CANADA:

16 - 211 Schoolhouse Street

Coquitlam, British Columbia

Canada V3K 4X9

ELECTROMAGNETIC COMPATIBILITY
TEST REPORT
TO
FCC 47 CFR Part 15 SUBPART C Class B
&
INDUSTRY CANADA RSS-210

Report Number:	E1051415-1305
Issue:	Release version 1.4
Date of Issue:	July 26, 2013
Number of Pages:	96

Testing laboratory..... :	Quality Auditing Institute
Address..... :	16 – 211 Schoolhouse Street, Coquitlam, BC, V3K 4X9, Canada

Accreditations (ISO 17025):

Standard Council of Canada: Accredited Laboratory No. 743
International Accreditation Service Inc.: Accredited Laboratory: No. TL-239

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Applicant's name ..... :	Recon Instruments Inc.
Address..... :	100-1050 Homer St. Vancouver BC, V6B 2W9, Canada
Contact..... :	Dominique Kwong, dom@reconinstruments.com
Industry Canada Registration :	9717A-008
FCC Registration:	ZW5008

Test specifications:

Standard..... :	RSS-Gen, Issue 3; RSS-210, Issue 8; FCC Part 15.247.
Test procedure..... :	As called by the standard above
Non-standard test method……..:	N/A

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Test Item Description:	Head Mounted Display system for sports goggles with Wi-Fi & Bluetooth
Trade Mark:	
Manufacturer:	Recon Instruments, Inc.
Model Number:	008
Model Description:	RI-SNOW2

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Revision History

Date	Report Number	Rev #	Details	Authors Initials
Jun 21, 2013	E10415-1308	0.0	Draft Test Report	AM
Jun 28, 2013	E10415-1308	0.1	Bluetooth data added	AM
July 5, 2013	E10415-1308	0.2	Typos fixed	AM
July 9, 2013	E10415-1305	0.3	Report is segregated from Digital Circuitry report	AM
July 10, 2013	E10415-1305	0.4	Style is changed to be consistent with QAI one.	AM
July 10, 2013	E10415-1305	0.5	Revision number is changed to avoid version confusion	AM
July 11, 2013	E10415-1305	0.6	Data for hopping frequencies added	AM
July 15, 2013	E10415-1305	0.8	Corrupted version 0.7 fixed	AM
July 15, 2013	E10415-1305	0.9	Results for temperature testing added	AM
July 17, 2013	E10415-1305	0.10	Results for spurious conducted added	AM
July 18, 2013	E10415-1305	0.11	Document Cleanup	DJ
July 18, 2013	E10415-1305	0.12	Document Cleanup revision	AM
July 19, 2013	E10415-1305	0.13	Version numbers fixed	AM
July 22, 2013	E10415-1305	0.14	Client's comments incorporated	AM
July 22, 2013	E10415-1305	1.0	Release version	AM
July 25, 2013	E10415-1305	1.1	Reviewer comments added	AM
July 26, 2013	E10415-1305	1.2	More reviewer comments fixed	AM
July 26, 2013	E10415-1305	1.3	Release version	AM
July 26, 2013	E10415-1305	1.4	IC comments fixed	AM

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Section I. GENERAL TEST INFORMATION

EMC TEST SUMMARY

The following tests demonstrate testimony for the FCC & IC Marks for Transceivers / electromagnetic compatibility testing for this EUT.

Test / Requirement Description	Deviations from:		Pass / Fail	Applicable FCC Rule Parts	Applicable Industry Canada Rule Parts
	Base Standard	Test Basis			
Antenna Requirements	No	No	Pass	N/A	RSS-Gen, Issue 3
Emission Bandwidth (EBW)	No	No	Pass	FCC Subpart C 15.247 (a) (2)	RSS-210, Issue 8
Maximum Peak Conducted Output Power Level	No	No	Pass	FCC Subpart C 15.247 (b) (3)	RSS-210, Issue 8
Maximum Power Spectral Density Level in Fundamental Emission	No	No	Pass	FCC Subpart C 15.247 (e)	RSS-210, Issue 8
Spurious Conducted Emissions	No	No	Pass	FCC Subpart C 15.247 (d)	RSS-210, Issue 8
AC Mains Power Line Conducted Emissions	No	No	Pass	FCC Subpart C 15.207 (a)	RSS-210, Issue 8
Radiated Spurious Emissions	No	No	Pass	FCC Subpart C 15.209 (a)	RSS-210, Issue 8
Band Edge	No	No	Pass	FCC Subpart C 15.209	RSS-210, Issue 8
Hopping Frequency Separation	No	No	Pass	FCC Subpart C 15.247 (a) (1)	RSS-210, Issue 8
Number of Hopping Channels	No	No	Pass	FCC Subpart C 15.247 (a) (1) (iii)	RSS-210, Issue 8
Average Time of Occupancy	No	No	Pass	FCC Subpart C 15.247 (a) (1) (iii)	RSS-210, Issue 8
RF Exposure Compliance	No	No	Pass	FCC Subpart C 15.215 (c)	RSS-Gen, Issue 3

Tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with CFR 47 FCC Part 15 Subpart C and Industry Canada RSS-Gen. The manufacturer is responsible for the tested product configuration, continued product compliance with these standards listed, and for the appropriate auditing of subsequent products as required.

X

Tested By & Report Written By Andrei Moldav…
Senior RF/EMC Engineer, NCE

X

Reviewed By Parminder Singh
EMC Division Manager

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TEST RESULT CERTIFICATION

Applicant: Recon Instruments, Inc.
100-1050 Homer St. Vancouver BC, V6B 2W9, Canada
Equipment Under Test: Head Mounted Display system for sports goggles with Wi-Fi & Bluetooth
Trade Name: SNOW2
Model: RI-SNOW2
Date of Test: June 19 – July 19, 2013

EUT DESCRIPTION

EUT	Head Mounted Display system for sports goggles with Wi-Fi & Bluetooth
Functional Description	RI-SNOW2 is a Head Mounted Display system for sports goggles. It measures the athlete's performance using an onboard GPS receiver and multiple motion sensors, displays the sensor data in real-time on a small LCD, and records sensor data in non-volatile memory for post processing.
Operational Description	A Bluetooth (BT), a Bluetooth Low Energy (BLE) as well as WiFi technology is implemented in RI-SNOW2 to receive control signals from a Recon Remote and communicate with various computer programs. The BLE &WiFi transceiver inside the SNOW2 was programmed to transmit the maximum output power at the low, mid and high channels of the Bluetooth (2402, 2441 and 2480 MHz) and Wi-Fi band (2412, 2442, and 2477 MHz) respectively). In order to set the goggle in a continuous transmission mode a Laptop PC was used to the send the various commands.
Manufacturer	Recon Instruments Inc.
Model/Type	RI-SNOW2
Serial No.	#9004(RF Conducted Emissions) and #32 (Radiated Emissions)
Frequency Range	IEEE 802.11b – 2412 – 2462 MHz IEEE 802.11g – 2412 – 2462 MHz IEEE 802.11n – 2422 – 2452 MHz Bluetooth – 2402 – 2480 MHz
Transmit Power	IEEE 802.11b – 1.25 mW IEEE 802.11g – 2.77 mW IEEE 802.11n – 3.44 mW Bluetooth GFSK 1.24mW Bluetooth EDR2 – 1.21 mW
Modulation	IEEE 802.11b – DSSS IEEE 802.11g – OFDM, DSSS IEEE 802.11n – OFDM 20MHz Bluetooth Low Energy – GFSK Bluetooth - EDR2 (Tested using Frequency Hopping Procedures)
Number of Channels	IEEE 802.11b – 11 IEEE 802.11g – 11 IEEE 802.11n – 2 Bluetooth – 79
Antenna	Integrated, flat, maximum gain is -1.25 dBi
Ratings	+3.7Vdc Rechargeable Battery – charged by 100-240Vac 50-60Hz adapter via mini-USB cable
Software and Firmware	The EUT driver software installed in the host laptop equipment during testing was GNOME Terminal firmware version 3.4.1.1. The operation system is Ubuntu 64-bit

	& Recon OS 3.0.
Received Date	June 19, 2013
Received By	David Johanson
Sample Log	QAI Product Control Log (QM 1305 - Sample Inventory)

FACILITIES AND ACCREDITATION

Testing Laboratory:	Quality Auditing Institute
Address.....:	16 – 211 Schoolhouse Street, Coquitlam, BC, 3K 4X9, Canada
Associated Laboratory:	Quality Auditing Institute EMC lab (Remote location)
Address.....:	19473 Fraser Way, Pitt Meadows, BC, V3Y 2V4, Canada
Tested & Reported by.....:	David Johanson / Andrei Moldavanov
Checked by.....:	Parminder Singh

ENVIROMENTAL CONDITIONS: INDOORS

Temperature: 22-28ºC R.H.: 39.7 - 54.4%

TESTING METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4, ANSI C63.10, FCC CFR 47 Part 2, FCC CFR 47 Part 15, and RSS-Gen, Issue 3 and RSS-210, Issue 8. The FCC testing was also done using the FCC KDB 558074 D01 DTS Measurement Guidance v03r01 for the Wi-Fi and BLE transmitters and the FCC Public Notice DA 00-705 Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

EUT TESTING CONFIGURATION

For the purpose of compliance testing, the EUT was powered using the +5.0Vdc power supply since the battery would not have enough power to complete the testing. The transmitter was set for continuous operation on various frequencies in modulated modes of operation.

WORST TEST CASE

The worst-case channel is determined as the channel with the highest output power. The highest measured output power was at 2422 MHz for the 802.11n mode.

TEST SETUP

For conducted tests the EUT is installed in a test fixture connected to An EMI receiver and Spectrum Analyzer as well as a host laptop computer during the tests. Test software exercised the radio card. A separate EUT connected to an AC power adapter was used for the radiated tests.

GENERAL TEST PROCEDURES

RF Conducted Emissions

The EUT is placed on a test bench connected directly to an EMI Receive and Spectrum Analyzer Conducted emissions are measured in the frequency range 10kHz to 25GHz using CISPR Peak, Quasi-Peak and Average detectors.

AC Mains Conducted Emissions

The EUT is placed on the turntable 0.8m above a ground plane. Conducted emissions are measured in the frequency range 0.15 – 30MHz using CISPR quasi-peak and average detector.

Radiated Emissions

The EUT is placed on the turntable 0.8m above a ground plane 3m away from a receiving antenna. Height of receiving antenna varied from 1m to 4m, its polarity changes from vertical to horizontal. Turntable rotates 360 degrees. Motion of turntable and receiving antenna allows determining position of maximum emission level. Quasi-peak detector applies for measurements of emissions with frequency range of 30 to 1000MHz. and average/peak detector otherwise.

RESTRICTED BANDS OF OPERATION

(a) Except as shown in paragraph (d) of this section, only spurious emissions 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-	608-614	5.35-5.46
2.1735-2.1905	16.80425-	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-	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-	240-285	3345.8-3358	36.43-36.5
12.57675-	322-335.4	3600-4400	(2)
13.36-13.41			

* - note FCC-specific .

Canada-specific frequency rangs - 3.020-3.026, 5.677–5.683, 121.94-123.0. 149.9-150.05, 162.0125-167.17, 167.72-173.2, 1300-1427, 2483.5-2500, 3500-3600,

(2) Above 38,6 GHz

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

MEASUREMENT UNCERTAINTY

Radio Frequency .....: ±1,5 x 10-5
Total RF power, conducted.....: ±1 dB
RF power density, conducted.....: ±2.75 dB
Spurious emissions, conducted.....: ±3 dB
All emissions, radiated.....: ±3.5 dB
Temperature.....: ±1ºC
Humidity.....: ±5 %
DC and low frequency voltages.....: ±3 %

ANTENNA DESCRIPTION

1.575GHz GPS Ceramic Chip Antenna, Pulse part number W3010

Directivity of radiation	Omni
Profile	Low
Compact Size	WxLxH (10x3,2x2 mm)
Weight	310 mg
Clearance Area	10.80x6.25 mm
SMD	Compatible
Frequency Range	1575±10 MHz
Linear Max Gain	2.8 dBi
Return Loss	-18 dB
Impedance	50 Ω
Operating Temperature	-40 to +85 ^{o}C

SavviTM Embedded Ceramic Bluetooth, Wi-Fi Antennas

Polarization	Linear
Power	.0.5 W cw
Compact Size	WxLxH (3x1.5x0.8 mm)
Weight	0.15 g
VSWR	1.02
RoHS	Compatible
Frequency Range	2400 – 2480 MHz
Linear Max Gain	-1.3 dBi
Impedance	50 Ω
Efficiency9	75%
Part Number	M310210

TESTING EQUIPMENT

Test Equipment List

Semi-Anechoic Chamber Equipment List

Manufacturer	Model	Description	Serial No.	Last Cal	Cal Due Date
ETS Lindgren	2165	Turntable	00043677	N/A	N/A
ETS Lindgren	2125	Mast	00077487	N/A	N/A
Sunol Sciences	JB3	Biconilog Antenna 30MHz-3GHz (Prescan use only)	A120106	28-Oct-2013	28-Oct-2015
Sunol Sciences	JB3	Biconilog Antenna 30MHz-3GHz (Prescan use only)	A120106	Verified: 12-Mar-2012	
Rohde & Schwarz	ESU40	EMI Receiver	100011	26-June-2012	26-Jun-2015
COM-POWER	LI-115	LISN	241036	9-Mar-2011	9-Mar-2014
COM-POWER	AHA-118	Dual Ridge Horn Antenna	711040	11-Mar-2011	11-Mar-2014
ETS Lindgren	S201	5 meter Semi-Anechoic Chamber	1030	N/A	N/A
Thurlby Thandar	HA1600	Power and Harmonics	318801	18-Oct-2012	18-Oct-2015
Thurlby Thandar	AC1000	Power Supply	317113	18-Oct-2012	18-Oct-2015
Acme Testing Co.	JJBIG1	Double-wound Magnetic Solenoid, 36" diameter X 38" high	081906	Conditional use	Conditional use
F.W Bell	615	Gaussmeter	52838	Conditional use	Conditional use
Leupold	SW0	Survey Magnetic Compass	6	No Calibration Required	No Calibration Required

Immunity Testing Equipment List

Manufacturer	Model	Description	Serial No.	Last Cal	Cal Due Date
Ophir	5048FE	RF Amplifier 0.15-230 MHz	1035	N/A	N/A
Ophir	5125FE	RF Amplifier 20-1000 MHz	1030	N/A	N/A
Ophir	5163FE	RF Amplifier 0.8-4.2 GHz	1044	N/A	N/A
ETS-Lindgren	HI-6005	RF Field Probe 100kHz-6GHz	00098813	11-Oct-2012	11-Oct-2015
Chase	EmCELL	RF Immunity Chamber	1016	N/A	N/A
ETS Lindgren	S201	5 meter Semi-Anechoic Chamber	1030	N/A	N/A
HP	8648C	Signal Generator	3623A03622	N/A	N/A
Keytek	MZ-15/EL	ESD Simulator:	0402265	5-July-2012	5-July-2015
EMC Partner	CN-EFT1000	Capacitive Clamp	#408	N/A	N/A
FCC	F-120-9A	Bulk Injection Clamp	399	N/A	N/A

EMC Partner	MG-OS-OS1	1MHz Damped Oscillatory Test System with CDN2000-06-25	818	26-May-2011	26-May-2014
Low Frequency Test System	Custom	Low Frequency Test System		N/A	N/A
Tektronics	TDS220	Digital Oscilloscope	B049140	14-Jul-2010	22-Jul-2013
Fluke	79-III	True RMS Multimeter	73941233	14-Jul-2010	22-Jul-2013
TESEQ	NSG 3000	Surge, EFT & Voltage Dips Immunity Test System	184	12/14/2012	12/14/2015
TESEQ	NSG 3061	CDN	184	12/14/2012	12/14/2015
TESEQ	INA 6502	Transformer	124	12/14/2012	12/14/2015

Measurement Software List

Manufacturer	Model	Version	Description
Rhode & Schwarz	EMC 32	6.20.0	Emissions Pre-scan Test Software
VI Automation	Via EMC Immunity Executive	1.0.308	Radiated and Conducted Immunity Test Program
TESEQ	WIN 3000	1.2.0	Surge, EFT & Voltage Dips Immunity Test Program
California Instruments	CTS	3.0	Flicker, Harmonics emissions, Inter-harmonics and Harmonics Immunity, Dips, Interruptions, Voltage Fluctuations, DC ripple, Voltage Frequency Variations Test Program
Thurlby Thandar Instruments	HA-PC Link Version	2.02	Harmonics and Flicker Test Program

Auxiliary Equipment List

Description	+5Vdc Switch Mode Power Supply
Manufacturer	Recon Instruments
Model No.	3A-053WP05
Input	100-240Vac 50-60Hz 0.2A
Output	+5Vdc .1.0A
Plug	NEMA 1-15 Un-polarized 2 prong blade Type A

Cables

Description	Length	Connector A	Connector B	Shielded	Ferrites
USB Power/Communications	1m	USB A	USB Micro B	Yes	No

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Section II. Requirements for the Canadian Market: Industry Canada mark

Summary of requirements RSS-Gen issue 3 and RSS-210 Issue 8

	Test	Wi-Fi Standard	Bluetooth Standard	Description	Result
Part 1	Antenna requirement	RSS-Gen (7.1.2)	N/A	Soldered, non-replaceable antenna	Complies
Part 2	Output power conducted	RSS-210	RSS-210	Digitally modulated and frequency hopping systems emissions should not excedd the limits	Complies
Part 3	Radiated spurious emissions	RSS-210	RSS-210	Emissions from intentional radiator should not exceed the limits	Complies
Part 4	Maximum Power Spectral Density in the Fundamental Emission	RSS-210	N/A	Conducted power spectral density shall be not higher than 8 dBm in any 3 kHz band segment	Complies
Part 5	AC Mains Conducted Emissions	RSS-210	RSS-210	The Conducted Emissions are measured on the Phase and Neutral Power lines in the 0.15 - 30.0 MHz range	Complies
Part 6	20 dB Occupied Bandwidth	RSS-Gen (4.6.1)	RSS-Gen (4.6.1)	The transmitted signal bandwidth to be reported adjusted to be 20 dB	Complies
Part 7	Band edge	RSS-210	RSS-210	Spurious emissions shall be 50dBc	Complies
Part 8	Conducted Spurious Emissions	RSS-210 (A2.9)(e)	RSS-210 (A2.9)(e)	Radiated Spurious emissions shall be 50dBc	Complies
Part 9	Hopping Frequency Separation	N/A	RSS-210	Should be frequency separation between peaks in adjacent channels	Complies

Part 10	Number of Hopping Channels	N/A	RSS-210	EUT must have number of hopping channels enabled	Complies
Part 11	Average Time of Occupancy	N/A	RSS-Gen (4.6.1)	Value of dwell time should not be less the limit	Complies
Part 12	RF Exposure Evaluation	IC RSS-102(2.5.1)	IC RSS-102(2.5.1)	Any radio transmitter should not emit higher the limit.	Complies

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Part 1 - Antenna Requirements

DATE: July 05, 2011

TEST STANDARD: IC RSS-Gen Section 7.1.2

APPLICABLE REGULATIONS : - “An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited.”… “the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.”

RESULT : This unit meets this requirement. There are 2 antennas in this unit – GPS and Wi-Fi/Bluetooth antenna (see Antenna Description section). Antennas are soldered to the circuit board and are not accessible to the end-user.

Part 2 – RF Power Conducted

DATE: July 8, 2013

TEST STANDARD: IC RSS-210 Annex 2 Section (A2.9)(a)

TEST VOLTAGE: 5Vdc from AC Power Adapter

MINIMUM STANDARD: 1 W (30 dBm)

TEST SETUP: The antenna port of EUT was directly connected to a spectrum analyser.

MEASUREMENT METHOD: As called by the standards above.

DEVICE DESCRIPTIONS: As described in the above EUT description and set up section.

EMISSIONS DATA:

Wi-Fi Test Data

Test mode: IEEE 802.11b

Channel	Frequency, MHz	Output Power, dBm	Result
Low	2412	0.70	Pass
Mid	2437	0.96	Pass
High	2462	0.53	Pass

Test mode: IEEE 802.11g

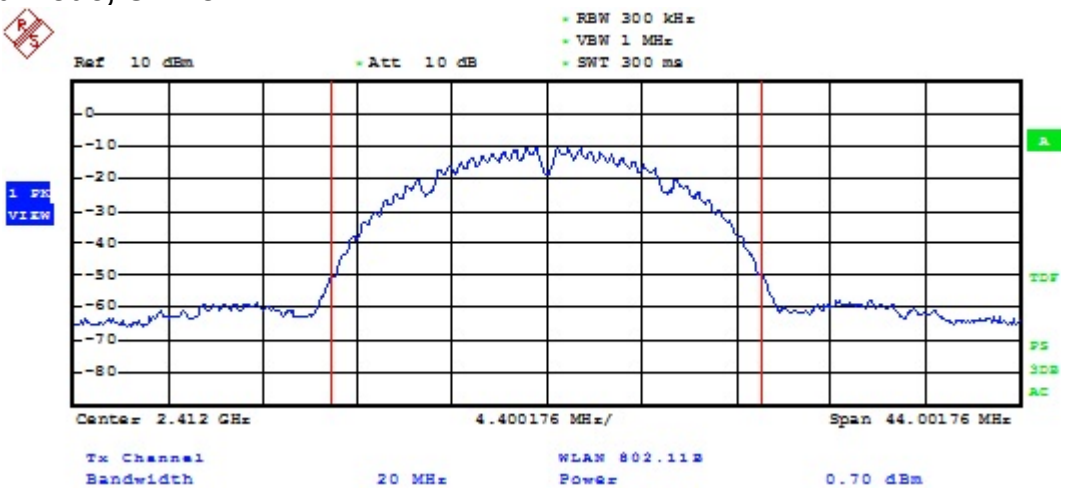
Channel	Frequency, MHz	Output Power, dBm	Result
Low	2412	3.94	Pass
Mid	2442	4.43	Pass
High	2462	4.04	Pass

Test mode: IEEE 802.11n

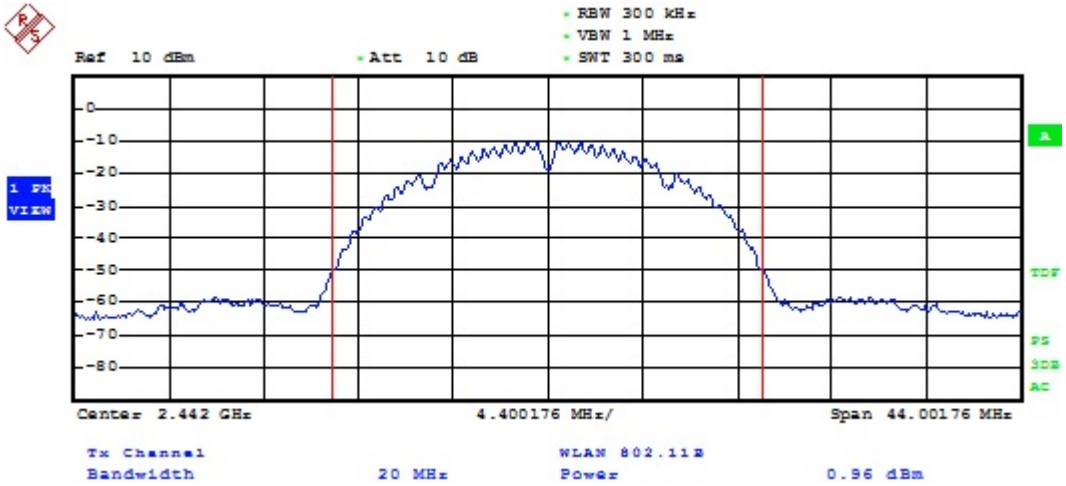
Channel	Frequency, MHz	Output Power, dBm	Result
Low	2422	5.36	Pass
High	2452	5.25	Pass

