FCC Part 15.247

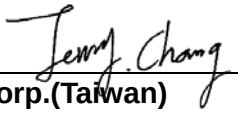
TEST REPORT

For

Brainchild Electronic Co., Ltd.

No. 209, Chung Yang Rd. Nan Kang Dist. Taipei, Taiwan 11573

FCC ID: 2AKAZ-CA20

Report Type Original Report	**Product Type:** Wire-free Camera	
Report Producer :	**Himiko Chen**	
Report Number :	**RLK1809002-00B**	
Report Date :	**2018/09/19**	
Reviewed By:	**Jerry Chang**	
Prepared By:	**Bay Area Compliance Laboratories Corp.(Taiwan)** **70, Lane 169, Sec. 2, Datong Road, Xizhi Dist.,** **New Taipei City 22183, Taiwan, R.O.C.** **Tel: +886 (2)2647 6898** **Fax: +886 (2) 2647 6895** **www.bacl.com.tw**	

***Note**: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Taiwan)*

Revision History

Revision	Report Number	Issue Date	Description	Author/Revised by
1.0	RLK1809002-00B	2018/09/19	Original Report	Himiko Chen

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	**Brainchild Electronic Co., Ltd.** No. 209, Chung Yang Rd. Nan Kang Dist. Taipei, Taiwan 11573
Manufacturer	**Brainchild Electronic Co., Ltd.** No. 209, Chung Yang Rd. Nan Kang Dist. Taipei, Taiwan 11573
Brand(Trade) Name	brilong
Product (Equipment)	Wire-free Camera
Model Name	CA20
EUT Function	IEEE 802.11 b/g/n HT20
Frequency Range	IEEE 802.11 b/g/n HT20 mode: 2412 ~ 2462 MHz
Number of Channels	IEEE 802.11 b/g/n HT20 mode: 11 Channels
Output Power	IEEE 802.11b mode: 18.31 dBm (0.068W) IEEE 802.11g mode: 23.74 dBm (0.237 W) IEEE 802.11n HT20 mode: 23.77 dBm (0.238 W)
Received Date	Sep 01, 2018.
Date of Test	Sep 10, 2018 ~ Sep 14, 2018
Modulation Type	IEEE 802.11b mode: CCK IEEE 802.11g/n HT 20 mode: OFDM

**All measurement and test data in this report was gathered from production sample serial number: 1803004 (Assigned by BACL, Taiwan).*

1.2 Operation Condition of EUT

Power Operation (Voltage Range)	☐ AC 120V/60Hz ☐ Adapter ☐ By Power Core
	☐ DC Type ☐ DC Power Supply ☒ Battery : *Rechargeable Li-ion Battery* *Brand Name: SAMSUNG* *Model: 1S2P* *3.7V ⎓ 5200mAh* ☒ External from USB Cable ☐ External DC Adapter
	☐ Host System

1.3 Objective and Test Methodology

The Objective of this Test Report was to document the compliance of the Brainchild Electronic Co., Ltd. Appliance (Model: CA20) to the requirements of the following Standards:

-Part 2, Subpart J, Part 15, Subparts A and C, section 15.247 of the Federal Communication Commission's rules.

- ANSI C63.10-2013 of t American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.

1.4 Measurement Uncertainty

Parameter	Expanded Measurement uncertainty
RF output power with Power Meter	± 0.55 dB
Occupied Channel Bandwidth	± 4.45 %
RF Conducted test with Spectrum	± 1.45 dB
AC Power Line Conducted Emission	± 4.64 dB
Radiated Below 1G	± 5.83 dB
Radiated Above 1G-18G	± 5.35 dB
Radiated Above 18G-40G	± 4.49 dB

1.5 Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Taiwan) to collect test data is located on

☒ 70, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

☒ 68-3, Lane 169, Sec. 2, Datong Road, Xizhi Dist., New Taipei City 22183, Taiwan, R.O.C.

2 System Test Configuration

2.1 Description of Test Configuration

The system was configured for testing in testing mode which was provided by manufacturer.

No special accessory, No modification was made to the EUT and No special equipment used during test.

For Wi-Fi 2.4G mode, there are totally 11 channels.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	**2412**	8	2447
2	2417	9	2452
3	2422	10	2457
4	2427	**11**	**2462**
5	2432	-	-
6	**2437**	-	-
7	2442	-	-

For 802.11b/g/n HT20 modes: Channel 1, 6 and 11 were tested.

The worst-case data rates are determined to be as follows for each mode based upon investigation by measuring the Peak power and PSD across all data rates and modulations of all bandwidth.

Radiated below 1G were tested worst output power mode.

2.2 Description of Worst Test Configuration

Modulation Used for Conformance Test			
Configuration	**NTX**	**Data Rate**	**Worst Data Rate**
802.11b mode	1	1-11 Mbps	1 Mbps
802.11g mode	1	6-54 Mbps	6 Mbps
802.11n HT 20 mode	1	MCS 0-7	MCS 0

Worst Case of Power Setting				
EUT Exercise Software		Command of Linux OS		
Configuration	**NTX**	**Low CH**	**Mid CH**	**High CH**
802.11b mode	1	Default	Default	Default
802.11g mode	1	Default	Default	Default
802.11n HT 20 mode	1	Default	Default	Default

2.3 Support Equipment List and Details

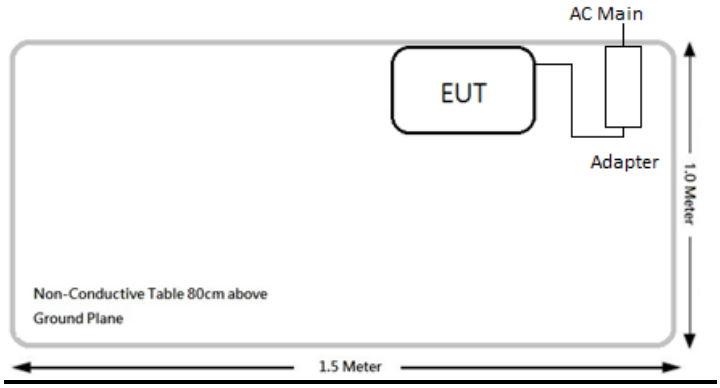
No.	Description	Manufacturer	Model Number	BSMI	FCC ID / DoC
A	Notebook PC	DELL	PP27LA	R33002	DoC
B	Adapter	HUAWEI	HW-050200C01	N/A	DoC

2.4 External Cable List and Details

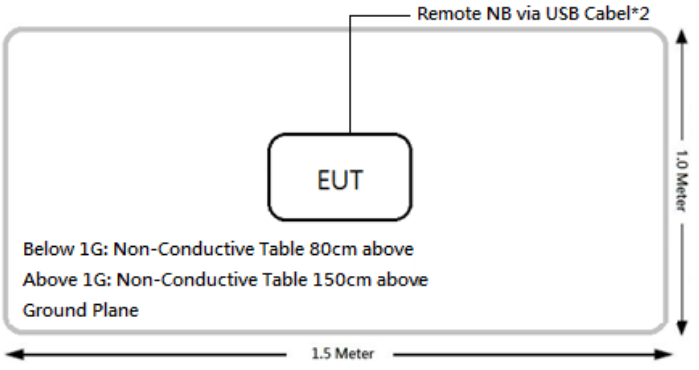
No.	Cable Description	Length (m)	From	To
1	USB Cable*2	1	EUT	USB Cable
2	USB Cable*2	10	USB Cable	NB

2.5 Block Diagram of Test Setup

Conduction



Radiation



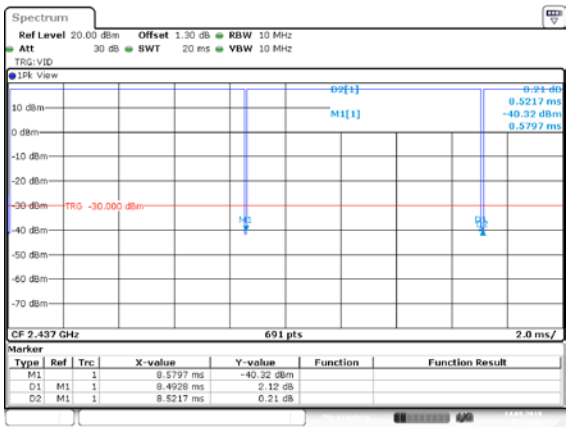
2.6 Duty Cycle

According to KDB 558074 D01 15.247 Meas Guidance v05:

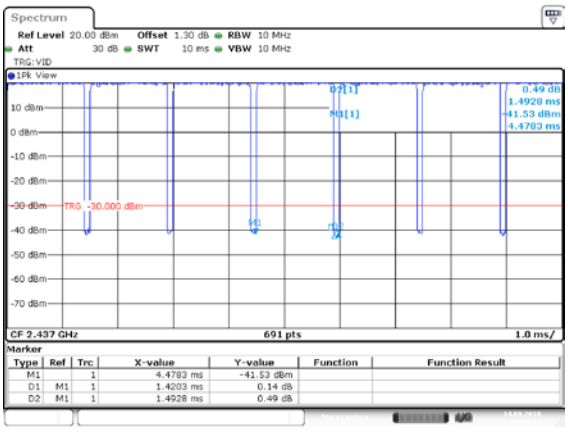
All measurements are to be performed with the EUT transmitting at 100% duty cycle at its maximum power control level; however, if 100% duty cycle cannot be achieved, measurements of duty cycle, x, and maximum power transmission duration, T, are required for each tested mode of operation.

Configuration	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Factor (dB)
802.11b mode	8.49	8.52	99.65	0.02
802.11g mode	1.42	1.49	95.30	0.21
802.11n HT 20 mode	1.34	1.42	94.37	0.25

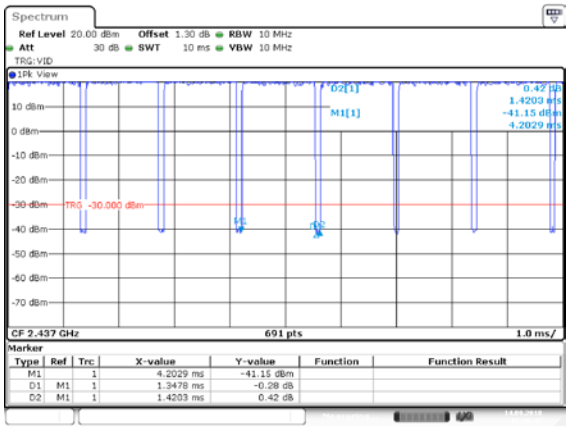
802.11b mode



802.11g mode



802.11n HT20 mode



**Note: Duty Factor = 10*log (1/Duty cycle)*

3 Summary of Test Results

FCC Rules	Description of Test	Result
§15.247(i), § 2.1091, § 1.1310	RF Exposure	Compliance
§15.203	Antenna Requirement	Compliance
§15.207(a)	AC Line Conducted Emissions	Compliance
§15.205, §15.209, §15.247(d)	Spurious Emissions	Compliance
§15.247(a)(2)	6 dB Emission Bandwidth	Compliance
§15.247(b)(3)	Maximum Peak Output Power	Compliance
§15.247(d)	100 kHz Bandwidth of Frequency Band Edge	Compliance
§15.247(e)	Power Spectral Density	Compliance

4 FCC§15.247(i), §1.1310, § 2.1091 - Maximum Permissible Exposure (MPE)

4.1 Applicable Standard

According to subpart 15.247(i)and subpart §1.1310, systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	**Electric Field Strength (V/m)**	**Magnetic Field Strength (A/m)**	**Power Density (mW/cm^2)**	**Averaging Time (minutes)**
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30
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;*

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary: Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm^2);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

4.2 RF Exposure Evaluation Result

MPE evaluation:

Mode	**Frequency Range (MHz)**	**Antenna Gain**		**Target Power**		**Evaluation Distance (cm)**	**Power Density (mW/cm^2)**	**MPE Limit (mW/cm^2)**
		(dBi)	**(numeric)**	**(dBm)**	**(mW)**			
Wi-Fi	2412-2462	1.95	1.567	24.0	251.189	20	0.0783	1

Result: MPE evaluation meet 20 cm the requirement of standard.

