



FCC Part 15.247

TEST REPORT

For

AAEON Technology Inc.

5F, No. 135, Lane 235, Pao Chiao Rd., Hsin-Tien Dist., New Taipei City 23145, Taiwan, R.O.C

FCC ID: OHBRTC1010

Report Type Original Report	Product Type: Rugged Tablet Computer
Report Producer :	Himiko Chen <i>Himiko Chen</i>
Report Number :	RLK1808003-00B
Report Date :	2018/10/14
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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)

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Revision History

Revision	Report Number	Issue Date	Description	Author/Revised by
1.0	RLK1808003-00B	2018/10/14	Original Report	Himiko Chen

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1 General Information

1.1 Product Description for Equipment under Test (EUT)

Applicant	AAEON Technology Inc. 5F, No. 135, Lane 235, Pao Chiao Rd., Hsin-Tien Dist., New Taipei City 23145, Taiwan, R.O.C
Manufacturer	AAEON Technology Inc. 5F, No. 135, Lane 235, Pao Chiao Rd., Hsin-Tien Dist., New Taipei City 23145, Taiwan, R.O.C
Brand(Trade) Name	AAEON
Product (Equipment)	Rugged Tablet Computer
Model Name	RTC-1010
Series Model	xRTC-1010x(x - Where x may be any combination of alphanumeric characters or "-"or blank.)
Model Discrepancy	For marketing purpose
EUT Function	IEEE 802.11 bgn + BT4.1
Frequency Range	IEEE 802.11 b/g/n HT20 mode: 2412 ~ 2462 MHz BLE mode : 2402 ~ 2480 MHz
Number of Channels	IEEE 802.11 b/g/n HT20 mode: 11 Channels BLE mode : 40 Channels
Output Power	IEEE 802.11b mode: 15.31 dBm (0.034 W) IEEE 802.11g mode: 22.11 dBm (0.163 W) IEEE 802.11n HT20 mode: 22.08 dBm (0.161 W) BLE mode: 1.17 dBm (0.0013W)
Received Date	Aug. 14, 2018.
Date of Test	Aug. 14, 2018 ~ Sep. 07, 2018
Related Submittal(s)/Grant(s)	FCC Part 15.225 DXX with FCC ID : OHBRTC1010 FCC Part 15.247 DSS with FCC ID : OHBRTC1010
Modulation Type	IEEE 802.11b mode: DSSS IEEE 802.11g/n HT 20 mode: OFDM BLE mode : GFSK 1Mbps

**All measurement and test data in this report was gathered from production sample serial number: 1808003*

(Assigned by BACL, Taiwan).

**Model Discrepancy,*

The major electrical and mechanical constructions of series models are identical to the basic model, except different Market segmentation. The model, RTC-1010 is the testing sample, and the final test data are shown on this test report.

1.2 Operation Condition of EUT

Power Operation (Voltage Range)	☒ AC 120V/60Hz ☒ Adapter <i>Brand Name: FSP</i> <i>Model: FSP036-DHAN3</i> <i>I/P: 100-240Vac, 1.2A</i> <i>O/P: 12Vdc, 3A</i> ☐ By Power Core
	☐ DC Type ☐ DC Power Supply ☒ Battery : (1) <i>Rechargeable Li-polymer Battery</i> <i>Brand Name: Getac</i> <i>Model: RTC600S</i> <i>7.4V = 1530mAh</i> (2) <i>Rechargeable Li-polymer Battery</i> <i>Brand Name: AAEON</i> <i>Model: RTC1200</i> <i>14.4V = 2270mAh</i> ☐ External from USB Cable ☐ External DC Adapter
	☐ Host System

*The worst was Adapter mode

1.3 Objective and Test Methodology

The Objective of this Test Report was to document the compliance of the AAEON Technology Inc. Displays (Model: RTC-1010, xRTC-1010x(x - Where x may be any combination of alphanumeric characters or "-" or blank.)) 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 the 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.

For BLE mode, there are totally 40 channels.

Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2442
1	2404	--	--
2	2406	--	--
3	2408	37	2476
--	--	38	2478
19	2440	39	2480

For BLE mode: Channel 0, 19 and 39 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
BLE mode	1	125 kbps-1 Mbps	1 Mbps

Worst Case of Power Setting				
EUT Exercise Software		wl		
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
BLE mode	1	Default	Default	Default

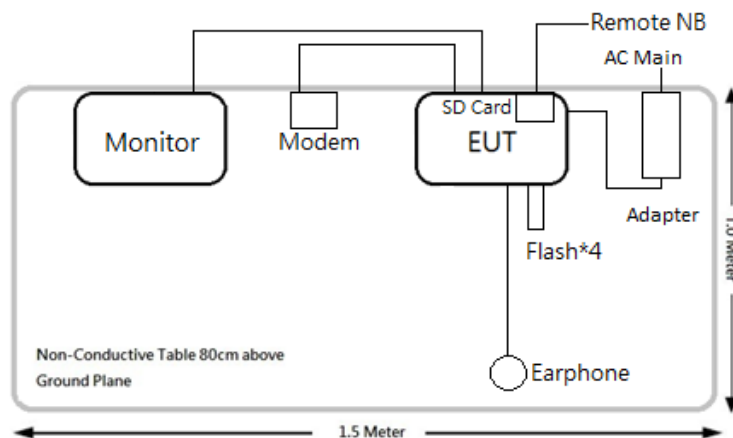
2.3 Support Equipment List and Cable List

No.	Description	Manufacturer	Model Number	BSMI	FCC ID
A	monitor	DELL	P2415Q	N/A	NA
B	Adapter	FSP	FSP036-DHAN3	NA	NA
C	Modem	NA	TY5600	NA	NA
D	SD Card	Transcend	4GB	NA	NA
E	NB	DELL	Latitude E5470	R33002	DoC
F	Flash drive*4	Transcend	64G	NA	NA
G	Earphone	NA	NA	NA	NA

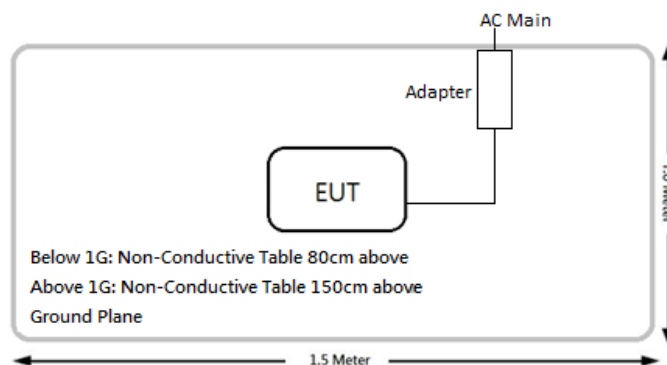
No.	Description	Shielded Type	Ferrite Core	Length (M)
1	HDIM to Micro Cable	Non-Shielded	No	1.5
2	DC Cable	Non-Shielded	No	1.8
3	COM Cable	Non-Shielded	No	1.8
4	LAN Cable	Non-Shielded	No	10
5	Earphone Cable	Non-Shielded	No	1.8

2.4 Block Diagram of Test Setup

Conduction



Radiation



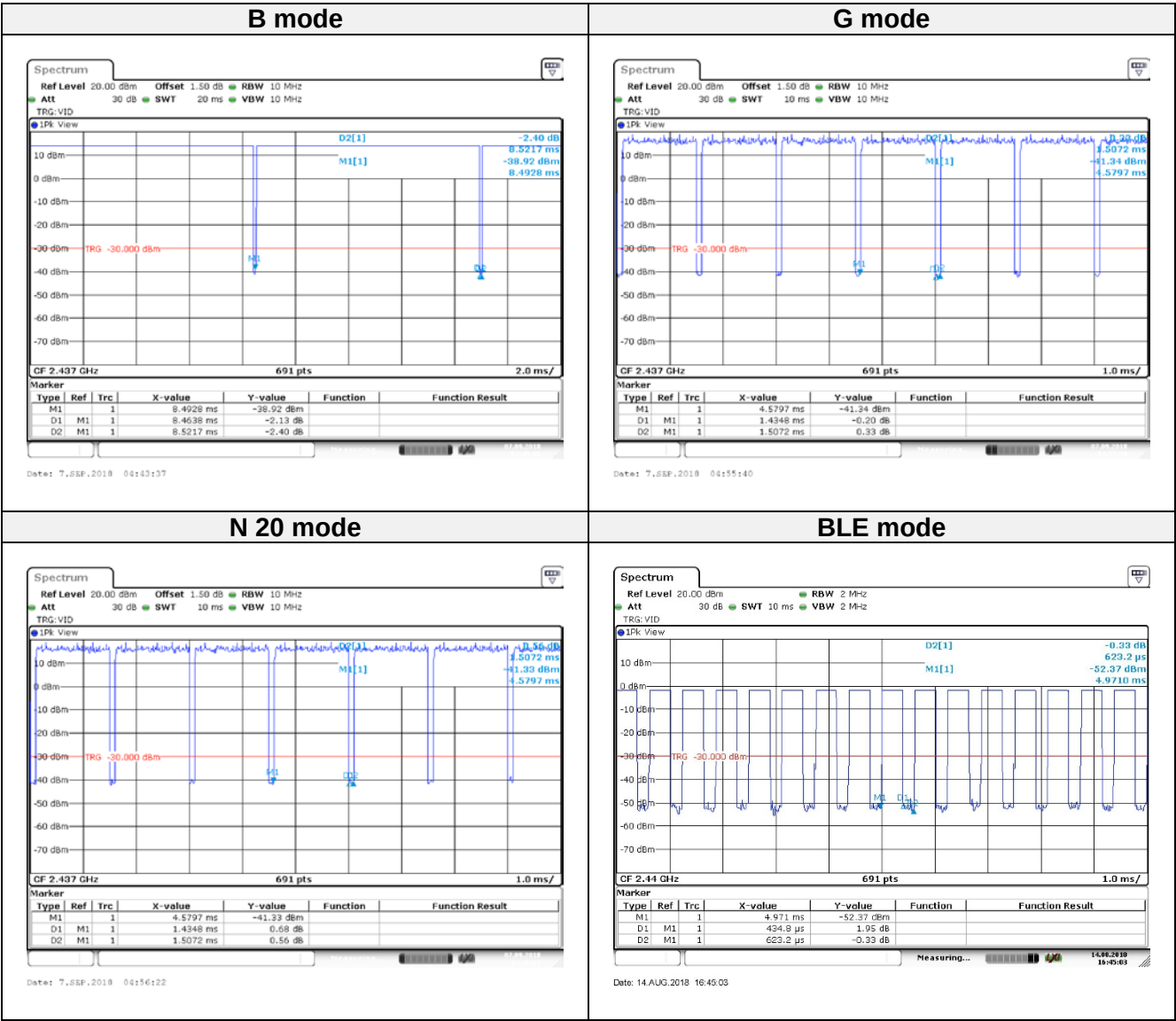
2.5 Duty Cycle

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	8.46	8.52	99.30%	0.03
802.11g mode	1.43	1.50	95.33%	0.21
802.11n HT 20 mode	1.43	1.50	95.33%	0.21
BLE mode	0.43	0.62	69.35	1.59

(Duty Factor = $10 \cdot \log(1/\text{Duty cycle})$)



3 Summary of Test Results

FCC Rules	Description of Test	Result
FCC §15.247(i), § 2.1093	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), § 2.1093 - RF Exposure

4.1 Applicable Standard

According to FCC §2.1093 and §1.1307(b) (1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

According to KDB 447498 D01 General RF Exposure Guidance v06

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:

$[(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm})] \cdot$

$[\sqrt{f(\text{GHz})}] \leq 3.0$ for 1-g SAR and ≤ 7.5 for 10-g extremity SAR, where

1. $f(\text{GHz})$ is the RF channel transmit frequency in GHz.

2. Power and distance are rounded to the nearest mW and mm before calculation.

3. The result is rounded to one decimal place for comparison.

4. 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum *test separation distance* is ≤ 50 mm, and for transmission frequencies between 100 MHz and 6 GHz. When the minimum *test separation distance* is < 5 mm, a distance of 5 mm according to 4.1 f) is applied to determine SAR test exclusion.