Test Plots

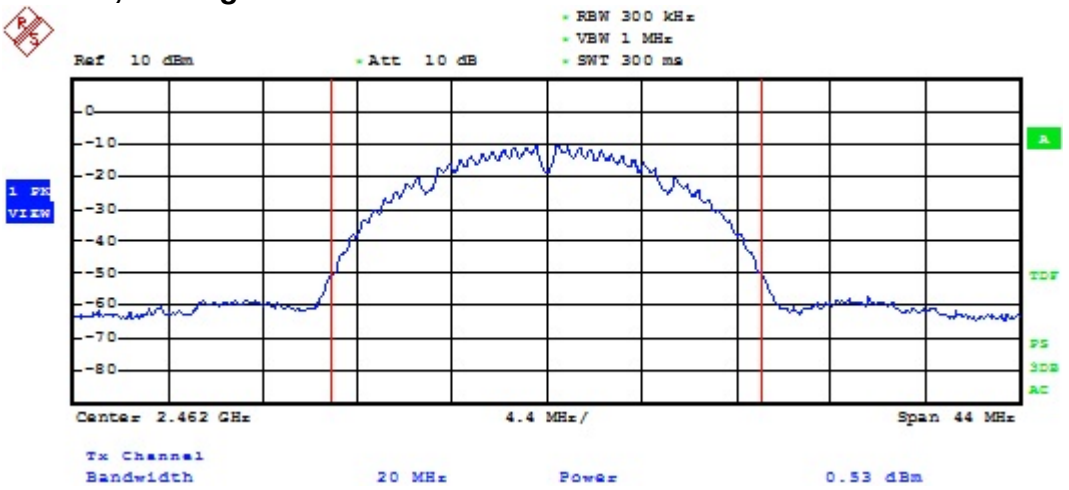
802.11b mode, CH Low



802.11b mode, CH Mid



802.11b mode, CH High

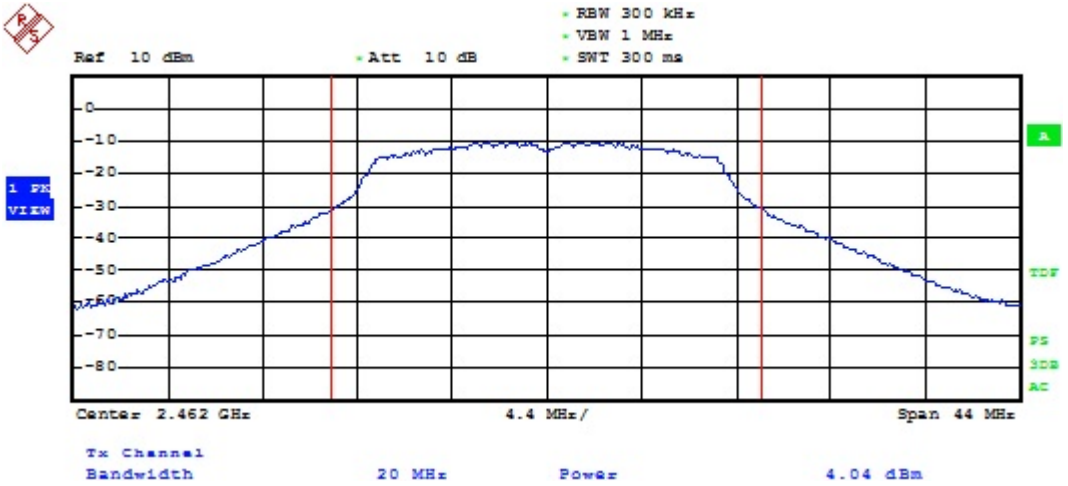


802.11g mode, CH Low

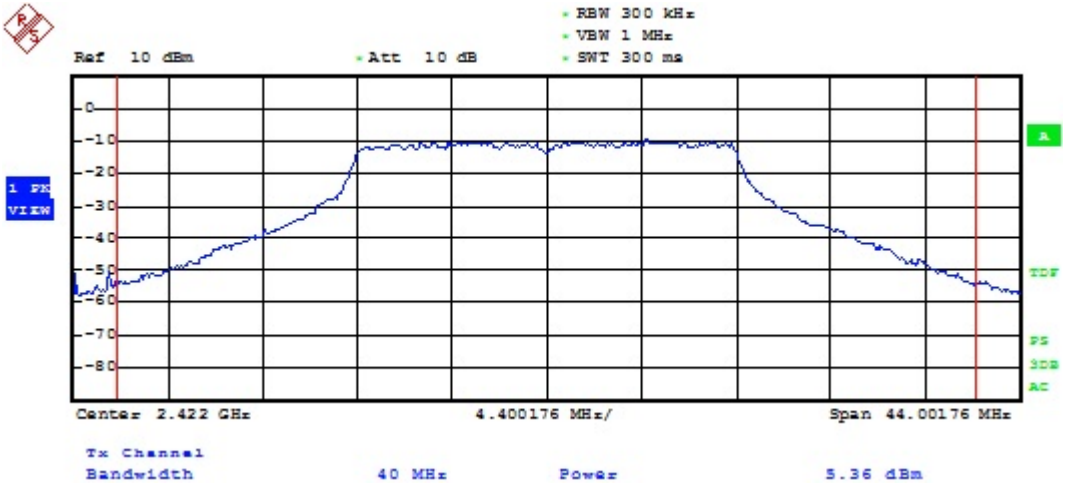
802.11g mode, CH Mid

802.11g mode, CH High

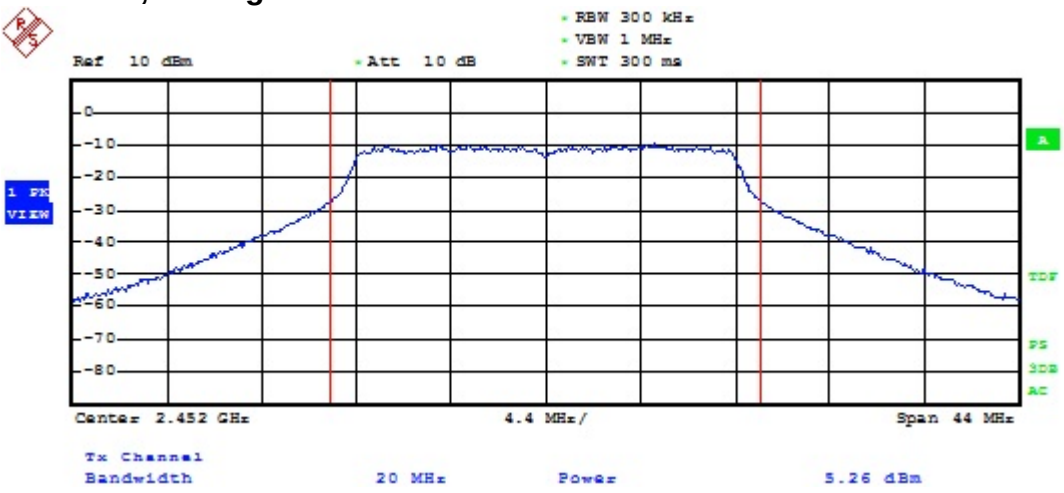
+



802.11n mode, CH Low



802.11n mode, CH High



Bluetooth Test Data

Test mode: GFSK

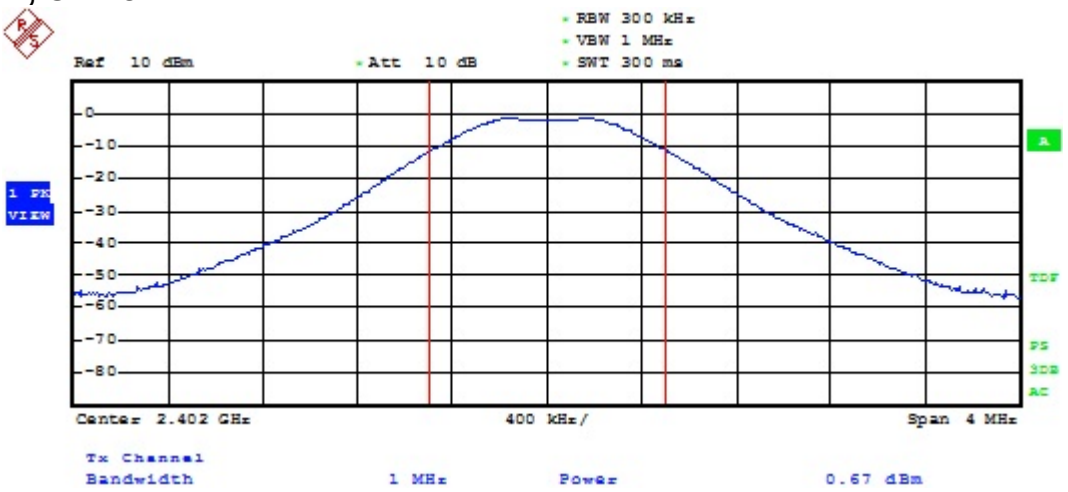
Channel	Frequency, MHz	Output Power, dBm	Result
Low	2402	0.67	Pass
Mid	2442	0.92	Pass
High	2480	0.62	Pass

Test mode: EDR2

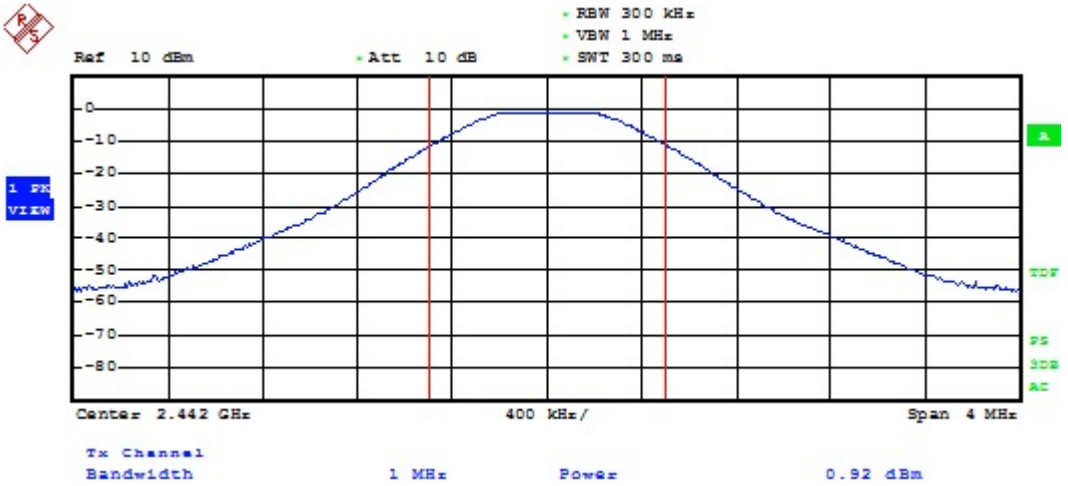
Channel	Frequency, MHz	Output Power, dBm	Result
Low	2402	0.44	Pass
Mid	2442	0.81	Pass
High	2480	0.70	Pass

Test Plots

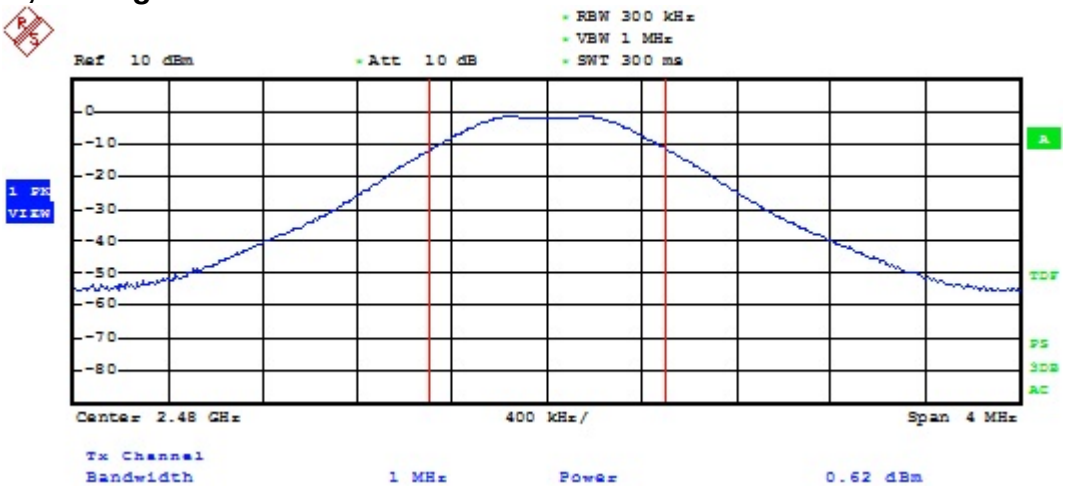
GFSK, CH Low



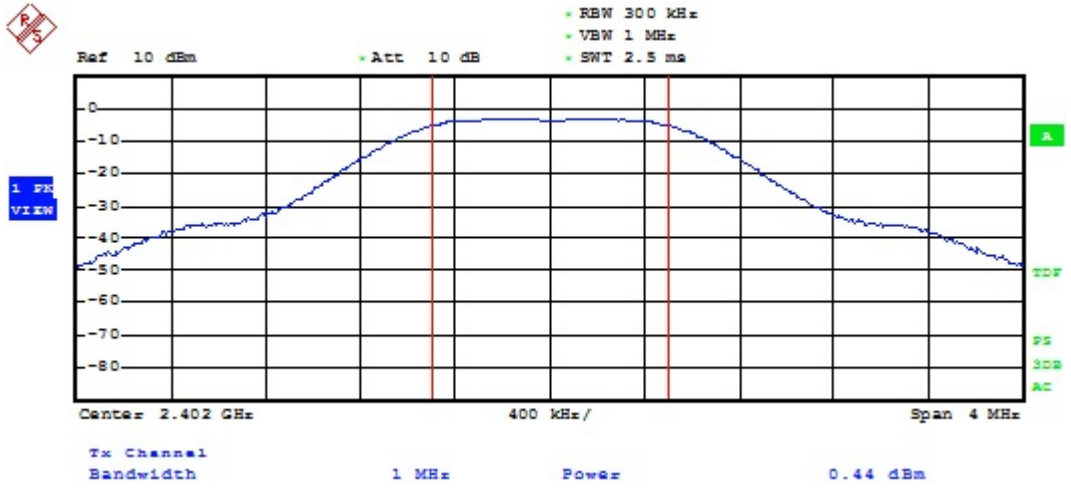
GFSK, CH Mid



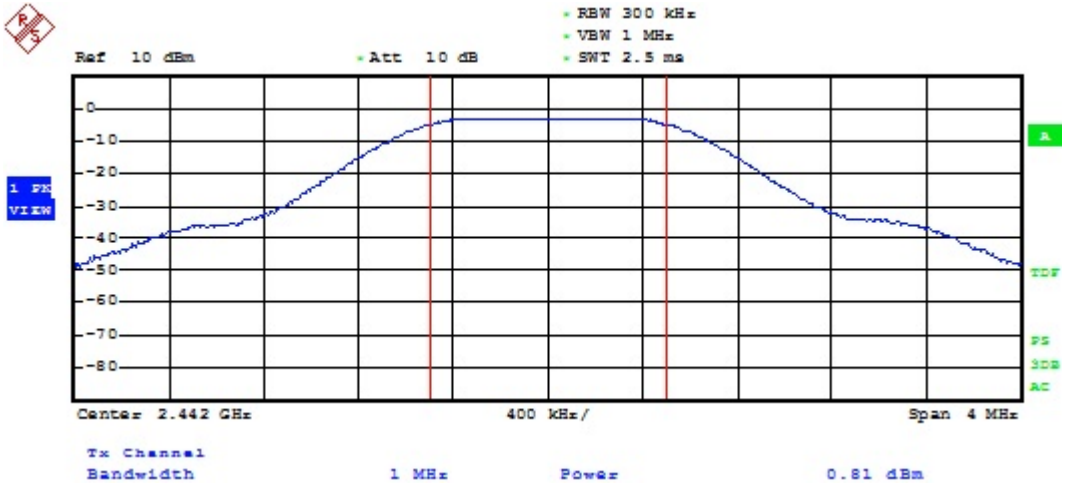
GFSK, CH High



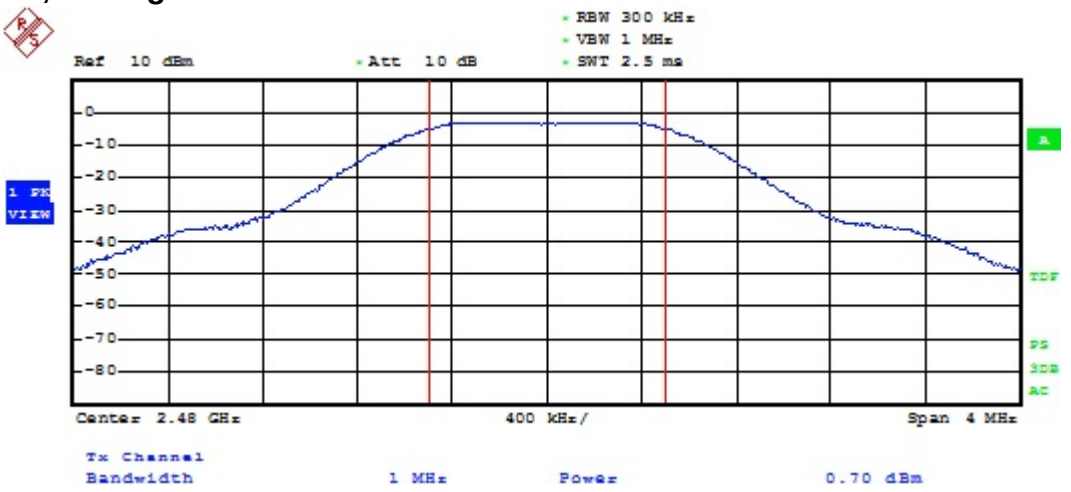
EDR2, CH Low



EDR2, CH Mid



EDR2, CH High



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OBSERVATIONS:	The EUT performed as expected.
PERFORMANCE:	Complies.

Part 3 - Radiated Spurious Emissions

DATE: July 09, 2011

TEST STANDARD: IC RSS-210 Annex 2 Section (A2.9)(b)

RSS-Gen Section (7.2.5)

TEST VOLTAGE: 5Vdc from AC Power Adapter

TEST CONDITIONS: Indoor

MINIMUM STANDARD: (b) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

In measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated in the equipment, whichever is lower, without going below 9 kHz, up to at least the frequency … if the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Table 1: General Field Strength Limits for Transmitters at Frequencies Above 30 MHz

Frequency (MHz)	Field Strength	
	uV/m @ 3-m	Calculated dBµV/m at 3m
30 – 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
960 - 1000	500	54.0

TEST SETUP: The EUT was tested in our 3 m semi-anechoic chamber and was positioned on the center of the turntable and connected to a 5Vdc power supply. The transmitter was set for continuous transmission. The lowest, middle and highest channels in the 2400-2483.5 MHz band were measured for all radiated emissions 10kHz to 18 GHz. The EUT was pre-scanned in 3 different orthogonal orientations and was found to radiate highest when placed flat on the table top as indicated in the test photos.

MEASUREMENT METHOD: Measurements were made using spectrum analyser and receiver, 200Hz RBW average detector for the frequency range 9-150KHz; 9kHz RBW average detector for the Frequency range 150kHz to 30MHz; 120kHz RBW quasi-peak detector using the appropriate antennas, amplifiers and filters.

DEVICE DESCRIPTIONS: As described in the above EUT description and setup section.

EMISSIONS DATA: Appropriate measurements are done with a loop antenna for 9 kHz – 30 MHz band and in conducted mode for 1 – 25 GHz. No disturbances are noted.

CANADA:
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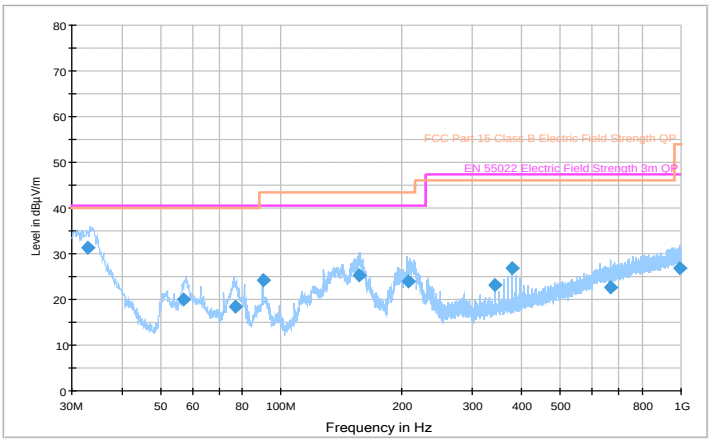
Radiated emission 30MHz – 1 GHz

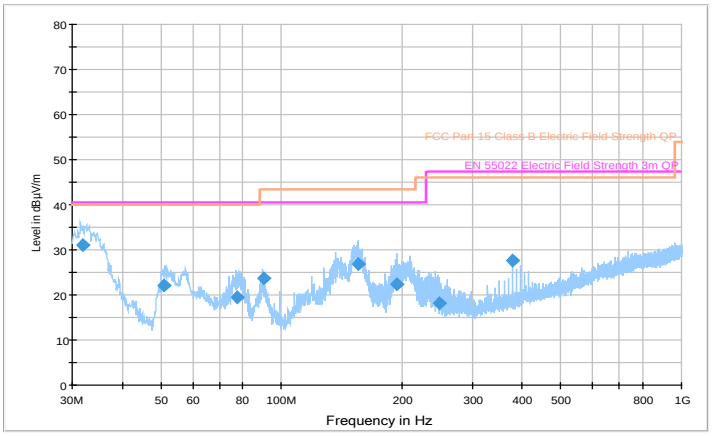
Wi-Fi transmitter on, Bluetooth off – worst case



Quasi-peak detector

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
32.788600	31.3	1000.00	120.000	100.0	V	143.0	19.1	9.2	40.5
57.189280	20.1	1000.00	120.000	133.0	V	241.0	8.1	20.4	40.5
76.713320	18.5	1000.00	120.000	145.0	V	259.0	8.7	22.0	40.5
90.005880	24.3	1000.00	120.000	146.0	V	251.0	9.8	16.2	40.5
157.153920	25.2	1000.00	120.000	186.0	H	92.0	13.9	15.3	40.5
207.440840	23.8	1000.00	120.000	150.0	H	315.0	12.8	16.7	40.5
342.006160	23.2	1000.00	120.000	100.0	H	265.0	16.5	24.3	47.5
378.021000	27.0	1000.00	120.000	100.0	H	222.0	17.4	20.5	47.5
667.897640	22.6	1000.00	120.000	225.0	H	48.0	22.7	24.9	47.5
991.011960	26.9	1000.00	120.000	225.0	H	52.0	26.8	20.6	47.5

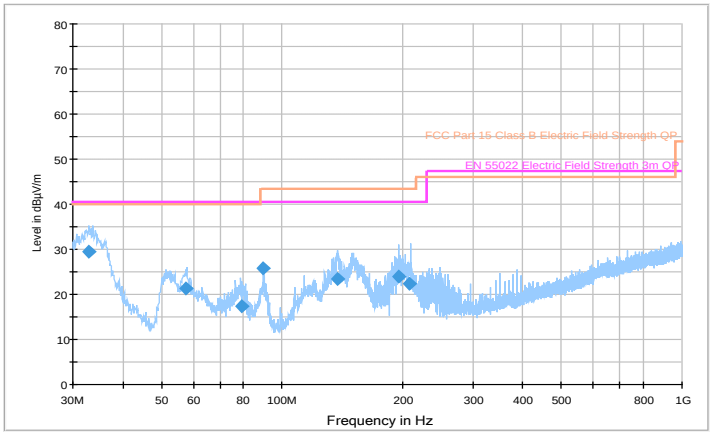
Wi-Fi transmitter off, Bluetooth on – worst case