5 FCC §15.203 – Antenna Requirements

5.1 Applicable Standard

According to § 15.203,

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 a broken antenna can be replaced by the user, but the user of a standard antenna jack or electrical connector is prohibited.

And according to FCC 47 CFR section 15.247 (b), if the transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna does not exceed 6 dBi

5.2 Antenna List and Details

Manufacturer	Model	Antenna Type	Antenna Gain	Result
WANSHIH ELECTRONIC CO.,LTD	CA20	FPCB Antenna	1.95 dBi	Compliance

The EUT has an internal antenna arrangement, which was permanently attached, fulfill the requirement of this section.

6 FCC §15.207 - AC Line Conducted Emissions

6.1 Applicable Standard

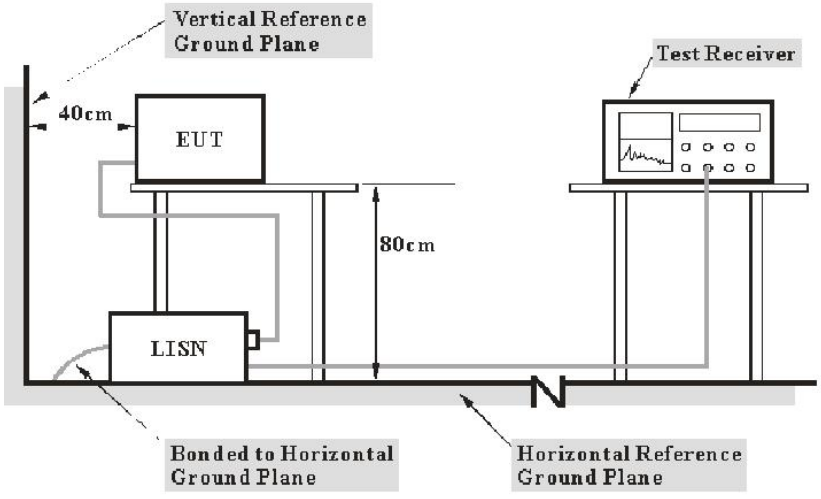
According to FCC §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note 1	56 to 46 Note 2
0.5-5	56	46
5-30	60	50

Note 1: Decreases with the logarithm of the frequency.
Note 2: A linear average detector is required

6.2 EUT Setup and Test Procedure



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 limits.

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz. During the conducted emission test, the EMI test receiver was set with the following configurations

Frequency Range	Receiver RBW
150 kHz - 30 MHz	9 kHz

During the conducted emission test, the adapter was connected to the outlet of the LISN. Maximizing procedure was performed on the six (6) highest emissions of the EUT. All data was recorded in the Quasi-peak and average detection mode.

6.3 Test Equipment List and Details

Manufacturers	Descriptions	Models	Serial Numbers	Calibration Date	Calibration Due Date
LISN	Rohde & Schwarz	ENV216	101612	2018/02/22	2019/02/21
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2017/11/06	2018/11/05
Pulse Limiter	Rohde & Schwarz	ESH3Z2	TXZEM104	2018/08/03	2019/08/02
RF Cable	EMEC	EM-CB5D	001	2018/07/02	2019/07/01
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

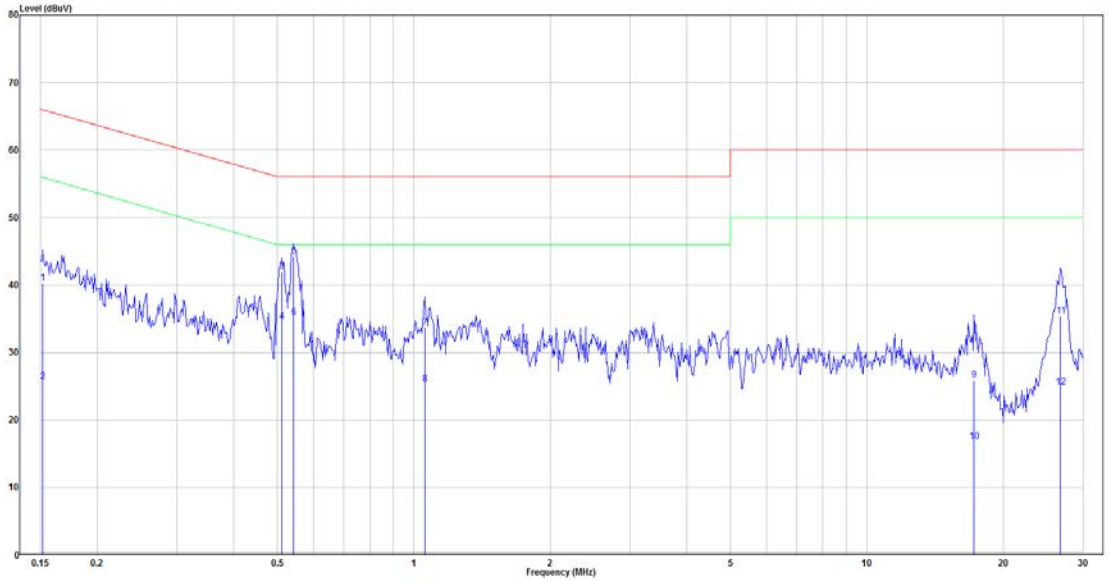
6.4 Test Environmental Conditions

Temperature:	25 ℃
Relative Humidity:	58 %
ATM Pressure:	1010 hPa

The testing was performed by Leo Chang on 2018-09-10.

6.5 AC Line Conducted Emission Test Plot and Data

Mode: AC 120V/60 Hz, Line



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.152	20.84	19.45	40.29	65.92	-25.62	QP
2	0.152	6.20	19.45	25.65	55.92	-30.27	Average
3	0.511	22.52	19.48	41.99	56.00	-14.01	QP
4	0.511	15.09	19.48	34.57	46.00	-11.43	Average
5	0.543	24.75	19.48	44.23	56.00	-11.77	QP
6	0.543	15.69	19.48	35.17	46.00	-10.83	Average
7	1.058	14.16	19.49	33.65	56.00	-22.35	QP
8	1.058	5.87	19.49	25.36	46.00	-20.64	Average
9	17.252	6.10	19.77	25.87	60.00	-34.13	QP
10	17.252	-2.99	19.77	16.78	50.00	-33.22	Average
11	26.751	15.48	19.91	35.39	60.00	-24.61	QP
12	26.751	4.92	19.91	24.83	50.00	-25.17	Average

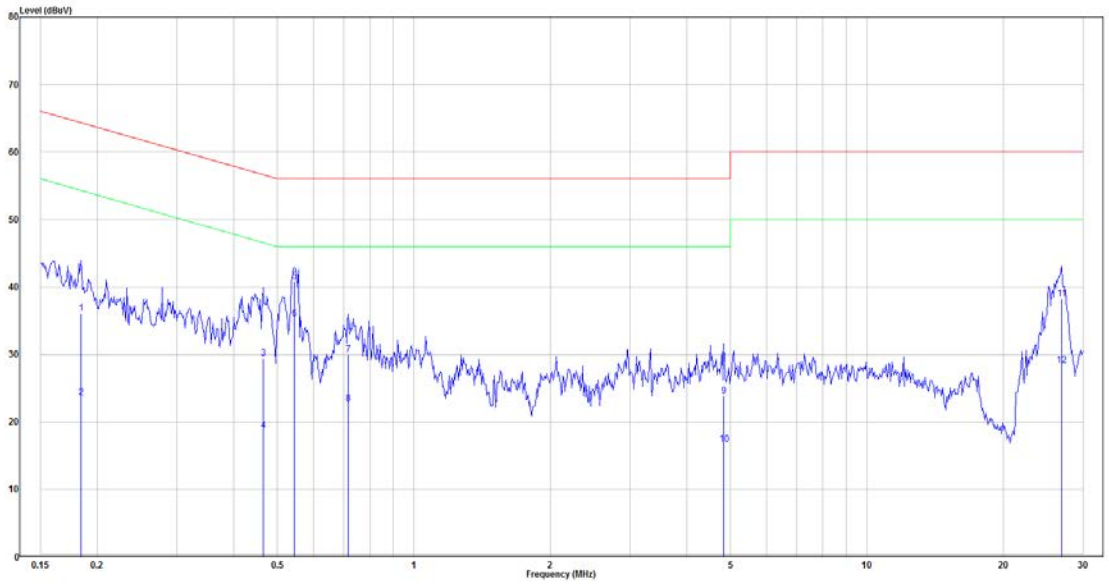
Note:

Level = Read Level + Factor

Over Limit (Margin) = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

Mode: AC 120V/60 Hz, Neutral



No.	Frequency	Reading	Correct	Result	Limit	Over limit	Remark
	(MHz)	(dBuV)	Factor(dB)	(dBuV)	(dBuV)	(dB)	
1	0.184	16.67	19.45	36.12	64.30	-28.18	QP
2	0.184	4.10	19.45	23.55	54.30	-30.75	Average
3	0.465	9.97	19.46	29.43	56.60	-27.17	QP
4	0.465	-0.71	19.46	18.75	46.60	-27.85	Average
5	0.545	21.36	19.47	40.83	56.00	-15.17	QP
6	0.545	15.86	19.47	35.33	46.00	-10.67	Average
7	0.717	10.48	19.47	29.95	56.00	-26.05	QP
8	0.717	3.25	19.47	22.72	46.00	-23.28	Average
9	4.840	4.27	19.60	23.87	56.00	-32.13	QP
10	4.840	-2.94	19.60	16.66	46.00	-29.34	Average
11	26.884	18.26	19.98	38.23	60.00	-21.77	QP
12	26.884	8.38	19.98	28.36	50.00	-21.64	Average

Note:

Level = Read Level + Factor

Over Limit (Margin) = Level – Limit Line

Factor = (LISN, ISN, PLC or current probe) Factor + Cable Loss + Attenuator

7 FCC §15.209, §15.205, §15.247(d) – Spurious Emissions

7.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As Per FCC §15.205(a) and RSS-Gen except as show 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 0.495 – 0.505 2.1735 – 2.1905 4.125 – 4.128 4.17725 – 4.17775 4.20725 – 4.20775 6.215 – 6.218 6.26775 – 6.26825 6.31175 – 6.31225 8.291 – 8.294 8.362 – 8.366 8.37625 – 8.38675 8.41425 – 8.41475 12.29 – 12.293 12.51975 – 12.52025 12.57675 – 12.57725 13.36 – 13.41	16.42 – 16.423 16.69475 – 16.69525 25.5 – 25.67 37.5 – 38.25 73 – 74.6 74.8 – 75.2 108 – 121.94 123 – 138 149.9 – 150.05 156.52475 – 156.52525 156.7 – 156.9 162.0125 –167.17 167.72 – 173.2 240 – 285 322 – 335.4 399.9 – 410 608 – 614	960 – 1240 1300 – 1427 1435 – 1626.5 1645.5 – 1646.5 1660 – 1710 1718.8 – 1722.2 2200 – 2300 2310 – 2390 2483.5 – 2500 2690 – 2900 3260 – 3267 3.332 – 3.339 3 3458 – 3 358 3.600 – 4.400	4. 5 – 5. 15 5. 35 – 5. 46 7.25 – 7.75 8.025 – 8.5 9.0 – 9.2 9.3 – 9.5 10.6 – 12.7 13.25 – 13.4 14.47 – 14.5 15.35 – 16.2 17.7 – 21.4 22.01 – 23.12 23.6 – 24.0 31.2 – 31.8 36.43 – 36.5 Above 38.6

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

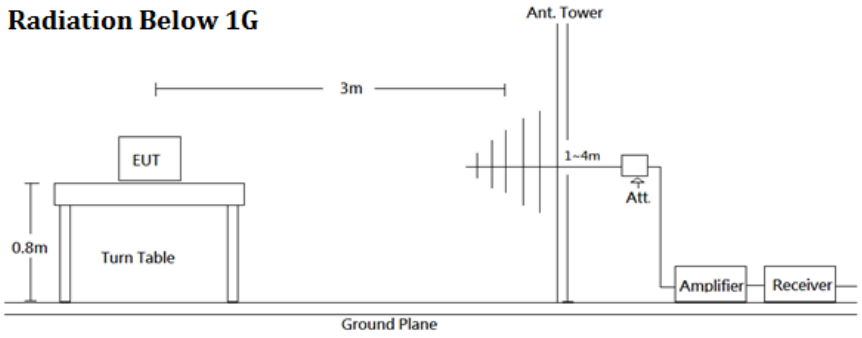
Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

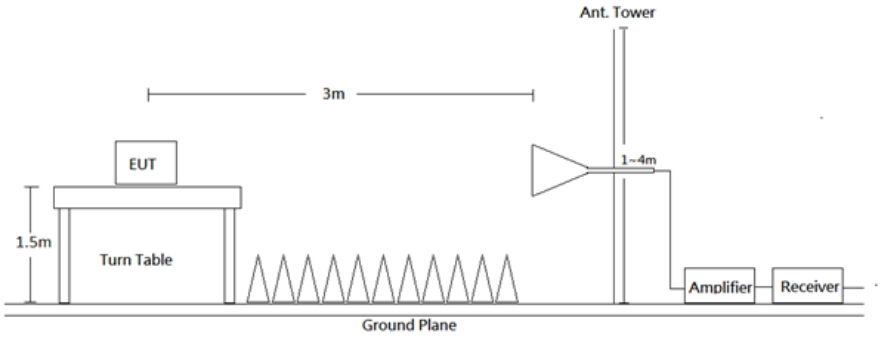
As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c).