4.2 RF Exposure Evaluation Result

For Wi-Fi:

Please refer to the SAR report, report No.: RLK1808003-23A

For BLE:

Frequency (MHz)	Tune-up Power		Evaluation Distance (mm)	SAR Exclusion Result	SAR Exclusion Limit
	(dBm)	(mW)			(1g SAR)
2402-2480	1.50	1.413	5	0.4496	3

Therefore, the stand-alone SAR evaluation for BLE is not necessary.

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
SINBON	A9704203	PIFA Antenna	1.60 dBi	Compliance

The EUT has an internal antenna arrangement, fulfill the requirement of this section.

6 FCC §15.207 - AC Line Conducted Emissions

6.1 Applicable Standard

According to FCC §15.207

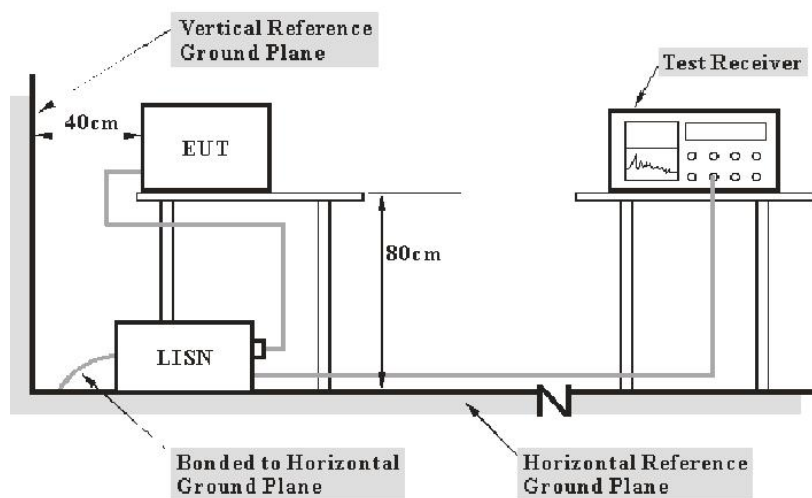
For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/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
LISN	Rohde & Schwarz	ENV216	101248	2018/06/27	2019/06/26
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).

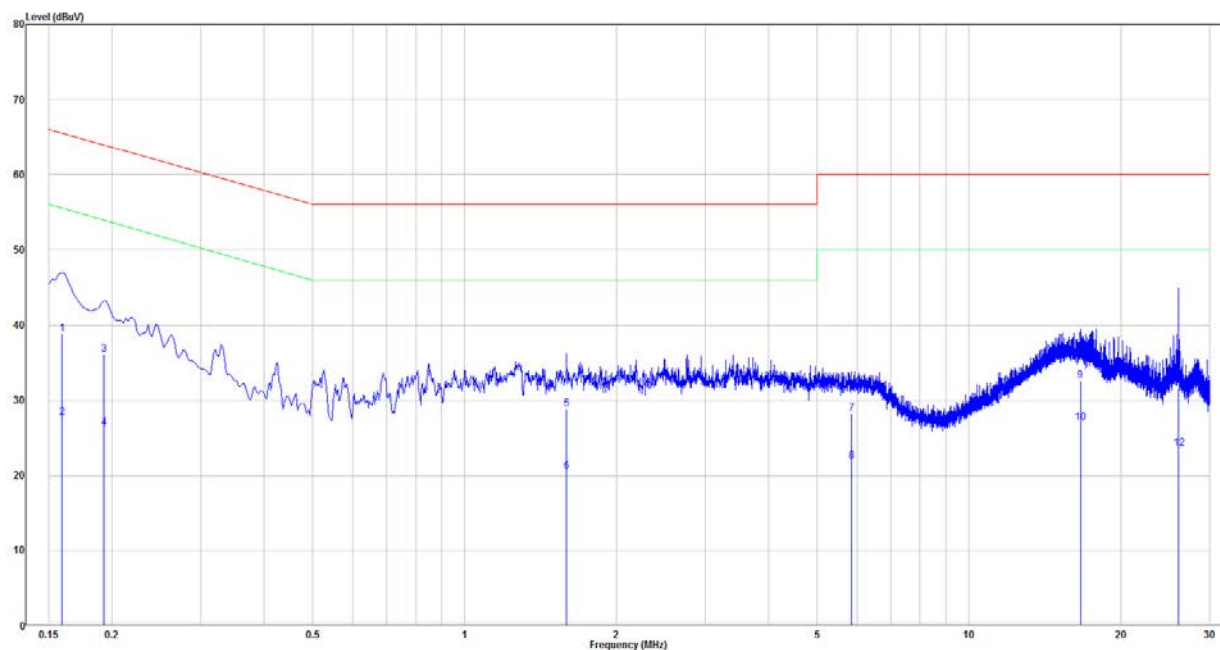
6.4 Test Environmental Conditions

Temperature:	22 °C
Relative Humidity:	42 %
ATM Pressure:	1010 hPa

The testing was performed by Ray Huang on 2018-08-23

6.5 AC Line Conducted Emission Test Plot and Data

Mode: AC 120V/60 Hz, Wi-Fi mode, Line



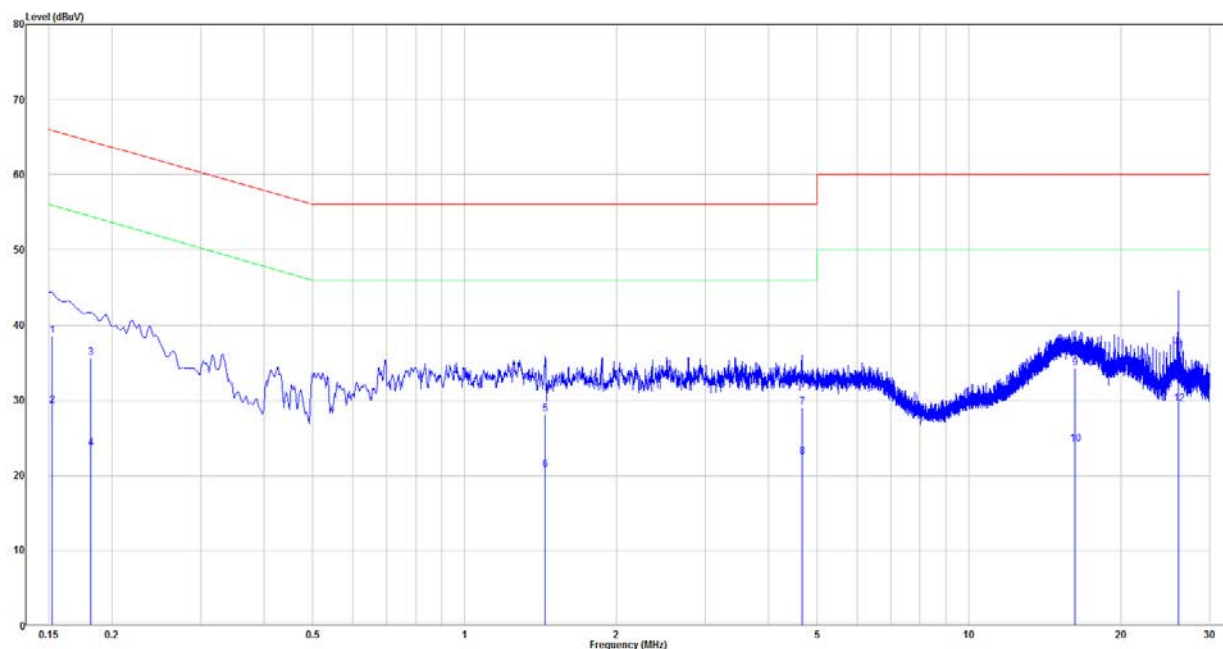
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Over limit (dB)	Remark
1	0.159	19.36	19.45	38.81	65.52	-26.71	QP
2	0.159	8.25	19.45	27.71	55.52	-27.81	Average
3	0.193	16.62	19.46	36.08	63.92	-27.84	QP
4	0.193	6.88	19.46	26.34	53.92	-27.58	Average
5	1.592	9.26	19.53	28.79	56.00	-27.21	QP
6	1.592	0.99	19.53	20.52	46.00	-25.48	Average
7	5.849	8.60	19.63	28.23	60.00	-31.77	QP
8	5.849	2.29	19.63	21.92	50.00	-28.08	Average
9	16.633	12.79	19.77	32.55	60.00	-27.45	QP
10	16.633	7.19	19.77	26.96	50.00	-23.04	Average
11	26.000	11.67	19.89	31.56	60.00	-28.44	QP
12	26.000	3.72	19.89	23.61	50.00	-26.39	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, Wi-Fi mode, Neutral

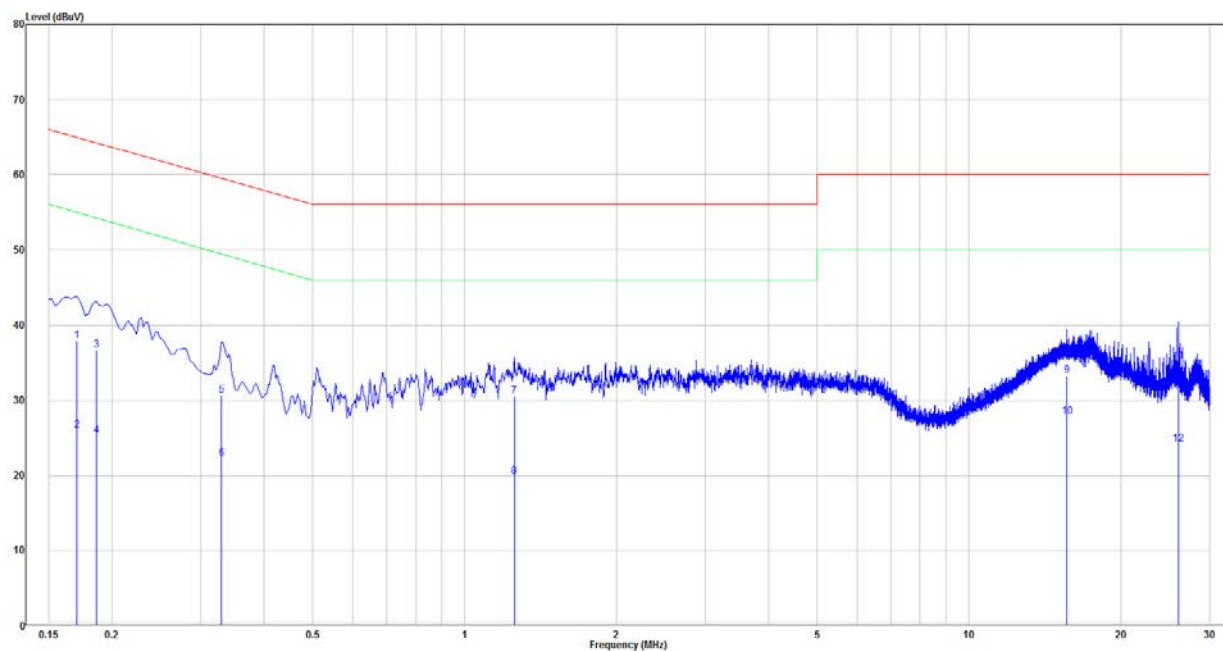
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Over limit (dB)	Remark
1	0.152	19.15	19.44	38.59	65.88	-27.29	QP
2	0.152	9.86	19.44	29.30	55.88	-26.58	Average
3	0.181	16.21	19.45	35.67	64.42	-28.75	QP
4	0.181	4.18	19.45	23.63	54.42	-30.79	Average
5	1.446	8.63	19.51	28.14	56.00	-27.86	QP
6	1.446	1.23	19.51	20.74	46.00	-25.26	Average
7	4.666	9.40	19.59	29.00	56.00	-27.00	QP
8	4.666	2.87	19.59	22.47	46.00	-23.53	Average
9	16.260	14.43	19.79	34.22	60.00	-25.78	QP
10	16.260	4.43	19.79	24.22	50.00	-25.78	Average
11	26.000	16.60	19.95	36.56	60.00	-23.44	QP
12	26.000	9.60	19.95	29.56	50.00	-20.44	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, BLE mode, Line