Quasi-peak detector

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
31.983360	31.2	1000.00	120.000	100.0	V	138.0	19.6	9.3	40.5
51.047120	22.0	1000.00	120.000	120.0	V	261.0	8.6	18.5	40.5
77.263360	19.4	1000.00	120.000	254.0	V	232.0	8.8	21.1	40.5
90.012000	23.6	1000.00	120.000	133.0	V	150.0	9.8	16.9	40.5
156.161760	27.0	1000.00	120.000	185.0	H	108.0	13.9	13.5	40.5
194.309360	22.3	1000.00	120.000	161.0	H	124.0	13.6	18.2	40.5
248.069800	18.1	1000.00	120.000	159.0	H	290.0	13.7	29.4	47.5
378.007920	27.7	1000.00	120.000	100.0	H	191.0	17.4	19.8	47.5

Wi-Fi transmitter on, Bluetooth on – worst case



Quasi-peak detector

Frequency (MHz)	QuasiPeak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
32.991520	29.5	1000.00	120.000	100.0	V	100.0	19.0	11.0	40.5
57.392080	21.4	1000.00	120.000	100.0	V	180.0	8.1	19.1	40.5
79.157200	17.3	1000.00	120.000	239.0	H	135.0	9.0	23.2	40.5
89.977560	25.9	1000.00	120.000	119.0	V	90.0	9.8	14.6	40.5
137.750080	23.3	1000.00	120.000	225.0	H	116.0	14.8	17.2	40.5
195.235360	23.8	1000.00	120.000	172.0	H	99.0	13.8	16.7	40.5
208.875240	22.3	1000.00	120.000	146.0	H	124.0	12.6	18.2	40.5

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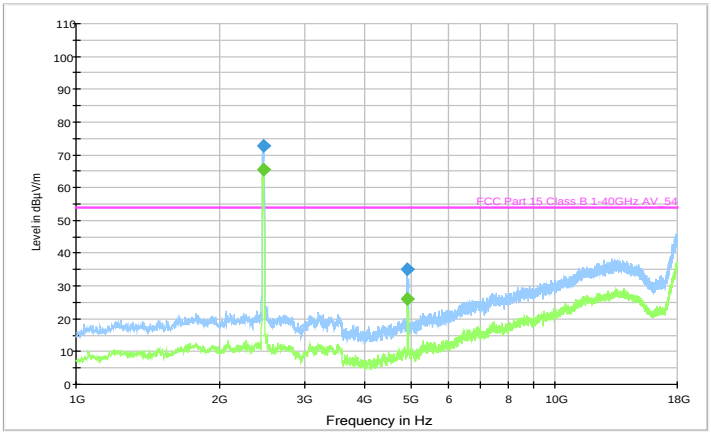
Radiated emission 1 GHz – 18 GHz

Wi-Fi transmitter on, Bluetooth off – worst case



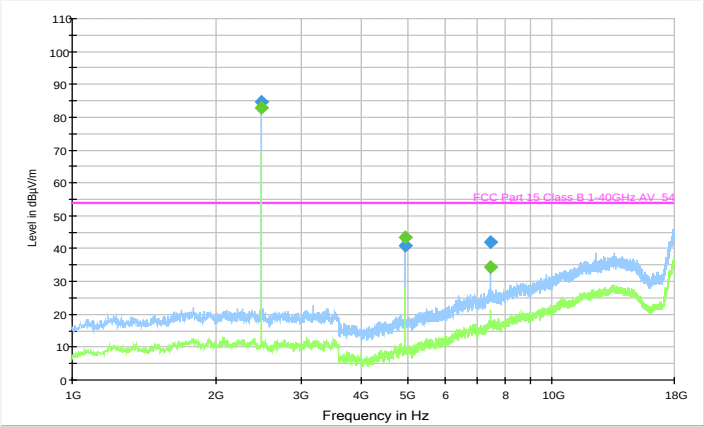
Peak detector

Frequency (MHz)	MaxPeak-MaxHold (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Comment
2412.70000	77.3	100.0	V	150.0	-9.6	
4823.30000	50.3	100.0	V	150.0	-6.9	

Average detector

Frequency (MHz)	Average-MaxHold (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Comment
2412.70000	70.6	100.0	V	150.0	-9.6	
4823.30000	30.0	100.0	V	150.0	-6.9	

Wi-Fi transmitter off, Bluetooth on – worst case



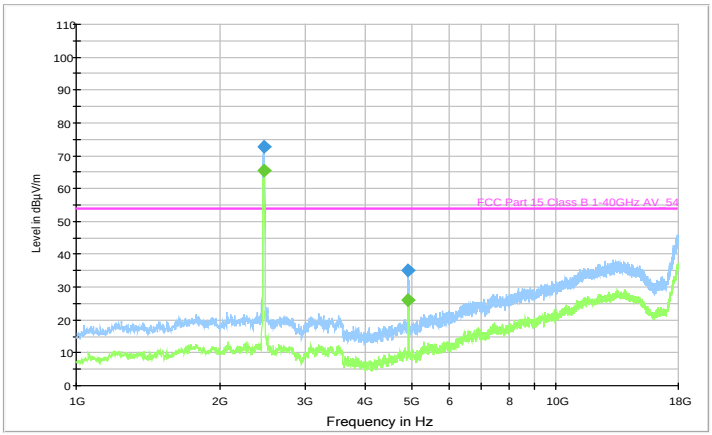
Peak detector

Frequency (MHz)	MaxPeak (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2478.94000	84.8	1000.000	182.0	V	210.0	-9.6	-30.8	54.0
4957.94666	40.9	1000.000	170.0	V	210.0	-6.4	13.1	54.0
7436.50333	42.1	1000.000	150.0	V	141.0	1.9	11.9	54.0

Average detector

Frequency (MHz)	Average (dBµV/m)	Bandwidth (kHz)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
2478.95000	82.8	1000.000	170.0	V	210.0	-9.6	-28.8	54.0
4958.05333	43.4	1000.000	150.0	H	91.0	-6.0	10.6	54.0
7437.50333	34.4	1000.000	100.0	V	150.0	1.9	19.6	54.0

Wi-Fi transmitter on, Bluetooth on – worst case



Peak detector

Frequency (MHz)	MaxPeak-MaxHold (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Comment
2467.10000	72.6	100.0	V	180.0	-9.6	
4927.00000	35.2	100.0	V	180.0	-6.5	

Average detector

Frequency (MHz)	Average-MaxHold (dBµV/m)	Antenna height (cm)	Polarity	Turntable position (deg)	Corr. (dB)	Comment
2467.10000	65.5	100.0	V	180.0	-9.6	
4927.00000	26.1	100.0	V	180.0	-6.5	

MODIFICATIONS: The EUT did not require any modifications.

PERFORMANCE: Complies with Standard

Part 4 – Power Spectral Density

DATE: July 05, 2013

TEST STANDARD: RSS-210, Issue 8

TEST METHOD: As called by the standards above

TEST VOLTAGE: 5Vdc from AC Power Adapter

MINIMUM STANDARD: 8 dBm in any 3 kHz band

TEST SETUP: The EUT was connected to the DUT in conducted mode likewise for output power measurements.

METHOD OF MEASUREMENT: Measurements were made using a spectrum analyser with 100 kHz resolution bandwidth, peak and detector.

DEVICE DESCRIPTIONS: As described in the equipment under test section, above.

MEASUREMENT DATA:

Wi-Fi Test Data

Test mode: IEEE 802.11b

Channel	Frequency, MHz	Power Spectral Density, dBm	Result
Low	2412	-28.45	Pass
Mid	2442	-28.20	Pass
High	2462	-27.92	Pass

Test mode: IEEE 802.11g

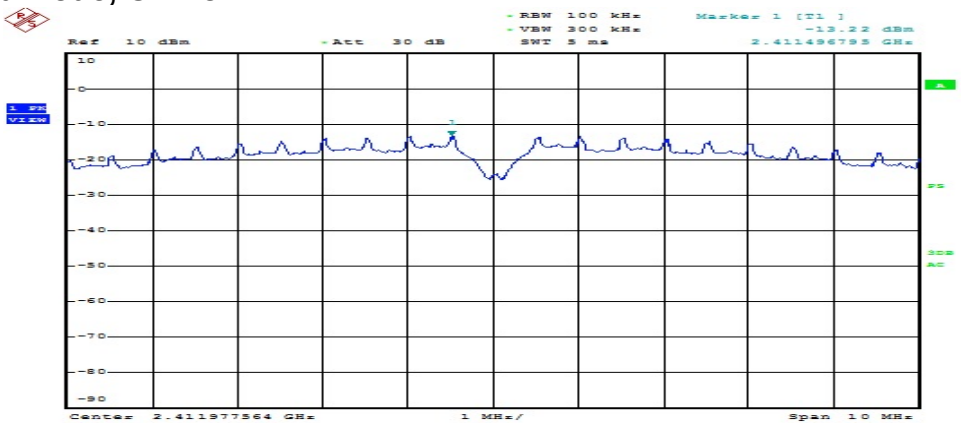
Channel	Frequency, MHz	Power Spectral Density, dBm	Result
Low	2412	-30.43	Pass
Mid	2442	-29.85	Pass
High	2462	-29.57	Pass

Test mode: IEEE 802.11n

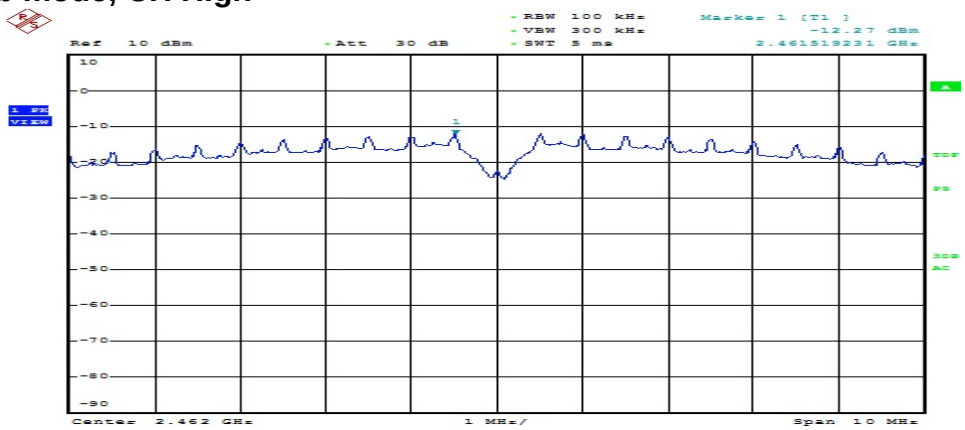
Channel	Frequency, MHz	Power Spectral Density, dBm	Result
Low	2422	-31.29	Pass
High	2452	-30.56	Pass

Test Plots

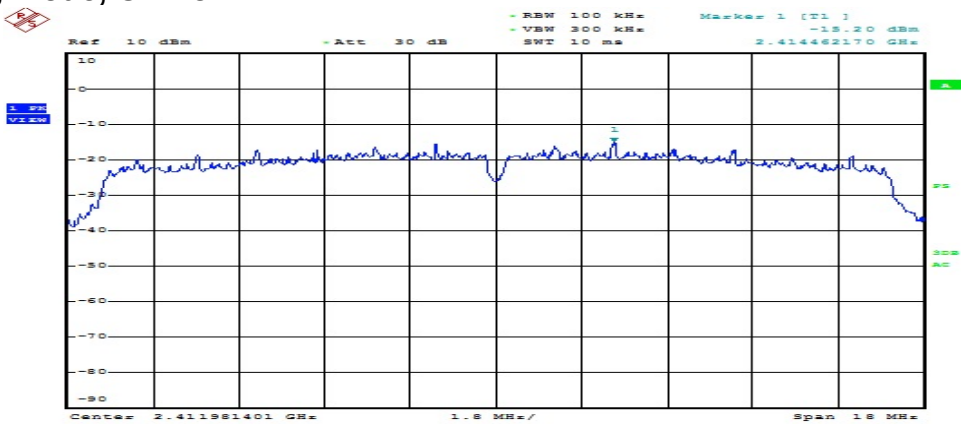
802.11b mode, CH Low



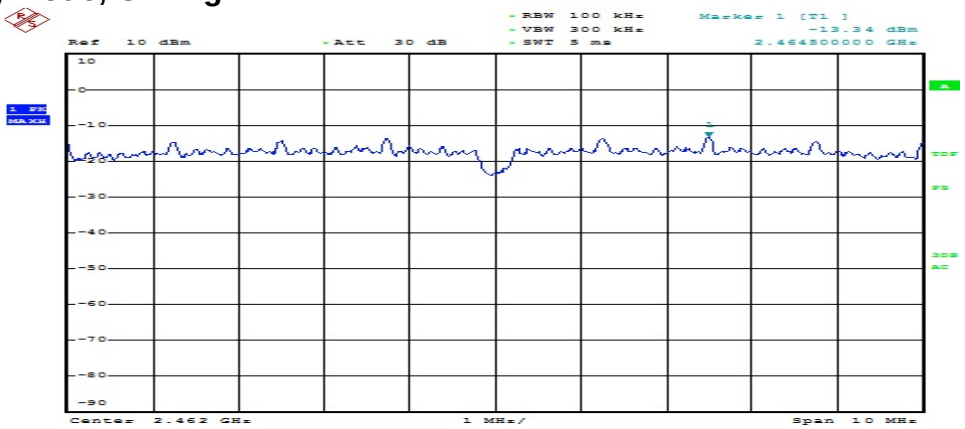
802.11b mode, CH High



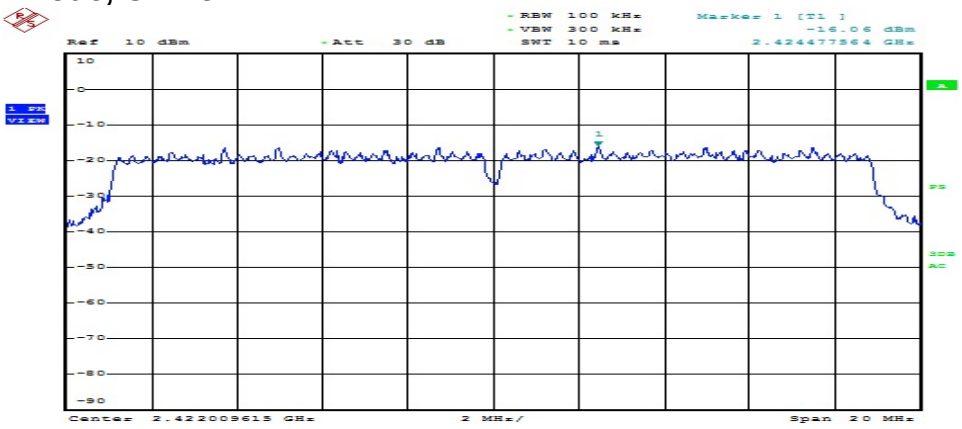
802.11g mode, CH Low



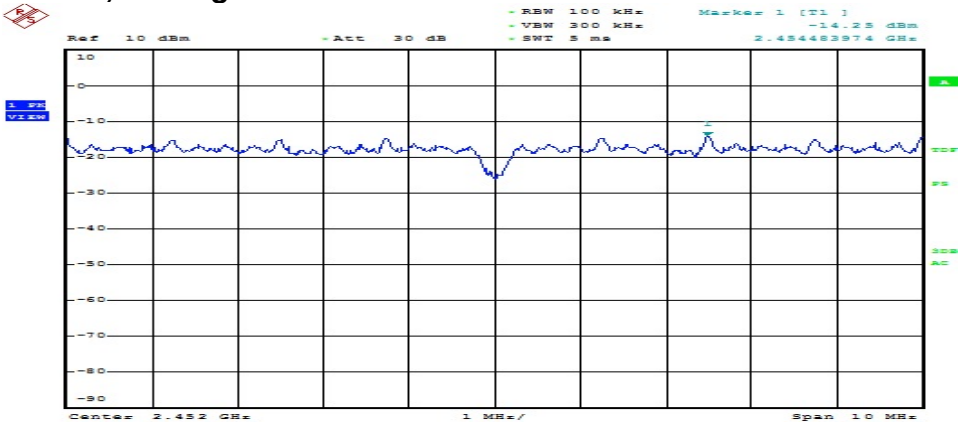
802.11g mode, CH High



802.11n mode, CH Low



802.11n mode, CH High



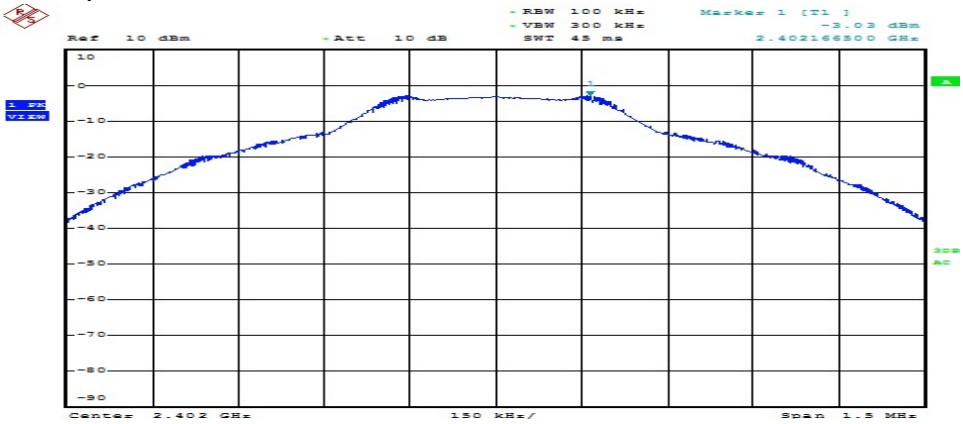
Bluetooth Test Data

Test mode: GFSK

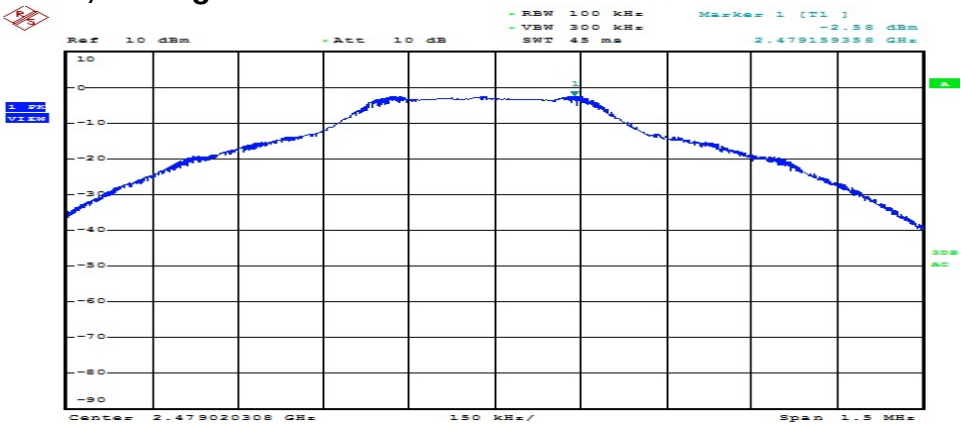
Channel	Frequency, MHz	Power Spectral Density, dBm	Result
Low	2412	-18.25	Pass
Mid	2442	-17.81	Pass
High	2480	-17.80	Pass

Test Plots

GFSK mode, CH Low



GFSK mode, CH High



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Part 5 – AC Mains Conducted Emissions

DATE: July 05, 2013

TEST STANDARD: RSS-210, Issue 8

TEST METHOD: RSS-Gen (7.1.4); CAN/USA – IEC CISPR 22

TEST VOLTAGE: 5Vdc from AC Power Adapter

MINIMUM STANDARD: Class B Limit:

Frequency (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.5 – 5	56	46
5 – 30	60	50
Note 1 The lower limit shall apply at the transition frequencies Note 2 The limit decreases linearly with the logarithim of the frequency in the 0.15 to 0.50 MHz..		

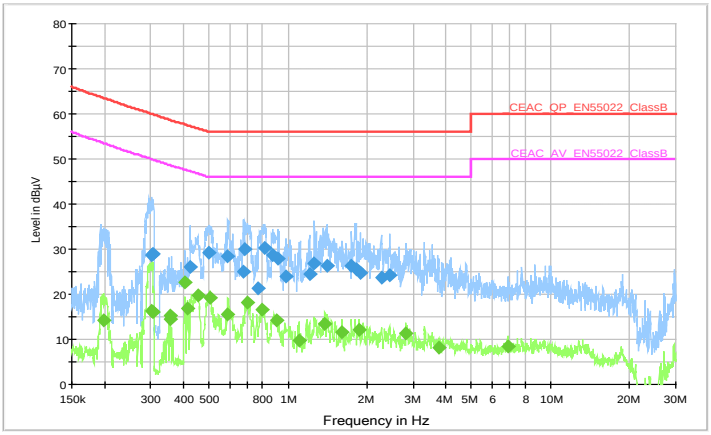
TEST SETUP: The EUT was connected to the conducted emissions LISN apparatus. The equipment was operated and tested at 120Vac 60Hz while in continuous mode of operation.

METHOD OF MEASUREMENT: Measurements were made using a test receiver with 9 kHz bandwidth, quasi-peak and average detector.

DEVICE DESCRIPTIONS: As described in the equipment test section above.