7.2 EUT Setup and Test Procedure

Radiation Below 1G



Radiation Above 1G



Radiated emission tests were performed in the 3 meters chamber test site, using the setup accordance with the ANSI C63.10-2013. The specification used was the FCC Part 15.209 and FCC 15.247 Limits.

The system was investigated from 30 MHz to 26.5 GHz. During the radiated emission test, the EMI test receiver was set with the following configurations measurement method 6.3 in ANSI C63.10.

Frequency Range	RBW	VBW	Detector	Duty cycle	Measurement method
30-1000 MHz	120 kHz	/	QP		QP
Above 1 GHz	1 MHz	3 MHz	PK		PK
	1 MHz	3 MHz	RMS	>98%	Ave
	1 MHz	1/T	PK	<98%	Ave

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

All data was recorded in the Quasi-peak detector mode from 30 MHz to 1 GHz and PK and average detector modes for frequencies above 1 GHz.

7.3 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Calibration Date	Calibration Due Date
966A Room					
Active Loop Antenna	ETS-Lindgren	6502	00035796	2018/03/13	2019/03/12
Bilog Antenna with 6 dB Attenuator	SUNOL SCIENCES & MINI-CIRCUITS	JB6/UNAT-6+	A050115/15542_01	2017/12/20	2018/12/19
Horn Antenna	EMCO	3115	9311-4158	2018/04/20	2019/04/19
Horn Antenna	ETS-Lindgren	3116	62638	2017/09/13	2018/09/12
Preamplifier	Sonoma	310N	130602	2018/07/04	2019/07/03
Preamplifier	EM Electronics Corp.	EM01G18G	060657	2017/12/14	2018/12/13
Microware Preamplifier	EM Electronics Corporation	EM18G40G	060656	2018/01/15	2019/01/14
EMI Test Receiver	Rohde & Schwarz	ESR7	101419	2017/11/06	2018/11/05
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2018/02/12	2019/02/13
Micro flex Cable	UTIFLEX	FSCM 64639 / (2M)	93D0127	2018/07/31	2019/07/30
Micro flex Cable	UTIFLEX	UFA210A-1-3149-300300	MFR64639 226389-001	2017/11/10	2018/11/09
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-450CM	160309-1	2018/03/05	2019/03/04
Micro flex Cable	ROSNOL	K1K50-UP0264-K1K50-80CM	160309-2	2018/01/17	2019/01/16
Turn Table	Champro	TT-2000	060772-T	N.C.R	N.C.R
Antenna Tower	Champro	AM-BS-4500-B	060772-A	N.C.R	N.C.R
Controller	Champro	EM1000	60772	N.C.R	N.C.R
Software	AUDIX	E3	V9.150826k	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2018/02/12	2019/02/13
Cable	WOKEN	SFL402	S02-160323-07	2018/02/12	2019/02/11

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

7.4 Test Environmental Conditions

Temperature:	23.5 ℃
Relative Humidity:	55.4 %
ATM Pressure:	1015 hPa

The testing was performed by Leo Chang from 2018-09-10 to 2018-09-14.

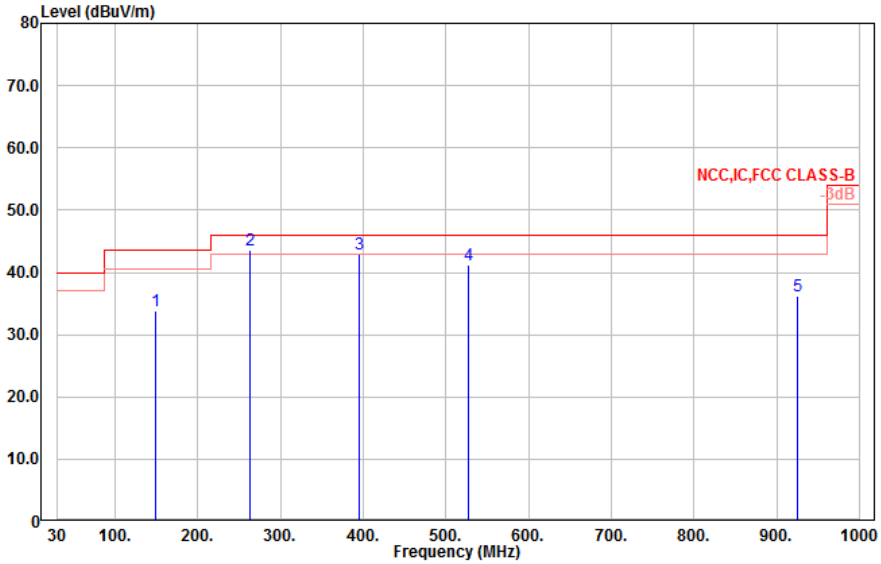
7.5 Radiated Emission Test Plot and Data

Wi-Fi Mode: Transmitting Mode *(Pre-scan with three orthogonal axis, and worse case as X axis)*

Below 1G (30 MHz-1 GHz) test the output power worst mode:

Wi-Fi mode: Worst case is 802.11n HT20 mode Middle Channel

Horizontal



EUT : CA20
Mode: WLAN 2.4G TX 11n20M 2437MHz
Note: data rate=MCS0/power=default/site=X

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	149.310	33.92	43.50	-9.58	52.41	-18.49	Peak
2 !	263.770	43.59	46.00	-2.41	62.55	-18.96	QP
3	395.690	42.91	46.00	-3.09	59.05	-16.14	Peak
4	527.610	41.27	46.00	-4.73	55.09	-13.82	Peak
5	924.340	36.13	46.00	-9.87	44.80	-8.67	Peak

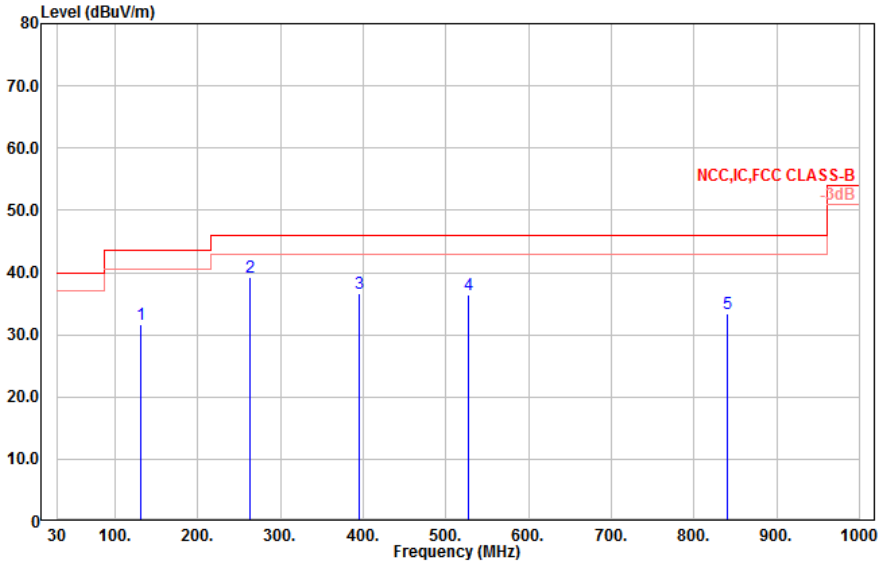
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

Vertical



EUT : CA20
Mode: WLAN 2.4G TX 11n20M 2437MHz
Note: data rate=MCS0/power=default/site=X

	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	131.850	31.65	43.50	-11.85	48.58	-16.93	Peak
2	263.770	39.31	46.00	-6.69	58.27	-18.96	Peak
3	395.690	36.58	46.00	-9.42	52.72	-16.14	Peak
4	527.610	36.43	46.00	-9.57	50.25	-13.82	Peak
5	839.950	33.32	46.00	-12.68	42.70	-9.38	Peak

Result = Reading + Correct Factor

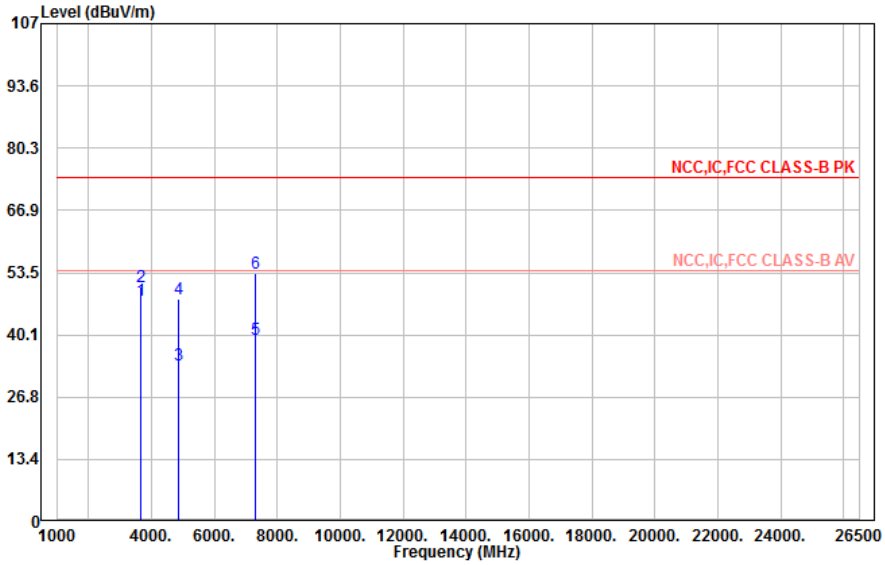
Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

Above 1G (1 GHz-26.5 GHz): the output power Worst case is 802.11n HT20 mode Middle channel

Horizontal



EUT : CA20
Mode: WLAN 2.4G TX 11n20M 2437MHz
Note: data rate=MCS0/power=default/site=X

		Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	!	3655.000	47.42	54.00	-6.58	51.29	-3.87	Average
2		3655.000	50.49	74.00	-23.51	54.36	-3.87	Peak
3		4874.000	33.52	54.00	-20.48	34.48	-0.96	Average
4		4874.000	47.85	74.00	-26.15	48.81	-0.96	Peak
5	!	7311.000	39.03	54.00	-14.97	35.55	3.48	Average
6		7311.000	53.24	74.00	-20.76	49.76	3.48	Peak