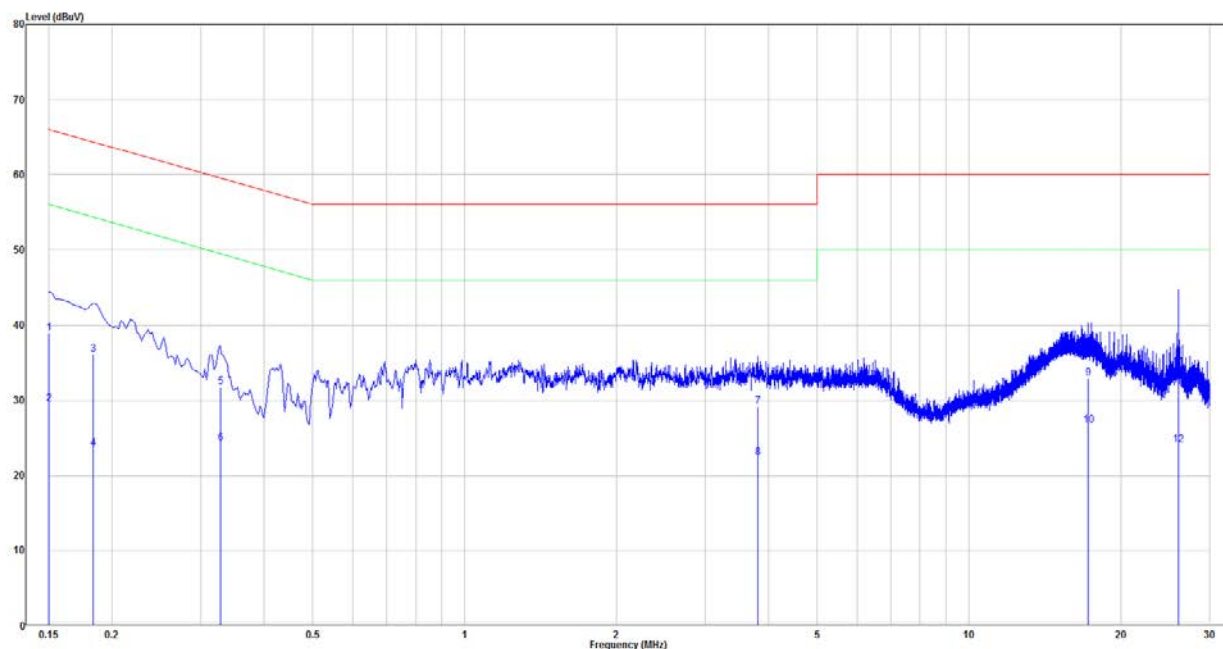
No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Over limit (dB)	Remark
1	0.170	18.42	19.45	37.88	64.95	-27.07	QP
2	0.170	6.54	19.45	26.00	54.95	-28.95	Average
3	0.186	17.19	19.46	36.65	64.21	-27.56	QP
4	0.186	5.82	19.46	25.27	54.21	-28.94	Average
5	0.330	11.22	19.47	30.69	59.45	-28.76	QP
6	0.330	2.83	19.47	22.29	49.45	-27.16	Average
7	1.255	11.02	19.51	30.53	56.00	-25.47	QP
8	1.255	0.30	19.51	19.81	46.00	-26.19	Average
9	15.641	13.47	19.75	33.22	60.00	-26.78	QP
10	15.641	8.02	19.75	27.77	50.00	-22.23	Average
11	25.997	15.25	19.89	35.14	60.00	-24.86	QP
12	25.997	4.30	19.89	24.19	50.00	-25.81	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, BLE mode, Neutral

No.	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB)	Result (dBuV)	Limit (dBuV)	Over limit (dB)	Remark
1	0.150	19.43	19.44	38.87	66.00	-27.13	QP
2	0.150	10.08	19.44	29.52	56.00	-26.48	Average
3	0.184	16.64	19.45	36.09	64.31	-28.22	QP
4	0.184	4.14	19.45	23.60	54.31	-30.71	Average
5	0.328	12.34	19.46	31.80	59.51	-27.71	QP
6	0.328	4.84	19.46	24.30	49.51	-25.21	Average
7	3.811	9.64	19.57	29.21	56.00	-26.79	QP
8	3.811	2.75	19.57	22.32	46.00	-23.68	Average
9	17.229	13.10	19.80	32.91	60.00	-27.09	QP
10	17.229	6.82	19.80	26.62	50.00	-23.38	Average
11	25.997	14.41	19.95	34.36	60.00	-25.64	QP
12	25.997	4.11	19.95	24.06	50.00	-25.94	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) 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	16.42 – 16.423	960 – 1240	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5.35 – 5.46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 –	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.52525	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	156.7 – 156.9	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	162.0125 – 167.17	3.3458 – 3.358	23.6 – 24.0
12.29 – 12.293	167.72 – 173.2	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	240 – 285		36.43 – 36.5
12.57675 – 12.57725	322 – 335.4		Above 38.6
13.36 – 13.41	399.9 – 410		
	608 – 614		

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:

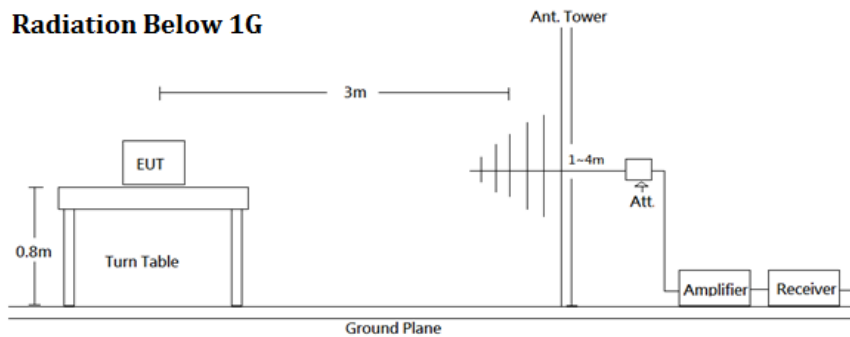
Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** 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.

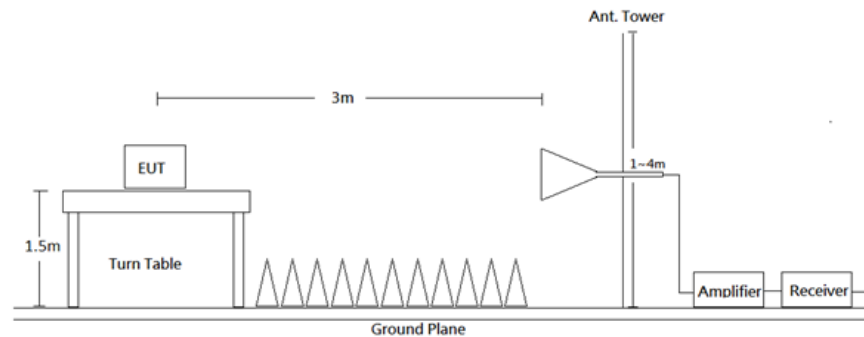
As per FCC §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the 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					
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
Microwave 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
20 dB Attenuator	NCL	BW-S20W5+	ATT-20-01	Each Use	/
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	060772	N.C.R	N.C.R
Software	Farad	EZ EMC	BACL-03A1	N.C.R	N.C.R
Conducted Room					
Spectrum Analyzer	Rohde & Schwarz	FSU26	200268	2018/05/04	2019/05/03
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:	22.1 °C
Relative Humidity:	61.0 %
ATM Pressure:	1015 hPa

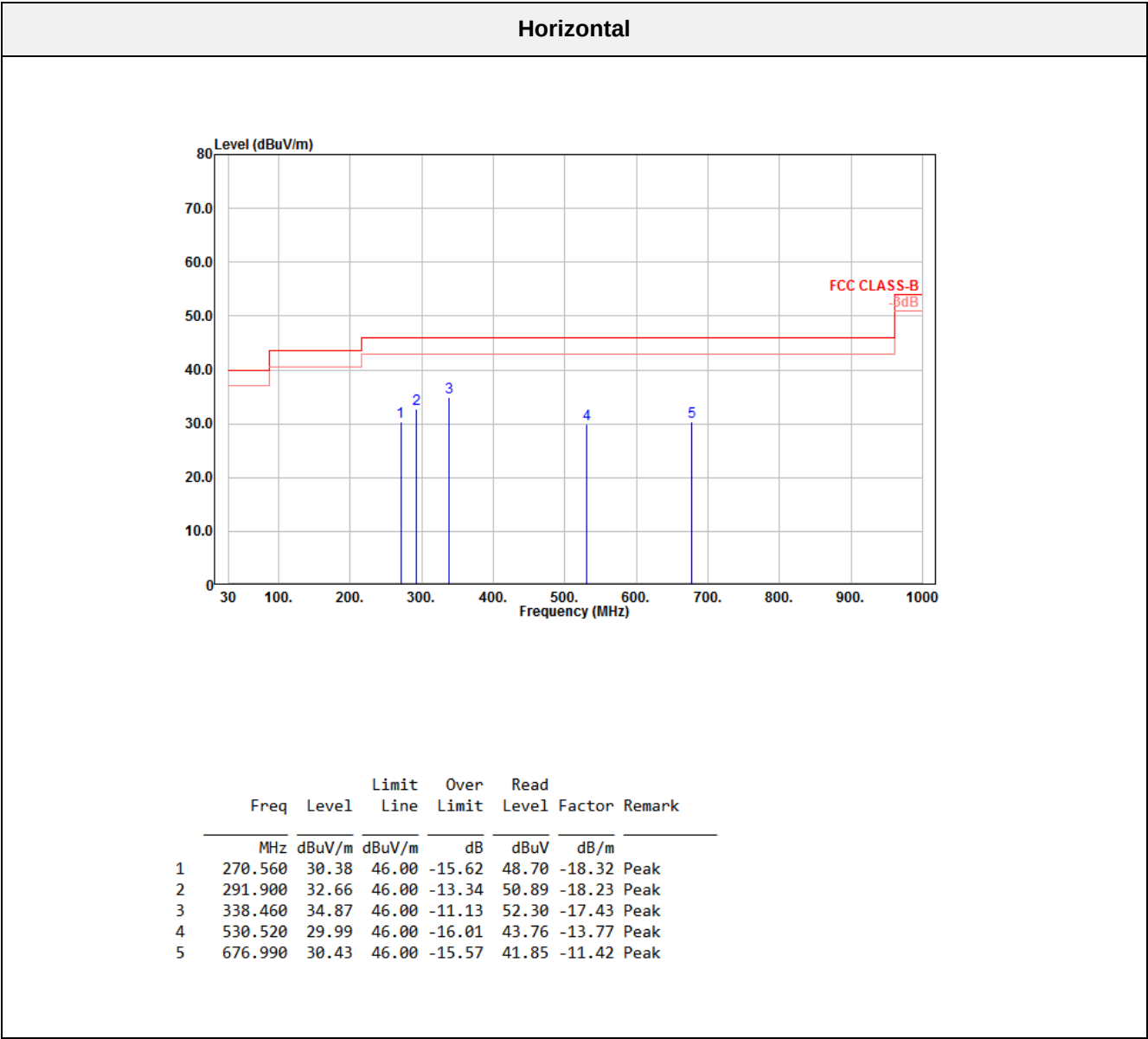
The testing was performed by Eric Lee from 2018-08-14 to 2018-09-07.