MEASUREMENT DATA:

Line 1, Wi-Fi&Bluetooth transmitter on



Final Result, quasi-peak detector

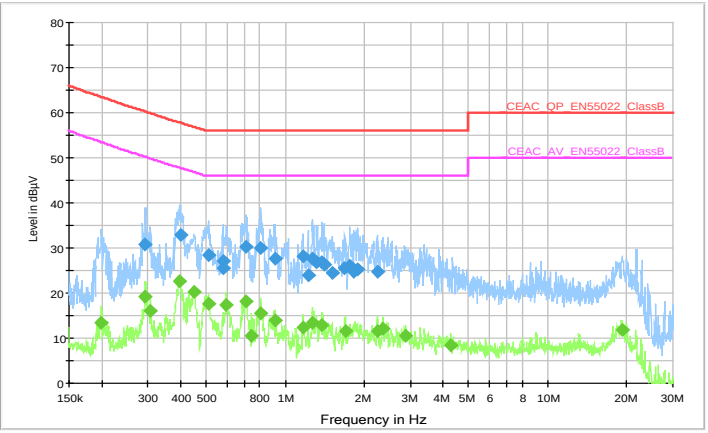
Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.303667	28.8	1000.00	9.000	On	L1	0.4	31.1	59.9
0.305492	28.9	1000.00	9.000	On	L1	0.4	31.0	59.9
0.423096	26.0	1000.00	9.000	On	L1	0.4	31.3	57.3
0.501412	29.3	1000.00	9.000	On	L1	0.4	26.7	56.0
0.590675	28.3	1000.00	9.000	On	L1	0.4	27.7	56.0
0.675283	25.1	1000.00	9.000	On	L1	0.5	30.9	56.0
0.687535	30.1	1000.00	9.000	On	L1	0.5	25.9	56.0
0.764336	21.3	1000.00	9.000	On	L1	0.5	34.7	56.0
0.813174	30.4	1000.00	9.000	On	L1	0.5	25.6	56.0
0.875567	28.6	1000.00	9.000	On	L1	0.5	27.4	56.0
0.916742	27.8	1000.00	9.000	On	L1	0.5	28.2	56.0
0.987081	24.0	1000.00	9.000	On	L1	0.5	32.0	56.0
1.207793	24.5	1000.00	9.000	On	L1	0.5	31.5	56.0
1.259548	26.9	1000.00	9.000	On	L1	0.5	29.1	56.0
1.403045	26.3	1000.00	9.000	On	L1	0.5	29.7	56.0
1.747918	26.3	1000.00	9.000	On	L1	0.5	29.7	56.0
1.815548	25.6	1000.00	9.000	On	L1	0.5	30.4	56.0
1.889566	24.8	1000.00	9.000	On	L1	0.5	31.2	56.0
2.266339	23.8	1000.00	9.000	On	L1	0.5	32.2	56.0
2.440229	24.3	1000.00	9.000	On	L1	0.5	31.7	56.0

Final Result, average detector

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.198811	14.3	1000.00	9.000	On	L1	0.5	39.2	53.5
.303060	16.3	1000.00	9.000	On	L1	0.4	33.6	49.9
0.304882	15.9	1000.00	9.000	On	L1	0.4	34.0	49.9
0.354878	15.2	1000.00	9.000	On	L1	0.4	33.5	48.7
0.357726	14.4	1000.00	9.000	On	L1	0.4	34.2	48.6
0.405711	22.5	1000.00	9.000	On	L1	0.4	25.1	47.6
0.415556	16.9	1000.00	9.000	On	L1	0.4	30.5	47.4
0.451932	19.7	1000.00	9.000	On	L1	0.4	27.1	46.8
0.505436	19.3	1000.00	9.000	On	L1	0.4	26.7	46.0
0.590675	15.5	1000.00	9.000	On	L1	0.4	30.5	46.0
0.701411	18.1	1000.00	9.000	On	L1	0.5	27.9	46.0

0.793910	16.6	1000.00	9.000	On	L1	0.5	29.4	46.0
0.905817	14.1	1000.00	9.000	On	L1	0.5	31.9	46.0
1.097342	9.7	1000.00	9.000	On	L1	0.5	36.3	46.0
1.383559	13.4	1000.00	9.000	On	L1	0.5	32.6	46.0
1.604017	11.6	1000.00	9.000	On	L1	0.5	34.4	46.0
1.855892	12.1	1000.00	9.000	On	L1	0.5	33.9	46.0
2.817776	11.2	1000.00	9.000	On	L1	0.6	34.8	46.0
3.742165	8.2	1000.00	9.000	On	L1	0.6	37.8	46.0
6.910563	8.4	1000.00	9.000	On	L1	0.6	41.6	50.0

Line 2, Wi-Fi&Bluetooth transmitter on



Final Result, quasi-peak detector

Frequency (MHz)	QuasiPeak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.292355	30.8	1000.00	9.000	On	L1	0.4	29.5	60.3
0.397685	32.8	1000.00	9.000	On	L1	0.4	25.0	57.8
0.508474	28.5	1000.00	9.000	On	L1	0.4	27.5	56.0
0.578990	25.6	1000.00	9.000	On	L1	0.4	30.4	56.0
0.582471	27.1	1000.00	9.000	On	L1	0.4	28.9	56.0
0.711289	30.3	1000.00	9.000	On	L1	0.5	25.7	56.0
0.809931	30.0	1000.00	9.000	On	L1	0.5	26.0	56.0
0.913086	27.7	1000.00	9.000	On	L1	0.5	28.3	56.0
1.172133	28.1	1000.00	9.000	On	L1	0.5	27.9	56.0
1.219919	23.9	1000.00	9.000	On	L1	0.5	32.1	56.0
1.264591	27.6	1000.00	9.000	On	L1	0.5	28.4	56.0
1.318780	26.9	1000.00	9.000	On	L1	0.5	29.1	56.0
1.383559	26.9	1000.00	9.000	On	L1	0.5	29.1	56.0
1.403045	26.2	1000.00	9.000	On	L1	0.5	29.8	56.0
1.504672	24.6	1000.00	9.000	On	L1	0.5	31.4	56.0
1.689545	25.5	1000.00	9.000	On	L1	0.5	30.5	56.0
1.761943	26.0	1000.00	9.000	On	L1	0.5	30.0	56.0
1.826463	24.7	1000.00	9.000	On	L1	0.5	31.3	56.0
1.893346	25.4	1000.00	9.000	On	L1	0.5	30.6	56.0
2.239332	24.8	1000.00	9.000	On	L1	0.5	31.2	56.0

CANADA:
16 - 211 Schoolhouse Street
Coquitlam, British Columbia
Canada V3K 4X9

Final Result, average detector

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.199607	13.3	1000.00	9.000	On	L1	0.5	40.1	53.4
0.292355	19.2	1000.00	9.000	On	L1	0.4	31.0	50.2
0.307329	15.9	1000.00	9.000	On	L1	0.4	33.9	49.8
0.395309	22.7	1000.00	9.000	On	L1	0.4	25.1	47.8
0.451030	20.2	1000.00	9.000	On	L1	0.4	26.6	46.8
0.509491	17.6	1000.00	9.000	On	L1	0.4	28.4	46.0
0.597798	17.4	1000.00	9.000	On	L1	0.4	28.6	46.0
0.705627	18.1	1000.00	9.000	On	L1	0.5	27.9	46.0
0.746228	10.7	1000.00	9.000	On	L1	0.5	35.3	46.0
0.809931	15.6	1000.00	9.000	On	L1	0.5	30.4	46.0
0.913086	14.0	1000.00	9.000	On	L1	0.5	32.0	46.0
1.172133	12.4	1000.00	9.000	On	L1	0.5	33.6	46.0
1.272194	13.4	1000.00	9.000	On	L1	0.5	32.6	46.0
1.383559	13.0	1000.00	9.000	On	L1	0.5	33.0	46.0
1.692924	11.6	1000.00	9.000	On	L1	0.5	34.4	46.0
2.239332	11.7	1000.00	9.000	On	L1	0.5	34.3	46.0
2.354027	12.1	1000.00	9.000	On	L1	0.5	33.9	46.0
2.874641	10.6	1000.00	9.000	On	L1	0.6	35.4	46.0
4.261130	8.5	1000.00	9.000	On	L1	0.6	37.5	46.0
19.259924	11.8	1000.00	9.000	On	L1	0.8	38.2	50.0

MODIFICATIONS: The EUT did not require any modifications.

PER FORMANCE: Complies with Standard

Part 6 – 20 dB Occupied Bandwidth

DATE: July 10, 2013

TEST STANDARD: RSS-210 §A8.2(1), RSS-Gen § (4.6.1).

TEST VOLTAGE: 5Vdc from AC Power Adapter

MINIMUM STANDARD: When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported.

TEST SETUP: The EUT was directly connected to a spectrum analyser.

MEASUREMENT METHOD: Measurements were made using spectrum analyser with 300 kHz RBW, peak detector set on maximum hold using the appropriate antennas, amplifiers and filters.

DEVICE DESCRIPTIONS: As described in the above EUT description and setup section.

EMISSIONS DATA:

Wi-Fi Test Data

Test mode: IEEE 802.11b

Channel	Frequency, MHz	Occupied Bandwidth, MHz	Result
Low	2412	16.5	Pass
Mid	2442	16.5	Pass
High	2462	16.4	Pass

Test mode: IEEE 802.11g

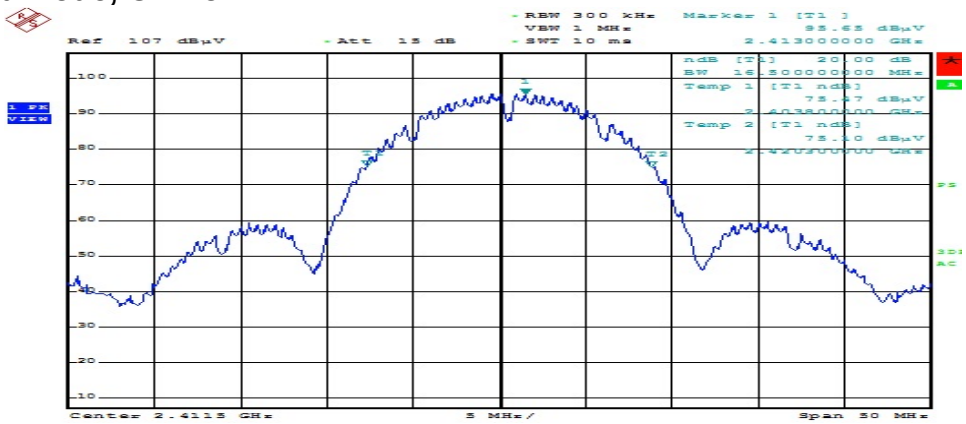
Channel	Frequency, MHz	Output Power, dBm	Result
Low	2412	18.5	Pass
Mid	2442	19.4	Pass
High	2462	19.3	Pass

Test mode: IEEE 802.11n

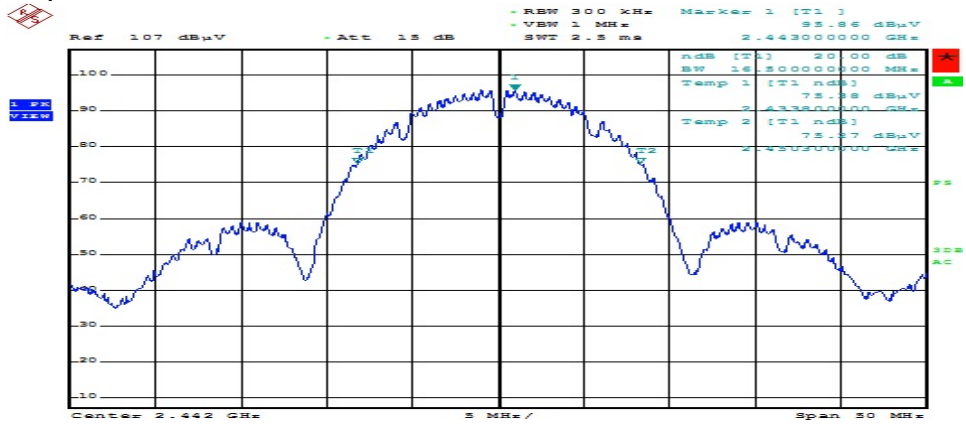
Channel	Frequency, MHz	Output Power, dBm	Result
Low	2422	21.0	Pass
High	2452	20.9	Pass

Test Plots

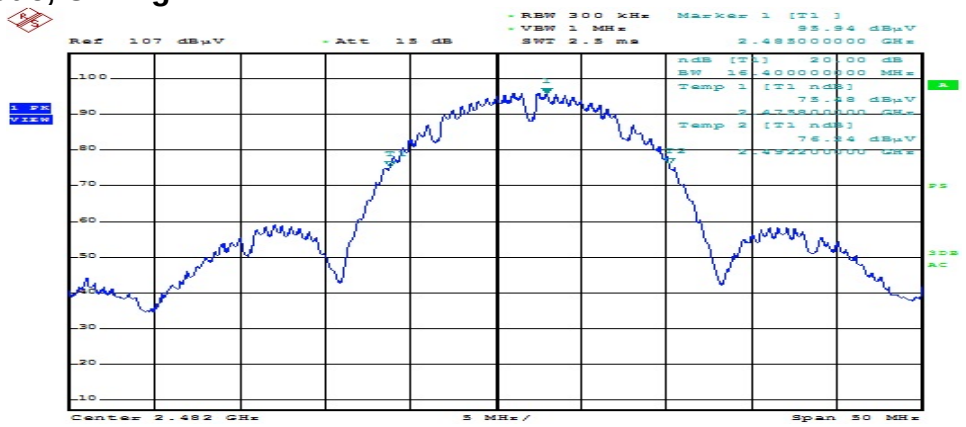
802.11b mode, CH Low



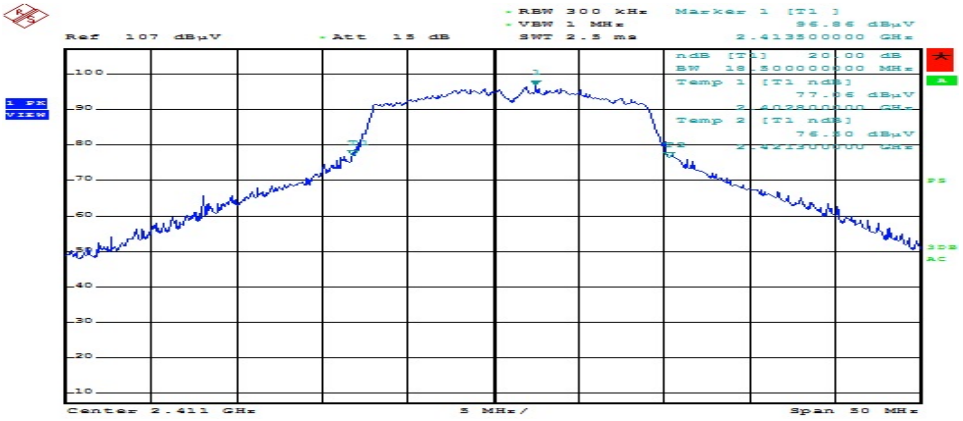
802.11b mode, CH Mid



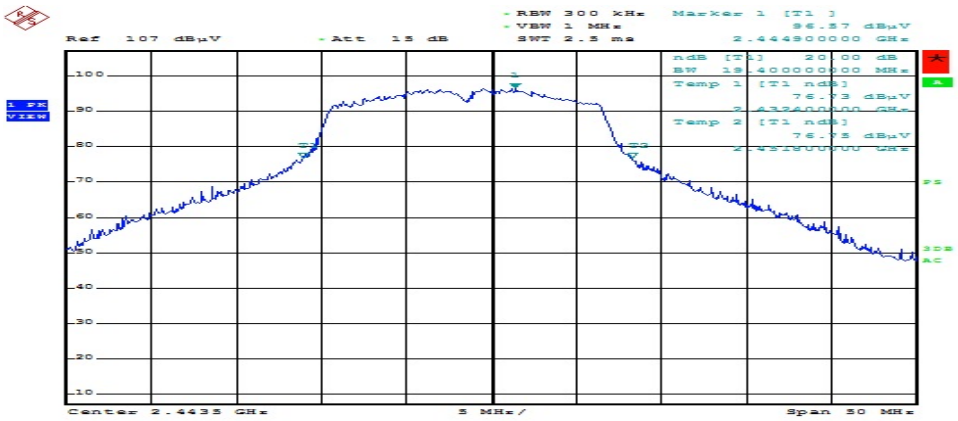
802.11b mode, CH High



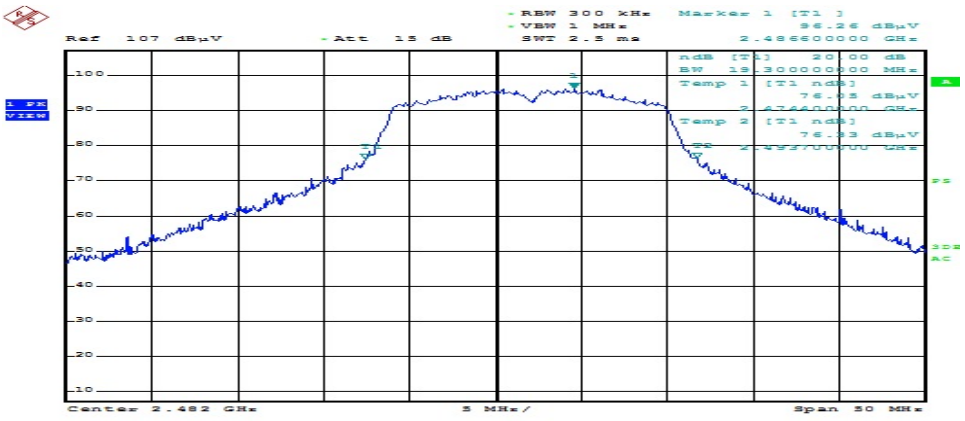
802.11g mode, CH Low



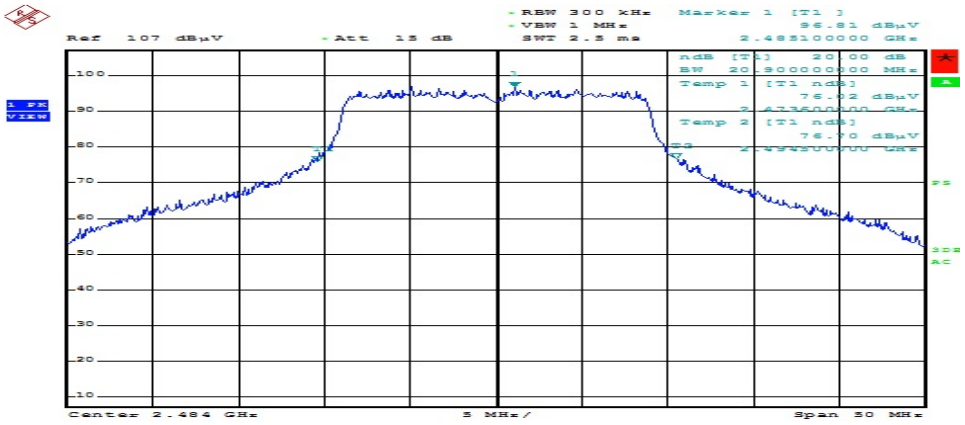
802.11g mode, CH Mid



802.11g mode, CH High



802.11n mode, CH High



Bluetooth Test Data

Test mode: GFSK

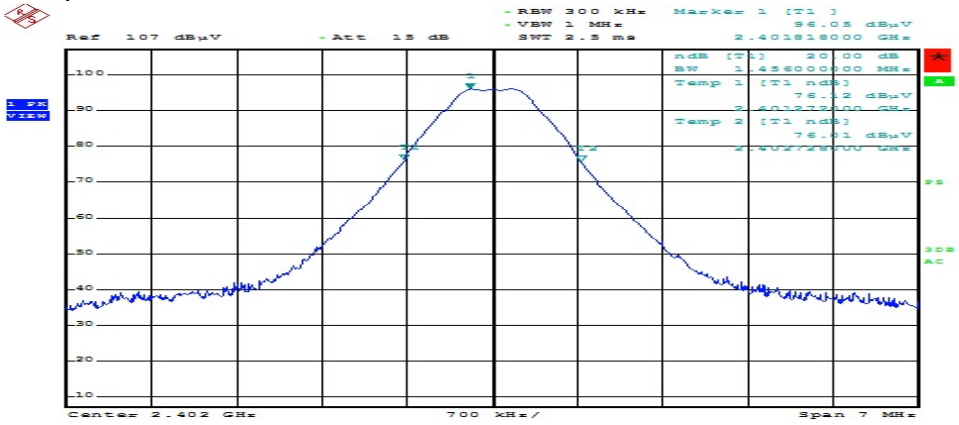
Channel	Frequency, MHz	Occupied Bandwidth, MHz	Result
Low	2402	1.46	Pass
Mid	2442	1.46	Pass
High	2480	1.46	Pass

Test mode: EDR2

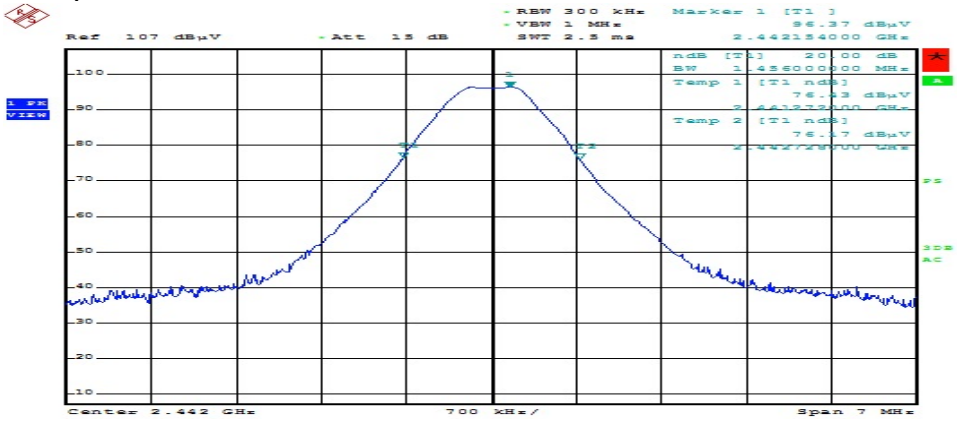
Channel	Frequency, MHz	Output Power, dBm	Result
Low	2402	1.92	Pass
Mid	2442	1.93	Pass
High	2480	1.90	Pass

Test Plots

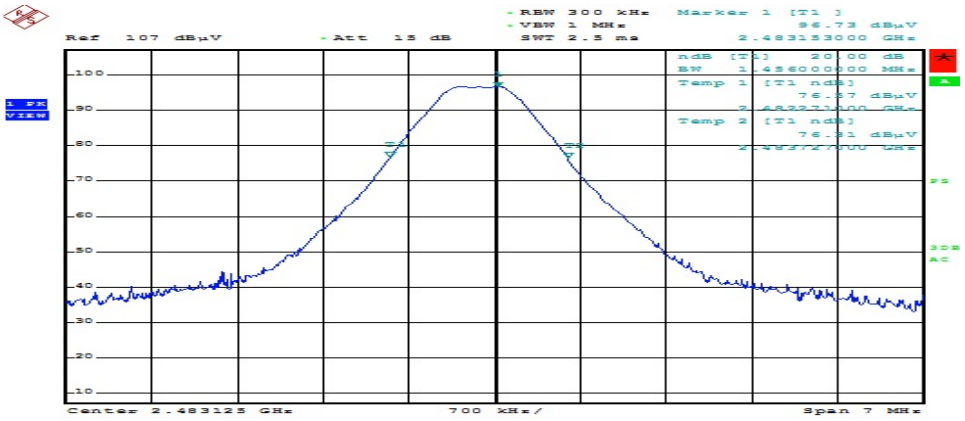
GFSK modulation, CH Low



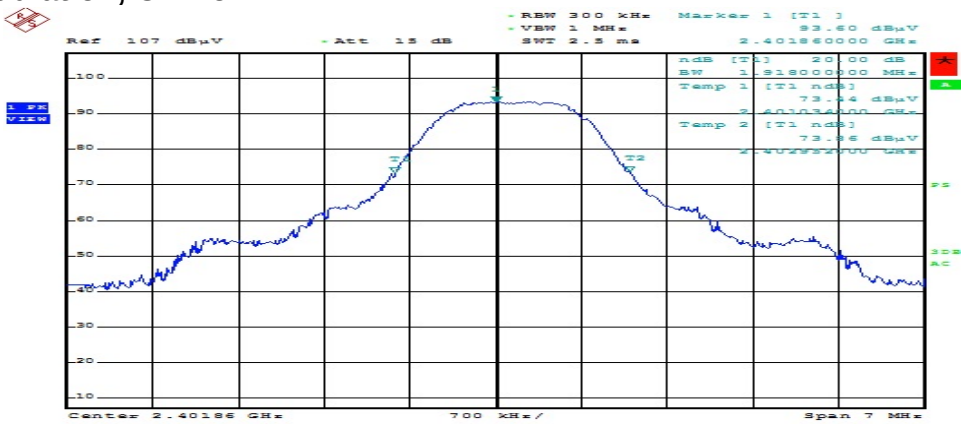
GFSK modulation, CH Mid



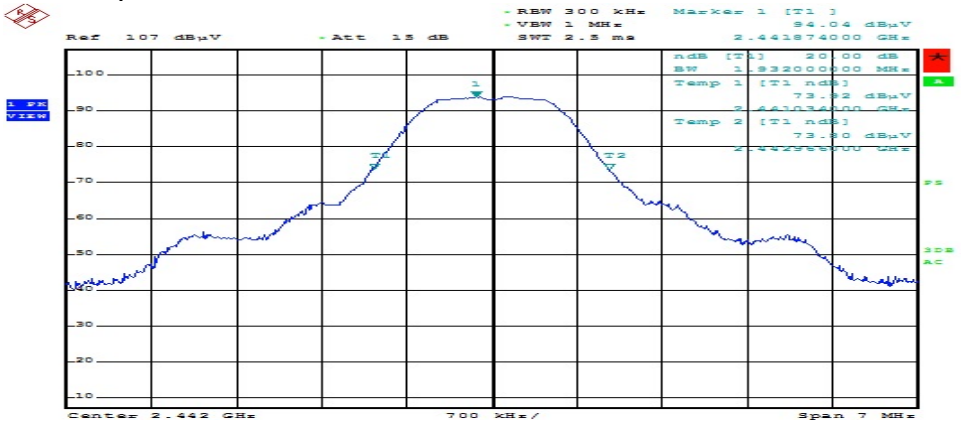
GFSK modulation, CH High



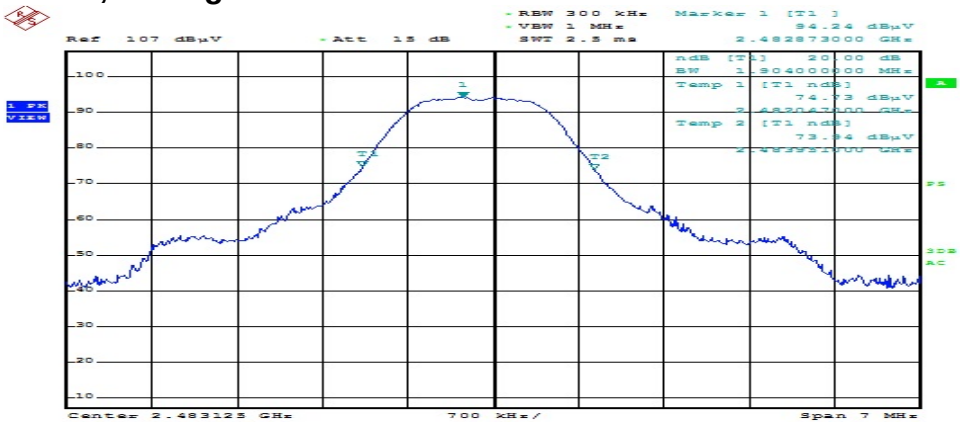
EDR2 modulation, CH Low



EDR2 modulation, CH Mid



EDR2 modulation, CH High



OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies

Part 7 – Band Edge

DATE: July 11, 2011

TEST STANDARD: FCC Subpart C §§15.209(d) and 15.247(c)

TEST VOLTAGE: 5Vdc

MINIMUM STANDARD:(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation. (e) As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

15.209 General Field Strength Limits

Frequency (MHz)	Field Strength	
	uV/m @ 3-m	Calculated dBµV/m at 3m
30 - 88	100	40.0
88 - 216	150	43.5
16 - 960	200	46.0
960 - 1000	500	54.0

TEST SETUP: The EUT was directly connected to a spectrum analyser. The transmitter was set for continuous transmission.