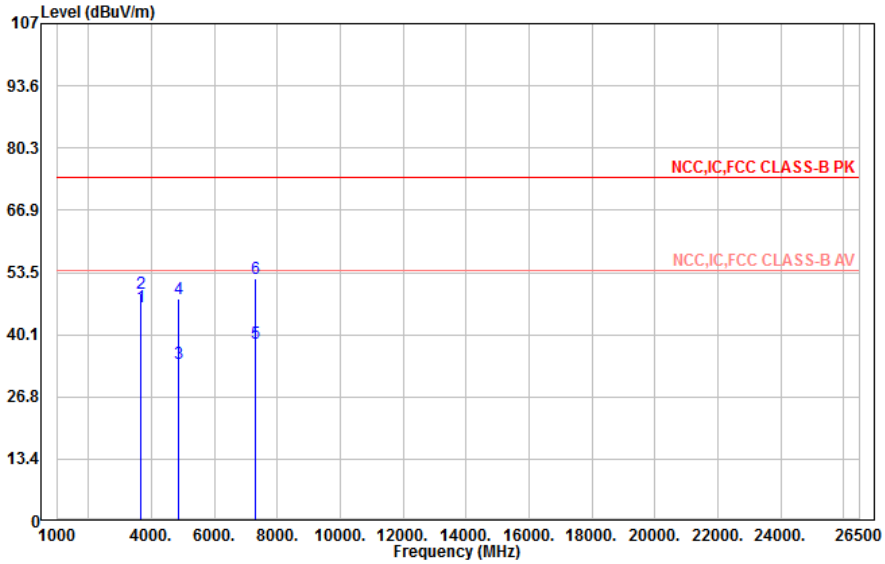
Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

Vertical



EUT : CA20
Mode: WLAN 2.4G TX 11n20M 2437MHz
Note: data rate=MCS0/power=default/site=X

		Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
		MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
1	!	3655.000	46.13	54.00	-7.87	50.00	-3.87	Average
2		3655.000	48.89	74.00	-25.11	52.76	-3.87	Peak
3		4874.000	33.81	54.00	-20.19	34.77	-0.96	Average
4		4874.000	47.88	74.00	-26.12	48.84	-0.96	Peak
5	!	7311.000	38.33	54.00	-15.67	34.85	3.48	Average
6		7311.000	52.27	74.00	-21.73	48.79	3.48	Peak

Result = Reading + Correct Factor

Margin = Result – Limit

Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

Wi-Fi 802.11b mode

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2384.816	43.61	54.00	-10.39	52.30	-8.69	Average
2384.816	52.59	74.00	-21.41	61.28	-8.69	Peak
2411.248	98.47			107.21	-8.74	Average
2411.248	100.85			109.59	-8.74	Peak
3618.000	47.65	54.00	-6.35	51.51	-3.86	Average
3618.000	50.02	74.00	-23.98	53.88	-3.86	Peak
4824.000	45.91	54.00	-8.09	46.93	-1.02	Average
4824.000	50.64	74.00	-23.36	51.66	-1.02	Peak
7236.000	41.22	54.00	-12.78	37.96	3.26	Average
7236.000	50.29	74.00	-23.71	47.03	3.26	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2384.816	46.54	54.00	-7.46	55.23	-8.69	Average
2384.816	53.89	74.00	-20.11	62.58	-8.69	Peak
2412.928	101.21			109.95	-8.74	Average
2412.928	103.58			112.32	-8.74	Peak
3618.000	46.76	54.00	-7.24	50.62	-3.86	Average
3618.000	49.85	74.00	-24.15	53.71	-3.86	Peak
4824.000	47.49	54.00	-6.51	48.51	-1.02	Average
4824.000	51.63	74.00	-22.37	52.65	-1.02	Peak
7236.000	45.96	54.00	-8.04	42.70	3.26	Average
7236.000	53.13	74.00	-20.87	49.82	3.31	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2328.960	37.31	54.00	-16.69	45.87	-8.56	Average
2328.960	48.89	74.00	-25.11	57.45	-8.56	Peak
2436.720	97.24			106.00	-8.76	Average
2436.720	99.29			108.05	-8.76	Peak
2548.080	36.52	54.00	-17.48	45.23	-8.71	Average
2548.080	49.59	74.00	-24.41	58.30	-8.71	Peak
3655.000	47.52	54.00	-6.48	51.39	-3.87	Average
3655.000	49.79	74.00	-24.21	53.66	-3.87	Peak
4874.000	45.75	54.00	-8.25	46.63	-0.88	Average
4874.000	49.88	74.00	-24.12	50.76	-0.88	Peak
7311.000	45.13	54.00	-8.87	41.65	3.48	Average
7311.000	52.44	74.00	-21.56	48.96	3.48	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2335.440	37.94	54.00	-16.06	46.51	-8.57	Average
2335.440	50.98	74.00	-23.02	59.55	-8.57	Peak
2436.480	101.22			109.98	-8.76	Average
2436.480	103.76			112.52	-8.76	Peak
2489.040	37.81	54.00	-16.19	46.60	-8.79	Average
2489.040	49.38	74.00	-24.62	58.17	-8.79	Peak
3655.000	46.48	54.00	-7.52	50.35	-3.87	Average
3655.000	48.80	74.00	-25.20	52.67	-3.87	Peak
4874.000	46.05	54.00	-7.95	46.93	-0.88	Average
4874.000	49.95	74.00	-24.05	50.83	-0.88	Peak
7311.000	45.64	54.00	-8.36	42.16	3.48	Average
7311.000	52.18	74.00	-21.82	48.70	3.48	Peak

High CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2461.212	95.41			104.17	-8.76	Average
2461.212	98.20			106.96	-8.76	Peak
2492.670	41.60	54.00	-12.40	50.40	-8.80	Average
2492.670	50.55	74.00	-23.45	59.35	-8.80	Peak
3693.000	48.13	54.00	-5.87	51.88	-3.75	Average
3693.000	50.98	74.00	-23.02	54.73	-3.75	Peak
4924.000	41.85	54.00	-12.15	42.60	-0.75	Average
4924.000	47.16	74.00	-26.84	47.91	-0.75	Peak
7386.000	43.42	54.00	-10.58	39.61	3.81	Average
7386.000	52.69	74.00	-21.31	48.88	3.81	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2461.212	100.16			108.92	-8.76	Average
2461.212	102.54			111.30	-8.76	Peak
2484.830	46.68	54.00	-7.32	55.47	-8.79	Average
2484.830	52.92	74.00	-21.08	61.71	-8.79	Peak
3693.000	46.27	54.00	-7.73	50.02	-3.75	Average
3693.000	49.28	74.00	-24.72	53.03	-3.75	Peak
4924.000	38.09	54.00	-15.91	38.84	-0.75	Average
4924.000	47.24	74.00	-26.76	47.99	-0.75	Peak
7386.000	45.16	74.00	-28.84	41.38	3.78	Average
7386.000	53.43	74.00	-20.57	49.65	3.78	Peak

Result = Reading + Correct Factor

Margin = Result – Limit, Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

Wi-Fi 802.11g mode

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.632	46.06	54.00	-7.94	54.75	-8.69	Average
2389.632	66.55	74.00	-7.45	75.24	-8.69	Peak
2409.904	92.54			101.28	-8.74	Average
2409.904	104.84			113.58	-8.74	Peak
3618.000	46.85	54.00	-7.15	50.96	-4.11	Average
3618.000	50.49	74.00	-23.51	54.60	-4.11	Peak
4824.000	34.77	54.00	-19.23	35.79	-1.02	Average
4824.000	49.88	74.00	-24.12	50.90	-1.02	Peak
7236.000	39.92	54.00	-14.08	36.61	3.31	Average
7236.000	53.19	74.00	-20.81	49.88	3.31	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2388.400	48.31	54.00	-5.69	57.00	-8.69	Average
2388.400	67.30	74.00	-6.70	75.99	-8.69	Peak
2412.256	95.54			104.28	-8.74	Average
2412.256	107.54			116.28	-8.74	Peak
3618.000	46.83	54.00	-7.17	50.94	-4.11	Average
3618.000	49.64	74.00	-24.36	53.75	-4.11	Peak
4824.000	36.48	54.00	-17.52	37.50	-1.02	Average
4824.000	50.83	74.00	-23.17	51.85	-1.02	Peak
7236.000	41.18	54.00	-12.82	37.92	3.26	Average
7236.000	57.26	74.00	-16.74	54.00	3.26	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2382.000	37.60	54.00	-16.40	46.28	-8.68	Average
2382.000	58.43	74.00	-15.57	67.11	-8.68	Peak
2435.040	91.69			100.45	-8.76	Average
2435.040	103.97			112.73	-8.76	Peak
2484.000	36.82	54.00	-17.18	45.60	-8.78	Average
2484.000	57.38	74.00	-16.62	66.16	-8.78	Peak
3655.000	48.04	54.00	-5.96	51.91	-3.87	Average
3655.000	50.82	74.00	-23.18	54.69	-3.87	Peak
4874.000	33.96	54.00	-20.04	34.92	-0.96	Average
4874.000	48.66	74.00	-25.34	49.62	-0.96	Peak
7311.000	40.81	54.00	-13.19	37.33	3.48	Average
7311.000	54.32	74.00	-19.68	50.84	3.48	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.200	37.94	54.00	-16.06	46.63	-8.69	Average
2389.200	62.62	74.00	-11.38	71.31	-8.69	Peak
2436.720	95.02			103.78	-8.76	Average
2436.720	107.65			116.41	-8.76	Peak
2484.000	38.32	54.00	-15.68	47.10	-8.78	Average
2484.000	63.13	74.00	-10.87	71.91	-8.78	Peak
3655.000	46.51	54.00	-7.49	50.38	-3.87	Average
3655.000	48.90	74.00	-25.10	52.77	-3.87	Peak
4874.000	34.42	54.00	-19.58	35.38	-0.96	Average
4874.000	48.09	74.00	-25.91	49.05	-0.96	Peak
7311.000	40.25	54.00	-13.75	36.77	3.48	Average
7311.000	54.85	74.00	-19.15	51.37	3.48	Peak

High CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2461.702	89.60			98.36	-8.76	Average
2461.702	101.83			110.59	-8.76	Peak
2484.046	44.21	54.00	-9.79	52.99	-8.78	Average
2484.046	64.00	74.00	-10.00	72.78	-8.78	Peak
3693.000	48.91	54.00	-5.09	52.66	-3.75	Average
3693.000	51.05	74.00	-22.95	54.80	-3.75	Peak
4924.000	31.67	54.00	-22.33	32.96	-1.29	Average
4924.000	46.23	74.00	-27.77	47.52	-1.29	Peak
7386.000	40.36	54.00	-13.64	36.55	3.81	Average
7386.000	55.41	74.00	-18.59	51.60	3.81	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2461.604	94.56			103.32	-8.76	Average
2461.604	106.68			115.44	-8.76	Peak
2484.144	48.61	54.00	-5.39	57.39	-8.78	Average
2484.144	68.68	74.00	-5.32	77.46	-8.78	Peak
3693.000	46.63	54.00	-7.37	50.38	-3.75	Average
3693.000	49.30	74.00	-24.70	53.05	-3.75	Peak
4924.000	32.90	54.00	-21.10	33.65	-0.75	Average
4924.000	47.85	74.00	-26.15	48.60	-0.75	Peak
7386.000	38.68	54.00	-15.32	34.90	3.78	Average
7386.000	53.42	74.00	-20.58	49.64	3.78	Peak

Result = Reading + Correct Factor

Margin = Result – Limit, Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

Wi-Fi 802.11n HT20 mode

Low CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.520	47.49	54.00	-6.51	56.18	-8.69	Average
2389.520	65.64	74.00	-8.36	74.33	-8.69	Peak
2410.016	92.31			101.05	-8.74	Average
2410.016	105.07			113.81	-8.74	Peak
3618.000	46.29	54.00	-7.71	50.40	-4.11	Average
3618.000	49.43	74.00	-24.57	53.54	-4.11	Peak
4824.000	34.58	54.00	-19.42	35.60	-1.02	Average
4824.000	48.84	74.00	-25.16	49.86	-1.02	Peak
7236.000	40.22	54.00	-13.78	36.96	3.26	Average
7236.000	53.04	74.00	-20.96	49.78	3.26	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.335	50.15	54.00	-3.85	58.84	-8.69	Average
2389.335	69.13	74.00	-4.87	77.82	-8.69	Peak
2409.876	95.20			103.94	-8.74	Average
2409.876	107.13			115.87	-8.74	Peak
3618.000	44.92	54.00	-9.08	49.03	-4.11	Average
3618.000	47.86	74.00	-26.14	51.97	-4.11	Peak
4824.000	35.66	54.00	-18.34	36.68	-1.02	Average
4824.000	50.87	74.00	-23.13	51.89	-1.02	Peak
7236.000	40.19	65.00	-24.81	36.93	3.26	Average
7236.000	55.21	74.00	-18.79	51.95	3.26	Peak