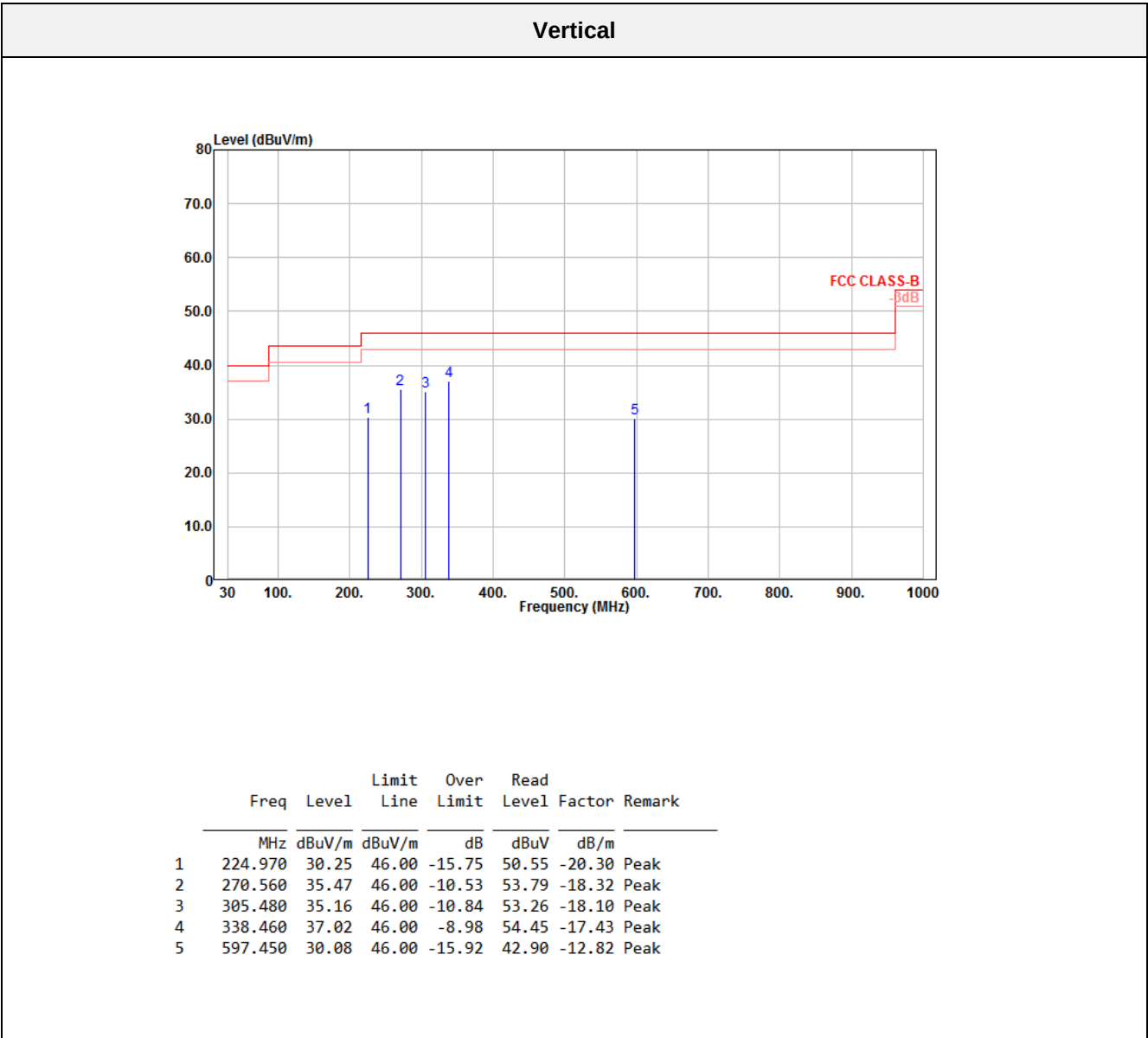
7.5 Radiated Emission Test Plot and Data

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

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

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





Wi-Fi B mode

Low Channel													
Horizontal							Vertical						
Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.520	32.01	54.00	-21.99	40.70	-8.69	Average	2383.808	33.75	54.00	-20.25	42.43	-8.68	Average
2389.520	46.88	74.00	-27.12	55.57	-8.69	Peak	2383.808	46.52	74.00	-27.48	55.20	-8.68	Peak
* 2411.136	93.95			102.69	-8.74	Average	2411.136	98.20			106.94	-8.74	Average
* 2411.136	96.54			105.28	-8.74	Peak	2411.136	100.76			109.50	-8.74	Peak
4824.000	30.49	54.00	-23.51	31.51	-1.02	Average	4824.000	37.38	54.00	-16.62	38.40	-1.02	Average
4824.000	42.80	74.00	-31.20	43.82	-1.02	Peak	4824.000	45.86	74.00	-28.14	46.88	-1.02	Peak
7236.000	33.88	54.00	-20.12	30.57	3.31	Average	7236.000	32.47	54.00	-21.53	29.16	3.31	Average
7236.000	45.27	74.00	-28.73	41.96	3.31	Peak	7236.000	44.60	74.00	-29.40	41.29	3.31	Peak
Mid Channel													
Horizontal							Vertical						
Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2332.320	31.66	54.00	-22.34	40.22	-8.56	Average	2370.240	31.98	54.00	-22.02	40.63	-8.65	Average
2332.320	45.73	74.00	-28.27	54.29	-8.56	Peak	2370.240	46.26	74.00	-27.74	54.91	-8.65	Peak
2437.920	96.74			105.49	-8.75	Average	2437.920	97.60			106.35	-8.75	Average
2437.920	96.36			105.11	-8.75	Peak	2437.920	100.21			108.96	-8.75	Peak
2532.960	31.60	54.00	-22.40	40.34	-8.74	Average	2508.240	31.87	54.00	-22.13	40.67	-8.80	Average
2532.960	45.57	74.00	-28.43	54.31	-8.74	Peak	2508.240	46.47	74.00	-27.53	55.27	-8.80	Peak
4874.000	30.65	54.00	-23.35	31.54	-0.89	Average	4874.000	36.34	54.00	-17.66	37.22	-0.88	Average
4874.000	41.66	74.00	-32.34	42.55	-0.89	Peak	4876.000	45.94	74.00	-28.06	46.82	-0.88	Peak
7311.000	33.45	54.00	-20.55	29.97	3.48	Average	7311.000	32.86	54.00	-21.14	29.35	3.51	Average
7311.000	45.71	74.00	-28.29	42.23	3.48	Peak	7311.000	45.95	74.00	-28.05	42.44	3.51	Peak
High Channel													
Horizontal							Vertical						
Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2461.114	93.09			101.85	-8.76	Average	2461.016	96.79			105.55	-8.76	Average
2461.114	95.70			104.46	-8.76	Peak	2461.016	99.39			108.15	-8.76	Peak
2488.946	31.85	54.00	-22.15	40.64	-8.79	Average	2486.398	32.41	54.00	-21.59	41.20	-8.79	Average
2488.946	45.26	74.00	-28.74	54.05	-8.79	Peak	2486.398	47.99	74.00	-26.01	56.78	-8.79	Peak
4924.000	34.71	54.00	-19.29	35.46	-0.75	Average	4924.000	34.71	54.00	-19.29	35.46	-0.75	Average
4924.000	44.48	74.00	-29.52	45.23	-0.75	Peak	4924.000	44.48	74.00	-29.52	45.23	-0.75	Peak
7375.000	46.26	74.00	-27.74	42.48	3.78	Peak	7375.000	46.26	74.00	-27.74	42.48	3.78	Peak
7386.000	34.15	54.00	-19.85	30.37	3.78	Average	7386.000	34.15	54.00	-19.85	30.37	3.78	Average

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 G mode

Low Channel													
Horizontal							Vertical						
Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2390.000	42.92	54.00	-11.08	51.61	-8.69	Average	2390.000	47.17	54.00	-6.83	55.86	-8.69	Average
2390.000	66.74	74.00	-7.26	75.43	-8.69	Peak	2390.000	71.11	74.00	-2.89	79.80	-8.69	Peak
2412.592	89.14			97.88	-8.74	Average	2412.704	92.48			101.22	-8.74	Average
2412.592	99.77			108.51	-8.74	Peak	2412.704	103.15			111.89	-8.74	Peak
4824.000	29.52	54.00	-24.48	30.54	-1.02	Average	4824.000	31.12	54.00	-22.88	32.14	-1.02	Average
4824.000	41.44	74.00	-32.56	42.46	-1.02	Peak	4824.000	41.79	74.00	-32.21	42.81	-1.02	Peak
7236.000	33.14	54.00	-20.86	29.83	3.31	Average	7236.000	32.44	54.00	-21.56	29.13	3.31	Average
7236.000	45.40	74.00	-28.60	42.09	3.31	Peak	7236.000	44.67	74.00	-29.33	41.36	3.31	Peak
Mid Channel													
Horizontal							Vertical						
Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2378.880	32.24	54.00	-21.76	40.92	-8.68	Average	2384.640	33.53	54.00	-20.47	42.22	-8.69	Average
2378.880	46.02	74.00	-27.98	54.70	-8.68	Peak	2384.640	47.85	74.00	-26.15	56.54	-8.69	Peak
2436.480	88.57			97.33	-8.76	Average	2436.480	92.73			101.49	-8.76	Average
2436.480	99.22			107.98	-8.76	Peak	2436.480	103.40			112.16	-8.76	Peak
2522.640	32.36	54.00	-21.64	41.13	-8.77	Average	2484.000	33.94	54.00	-20.06	42.72	-8.78	Average
2522.640	45.35	74.00	-28.65	54.12	-8.77	Peak	2484.000	47.41	74.00	-26.59	56.19	-8.78	Peak
4874.000	29.68	54.00	-24.32	30.56	-0.88	Average	4874.000	30.65	54.00	-23.35	31.54	-0.89	Average
4874.000	42.15	74.00	-31.85	43.03	-0.88	Peak	4874.000	42.37	74.00	-31.63	43.26	-0.89	Peak
7311.000	33.47	54.00	-20.53	29.99	3.48	Average	7311.000	33.45	54.00	-20.55	29.97	3.48	Average
7311.000	45.75	74.00	-28.25	42.27	3.48	Peak	7311.000	45.75	74.00	-28.25	42.27	3.48	Peak
High Channel													
Horizontal							Vertical						
Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2462.584	87.75			96.51	-8.76	Average	2462.584	91.74			100.50	-8.76	Average
2462.584	98.49			107.25	-8.76	Peak	2462.584	102.41			111.17	-8.76	Peak
2483.500	39.40	54.00	-14.60	48.18	-8.78	Average	2483.500	42.32	54.00	-11.68	51.10	-8.78	Average
2483.500	59.92	74.00	-14.08	68.70	-8.78	Peak	2483.500	63.54	74.00	-10.46	72.32	-8.78	Peak
4924.000	29.19	54.00	-24.81	29.94	-0.75	Average	4924.000	29.47	54.00	-24.53	30.22	-0.75	Average
4924.000	42.00	74.00	-32.00	42.75	-0.75	Peak	4924.000	43.11	74.00	-30.89	43.86	-0.75	Peak
7386.000	33.75	54.00	-20.25	29.97	3.78	Average	7386.000	33.76	54.00	-20.24	29.95	3.81	Average
7386.000	46.18	74.00	-27.82	42.40	3.78	Peak	7386.000	45.61	74.00	-28.39	41.80	3.81	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 n HT20 mode