MEASUREMENT METHOD: Measurements were made using a spectrum analyser with 300 kHz RBW peak detector using the appropriate antennas, amplifiers and filters.

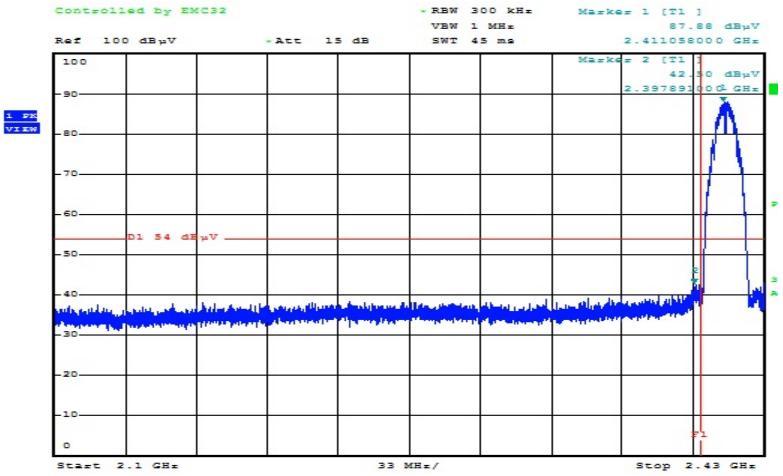
DEVICE DESCRIPTIONS: As described in the above EUT description and setup section.

EMISSIONS DATA:

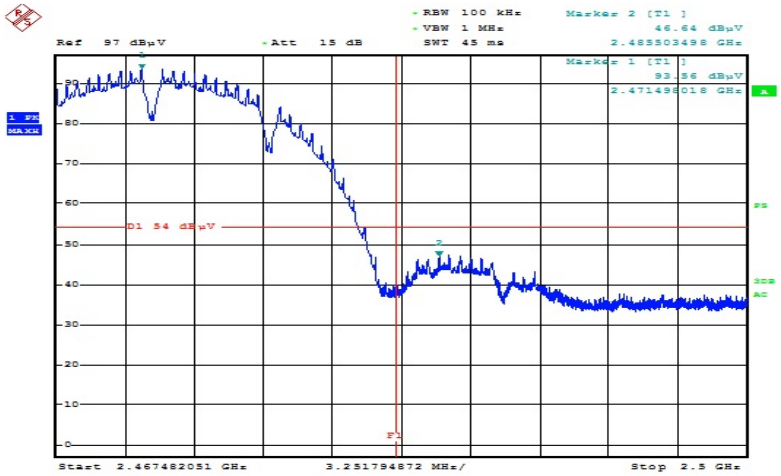
CANADA:
16 - 211 Schoolhouse Street
Coquitlam, British Columbia
Canada V3K 4X9

Wi-Fi Test Data

802.11b Ch. Low

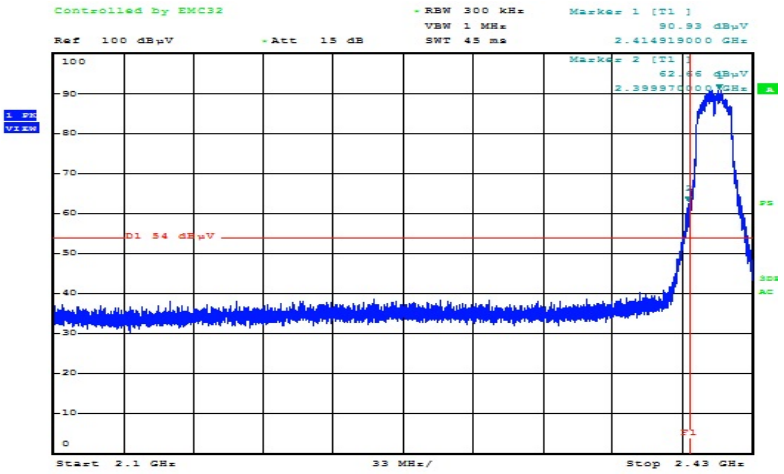


802,11b Ch.High

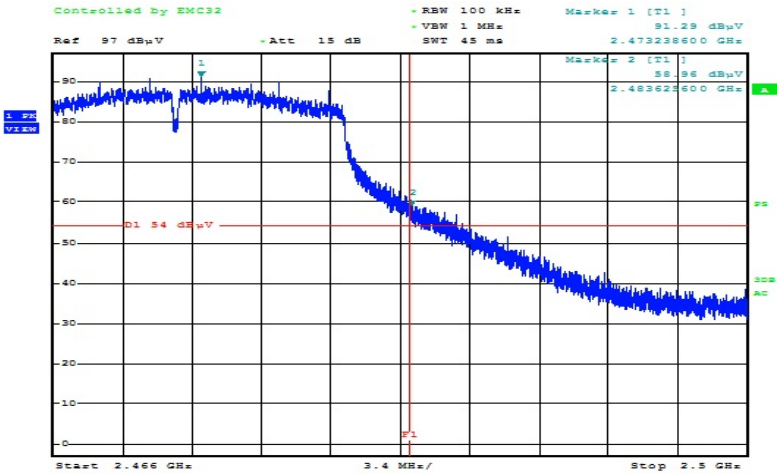


CANADA:
16 - 211 Schoolhouse Street
Coquitlam, British Columbia
Canada V3K 4X9

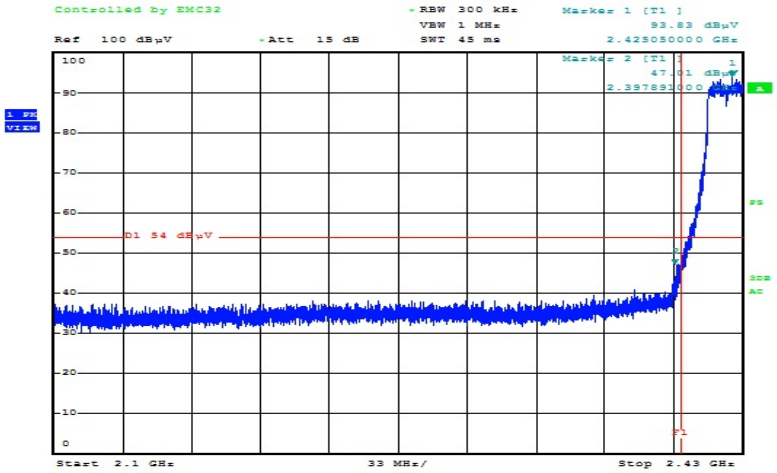
802.11g Ch Low



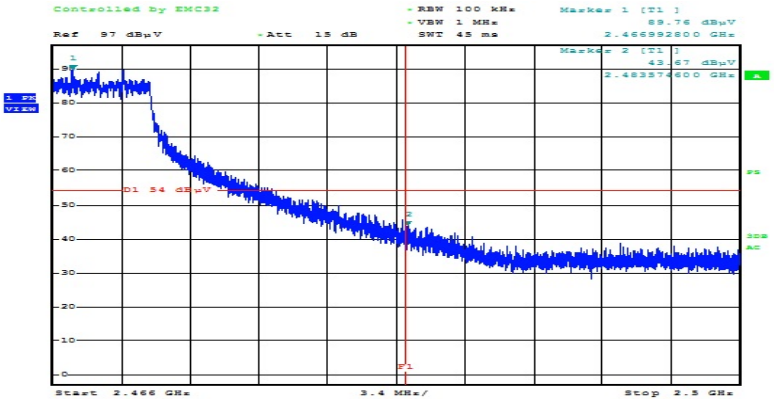
802.11g Ch High



802.11n Ch Low

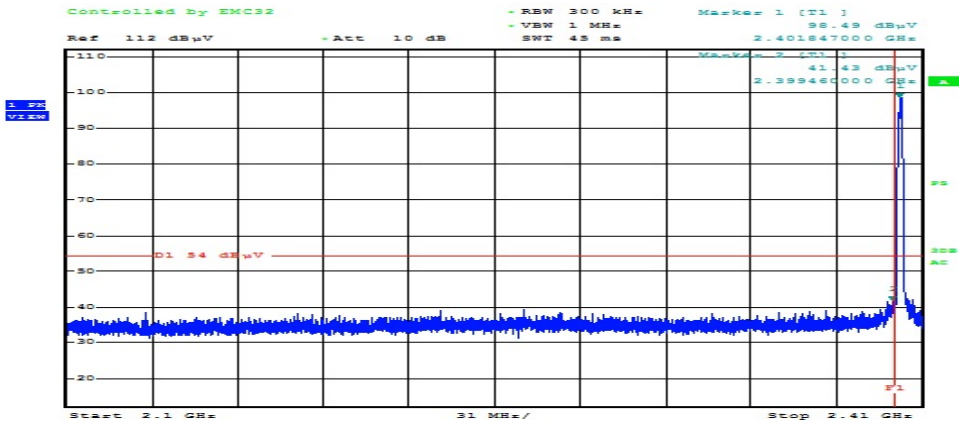


802.11n Ch High

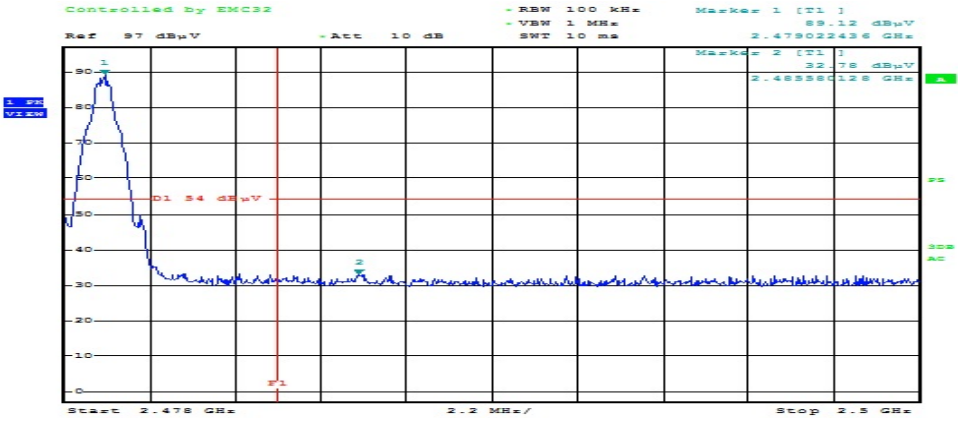


Bluetooth Test Data

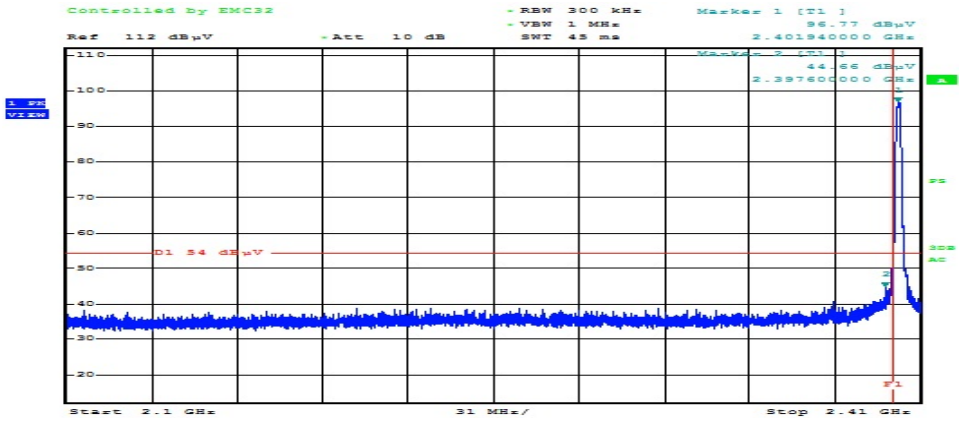
GFSK Ch Low



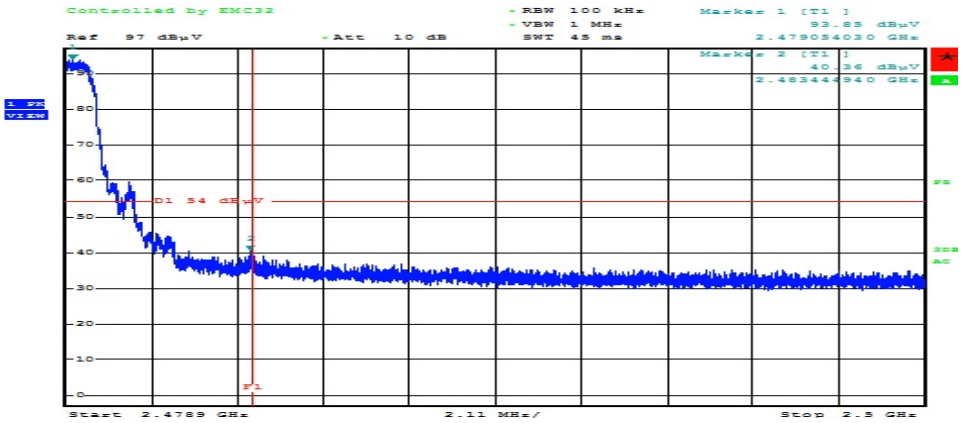
GFSK Ch High



EDR2 Ch Low



EDR2 Ch High



OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.

CANADA:
16 - 211 Schoolhouse Street
Coquitlam, British Columbia
Canada V3K 4X9

Part 8 – Conducted Spurious Emissions

DATE:	July 09, 2011
TEST STANDARD:	IC RSS-210 Annex 2 Section (A2.9)(b)
	RSS-Gen Section (7.2.5)
TEST VOLTAGE:	5Vdc from AC Power Adapter
TEST CONDITIONS:	Indoor
MINIMUM STANDARD:	(b) Emissions emitted outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in RSS-Gen, whichever is less stringent.
TEST SETUP:	The EUT was directly connected to a spectrum analyser. The transmitter was set for continuous transmission. Measurements were done up to 25GHz.
MEASUREMENT METHOD:	Measurements were made using a spectrum analyser with 300kHz RBW quasi-peak detector using the appropriate antennas, amplifiers and filters.
DEVICE DESCRIPTIONS:	As described in the above EUT description and setup section.

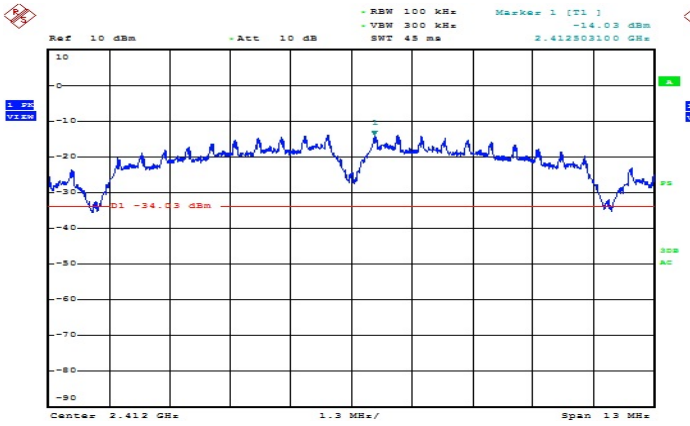
EMISSIONS DATA:

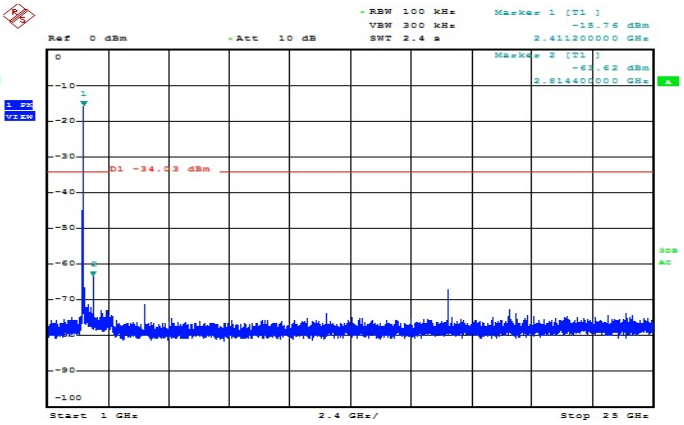
CANADA:
16 - 211 Schoolhouse Street
Coquitlam, British Columbia
Canada V3K 4X9