Middle CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.680	37.53	54.00	-16.47	46.22	-8.69	Average
2389.680	56.46	74.00	-17.54	65.15	-8.69	Peak
2434.320	91.13			99.88	-8.75	Average
2434.320	103.17			111.92	-8.75	Peak
2489.280	36.85	54.00	-17.15	45.64	-8.79	Average
2489.280	52.51	74.00	-21.49	61.30	-8.79	Peak
3655.000	47.42	54.00	-6.58	51.29	-3.87	Average
3655.000	50.49	74.00	-23.51	54.36	-3.87	Peak
4874.000	33.52	54.00	-20.48	34.48	-0.96	Average
4874.000	47.85	74.00	-26.15	48.81	-0.96	Peak
7311.000	39.03	54.00	-14.97	35.55	3.48	Average
7311.000	53.24	74.00	-20.76	49.76	3.48	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2380.320	38.19	54.00	-15.81	46.87	-8.68	Average
2380.320	58.92	74.00	-15.08	67.60	-8.68	Peak
2435.280	94.68			103.44	-8.76	Average
2435.280	106.42			115.18	-8.76	Peak
2482.800	38.26	54.00	-15.74	47.04	-8.78	Average
2482.800	58.87	74.00	-15.13	67.65	-8.78	Peak
3655.000	46.13	54.00	-7.87	50.00	-3.87	Average
3655.000	48.89	74.00	-25.11	52.76	-3.87	Peak
4874.000	33.81	54.00	-20.19	34.77	-0.96	Average
4874.000	47.88	74.00	-26.12	48.84	-0.96	Peak
7311.000	38.33	54.00	-15.67	34.85	3.48	Average
7311.000	52.27	74.00	-21.73	48.79	3.48	Peak

High CH

Horizontal

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2464.250	89.90			98.66	-8.76	Average
2464.250	102.23			110.99	-8.76	Peak
2484.242	43.53	54.00	-10.47	52.31	-8.78	Average
2484.242	65.38	74.00	-8.62	74.16	-8.78	Peak
3693.000	47.72	54.00	-6.28	51.47	-3.75	Average
3693.000	50.14	74.00	-23.86	53.89	-3.75	Peak
4924.000	32.22	54.00	-21.78	33.00	-0.78	Average
4924.000	46.14	74.00	-27.86	46.92	-0.78	Peak
7386.000	40.37	54.00	-13.63	36.56	3.81	Average
7386.000	53.42	74.00	-20.58	49.61	3.81	Peak

Vertical

Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2460.918	93.79			102.55	-8.76	Average
2460.918	105.61			114.37	-8.76	Peak
2484.438	51.92	54.00	-2.08	60.71	-8.79	Average
2484.438	70.48	74.00	-3.52	79.27	-8.79	Peak
3693.000	45.28	54.00	-8.72	49.03	-3.75	Average
3693.000	48.74	74.00	-25.26	52.49	-3.75	Peak
4924.000	31.87	54.00	-22.13	32.65	-0.78	Average
4924.000	45.11	74.00	-28.89	45.89	-0.78	Peak
7386.000	40.65	54.00	-13.35	36.87	3.78	Average
7386.000	55.64	74.00	-18.36	51.86	3.78	Peak

Result = Reading + Correct Factor

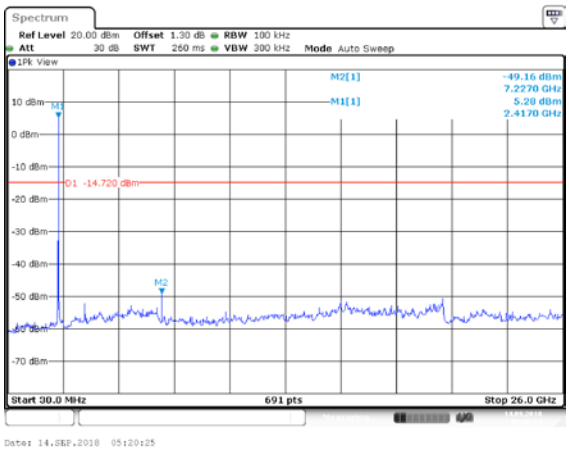
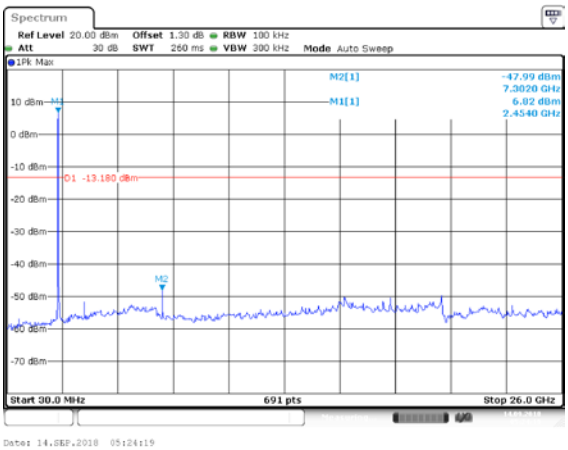
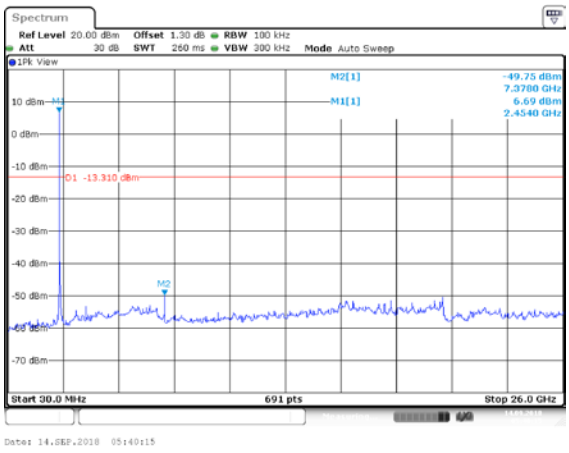
Margin = Result – Limit, Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

Spurious emissions more than 20 dB below the limit were not reported

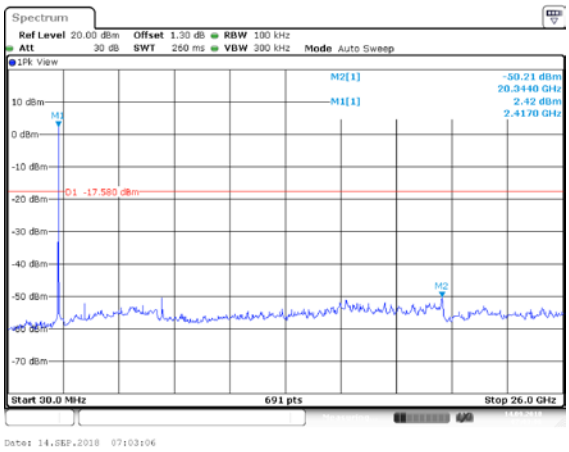
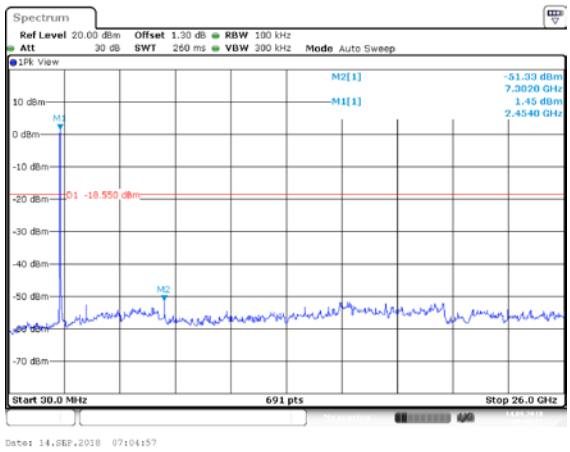
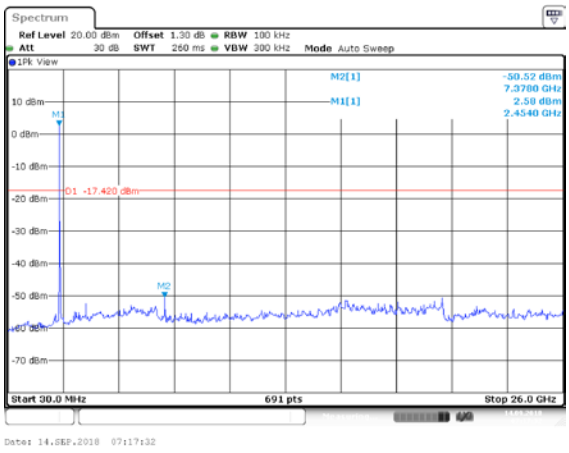
Conducted Spurious Emissions:

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
B mode				
Low	2412	54.44	≥ 20	Compliance
Mid	2437	54.81	≥ 20	Compliance
High	2462	56.44	≥ 20	Compliance
G mode				
Low	2412	52.63	≥ 20	Compliance
Mid	2437	52.78	≥ 20	Compliance
High	2462	53.10	≥ 20	Compliance
N20 mode				
Low	2412	56.20	≥ 20	Compliance
Mid	2437	51.93	≥ 20	Compliance
High	2462	50.97	≥ 20	Compliance

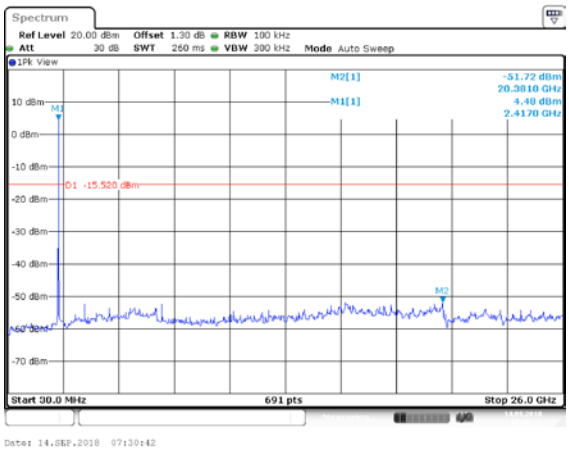
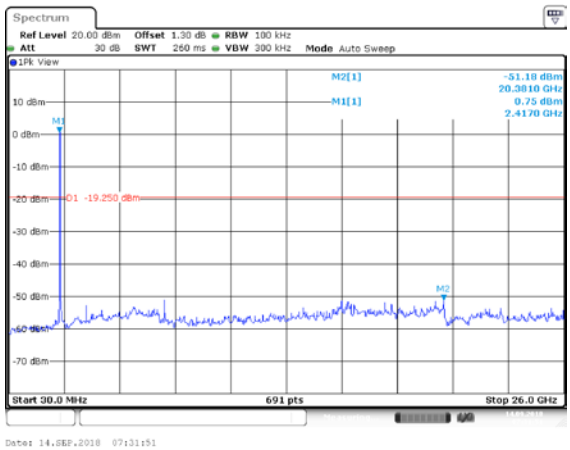
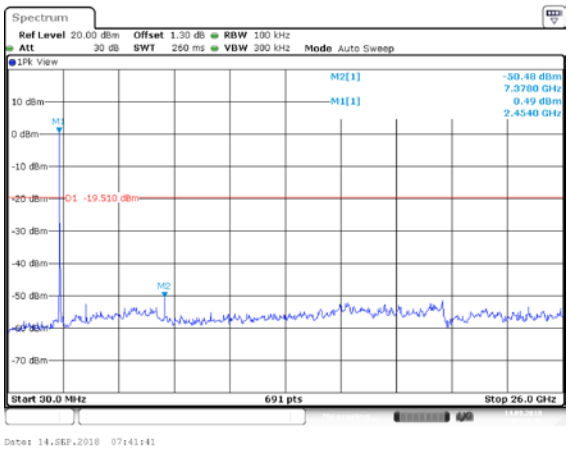
Wi-Fi 802.11b mode

Low CH	Middle CH
	
High CH	
	

Wi-Fi 802.11g mode

Low CH	Middle CH
	
High CH	
	

Wi-Fi 802.11n HT20 mode

Low CH	Middle CH
	
High CH	
	

8 FCC §15.247(a)(2) – 6 dB Emission Bandwidth

8.1 Applicable Standard

According to FCC §15.247(a) (2),

Systems using digital modulation techniques may operate in the 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

8.2 Test Procedure

According to ANSI C63.10-2013, The steps for the first option are as follows:

a) Set RBW = 100 kHz. b) Set the VBW $\geq$ [3 $\times$ RBW].

c) Detector = peak. d) Trace mode = max hold.

e) Sweep = auto couple. f) Allow the trace to stabilize.

g) Measure the maximum width of the emission that is constrained by the frequencies associated

with the two outermost amplitude points (upper and lower frequencies) that are attenuated by

6 dB relative to the maximum level measured in the fundamental emission.