Low Channel													
Horizontal							Vertical						
Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.744	43.57	54.00	-10.43	52.26	-8.69	Average	2389.968	48.94	54.00	-5.06	57.63	-8.69	Average
2389.744	69.26	74.00	-4.74	77.95	-8.69	Peak	2389.968	73.86	74.00	-0.14	82.55	-8.69	Peak
2411.248	87.96			96.70	-8.74	Average	2409.904	92.47			101.21	-8.74	Average
2411.248	99.72			108.46	-8.74	Peak	2409.904	104.53			113.27	-8.74	Peak
4824.000	29.52	54.00	-24.48	30.54	-1.02	Average	4824.000	31.37	54.00	-22.63	32.39	-1.02	Average
4824.000	42.14	74.00	-31.86	43.16	-1.02	Peak	4824.000	42.80	74.00	-31.20	43.82	-1.02	Peak
7236.000	33.10	54.00	-20.90	29.79	3.31	Average	7236.000	32.96	54.00	-21.04	29.61	3.35	Average
7236.000	44.51	74.00	-29.49	41.20	3.31	Peak	7236.000	45.23	74.00	-28.77	41.88	3.35	Peak
Mid Channel													
Horizontal							Vertical						
Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2389.440	32.03	54.00	-21.97	40.72	-8.69	Average	2387.760	33.33	54.00	-20.67	42.02	-8.69	Average
2389.440	45.87	74.00	-28.13	54.56	-8.69	Peak	2387.760	48.55	74.00	-25.45	57.24	-8.69	Peak
2436.720	87.52			96.28	-8.76	Average	2436.240	91.69			100.45	-8.76	Average
2436.720	98.55			107.31	-8.76	Peak	2436.240	103.49			112.25	-8.76	Peak
2483.760	32.17	54.00	-21.83	40.95	-8.78	Average	2485.200	33.62	54.00	-20.38	42.41	-8.79	Average
2483.760	45.72	74.00	-28.28	54.50	-8.78	Peak	2485.200	47.56	74.00	-26.44	56.35	-8.79	Peak
4874.000	29.07	54.00	-24.93	29.96	-0.89	Average	4874.000	30.76	54.00	-23.24	31.64	-0.88	Average
4874.000	42.41	74.00	-31.59	43.30	-0.89	Peak	4876.000	42.30	74.00	-31.70	43.18	-0.88	Peak
7311.000	33.15	54.00	-20.85	29.67	3.48	Average	7311.000	33.26	54.00	-20.74	29.75	3.51	Average
7311.000	46.67	74.00	-27.33	43.19	3.48	Peak	7311.000	45.21	74.00	-28.79	41.70	3.51	Peak
High Channel													
Horizontal							Vertical						
Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2459.742	86.96			95.72	-8.76	Average	2459.938	91.09			99.85	-8.76	Average
2459.742	98.95			107.71	-8.76	Peak	2459.938	103.32			112.08	-8.76	Peak
2483.556	38.50	54.00	-15.50	47.28	-8.78	Average	2483.850	42.42	54.00	-11.58	51.20	-8.78	Average
2483.556	63.51	74.00	-10.49	72.29	-8.78	Peak	2483.850	67.06	74.00	-6.94	75.84	-8.78	Peak
4924.000	28.89	54.00	-25.11	29.64	-0.75	Average	4924.000	30.19	54.00	-23.81	30.94	-0.75	Average
4924.000	41.30	74.00	-32.70	42.05	-0.75	Peak	4924.000	41.61	74.00	-32.39	42.36	-0.75	Peak
7386.000	33.45	54.00	-20.55	29.64	3.81	Average	7386.000	33.16	54.00	-20.84	29.35	3.81	Average
7386.000	45.70	74.00	-28.30	41.89	3.81	Peak	7386.000	44.31	74.00	-29.69	40.50	3.81	Peak

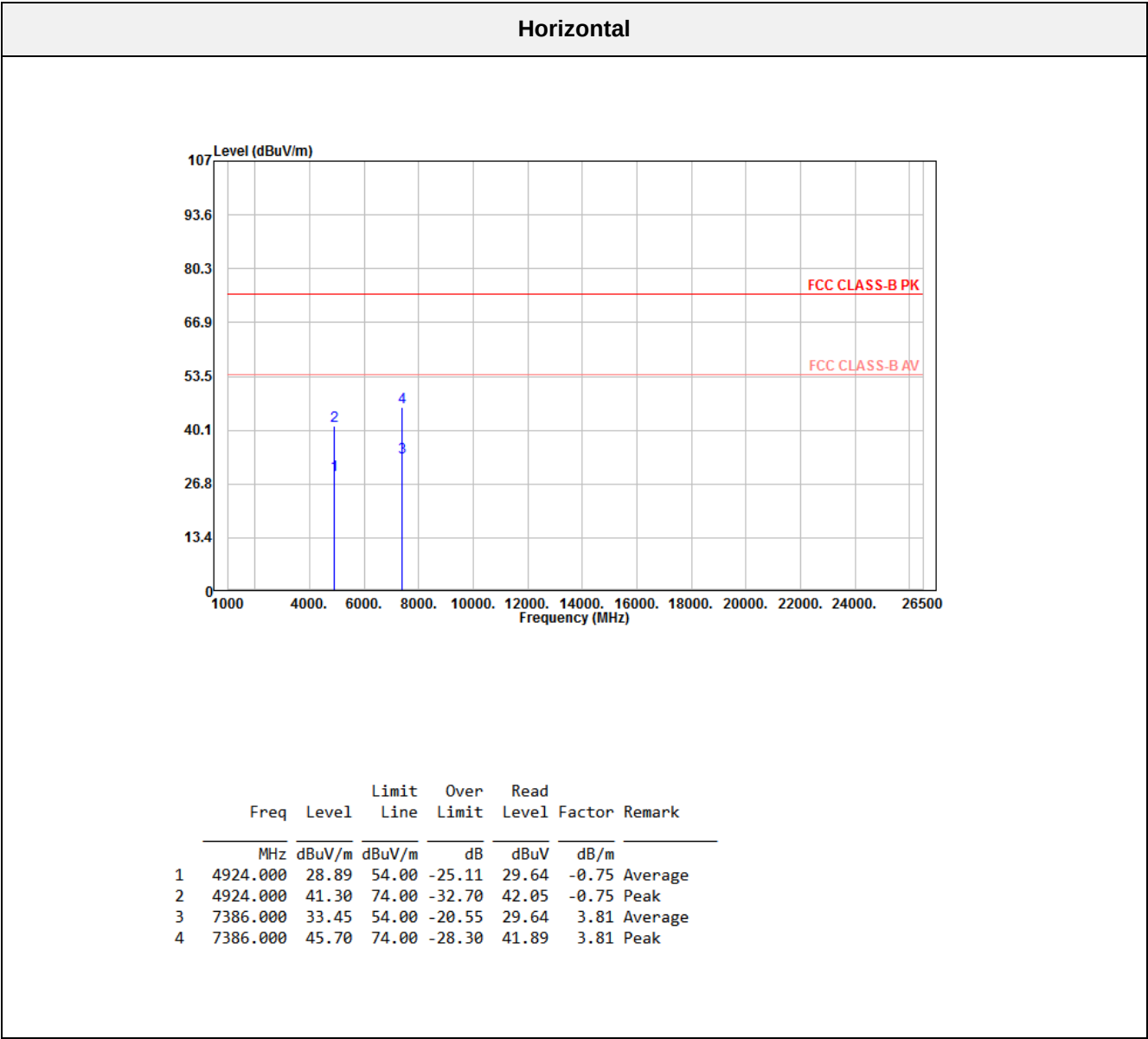
Result = Reading + Correct Factor

Margin = Result – Limit

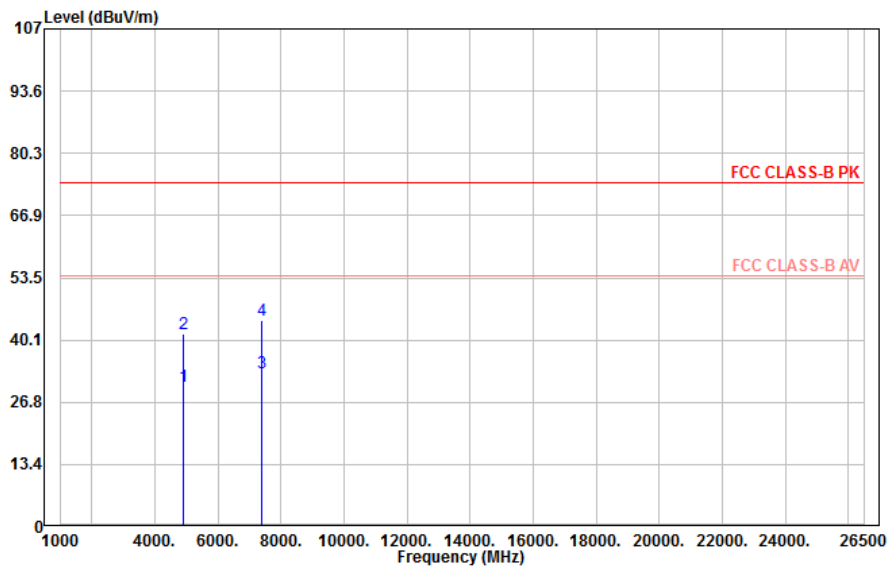
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

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 High channel



Vertical

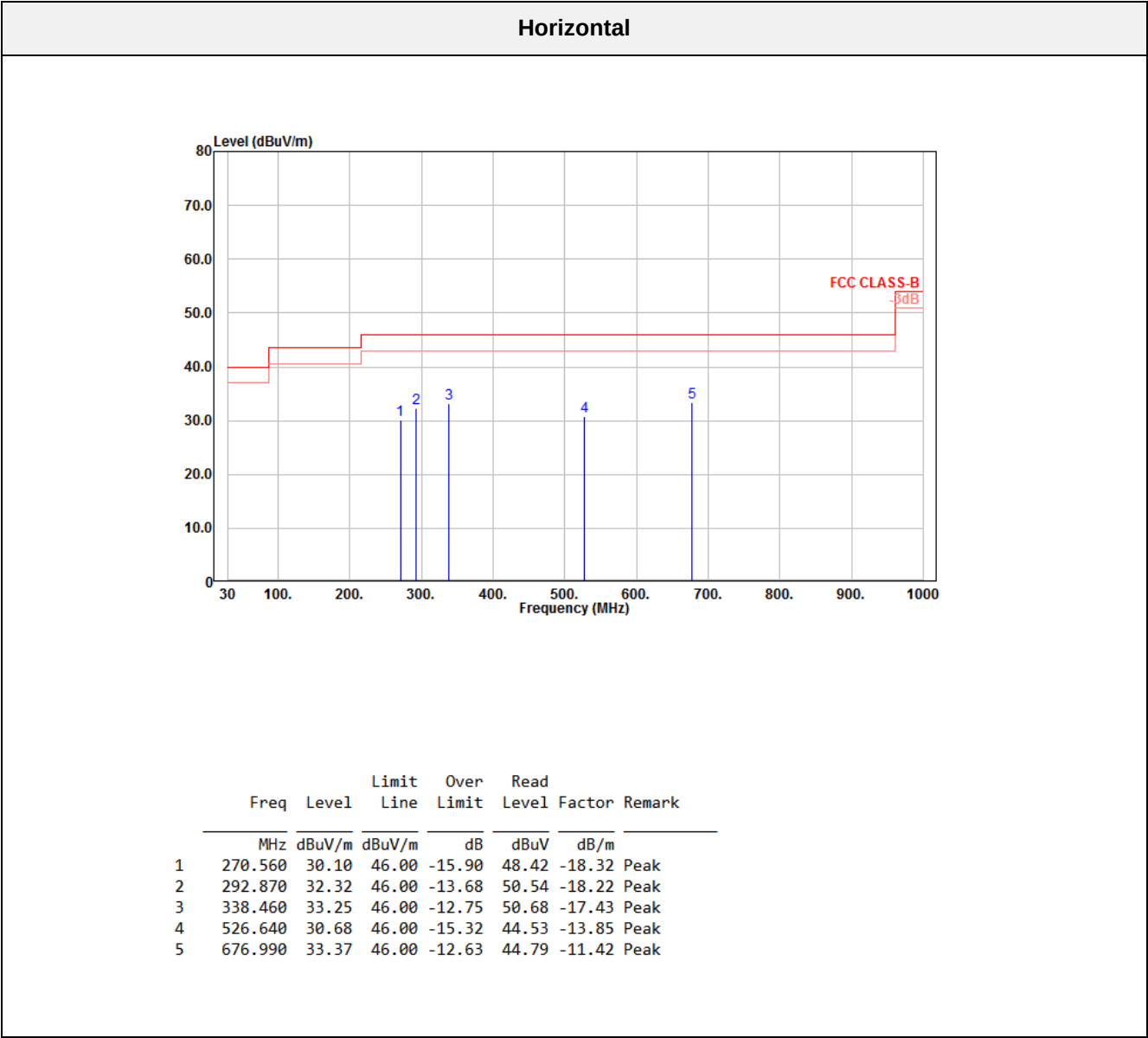


	Freq	Level	Limit	Over	Read		
	MHz	dBuV/m	dBuV/m	Limit	Level	Factor	Remark
1	4924.000	30.19	54.00	-23.81	30.94	-0.75	Average
2	4924.000	41.61	74.00	-32.39	42.36	-0.75	Peak
3	7386.000	33.16	54.00	-20.84	29.35	3.81	Average
4	7386.000	44.31	74.00	-29.69	40.50	3.81	Peak