Wi-Fi Test Data

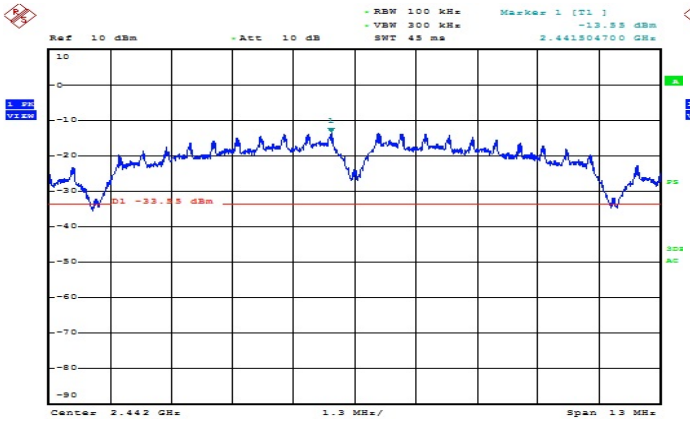
Test Plots

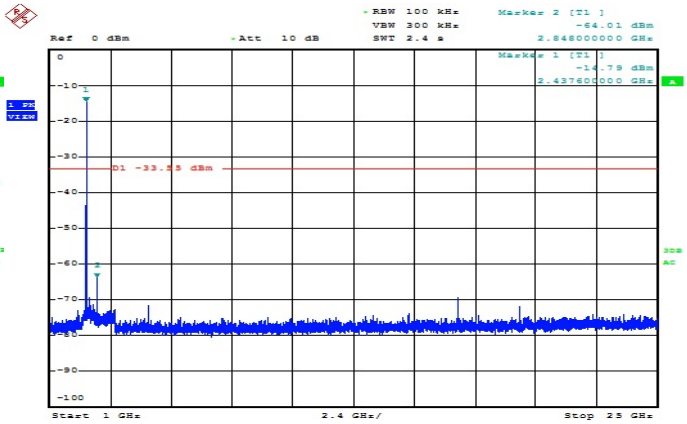
Wi-Fi 11b Ch. Low



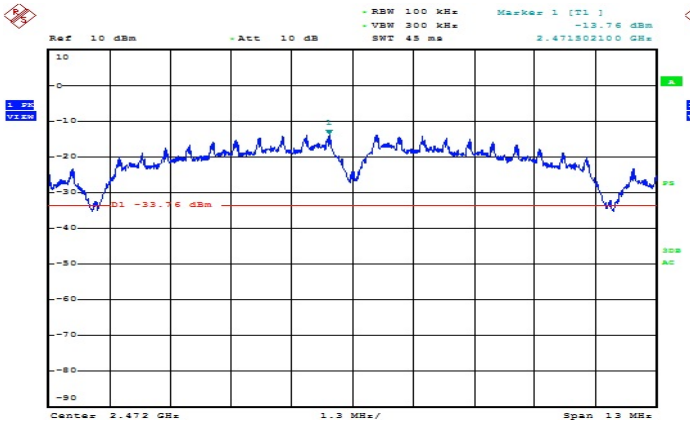


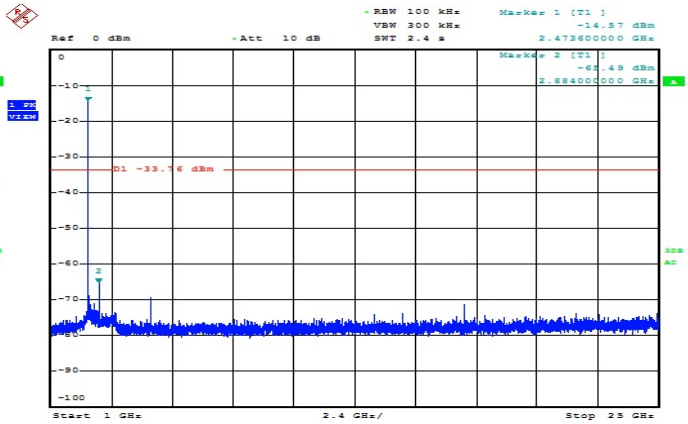
Wi-Fi 11b Ch. Mid



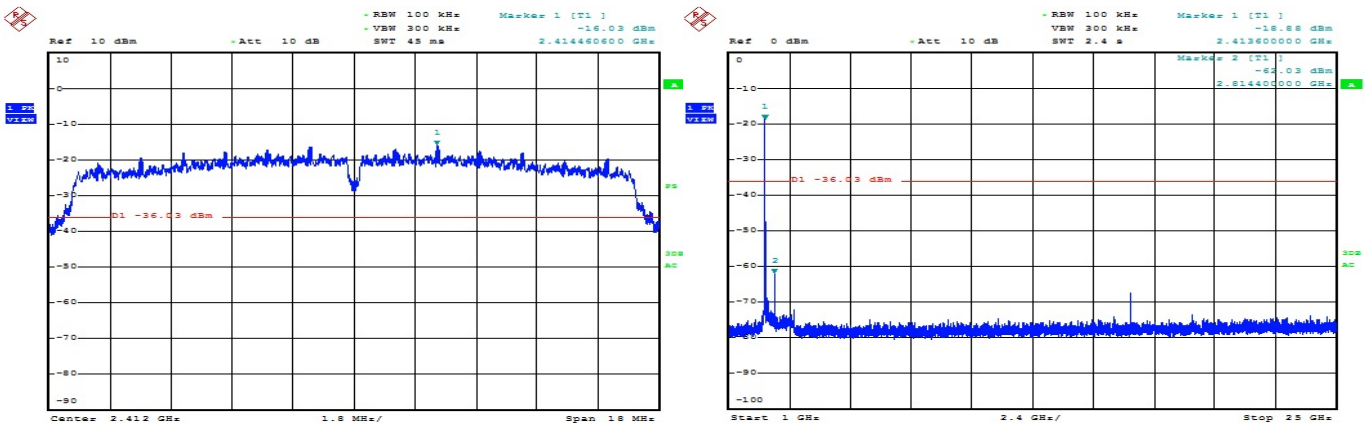


Wi-Fi 11b Ch. High

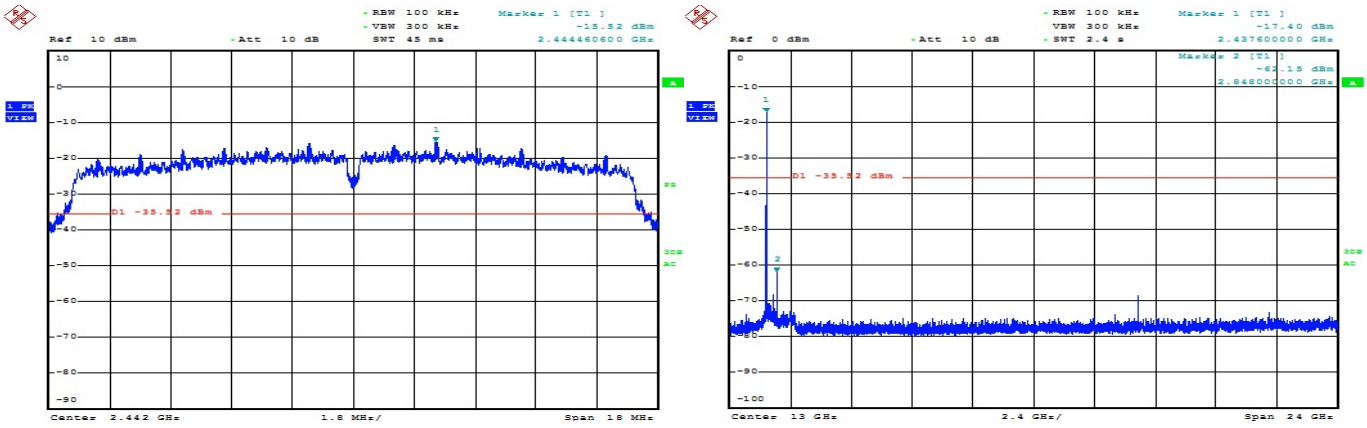




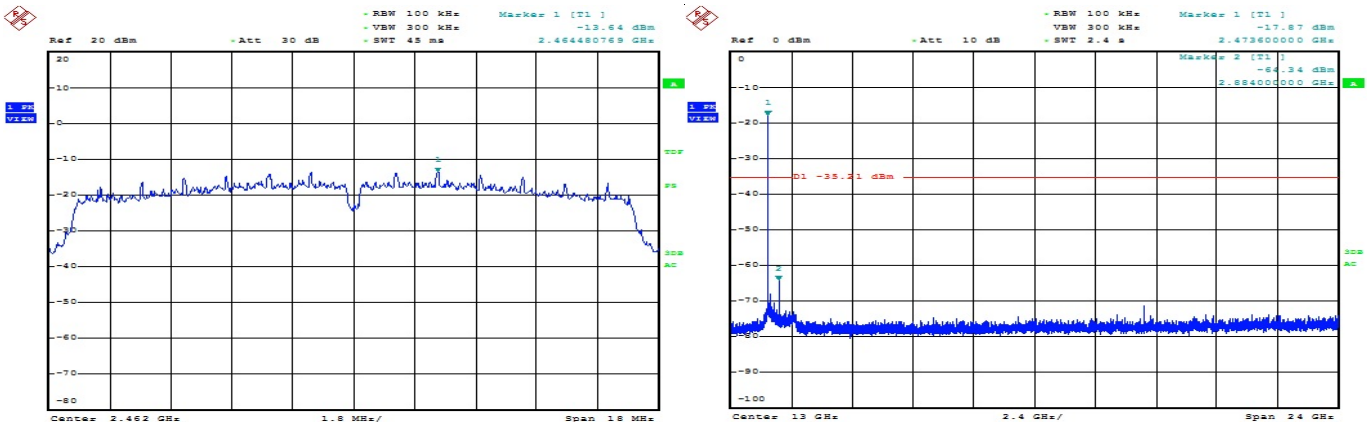
Wi-Fi 11g Ch. Low



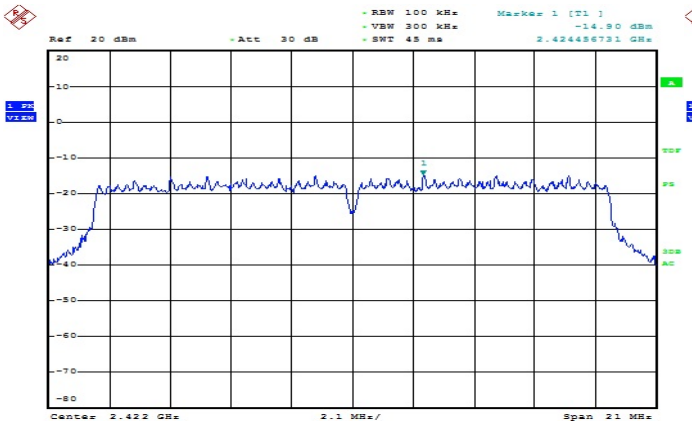
Wi-Fi 11g Ch. Mid

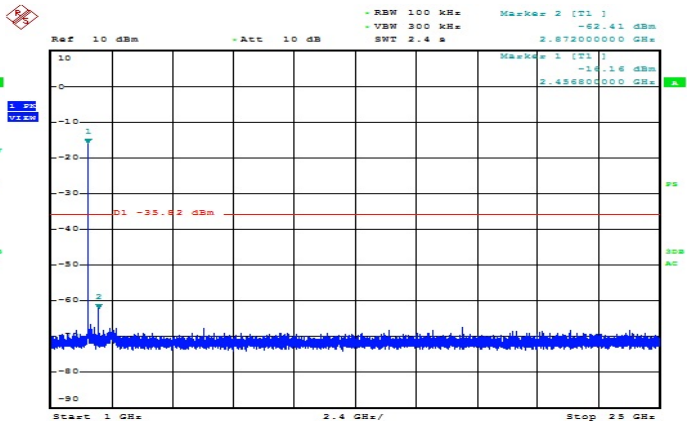


Wi-Fi 11g Ch. High

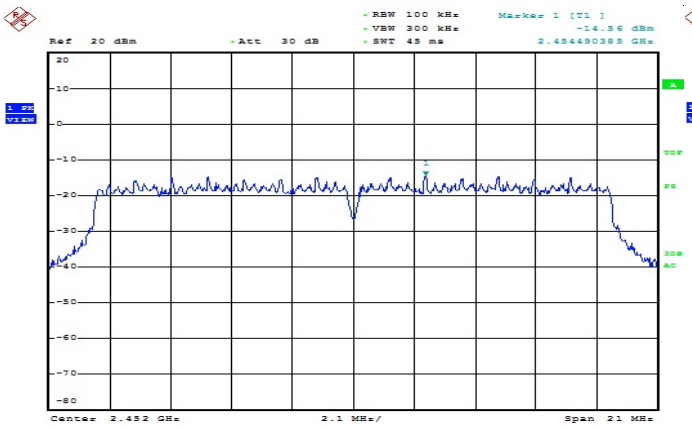


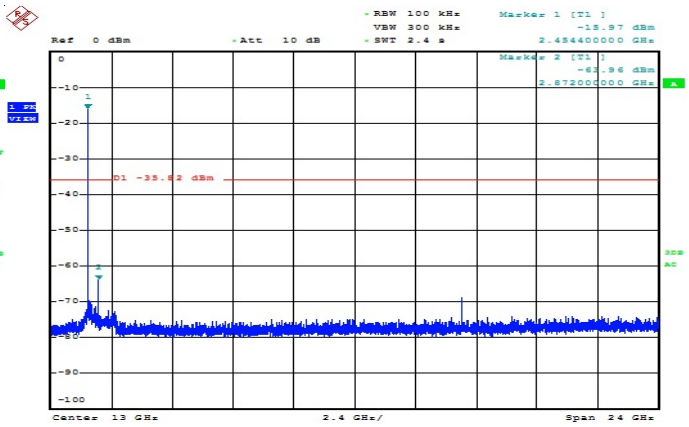
Wi-Fi 11n Ch. Low





Wi-Fi 11n Ch. High

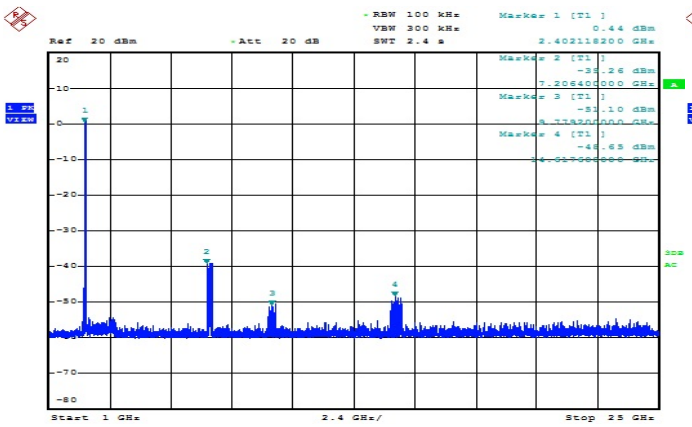




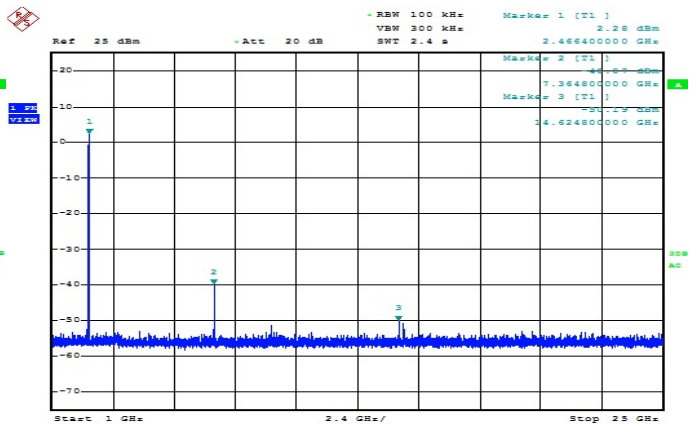
CANADA:
16 - 211 Schoolhouse Street
Coquitlam, British Columbia
Canada V3K 4X9

Bluetooth Test Data

EDR2 modulation



GFSK modulation

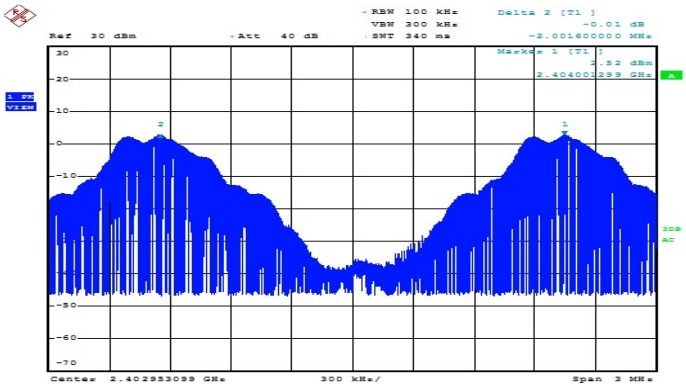


CANADA:
16 - 211 Schoolhouse Street
Coquitlam, British Columbia
Canada V3K 4X9

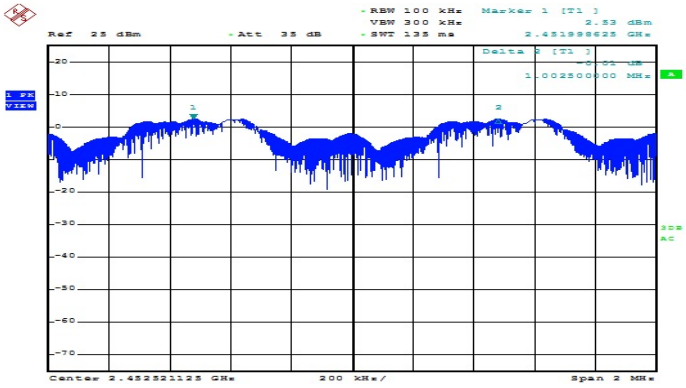
Part 9 – Carrier Frequency Separation

DATE:	July 09, 2011
TEST STANDARD:	IC RSS-210 Annex 2 Section (A2.9)(b)
	RSS-Gen Section (7.2.5)
TEST VOLTAGE:	5Vdc from AC Power Adapter
TEST CONDITIONS:	Indoor
MINIMUM STANDARD:	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.
TEST SETUP:	The EUT is directly connected to a spectrum analyser.
MEASUREMENT METHOD:	Measurements were made using spectrum analyser with RBW and VBW of 100 kHz using the appropriate antennas, amplifiers and filters.
DEVICE DESCRIPTIONS:	As described in the above EUT description and setup section.
EMISSIONS DATA:	

GFSK mode



EDR2 mode



RESULTS: Compliance to standard is confirmed.

CANADA:
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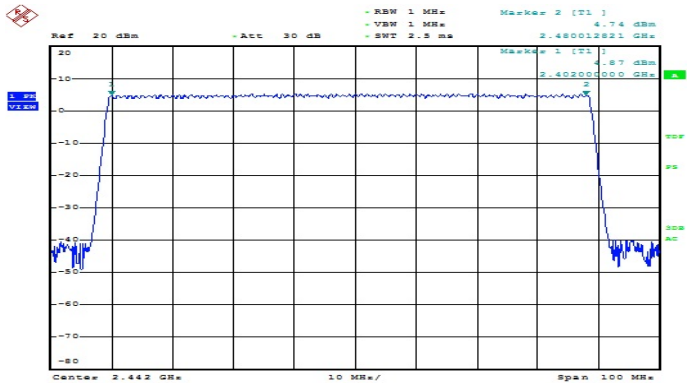
Part 10 – Number of Hopping Frequencies

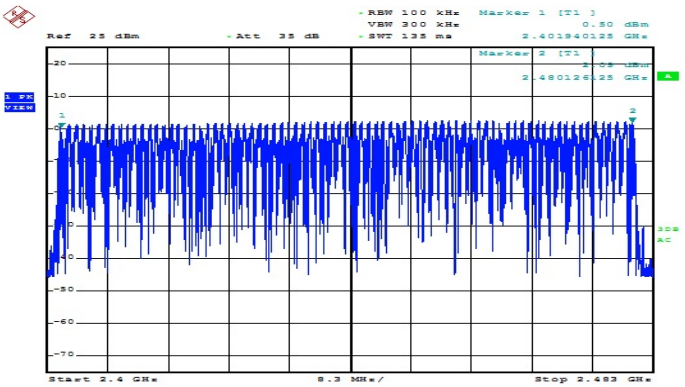
DATE:	July 09, 2011
TEST STANDARD:	IC RSS-210 Annex 2 Section (A2.9)(b)
	RSS-Gen Section (7.2.5)
TEST VOLTAGE:	5Vdc from AC Power Adapter
TEST CONDITIONS:	Indoor
MINIMUM STANDARD:	Frequency hopping systems in the 2400 – 2483.5 MHz shall use at least 15 non-overlapping channels.
TEST SETUP:	The EUT is directly connected to a spectrum analyser. The span is set to cover authorised band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 1% of the span. The analyser is set to Max Hold.
MEASUREMENT METHOD:	Measurements were made using spectrum analyser using the appropriate antennas, amplifiers and filters.
DEVICE DESCRIPTIONS:	As described in the above EUT description and setup section.

EMISSIONS DATA:

GFSK mode, 79 channels



EDR2 mode, 79 channels



RESULTS: Compliance to standard is confirmed. 79 channels observed.

CANADA:
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Part 11 – Time Of Ocupancy (Dwell Time)

DATE:	July 09, 2011
TEST STANDARD:	IC RSS-210 Annex 2 Section (A2.9)(b) RSS-Gen Section (7.2.5)
TEST VOLTAGE:	5Vdc from AC Power Adapter
TEST CONDITIONS:	Indoor
MINIMUM STANDARD:	For frequency hopping systems average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.
TEST SETUP:	The EUT is directly connected to a spectrum analyser. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a second scan to enable resolution of each occurrence. The averaged time of occupancy in the specified period 31.6 seconds (79*0.4 s) is equal to 316* (# of pulses in 100 ms) * pulse width.
MEASUREMENT METHOD:	Measurements were made using spectrum analyser using the appropriate antennas, amplifiers and filters.
DEVICE DESCRIPTIONS:	As described in the above EUT description and setup section.

EMISSIONS DATA:

Test mode: GFSK

DH Packet	Pulse Width, ms	Number of Pulses in 100 ms	Average Time of Occupancy, s	Limit, s	Result
DH1	89.7	10	0.284	0.4	Pass
DH2	367.2	3	0.348	0.4	Pass
DH3	534.1	2	0.338	0.4	Pass

Test mode: EDR2

DH Packet	Pulse Width, µs	Number of Pulses in 100 ms	Average Occupancy Time, s	Limit, s	Result
2-DH1	95.9	10	0.303	0.4	Pass
2-DH2	392.6	3	0.372	0.4	Pass
2-DH3	571.0	2	0.361	0.4	Pass

RESULTS: Compliance to standard is confirmed

Part 12 – RF Exposure Compliance

DATE: July 09, 2011

TEST STANDARD: IC RSS-Gen Section 5.6,RSS-102 Section 2.5

TEST VOLTAGE: 5Vdc from AC Power Adapter

TEST CONDITIONS: Indoor

MINIMUM STANDARD: All transmitters are exempt from routine SAR and RF exposure evaluations provided that output power complies with the power levels of sections 2.5.1…

SAR evaluation is required if the separation distance between the user and the radiating element of the device is less than or equal to 20 cm, except when the device operates as follows:

- from 3 kHz up to 1 GHz inclusively, and with output power (i.e. the higher of the conducted or equivalent isotropically radiated power (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 200 mW for general public use and 1000 mW for controlled use;

- above 1 GHz and up to 2.2 GHz inclusively, and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 100 mW for general public use and 500 mW for controlled use;

- above 2.2 GHz and up to 3 GHz inclusively, and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 20 mW for general public use and 100 mW for controlled use;

- above 3 GHz and up to 6 GHz inclusively, and with output power (i.e. the higher of the conducted or radiated (e.i.r.p.) source-based, time-averaged output power) that is less than or equal to 10 mW for general public use and 50 mW for controlled use.

EUT DESIGN PARAMETERS:

Minimum separation distance – 14.5 mm;

WiFi maximum transmit power: 3.44 mW (5.36 dBm);

Bluetooth maximum transmit power: 1.24 mW;

Antenna gain: -1.25 dBi.

RARIONALE: Max transmit power: 5.36 dBm, antenna gain: -1.25 dBi, then e.i.r.p = 2.58 mW, or 0.28 mW/mm, which definitely meets above standard requirements.

RESULT: The Recon SNOW2 Heads-Up Display is exempt from SAR evaluation.

Section III. Requirements for the US Market: FCC Mark

Summary of requirements FCC 15.247

	Test	Wi-Fi Standard	Bluetooth Standard	Description	Result
Part 1	Output power conducted	FCC Subpart C 15.247 (a) (2)	FCC Subpart C 15.247 (b)	Digitally modulated and frequency hopping systems emissions should not excedd the limits	Complies
Part 2	Radiated Spurious Emissions	FCC Subpart C 15.209 (a)	FCC Subpart C 15.247	Emissions from intentional radiator should not exceed the limits	Complies
Part 3	Maximum Power Spectral Density in the Fundamental Emission	FCC Subpart C 15.247 (e)	N/A	Conducted power spectral density shall be not higher than 8 dBm in any 3 kHz band segment	Complies
Part 4	AC Mains Conducted Emissions	FCC Subpart C 15.207 (a)	FCC Subpart C 15.207 (a)	The Conducted Emissions are measured on the Phase and Neutral Power lines in the 0.15 - 30.0 MHz range	Complies
Part 5	6 dB Occupied Bandwidth	FCC Subpart C 15.247 (a) (2)	N/A	The transmitted signal bandwidth to be reported adjusted to be 6 dB	Complies
Part 6	20 dB Occupied Bandwidth	N/A	FCC Subpart C 15.247 (a) (2)	The transmitted signal bandwidth to be reported adjusted to be 6 dB	Complies
Part 7	Band edge	FCC Subpart C 15.209	FCC Subpart C 15.247 (c)	Radiated Spurious emissions shall be 50dBc	Complies
Part 8	Conducted Spurious Emissions	FCC Subpart C 15.209 (a)	FCC Subpart C 15.247 (c)	Radiated Spurious emissions shall be 50dBc	Complies
Part 9	Hopping Frequency Separation	N/A	FCC Subpart C 15.247 (a)	Should be frequency separation between peaks in adjacent channels	Complies

Part 10	Number of Hopping Channels	N/A	FCC Subpart C 15.247 (a)	EUT must have number of hopping channels enabled	Complies
Part 11	Average Time of Occupancy	N/A	FCC Subpart C 15.247 (a)	Value of dwell time should not be less the limit	Complies
Part 12	RF Exposure Evaluation	FCC KDB447498; CFR 47, Part 1.1307, 1310; Part 2, Subpart J 1091	FCC KDB447498; CFR 47, Part 1.1307, 1310; Part 2, Subpart J 1091	Any radio transmitter should not emit higher the limit.	Complies

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Part 1 – Output Power Conducted

DATE:	July 8, 2013
TEST STANDARD:	FCC Subpart C §§15.247(a) (2), 15.247Ib)
TEST VOLTAGE:	5Vdc from AC Power Adapter
MINIMUM STANDARD:	1 W (30 dBm)
TEST SETUP:	The antenna port of EUT was directly connected to a spectrum analyser.
MEASUREMENT METHOD:	As called by the standards above.
DEVICE DESCRIPTIONS:	As described in the above EUT description and set up section.