8.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2018/02/12	2019/02/13
Cable	WOKEN	SFL402	S02-160323-07	2018/02/21	2019/02/20

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

8.4 Test Environmental Conditions

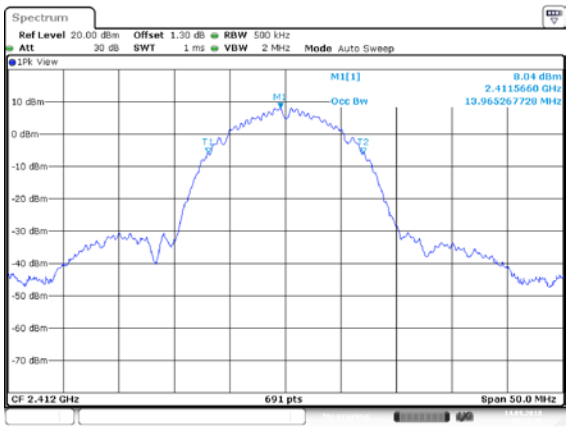
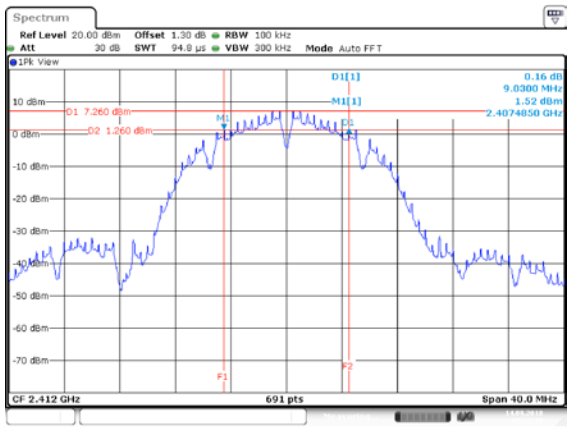
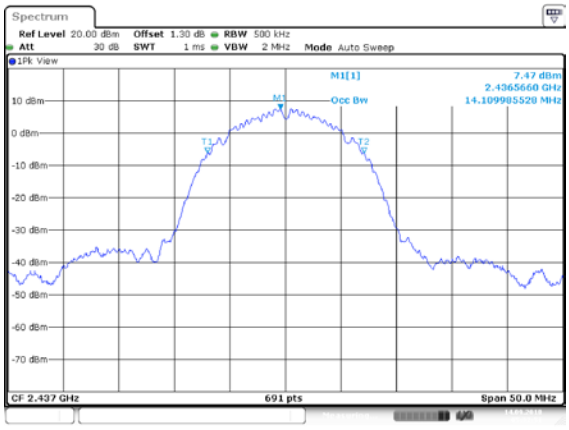
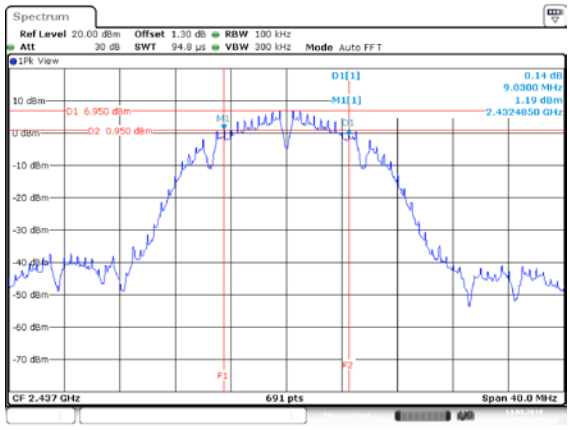
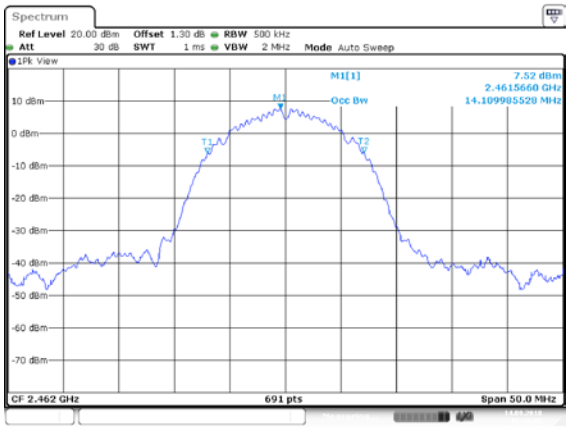
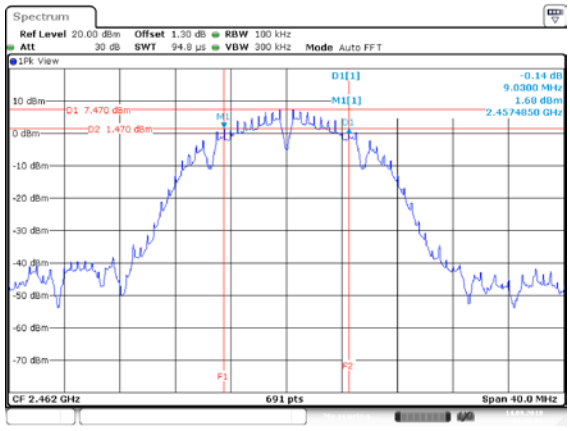
Temperature:	23.5 ℃
Relative Humidity:	55.4 %
ATM Pressure:	1015 hPa

The testing was performed by Leo Chang on 2018-09-14

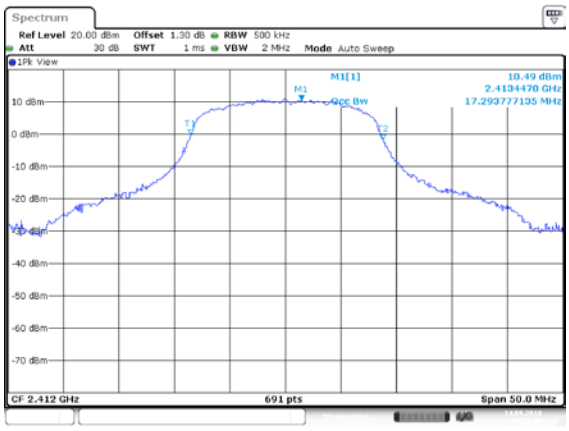
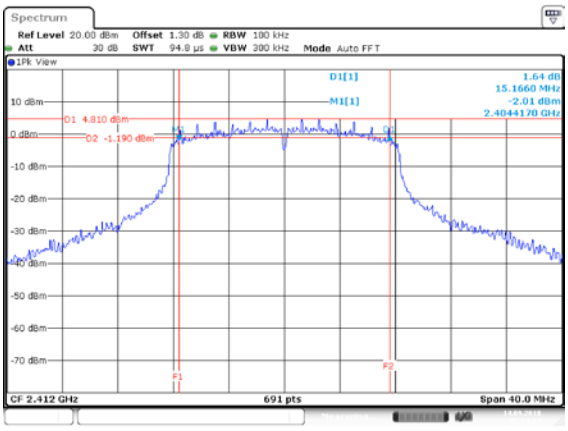
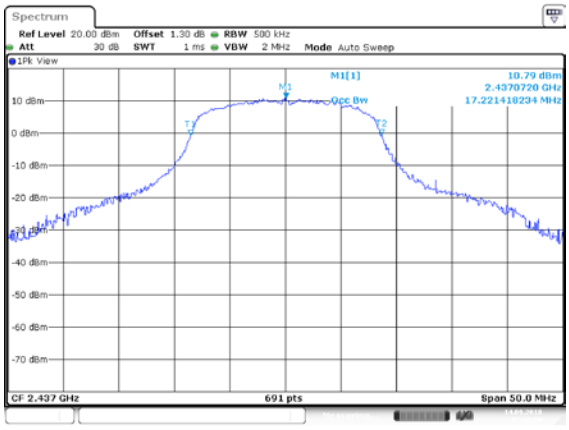
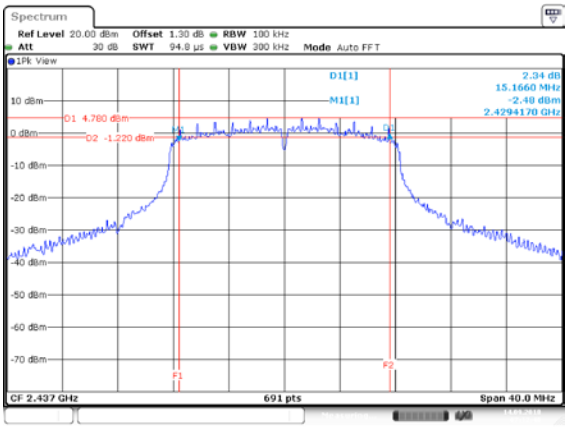
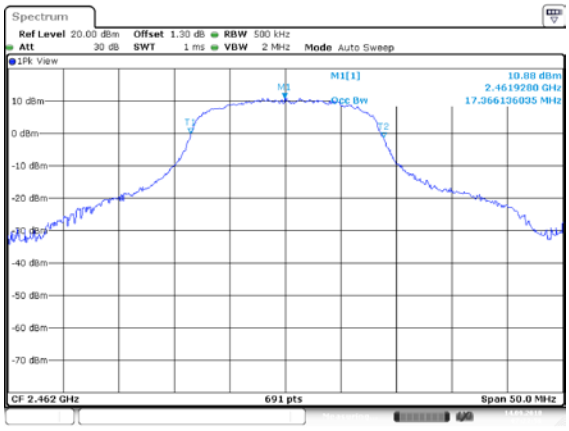
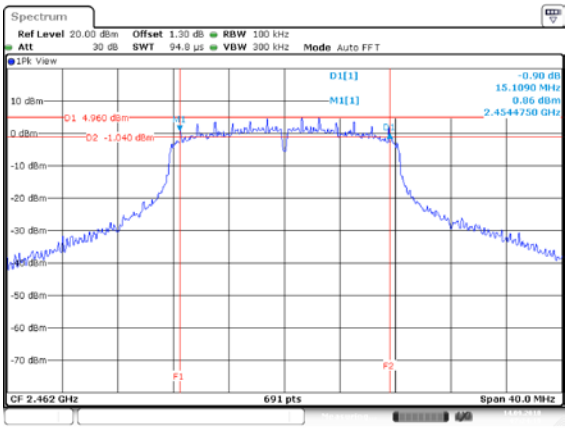
8.5 Test Results