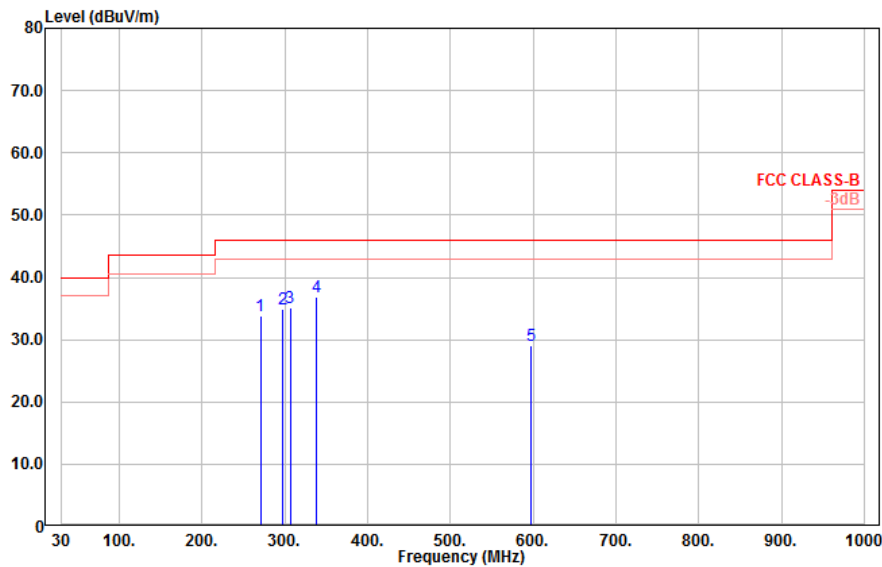
BLE Mode: Transmitting Mode (Pre-scan with three orthogonal axis, and worse case as Z axis)

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

BLE mode: Worst case is BLE Low Channel



Vertical



	Freq	Level	Limit	Over	Read		
	MHz	dBuV/m	dBuV/m	Limit	Level	Factor	Remark
1	270.560	33.75	46.00	-12.25	52.07	-18.32	Peak
2	297.720	34.90	46.00	-11.10	53.10	-18.20	Peak
3	306.450	35.02	46.00	-10.98	53.12	-18.10	Peak
4	338.460	36.96	46.00	-9.04	54.39	-17.43	Peak
5	597.450	29.12	46.00	-16.88	41.94	-12.82	Peak

BLE mode

Low Channel													
Horizontal							Vertical						
Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2364.800	25.85	54.00	-28.15	34.49	-8.64	Average	2364.100	29.43	54.00	-24.57	38.06	-8.63	Average
2364.800	36.55	74.00	-37.45	45.19	-8.64	Peak	2364.100	37.80	74.00	-36.20	46.43	-8.63	Peak
2402.300	94.89			103.61	-8.72	Average	2401.800	99.41			108.13	-8.72	Average
2402.300	95.94			104.66	-8.72	Peak	2401.800	100.46			109.18	-8.72	Peak
4804.000	28.95	54.00	-25.05	30.06	-1.11	Average	4804.000	30.27	54.00	-23.73	31.38	-1.11	Average
4804.000	41.92	74.00	-32.08	43.03	-1.11	Peak	4804.000	41.54	74.00	-32.46	42.65	-1.11	Peak
7206.000	32.13	54.00	-21.87	28.92	3.21	Average	7206.000	31.68	54.00	-22.32	28.47	3.21	Average
7206.000	45.24	74.00	-28.76	42.03	3.21	Peak	7206.000	45.40	74.00	-28.60	42.19	3.21	Peak
Mid Channel													
Horizontal							Vertical						
Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2362.560	23.76	54.00	-30.24	32.39	-8.63	Average	2358.960	23.72	54.00	-30.28	32.34	-8.62	Average
2362.560	35.89	74.00	-38.11	44.52	-8.63	Peak	2358.960	35.77	74.00	-38.23	44.39	-8.62	Peak
2439.840	95.05			103.80	-8.75	Average	2439.840	99.82			108.57	-8.75	Average
2439.840	96.11			104.86	-8.75	Peak	2439.840	100.87			109.62	-8.75	Peak
2524.080	23.42	54.00	-30.58	32.19	-8.77	Average	2515.200	26.14	54.00	-27.86	34.92	-8.78	Average
2524.080	35.24	74.00	-38.76	44.01	-8.77	Peak	2515.200	35.85	74.00	-38.15	44.63	-8.78	Peak
4880.000	29.16	54.00	-24.84	30.04	-0.88	Average	4960.000	29.08	54.00	-24.92	29.82	-0.74	Average
4880.000	44.02	74.00	-29.98	44.90	-0.88	Peak	4960.000	42.36	74.00	-31.64	43.10	-0.74	Peak
7320.000	32.63	54.00	-21.37	29.10	3.53	Average	7320.000	32.40	54.00	-21.60	28.85	3.55	Average
7320.000	46.55	74.00	-27.45	43.02	3.53	Peak	7320.000	45.47	74.00	-28.53	41.92	3.55	Peak
High Channel													
Horizontal							Vertical						
Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Remark
MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	
2479.760	92.07			100.85	-8.78	Average	2479.760	97.40			106.18	-8.78	Average
2479.760	93.13			101.91	-8.78	Peak	2479.760	98.46			107.24	-8.78	Peak
2484.080	26.23	54.00	-27.77	35.01	-8.78	Average	2483.840	29.47	54.00	-24.53	38.25	-8.78	Average
2484.080	38.22	74.00	-35.78	47.00	-8.78	Peak	2483.840	40.70	74.00	-33.30	49.48	-8.78	Peak
4960.000	29.54	54.00	-24.46	30.28	-0.74	Average	4960.000	29.35	54.00	-24.65	30.09	-0.74	Average
4960.000	41.95	74.00	-32.05	42.69	-0.74	Peak	4960.000	41.00	74.00	-33.00	41.74	-0.74	Peak
7440.000	32.38	54.00	-21.62	28.35	4.03	Average	7440.000	33.36	54.00	-20.64	29.39	3.97	Average
7440.000	45.80	74.00	-28.20	41.77	4.03	Peak	7440.000	45.21	74.00	-28.79	41.24	3.97	Peak

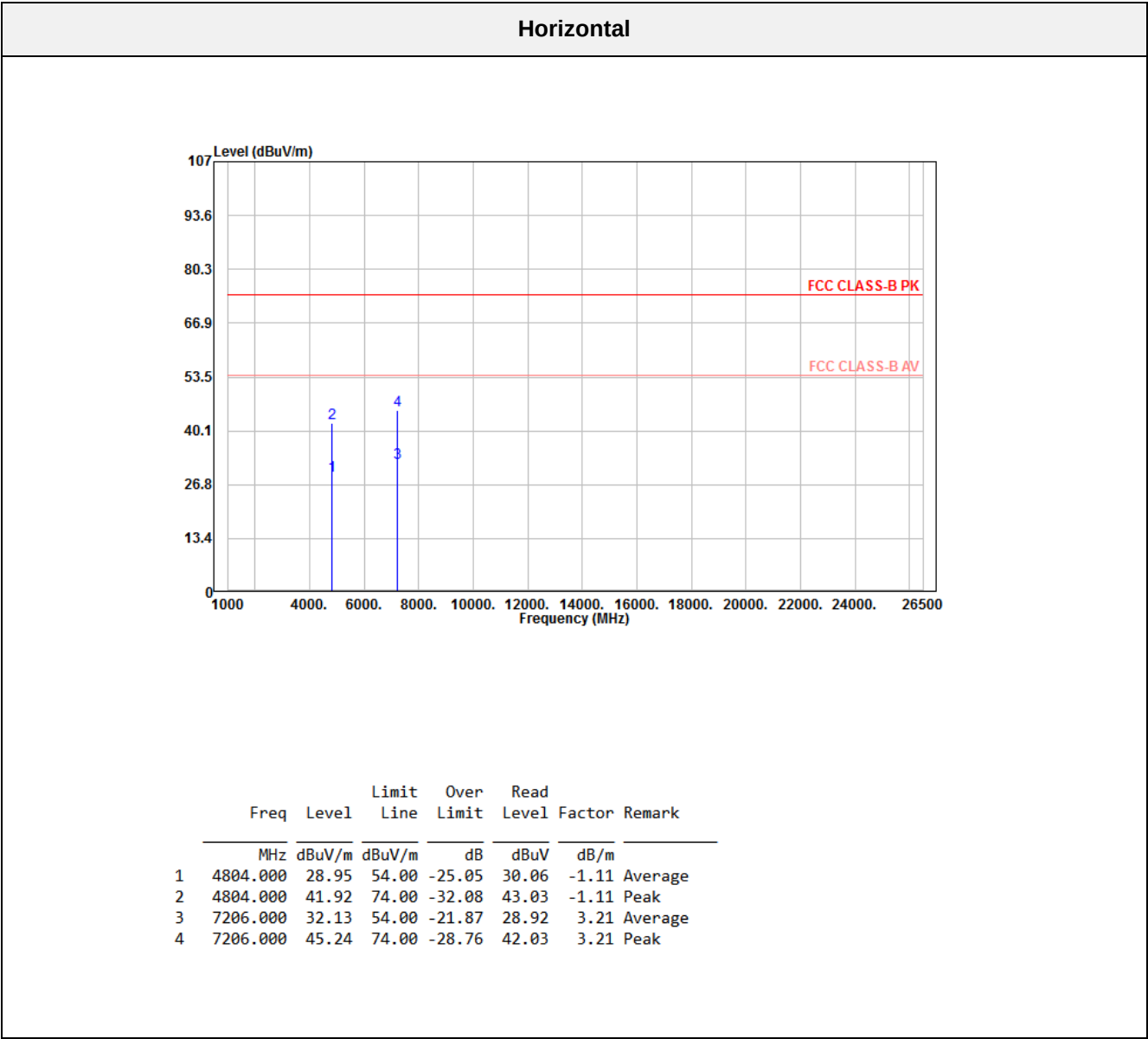
Result = Reading + Correct Factor

Margin = Result – Limit

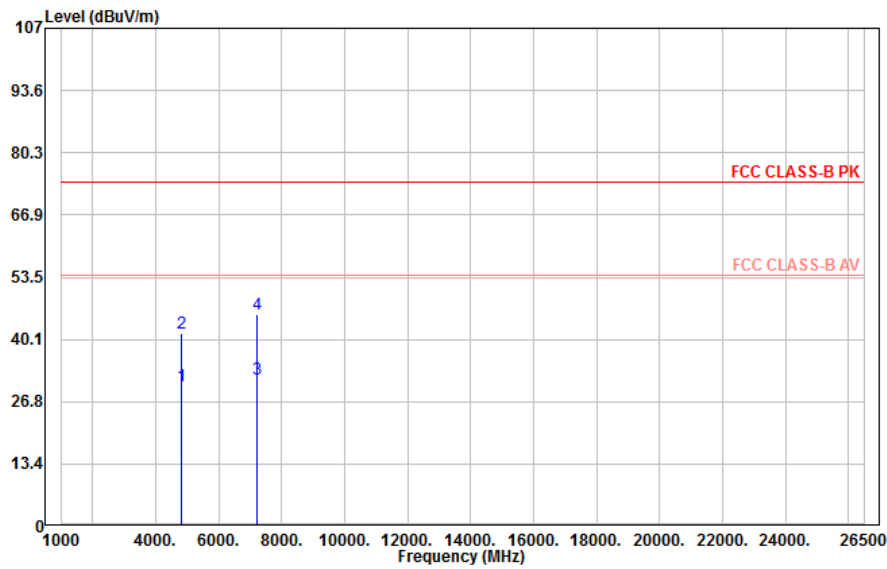
Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain

