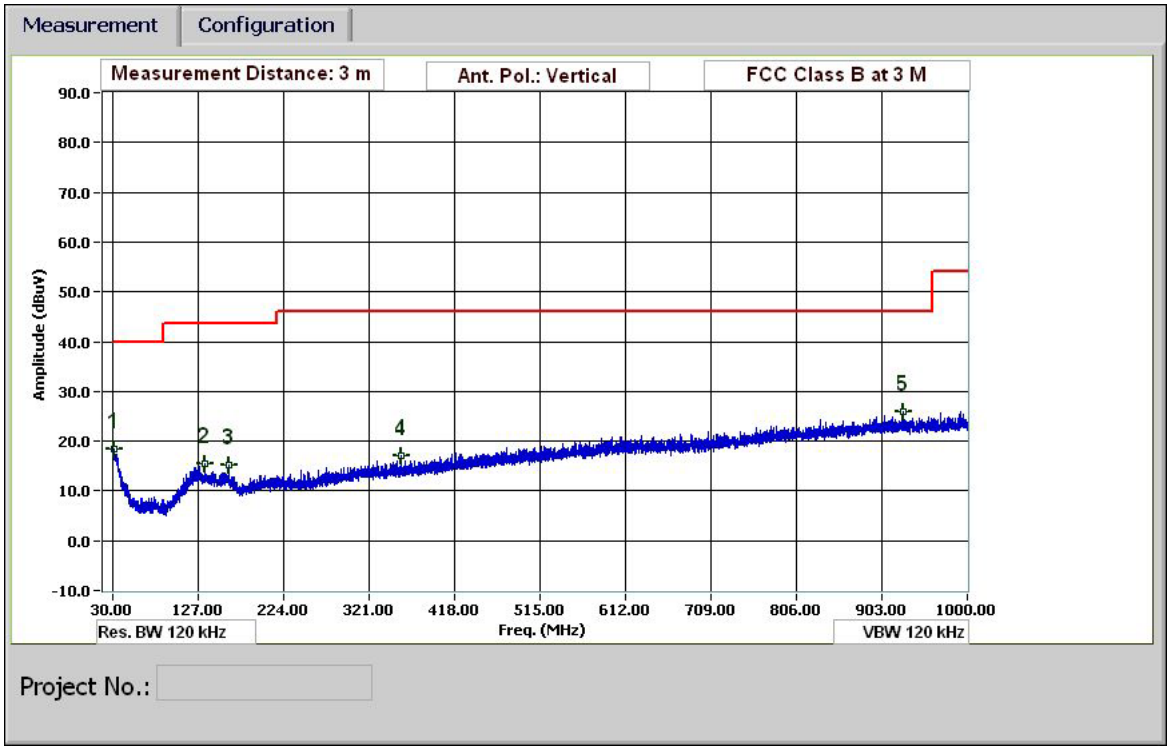
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Thanh Nguyen
Date: 12/11/10
Project #: 10U13497
Company: G4S Justice Services Canada, Inc.
Test Target: FCC Part 15 Class B
Mode Oper: Transmit Worst Case.

f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		
Read	Analyzer Reading	Filter	Filter Insert Loss		
AF	Antenna Factor	Corr.	Calculated Field Strength		
CL	Cable Loss	Limit	Field Strength Limit		

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Pad dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant. High cm	Table Angle Degree	Notes
Transmit worst case															
31.92	3.0	27.4	19.1	0.5	28.4	0.0	0.0	18.5	40.0	-21.5	V	P	100.0	0 - 360	
134.764	3.0	29.0	13.5	1.0	27.9	0.0	0.0	15.5	43.5	-28.0	V	P	100.0	0 - 360	
161.645	3.0	29.0	12.9	1.1	27.7	0.0	0.0	15.2	43.5	-28.3	V	P	100.0	0 - 360	
357.974	3.0	28.8	14.4	1.6	27.8	0.0	0.0	17.0	46.0	-29.0	V	P	100.0	0 - 360	
926.797	3.0	28.6	22.2	2.8	27.8	0.0	0.0	25.8	46.0	-20.2	V	P	100.0	0 - 360	
582.143	3.0	29.6	18.2	2.2	28.6	0.0	0.0	21.3	46.0	-24.7	H	P	100.0	0 - 360	
748.23	3.0	29.1	19.9	2.5	28.4	0.0	0.0	23.1	46.0	-22.9	H	P	100.0	0 - 360	
873.515	3.0	28.7	21.8	2.7	28.0	0.0	0.0	25.1	46.0	-20.9	H	P	100.0	0 - 360	
948.998	3.0	28.4	22.4	2.8	27.7	0.0	0.0	25.9	46.0	-20.1	H	P	100.0	0 - 360	

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Note: No other emissions were detected above the system noise floor.

9. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

EQUATIONS

Power density is given by:

S = EIRP / (4 * Pi * D^2)

where

S = Power density in W/m^2
EIRP = Equivalent Isotropic Radiated Power in W
D = Separation distance in m

Power density in units of W/m^2 is converted to units of mWc/m^2 by dividing by 10.

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm^2

RESULTS

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	FCC Power Density (mW/cm^2)
2.4 GHz	802.15.4	0.20	3.276	1.80	0.0006