Channel	Frequency (MHz)	99% Bandwidth (MHz)	6 dB BW (MHz)	6dB Limit (MHz)	Result
802.11b mode					
Low	2412	13.97	9.03	> 0.5	Compliance
Middle	2437	14.11	9.03	> 0.5	Compliance
High	2462	14.11	9.03	> 0.5	Compliance
802.11g mode					
Low	2412	17.29	15.17	> 0.5	Compliance
Middle	2437	17.22	15.17	> 0.5	Compliance
High	2462	17.37	15.11	> 0.5	Compliance
802.11n HT20 mode					
Low	2412	18.38	15.17	> 0.5	Compliance
Middle	2437	18.31	15.17	> 0.5	Compliance
High	2462	18.34	15.17	> 0.5	Compliance

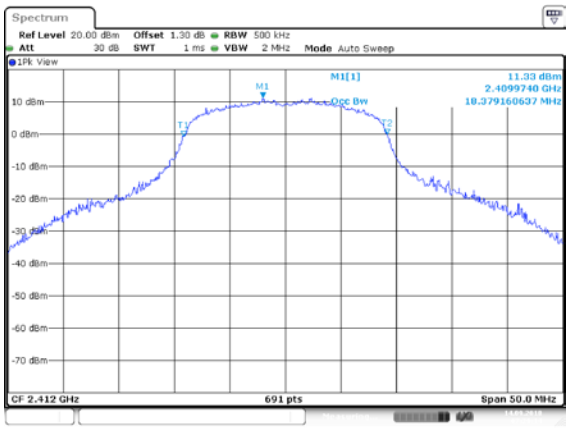
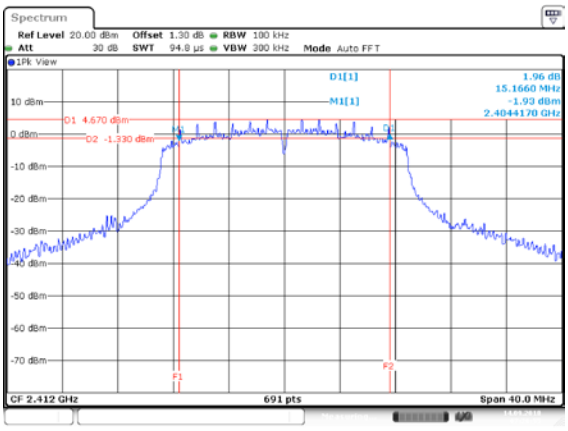
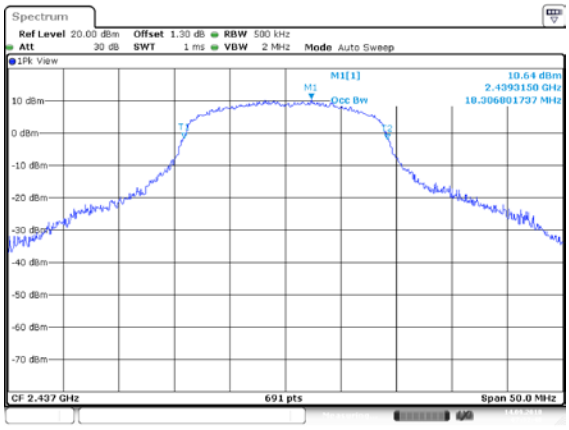
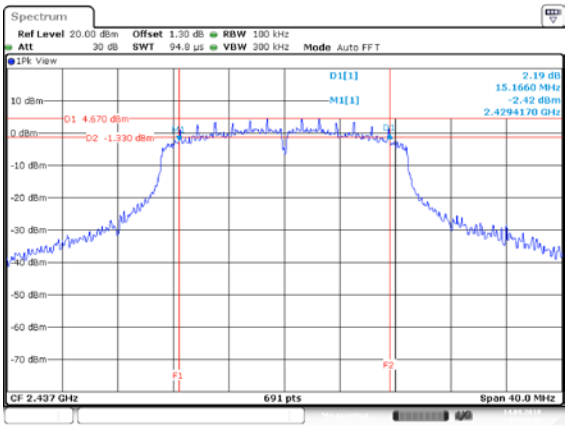
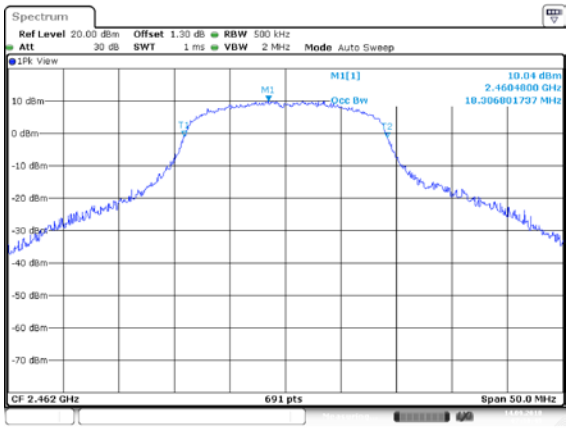
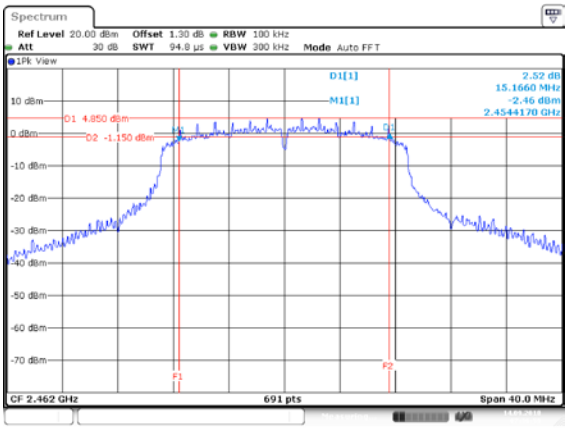
Wi-Fi 802.11b mode

99% Bandwidth	6 dB BW
Low CH	**Low CH**
	
Middle CH	**Middle CH**
	
High CH	**High CH**
	

Wi-Fi 802.11g mode

99% Bandwidth	6 dB BW
Low CH	Low CH
	
Middle CH	Middle CH
	
High CH	High CH
	

Wi-Fi 802.11n HT20 mode

99% Bandwidth	6 dB BW
Low CH	Low CH
	
Middle CH	Middle CH
	
High CH	High CH
	

9 FCC §15.247(b)(3) – Maximum Output Power

9.1 Applicable Standard

According to FCC §15.247(b) (3),

Systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

9.2 Test Procedure

1. Place the EUT on a bench and set it in transmitting mode.

2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to measuring equipment.

3. Add a correction factor to the display.

9.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2018/02/12	2019/02/13
Cable	WOKEN	SFL402	S02-160323-07	2018/02/21	2019/02/20

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

9.4 Test Environmental Conditions

Temperature:	23.5 ℃
Relative Humidity:	55.4 %
ATM Pressure:	1015 hPa

The testing was performed by Leo Chang on 2018-09-14

9.5 Test Results

Channel	Frequency (MHz)	Maximum peak Conducted Output Power (dBm)	Limit (dBm)	Result
B mode				
Low	2412	18.20	30	Compliance
Middle	2437	18.31	30	Compliance
High	2462	18.12	30	Compliance
G mode				
Low	2412	23.68	30	Compliance
Middle	2437	23.74	30	Compliance
High	2462	23.70	30	Compliance
N20 mode				
Low	2412	23.69	30	Compliance
Middle	2437	23.77	30	Compliance
High	2462	23.66	30	Compliance

Channel	Frequency (MHz)	Average Output Power (dBm)	Duty Factor	Total Average Output Power (dBm)	Limit (dBm)	Result
B mode						
Low	2412	15.82	0.02	15.84	30	Compliance
Middle	2437	15.81	0.02	15.83	30	Compliance
High	2462	15.80	0.02	15.82	30	Compliance
G mode						
Low	2412	15.37	0.21	15.58	30	Compliance
Middle	2437	15.33	0.21	15.54	30	Compliance
High	2462	15.38	0.21	15.59	30	Compliance
N20 mode						
Low	2412	15.06	0.25	15.31	30	Compliance
Middle	2437	15.17	0.25	15.42	30	Compliance
High	2462	15.13	0.25	15.38	30	Compliance

10 FCC §15.247(d) – 100 kHz Bandwidth of Frequency Band Edge

10.1 Applicable Standard

According to FCC §15.247(d),

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

10.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set RBW to 100 kHz and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

10.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2018/02/12	2019/02/13
Cable	WOKEN	SFL402	S02-160323-07	2018/02/21	2019/02/20

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

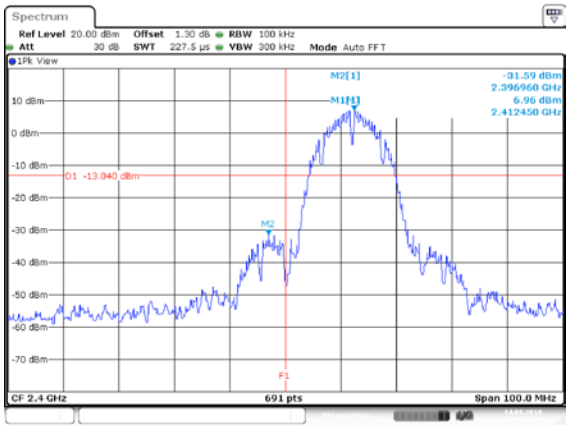
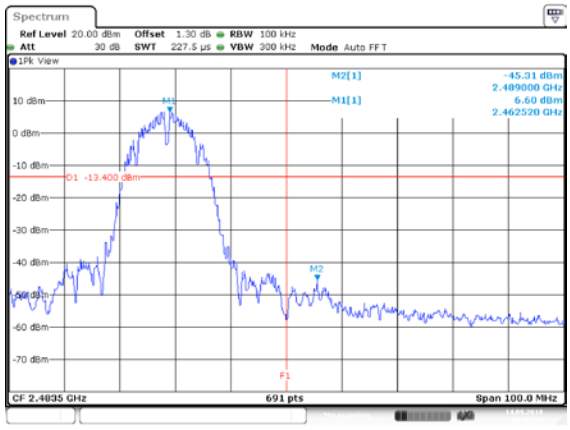
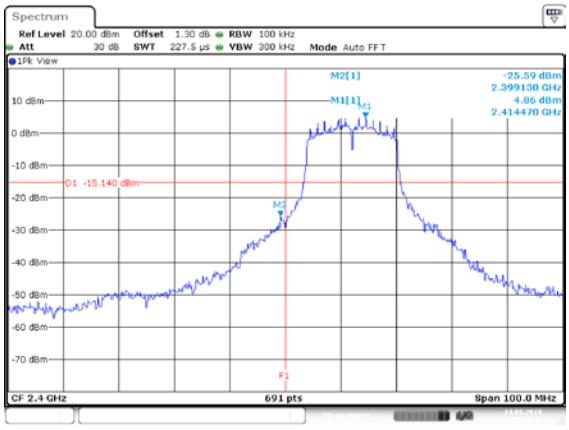
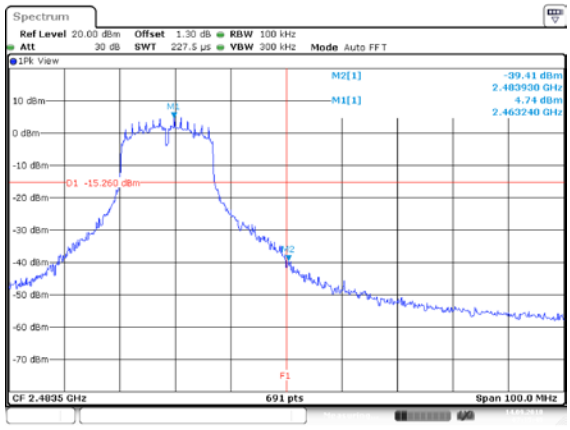
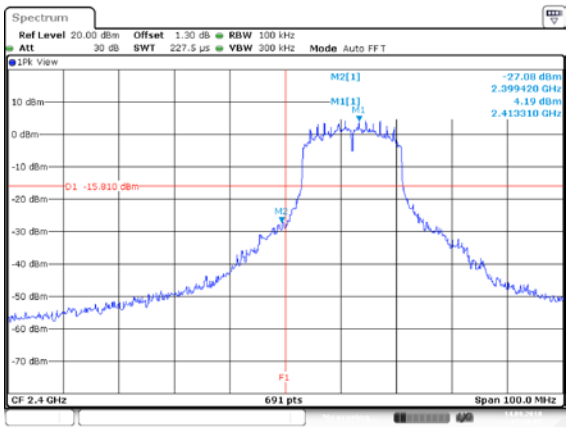
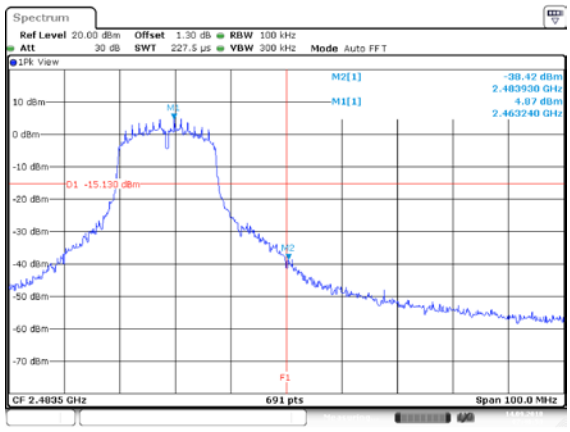
10.4 Test Environmental Conditions