EMISSIONS DATA:

Wi-Fi Test Data

Test mode: IEEE 802.11b

Channel	Frequency, MHz	Output Power, dBm	Result
Low	2412	0.70	Pass
Mid	2442	0.96	Pass
High	2462	0.68	Pass

Test mode: IEEE 802.11g

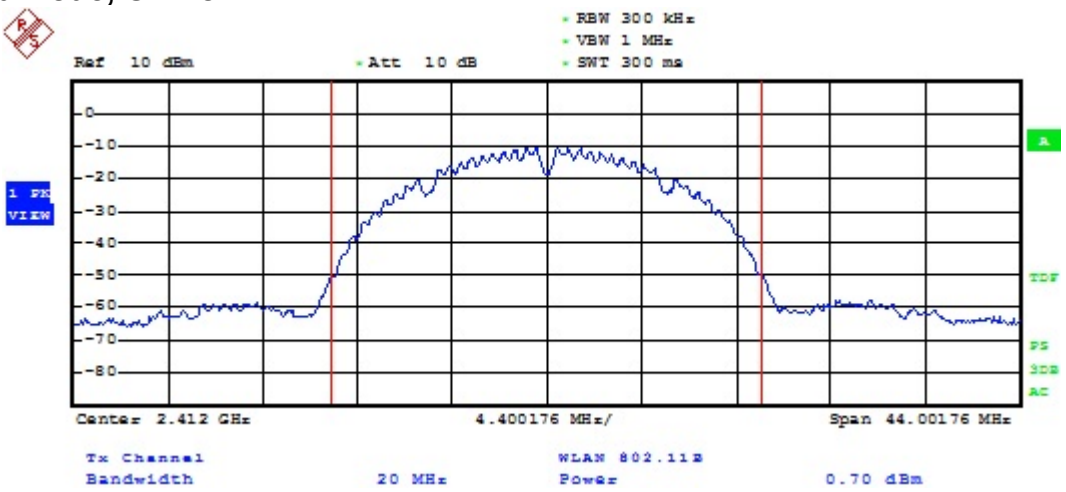
Channel	Frequency, MHz	Output Power, dBm	Result
Low	2412	3.94	Pass
Mid	2442	4.43	Pass
High	2462	4.30	Pass

Test mode: IEEE 802.11n

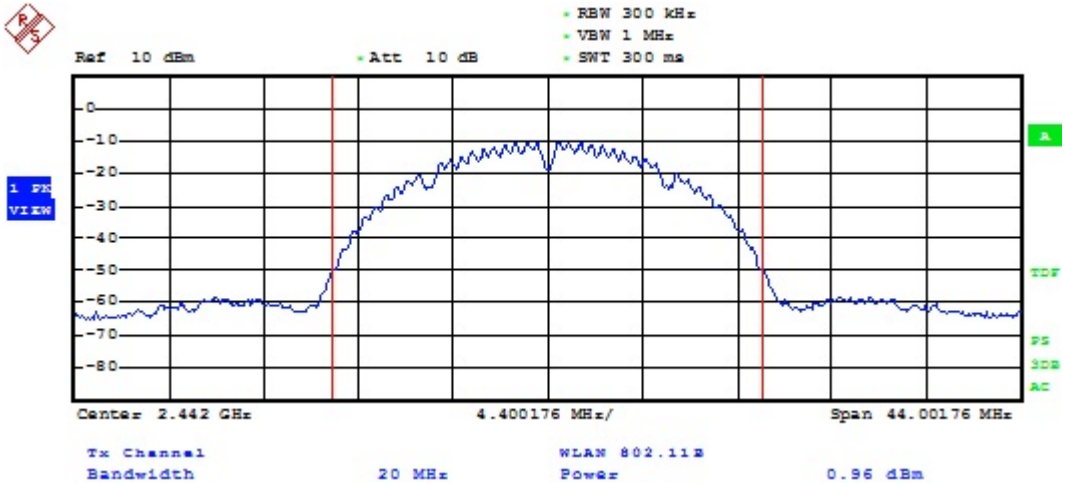
Channel	Frequency, MHz	Output Power, dBm	Result
Low	2422	5.36	Pass
High	2452	5.25	Pass

Test Plots

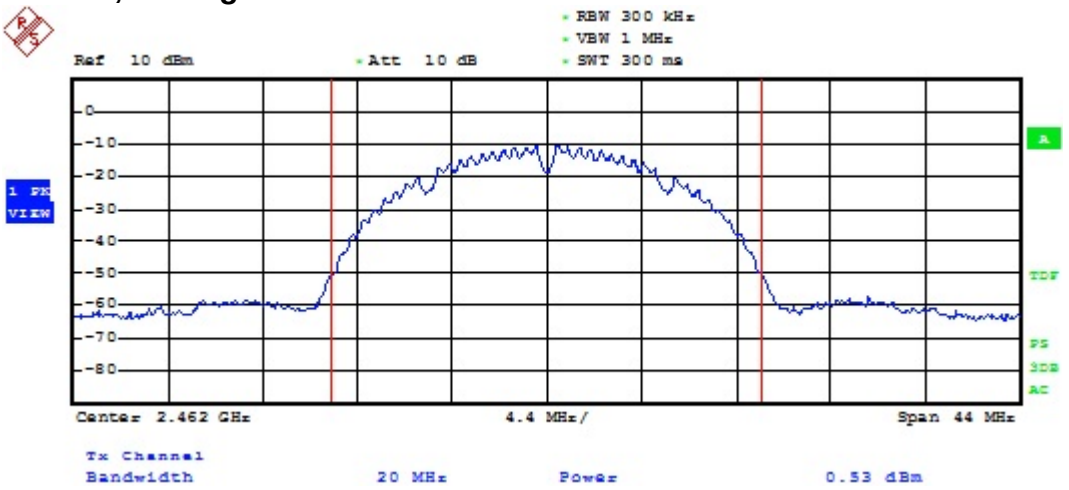
802.11b mode, CH Low



802.11b mode, CH Mid



802.11b mode, CH High

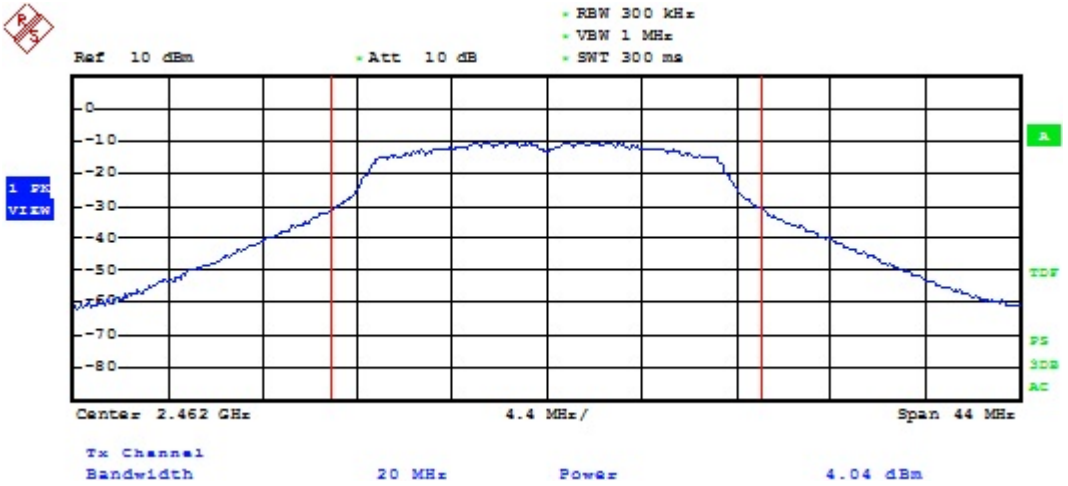


802.11g mode, CH Low

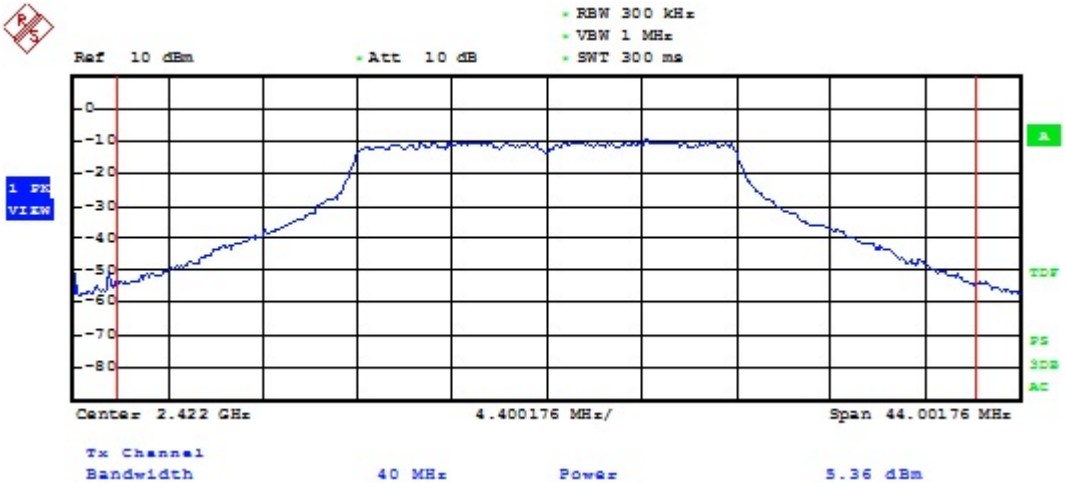
802.11g mode, CH Mid

802.11g mode, CH High

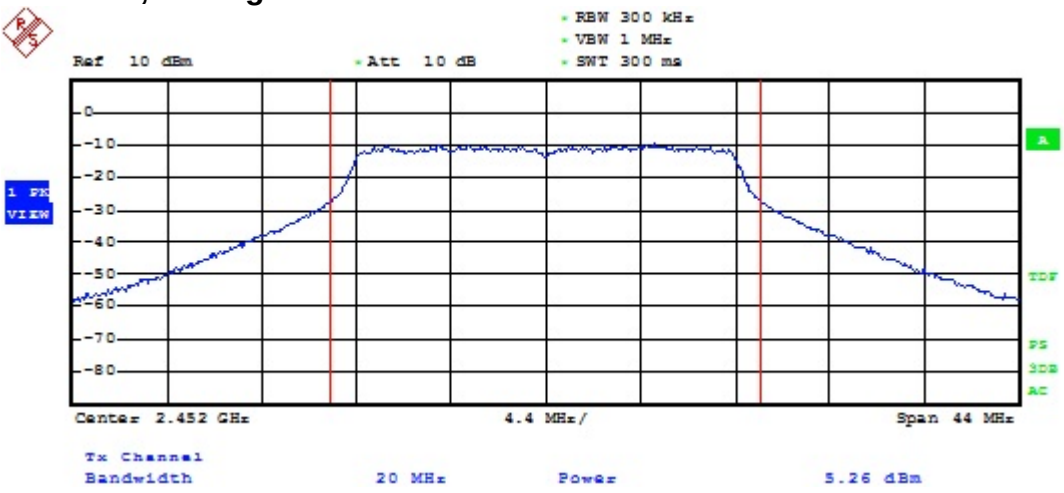
+



802.11n mode, CH Low



802.11n mode, CH High



Bluetooth Test Data

Test mode: GFSK

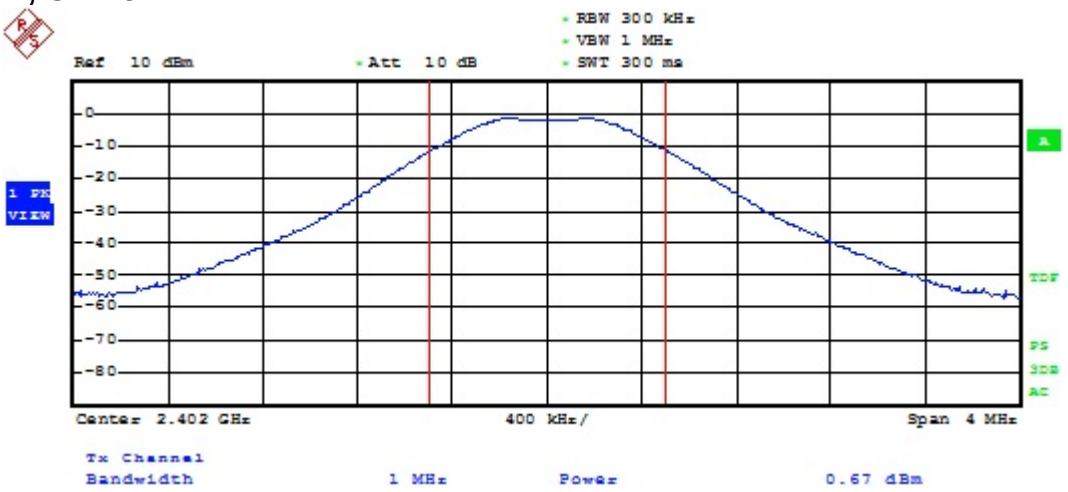
Channel	Frequency, MHz	Output Power, dBm	Result
Low	2402	0.67	Pass
Mid	2442	0.92	Pass
High	2480	0.62	Pass

Test mode: EDR2

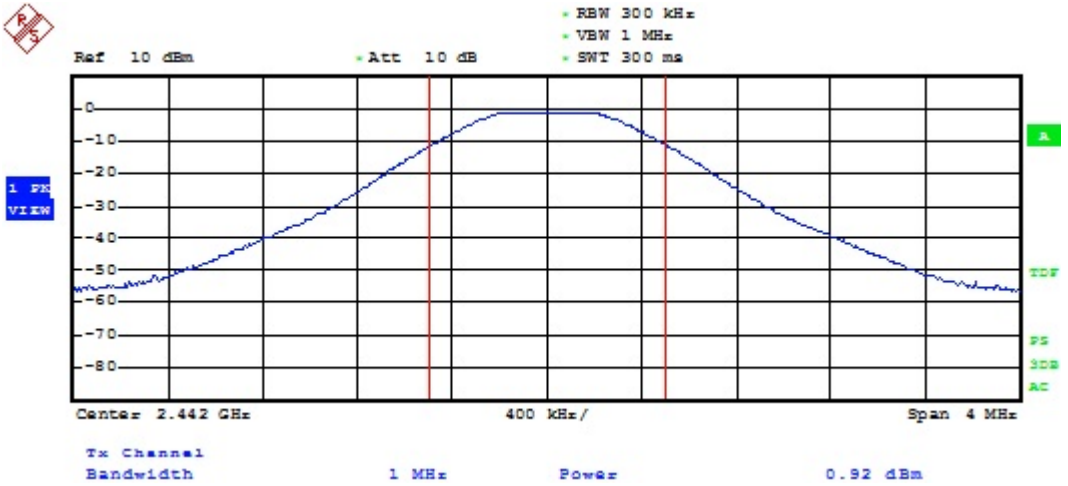
Channel	Frequency, MHz	Output Power, dBm	Result
Low	2402	0.44	Pass
Mid	2442	0.81	Pass
High	2480	0.70	Pass

Test Plots

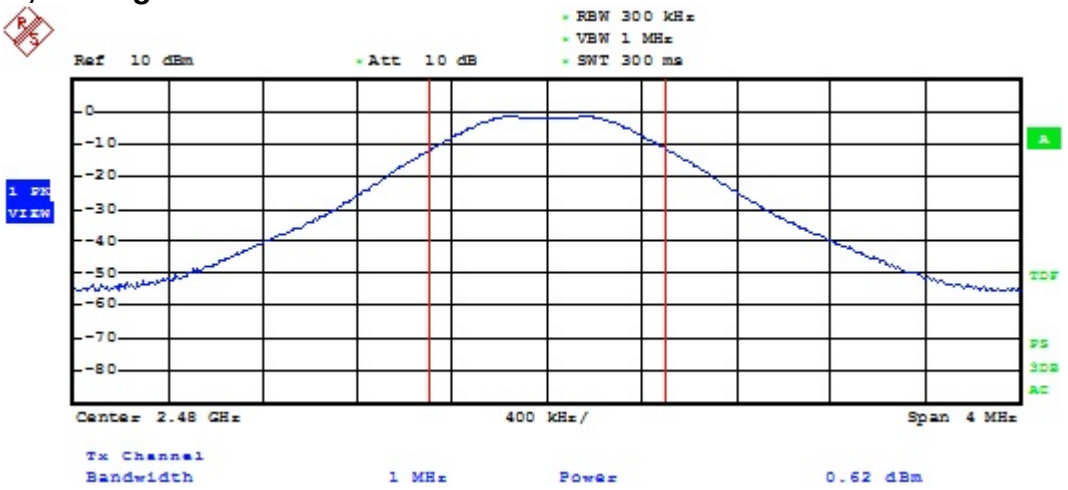
GFSK, CH Low



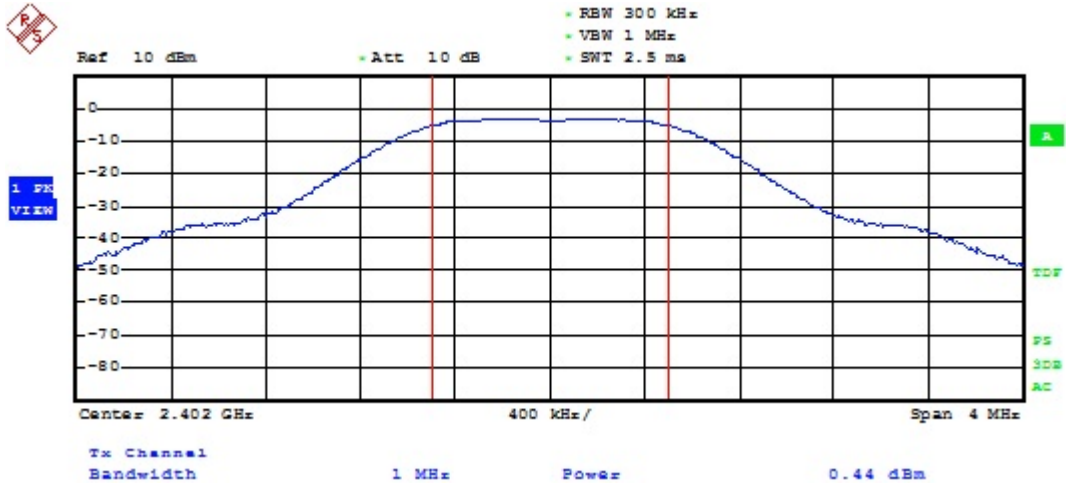
GFSK, CH Mid



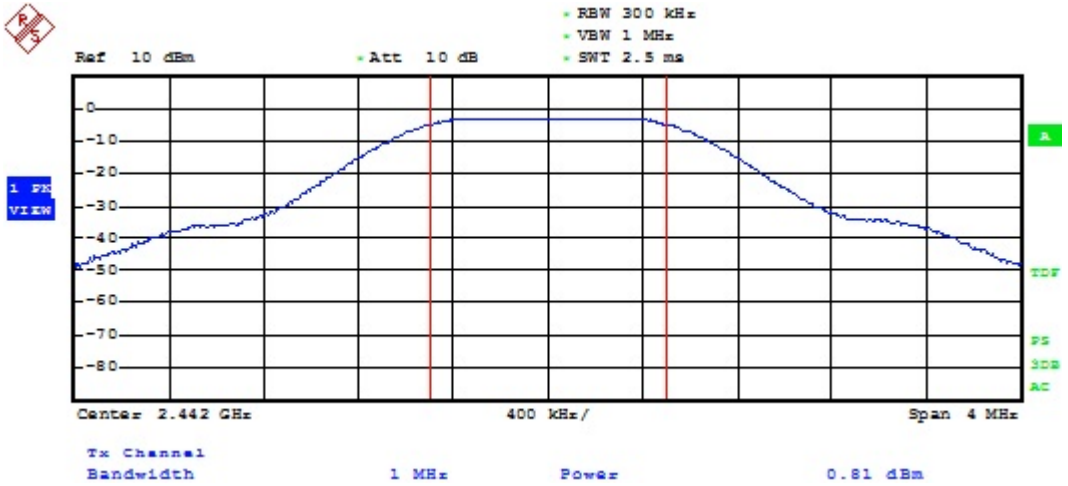
GFSK, CH High



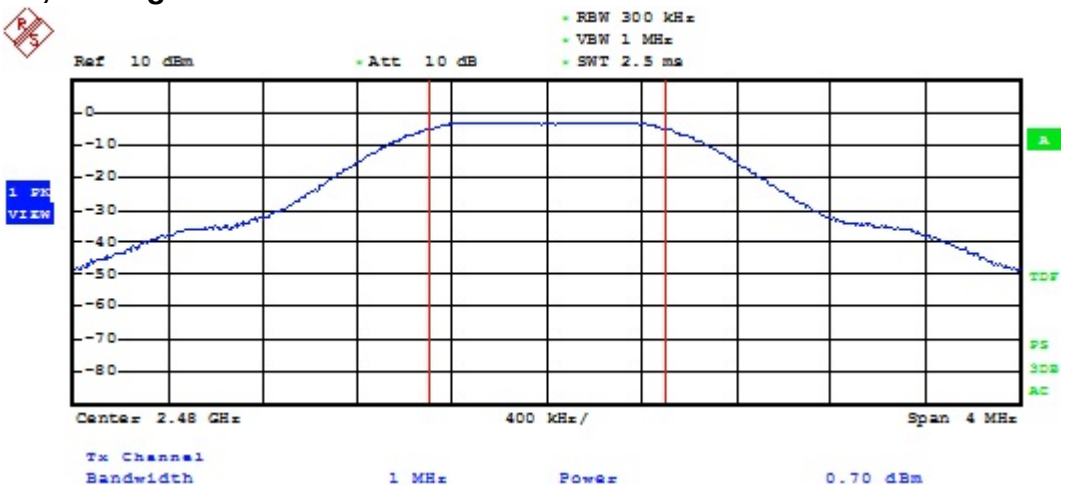
EDR2, CH Low



EDR2, CH Mid



EDR2, CH High



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OBSERVATIONS:	The EUT performed as expected.
PERFORMANCE:	Complies.

Part 2 - Radiated Spurious Emissions

DATE: July 09, 2011

TEST STANDARD: FCC Subpart C §§15.209(a) and 15.247(c)

TEST VOLTAGE: 5Vdc from AC Power Adapter

TEST CONDITIONS: Indoor

MINIMUM STANDARD: (b) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in RSS-Gen, whichever is less stringent.

In measuring unwanted emissions, the spectrum shall be investigated from 30 MHz or the lowest radio frequency signal generated in the equipment, whichever is lower, without going below 9 kHz, up to at least the frequency … if the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.

Table 1: General Field Strength Limits for Transmitters at Frequencies Above 30 MHz

Frequency (MHz)	Field Strength	
	uV/m @ 3-m	Calculated dBµV/m at 3m
30 – 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
960 - 1000	500	54.0

TEST SETUP: The EUT was tested in our 3 m semi-anechoic chamber and was positioned on the center of the turntable and connected to a 5Vdc power supply. The transmitter was set for continuous transmission. The lowest, middle and highest channels in the 2400-2483.5 MHz band were measured for all radiated emissions 10kHz to 18 GHz. The EUT was pre-scanned in 3 different orthogonal orientations and was found to radiate highest when placed flat on the table top as indicated in the test photos.

MEASUREMENT METHOD: Measurements were made using spectrum analyser and receiver, 200Hz RBW average detector for the frequency range 9-150KHz; 9kHz RBW average detector for the Frequency range 150kHz to 30MHz; 120kHz RBW quasi-peak detector using the appropriate antennas, amplifiers and filters.

DEVICE DESCRIPTIONS: As described in the above EUT description and setup section.

EMISSIONS DATA: Refer to section II, Part 3

CANADA:
16 - 211 Schoolhouse Street
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Canada V3K 4X9

Part 3 – Power Spectral Density

DATE:	July 05, 2013
TEST STANDARD:	FCC Subpart C §15.247(e)
TEST METHOD:	As called by the standards above
TEST VOLTAGE:	5Vdc from AC Power Adapter
MINIMUM STANDARD:	8 dBm in any 3 kHz band
TEST SETUP:	The EUT was connected to the DUT in conducted mode likewise for output power measurements.
METHOD OF MEASUREMENT:	Measurements were made using a spectrum analyser with 100 kHz resolution bandwidth, peak and detector.
DEVICE DESCRIPTIONS:	As described in the equipment under test section, above.
MEASUREMENT DATA:	Refer to Section II, Part 4
RESULT:	Complies

CANADA:
16 - 211 Schoolhouse Street
Coquitlam, British Columbia
Canada V3K 4X9

Part 4 – AC Mains Conducted Emissions

DATE: July 05, 2013

TEST STANDARD: FCC Subpart C §15.207(a)

TEST METHOD: FCC Subpart C §15.207(a)

TEST VOLTAGE: 5Vdc from AC Power Adapter

MINIMUM STANDARD: Class B Limit:

Frequency (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.5 – 5	56	46
5 – 30	60	50
Note 1 The lower limit shall apply at the transition frequencies Note 2 The limit decreases linearly with the logarithim of the frequency in the 0.15 to 0.50 MHz..		

TEST SETUP: The EUT was connected to the conducted emissions LISN apparatus. The equipment was operated and tested at 120Vac 60Hz while in continuous mode of operation.

METHOD OF MEASUREMENT: Measurements were made using a test receiver with 9 kHz bandwidth, quasi-peak and average detector.

DEVICE DESCRIPTIONS: As described in the equipment section, above.

MEASUREMENT DATA: Refer to Section II, Part 5

MODIFICATIONS: The EUT did not require any modifications.

PER FORMANCE: Complies

Part 5 – 6 dB Occupied Bandwidth

DATE: July 10, 2013

TEST STANDARD: §15.247(a)(2)

TEST VOLTAGE: 5Vdc from AC Power Adapter

MINIMUM STANDARD: 500 kHz

TEST SETUP: The EUT was directly connected to a spectrum analyser. The transmitter was set for continuous transmission..

MEASUREMENT METHOD: Measurements were made using an spectrum analyser 300kHz RBW peak detector set on maximum hold using the appropriate antennas, amplifiers and filters.

DEVICE DESCRIPTIONS: As described in the above EUT description and setup section.