Temperature:	23.5 ℃
Relative Humidity:	55.4 %
ATM Pressure:	1015 hPa

The testing was performed by Leo Chang on 2018-09-14

10.5 Test Results

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
B mode				
Low	2412	38.55	≥ 20	PASS
High	2462	51.91	≥ 20	PASS
G mode				
Low	2412	30.45	≥ 20	PASS
High	2462	44.15	≥ 20	PASS
N20 mode				
Low	2412	31.27	≥ 20	PASS
High	2462	43.29	≥ 20	PASS

802.11b Low CH	802.11b High CH
	
802.11g Low CH	**802.11g High CH**
	
802.11n HT20 Low CH	**802.11n HT20 High CH**
	

11 FCC §15.247(e) – Power Spectral Density

11.1 Applicable Standard

According to FCC §15.247(e).

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

11.2 Test Procedure

According to ANSI C63.10-2013

a) Set analyzer center frequency to DTS channel center frequency.

b) Set the span to 1.5 times the DTS bandwidth.

c) Set the RBW to 3 kHz ≤ RBW ≤ 100 kHz.

d) Set the VBW ≥ [3 × RBW].

e) Detector = peak.

f) Sweep time = auto couple.

g) Trace mode = max hold.

h) Allow trace to fully stabilize.

i) Use the peak marker function to determine the maximum amplitude level within the RBW.

j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat

11.3 Test Equipment List and Details

Descriptions	Manufacturers	Models	Serial Numbers	Calibration Date	Calibration Due Date
Spectrum Analyzer	Rohde & Schwarz	FSV40	101435	2018/02/12	2019/02/13
Cable	WOKEN	SFL402	S02-160323-07	2018/02/21	2019/02/20

***Statement of Traceability:** The testing equipment's listed above have finished the calibration by Electronics Testing Center, Taiwan (ETC) or other laboratories which were accredited by TAF or equivalent organizations. The calibration result could be traceable to the International System of Units (SI).*

11.4 Test Environmental Conditions

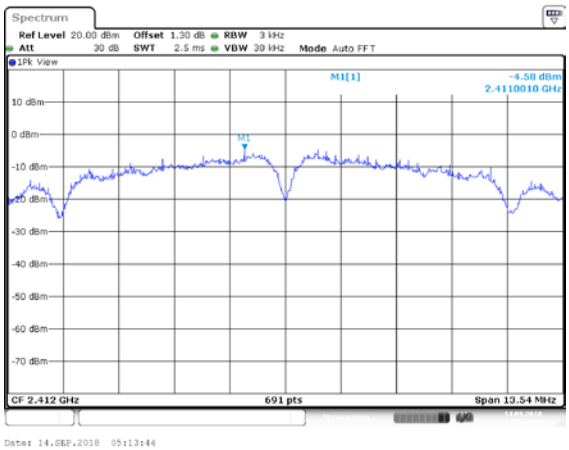
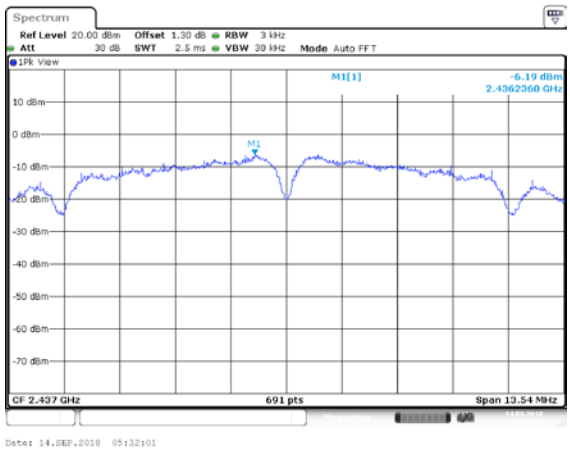
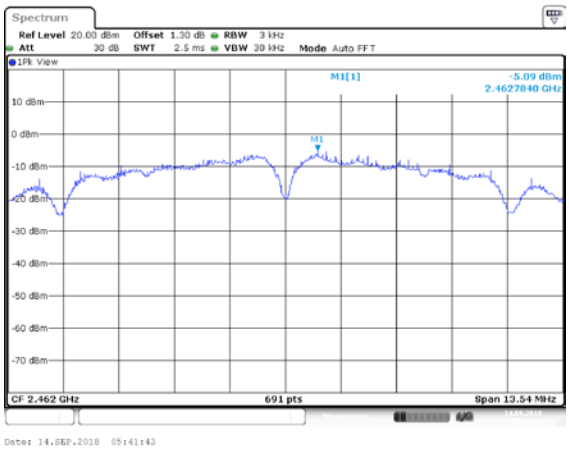
Temperature:	23.5 ℃
Relative Humidity:	55.4 %
ATM Pressure:	1015 hPa

The testing was performed by Ian on 2018-09-14.

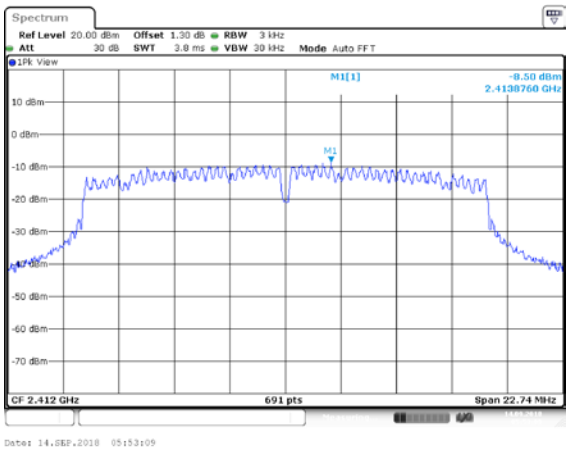
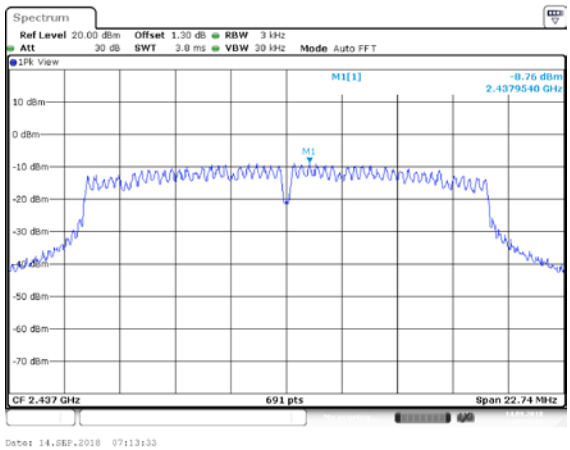
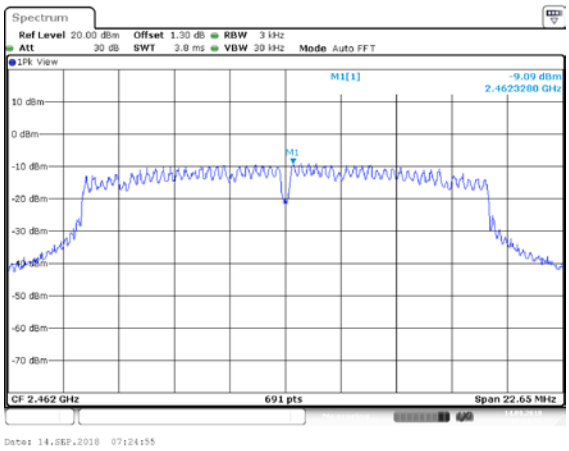
11.5 Test Results

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
B mode				
Low	2412	-4.58	8	Compliance
Middle	2437	-6.19	8	Compliance
High	2462	-5.09	8	Compliance
G mode				
Low	2412	-8.50	8	Compliance
Middle	2437	-8.76	8	Compliance
High	2462	-9.09	8	Compliance
N20 mode				
Low	2412	-8.47	8	Compliance
Middle	2437	-8.94	8	Compliance
High	2462	-8.63	8	Compliance

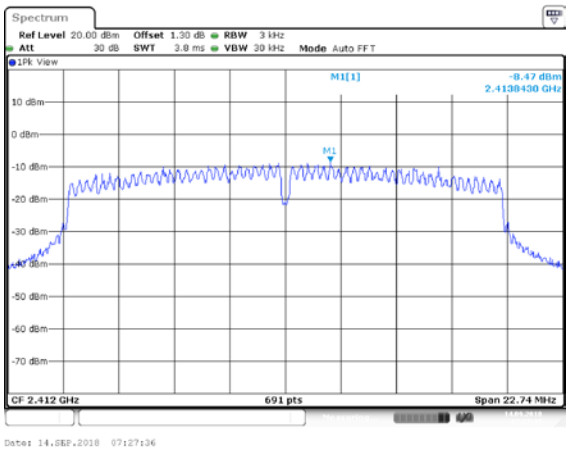
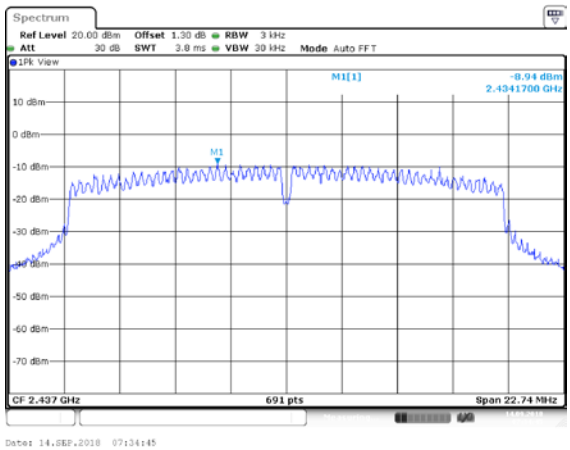
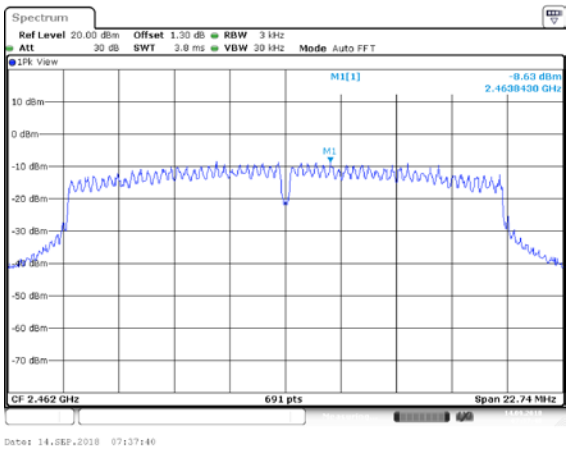
Wi-Fi 802.11b mode

Low CH	Middle CH
	
High CH	
	

Wi-Fi 802.11g mode

Low CH	Middle CH
	
High CH	
	

Wi-Fi 802.11n HT20 mode

Low CH	Middle CH
	
High CH	
	

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