EMISSIONS DATA:

Wi-Fi Test Data

Test mode: IEEE 802.11b

Channel	Frequency, MHz	Occupied bandwidth, MHz	Limit, kHz	Result
Low	2412	4.0	500	Pass
Mid	2442	4.0		Pass
High	2462	4.0		Pass

Test mode: IEEE 802.11g

Channel	Frequency, MHz	Occupied bandwidth, MHz	Limit, kHz	Result
Low	2412	16.0	30	Pass
Mid	2442	16.1		Pass
High	2462	16.1		Pass

Test mode: IEEE 802.11n

Channel	Frequency, MHz	Occupied bandwidth, MHz	Limit, kHz	Result
Low	2422	17.9	30	Pass
High	2452	17.9		Pass

CANADA:
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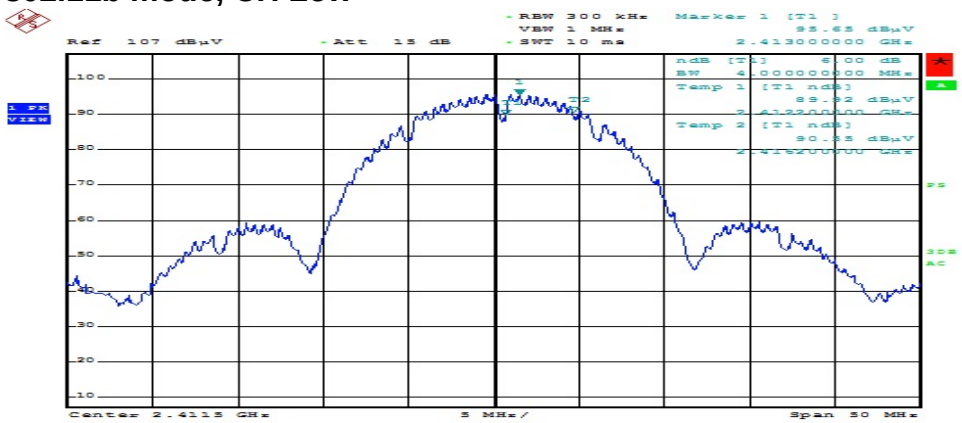
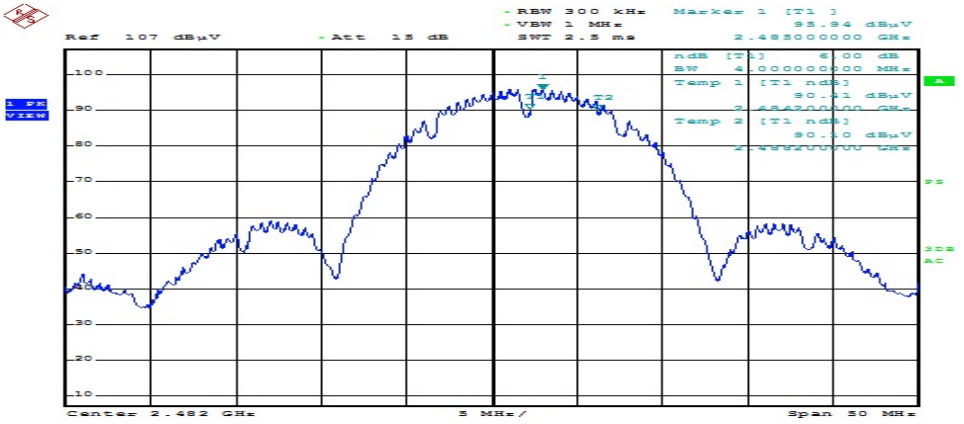
Test Plots

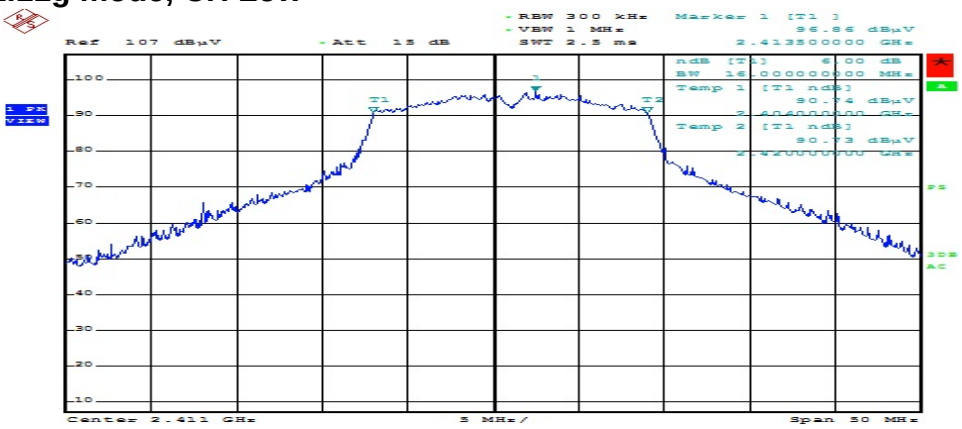
802.11b mode, CH Low



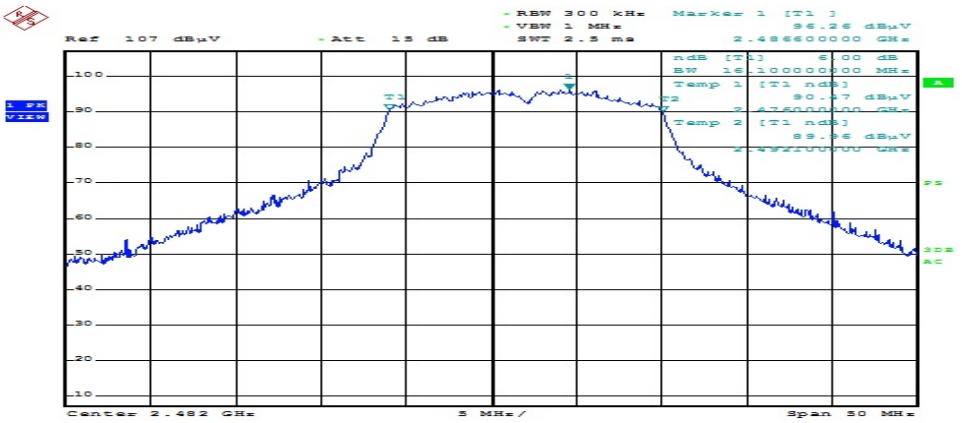
802.11b mode, CH High



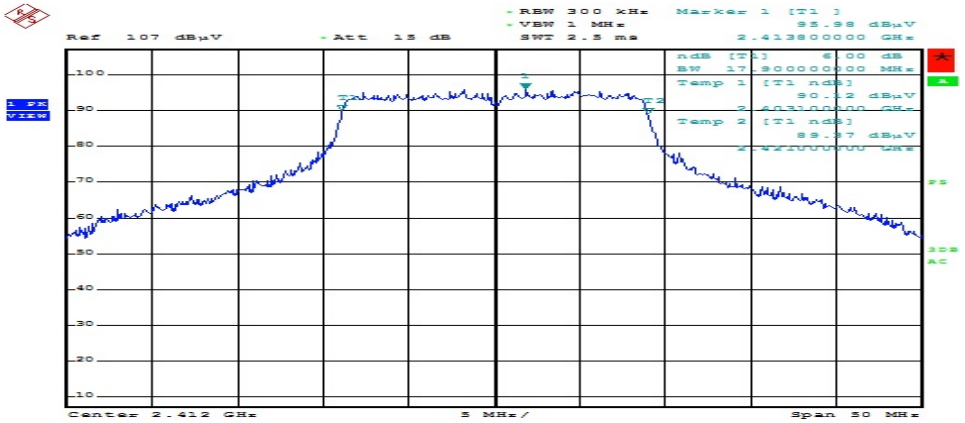
802.11g mode, CH Low



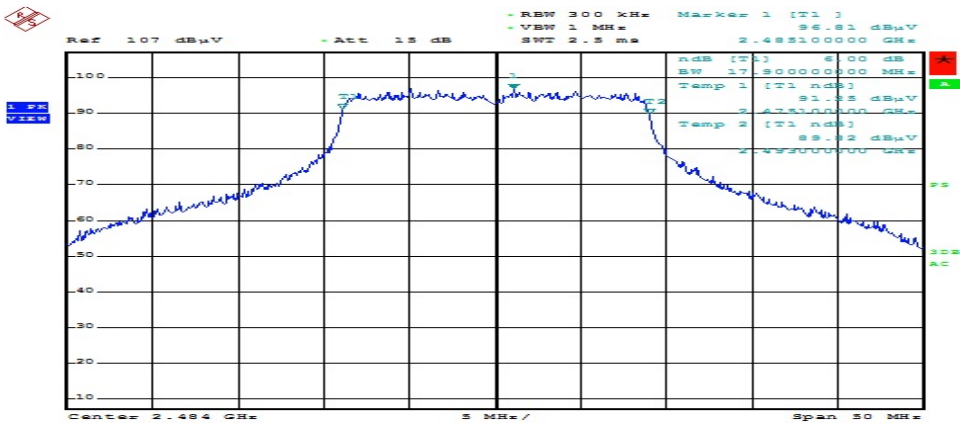
802.11g mode, CH High



802.11n mode, CH Low



802.11n mode, CH High



OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.

Part 6 – 20 dB Bandwidth

DATE: July 10, 2013

TEST STANDARD: §15.247(a)(2)

TEST VOLTAGE: 5Vdc from AC Power Adapter

MINIMUM STANDARD: 500 kHz

TEST SETUP: The EUT was directly connected to a spectrum analyser. The transmitter was set for continuous transmission..

MEASUREMENT METHOD: Measurements were made using an spectrum analyser 300kHz RBW peak detector set on maximum hold using the appropriate antennas, amplifiers and filters.

DEVICE DESCRIPTIONS: As described in the above EUT description and setup section.

EMISSIONS DATA:

Bluetooth Test Data

Test mode: GFSK modulation

Channel	Frequency, MHz	Occupied Bandwidth, kHz	Limit, kHz	Result
Low	2412	784	500	Pass
Mid	2442	798		Pass
High	2462	784		Pass

Test mode: EDR2 modulation

Channel	Frequency, MHz	Occupied Bandwidth, MHz	Limit, kHz	Result
Low	2412	1.27	500	Pass
Mid	2442	1.29		Pass
High	2462	1.27		Pass

OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies.

CANADA:
16 - 211 Schoolhouse Street
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Part 7 – Band Edge

DATE: July 11, 2011

TEST STANDARD: FCC Subpart C §§15.209(d) and 15.247(c)

TEST VOLTAGE: 5Vdc

MINIMUM STANDARD:(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in § 15.209, whichever is the lesser attenuation. (e) As shown in § 15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20dB under any condition of modulation.

15.209 General Field Strength Limits

Frequency (MHz)	Field Strength	
	uV/m @ 3-m	Calculated dBµV/m at 3m
30 - 88	100	40.0
88 - 216	150	43.5
16 - 960	200	46.0
960 - 1000	500	54.0

TEST SETUP: The EUT was directly connected to a spectrum analyser. The transmitter was set for continuous transmission.

MEASUREMENT METHOD: Measurements were made using a spectrum analyser with 300 kHz RBW peak detector using the appropriate antennas, amplifiers and filters.

DEVICE DESCRIPTIONS: As described in the above EUT description and setup section.

EMISSIONS DATA: Refer to Section II, Part 7

OBSERVATIONS: The EUT performed as expected.

PERFORMANCE: Complies

CANADA:
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Part 8 – Conducted Spurious Emissions

DATE:	July 09, 2011
TEST STANDARD:	FCC Subpart C §15.247(c)
TEST VOLTAGE:	5Vdc from AC Power Adapter
TEST CONDITIONS:	Indoor
MINIMUM STANDARD:	(b) Emissions emitted outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general field strength limits listed in RSS-Gen, whichever is less stringent.
TEST SETUP:	The EUT was directly connected to a spectrum analyser. The transmitter was set for continuous transmission. Measurements were done up to 25GHz.
MEASUREMENT METHOD:	Measurements were made using a spectrum analyser with 300kHz RBW quasi-peak detector using the appropriate antennas, amplifiers and filters.
DEVICE DESCRIPTIONS:	As described in the above EUT description and setup section.
EMISSIONS DATA:	Refer to Section II, Part 8

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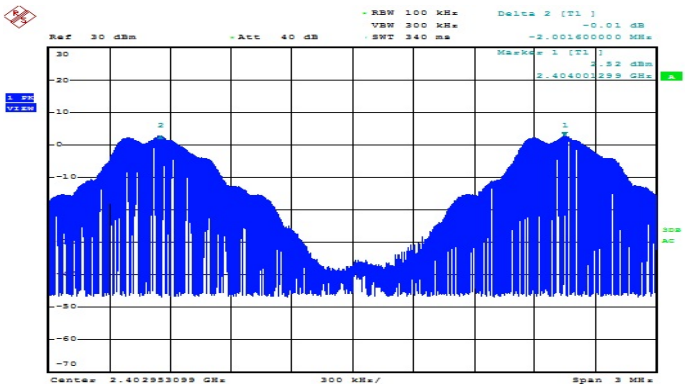
Part 9 – Hopping Carriers Frequency Separation

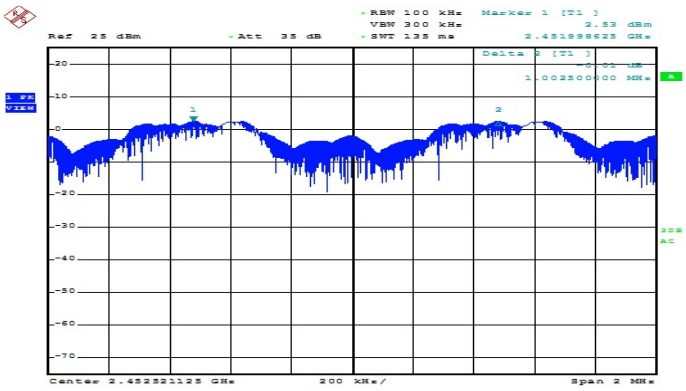
DATE:	July 09, 2011
TEST STANDARD:	FCC Subpart C §15,247(a)
TEST VOLTAGE:	5Vdc from AC Power Adapter
TEST CONDITIONS:	Indoor
MINIMUM STANDARD:	15.247 (a) (1) Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.
TEST SETUP:	The EUT is directly connected to a spectrum analyser.
MEASUREMENT METHOD:	Measurements were made using spectrum analyser with RBW and VBW of 100 kHz using the appropriate antennas, amplifiers and filters.
DEVICE DESCRIPTIONS:	As described in the above EUT description and setup section.

EMISSIONS DATA:

GFSK mode



EDR2 mode



RESULTS: Compliance to standard is confirmed.

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Part 10 – Number of Hopping Frequencies Channels

DATE:	July 09, 2011
TEST STANDARD:	FCC Subpart C §15,247(a)
TEST VOLTAGE:	5Vdc from AC Power Adapter
TEST CONDITIONS:	Indoor
MINIMUM STANDARD:	15.247 (a) (1) (iii) Frequency hopping systems in the 2400 – 2483.5 MHz shall use at least 15 non-overlapping channels.
TEST SETUP:	The EUT is directly connected to a spectrum analyser. The span is set to cover authorised band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to 1% of the span. The analyser is set to Max Hold.
MEASUREMENT METHOD:	Measurements were made using spectrum analyser using the appropriate antennas, amplifiers and filters.
DEVICE DESCRIPTIONS:	As described in the above EUT description and setup section.

EMISSIONS DATA:

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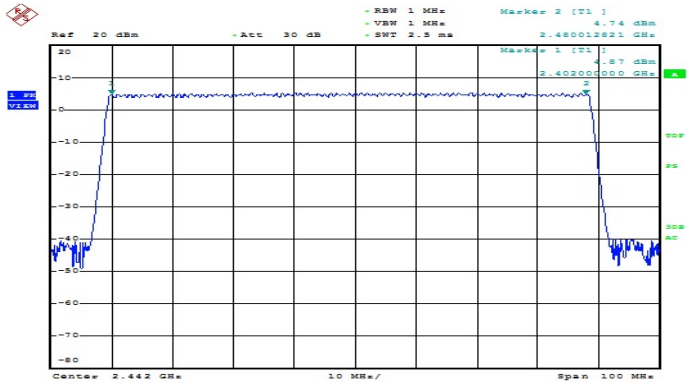
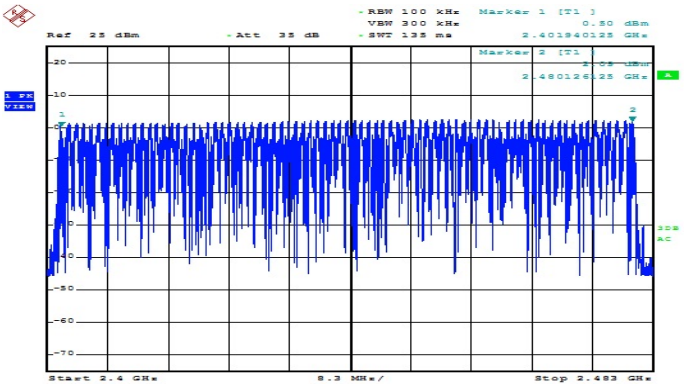
GFSK mode, 79 channels



EDR2 mode, 79 channels



RESULTS: Compliance to standard is confirmed. 79 channels observed.

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Part 11 – Average Time Of Ocupancy

DATE:	July 09, 2011
TEST STANDARD:	FCC Subpart C §15,247(a)
TEST VOLTAGE:	5Vdc from AC Power Adapter
TEST CONDITIONS:	Indoor
MINIMUM STANDARD:	15.247 (a) (1) (iii) For frequency hopping systems average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.
TEST SETUP:	The EUT is directly connected to a spectrum analyser. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured ib a second scan to enable resolution of each occurrence. The averaged time of occupancy in the specified second period 31.6 seconds (79*0.4 s) is equal to 316* (# of pulses in 100 ms) * pulse width.
MEASUREMENT METHOD:	Measurements were made using spectrum analyser using the appropriate antennas, amplifiers and filters.
DEVICE DESCRIPTIONS:	As described in the above EUT description and setup section.
EMISSIONS DATA:	

Test mode: GFSK

DH Packet	Pulse Width, ms	Number of Pulses in 100 ms	Average Time of Occupancy, s	Limit, s	Result
DH1	89.7	10	0.284	0.4	Pass
DH2	367.2	3	0.348	0.4	Pass
DH3	534.1	2	0.338	0.4	Pass

Test mode: EDR2

DH Packet	Pulse Width, µs	Number of Pulses in 100 ms	Average Occupancy Time, s	Limit, s	Result
2-DH1	95.9	10	0.303	0.4	Pass
2-DH2	392.6	3	0.372	0.4	Pass
2-DH3	571.0	2	0.361	0.4	Pass

RESULTS: Compliance to standard is confirmed

Part 12 – RF Exposure Compliance

DATE: July 09, 2011

TEST STANDARD: FCC KDB447498

MINIMUM STANDARD: KDB447498, sec. 4.3.1: Unless specifically required by the *published RF exposure KDB procedures*, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding *SAR Test Exclusion Threshold* condition, listed below, is satisfied …

…test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum *test separation distance* required for the exposure conditions.[22] The minimum *test separation distance* is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander…

TEST LIMIT: As per Appendix A "SAR Test Exclusion Thresholds for 100 MHz – 6 GHz and ≤ 50 mm" the limit is 29 mW/mm.

EUT DESIGN PARAMETERS:

Minimum separation distance – 14.5 mm;

WiFi maximum transmit power: 3.44mW(5.36 dBm);

Bluetooth maximum transmit power: 1.24mW;

Antenna gain: -1.25 dBi.

EVALUATION PROCEDURE:

1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
[(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] · [$\sqrt{f_{(GHz)}}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR,[24] where

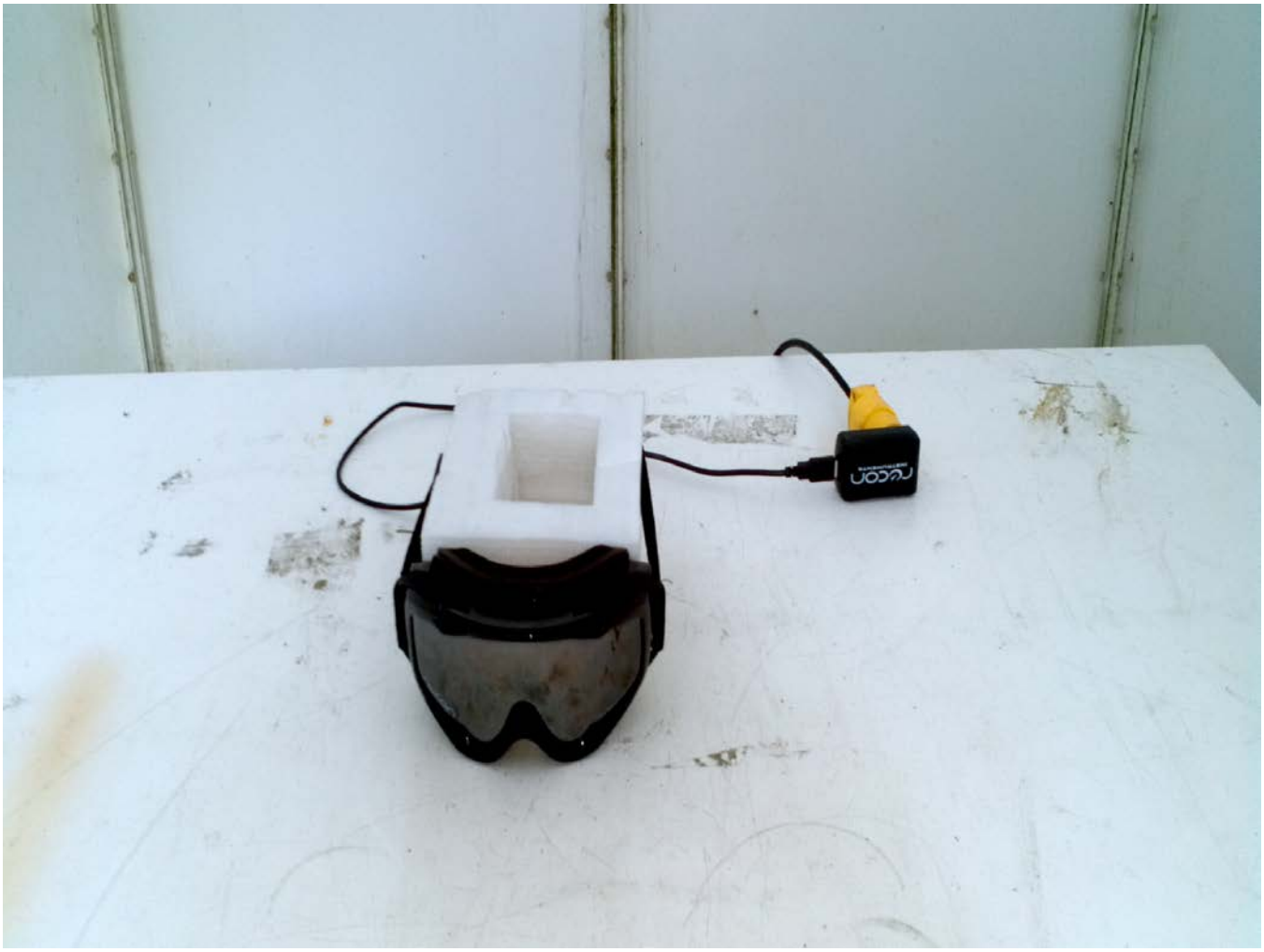
- $f_{(GHz)}$ is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation[25]
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

.

RATIONALE: Taking the EUT parameters referenced above, we have 1-g SAR in worst case(Bluetooth) is 0.28 mW/mm, which is less than limit of 29 mW/mm.

RESULT: The EUT is satisfied to SAR Test Exclusion Threshold.

Appendix A: EUT photos during the testing



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End of report

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