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 BLE mode High channel



Vertical

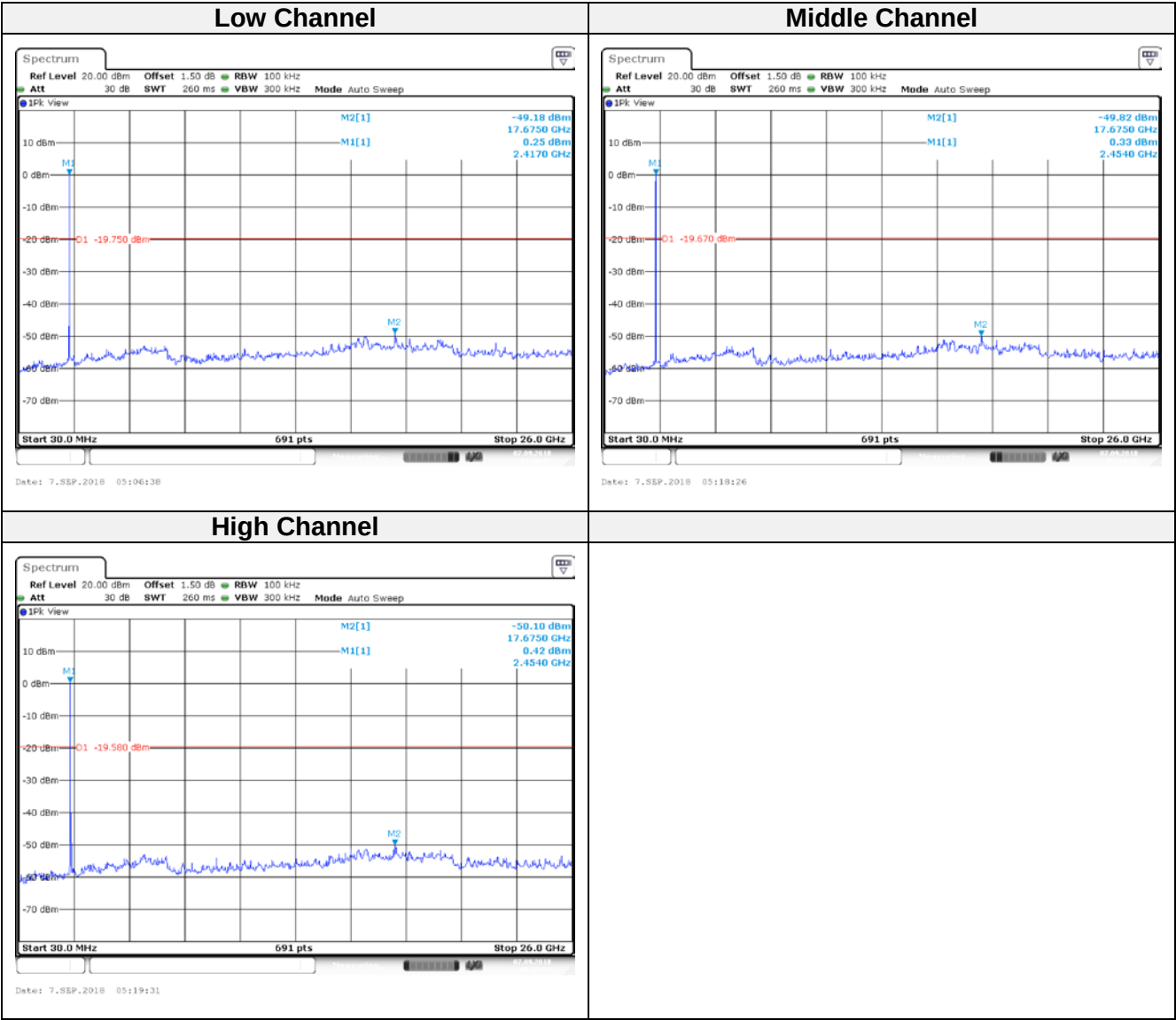


	Freq	Level	Limit	Over	Read		
	MHz	dBuV/m	dBuV/m	Limit	Level	Factor	Remark
1	4804.000	30.27	54.00	-23.73	31.38	-1.11	Average
2	4804.000	41.54	74.00	-32.46	42.65	-1.11	Peak
3	7206.000	31.68	54.00	-22.32	28.47	3.21	Average
4	7206.000	45.40	74.00	-28.60	42.19	3.21	Peak

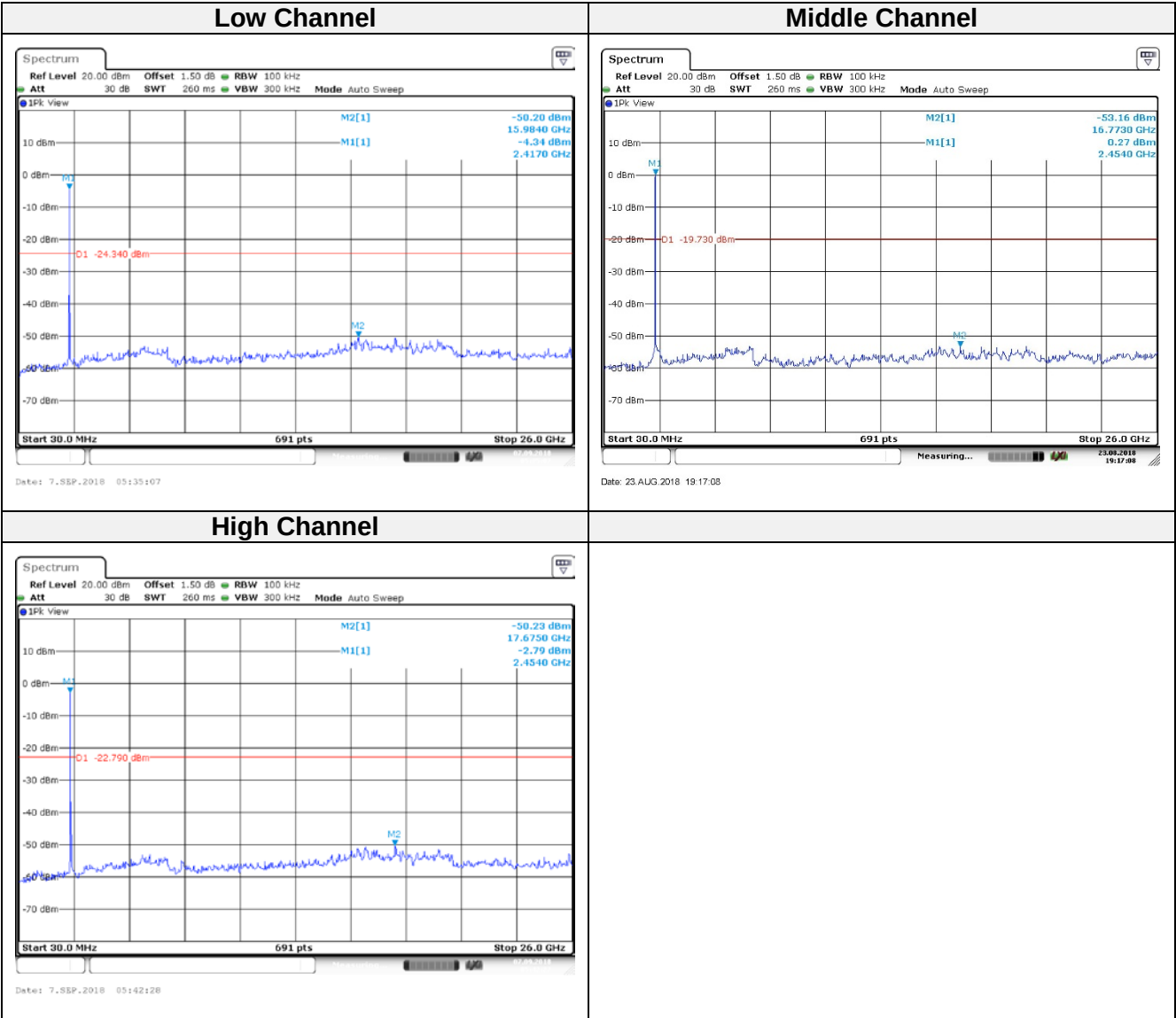
Conducted Spurious Emissions:

Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Result
B mode				
Low	2412	48.93	≥ 20	Compliance
Mid	2437	49.49	≥ 20	Compliance
High	2462	49.68	≥ 20	Compliance
G mode				
Low	2412	45.86	≥ 20	Compliance
Mid	2437	52.89	≥ 20	Compliance
High	2462	47.44	≥ 20	Compliance
N20 mode				
Low	2412	47.15	≥ 20	Compliance
Mid	2437	47.64	≥ 20	Compliance
High	2462	48.23	≥ 20	Compliance
BLE mode				
Low	2402	48.86	≥ 20	Compliance
Mid	2440	46.62	≥ 20	Compliance
High	2480	49.16	≥ 20	Compliance

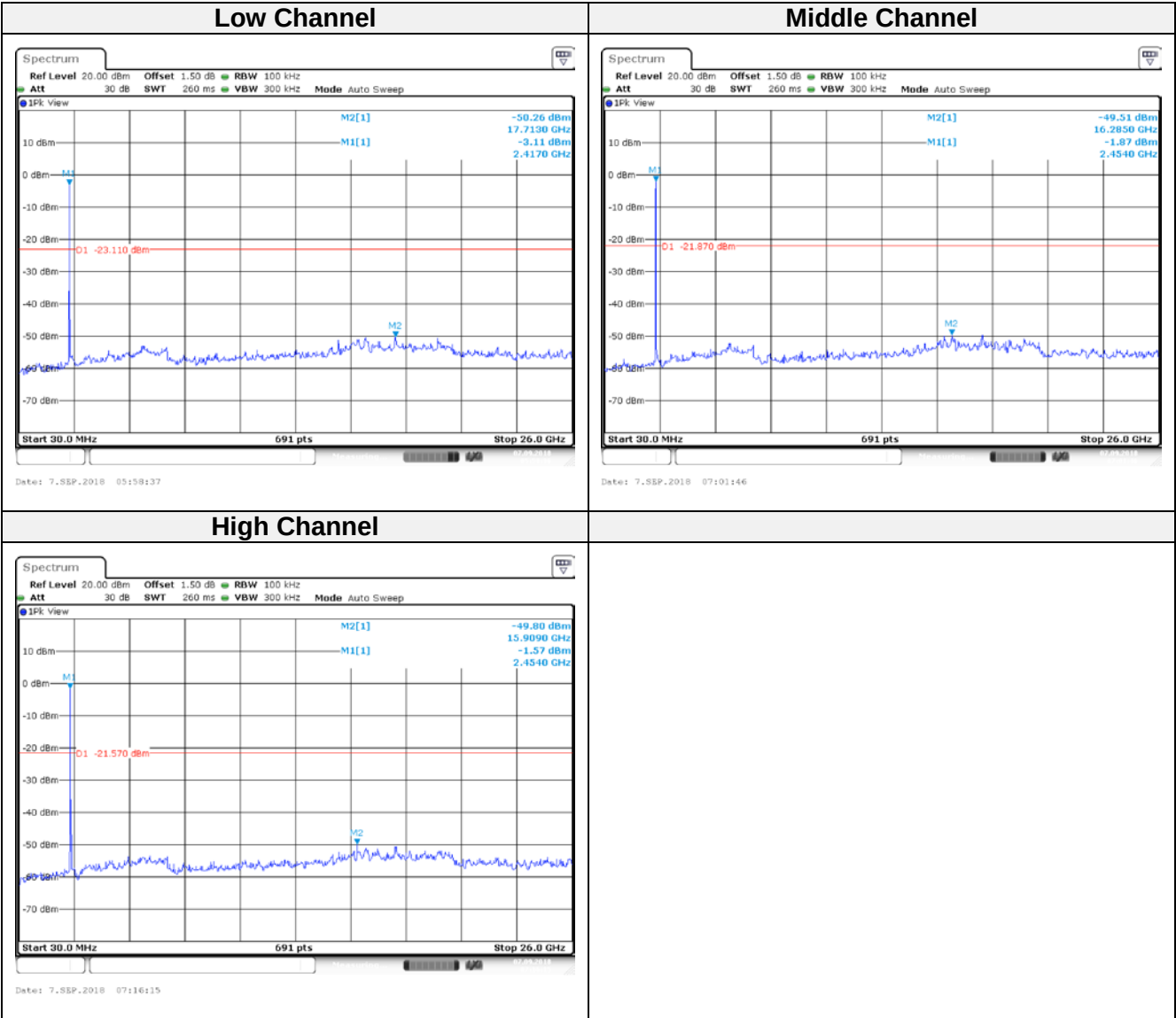
Wi-Fi B mode:



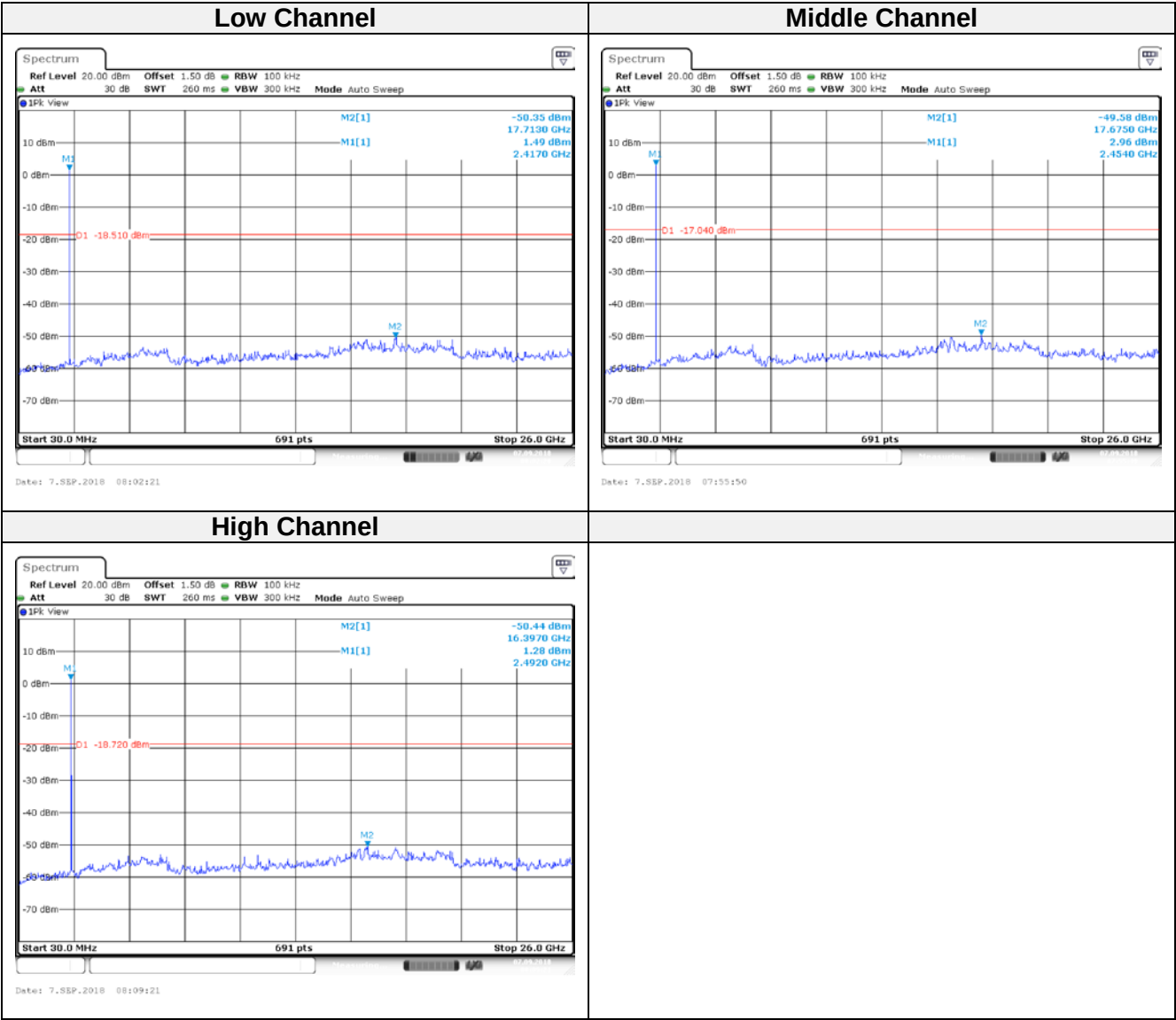
Wi-Fi G mode:



Wi-Fi N20 mode:



BLE mode:



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

6 dB Emission Bandwidth

The steps for the first option are as follows:

- a) Set RBW = 100 kHz.
- b) Set the VBW $\geq [3 \times \text{RBW}]$.
- 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	FSU26	101140	2017/11/15	2018/11/14
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).

8.4 Test Environmental Conditions

Temperature:	22.1 °C
Relative Humidity:	61.0 %
ATM Pressure:	1015 hPa

The testing was performed by Eric Lee from 2018-08-14 to 2018-09-07.

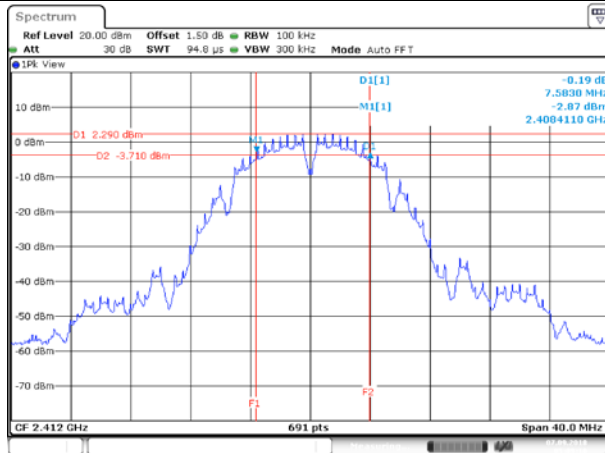
8.5 Test Results

Channel	Frequency (MHz)	99% Bandwidth (MHz)	6 dB Emission Bandwidth (MHz)	6dB Limit (MHz)	Result
B mode					
Low	2412	11.72	7.58	> 0.5	Compliance
Middle	2437	11.65	7.24	> 0.5	Compliance
High	2462	11.72	7.64	> 0.5	Compliance
G mode					
Low	2412	18.09	15.75	> 0.5	Compliance
Middle	2437	17.80	16.04	> 0.5	Compliance
High	2462	17.51	15.80	> 0.5	Compliance
N20 mode					
Low	2412	18.09	15.75	> 0.5	Compliance
Middle	2437	17.87	16.04	> 0.5	Compliance
High	2462	17.51	16.04	> 0.5	Compliance
BLE mode					
Low	2402	1.05	0.729	> 0.5	Compliance
Middle	2440	1.05	0.725	> 0.5	Compliance
High	2480	1.05	0.695	> 0.5	Compliance

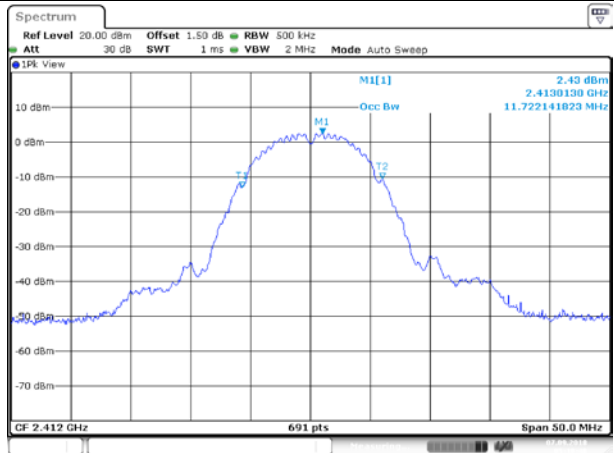
Please refer to the following plots

Wi-Fi B mode Low CH:

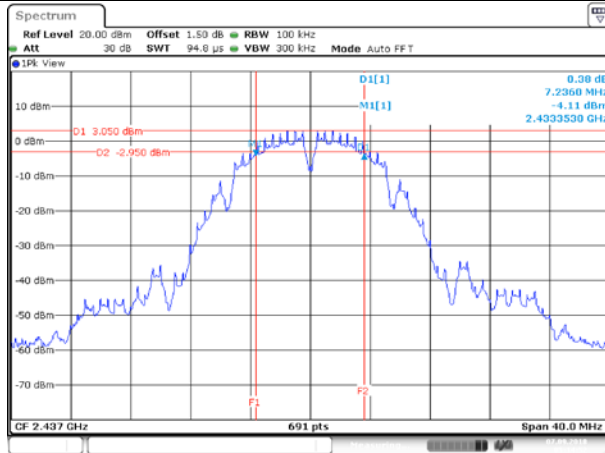
6 dB Emission Bandwidth Low Channel



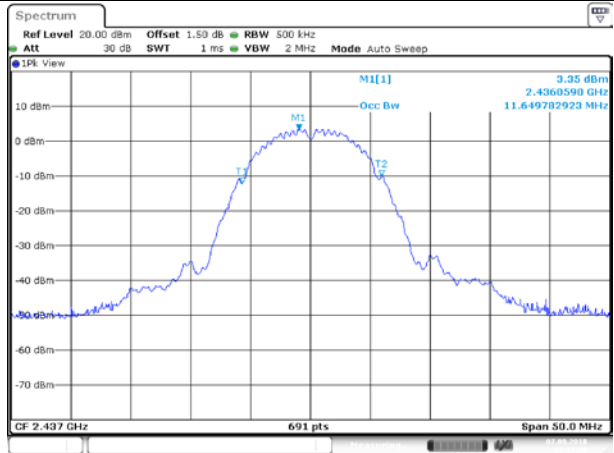
Occupied Bandwidth (99%) Low Channel



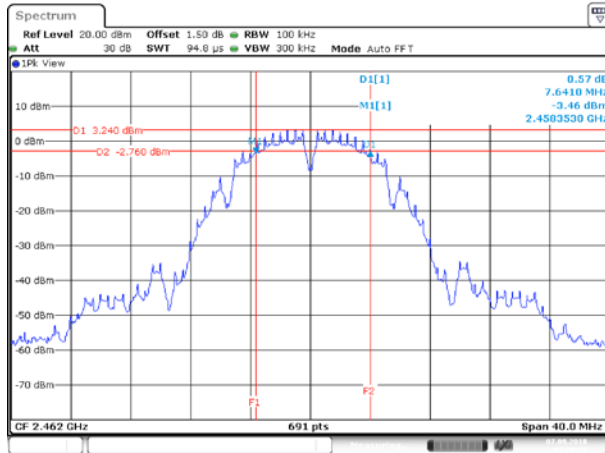
Middle Channel



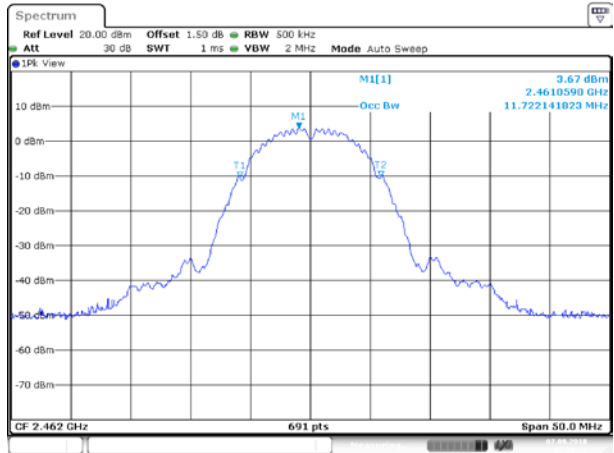
Middle Channel



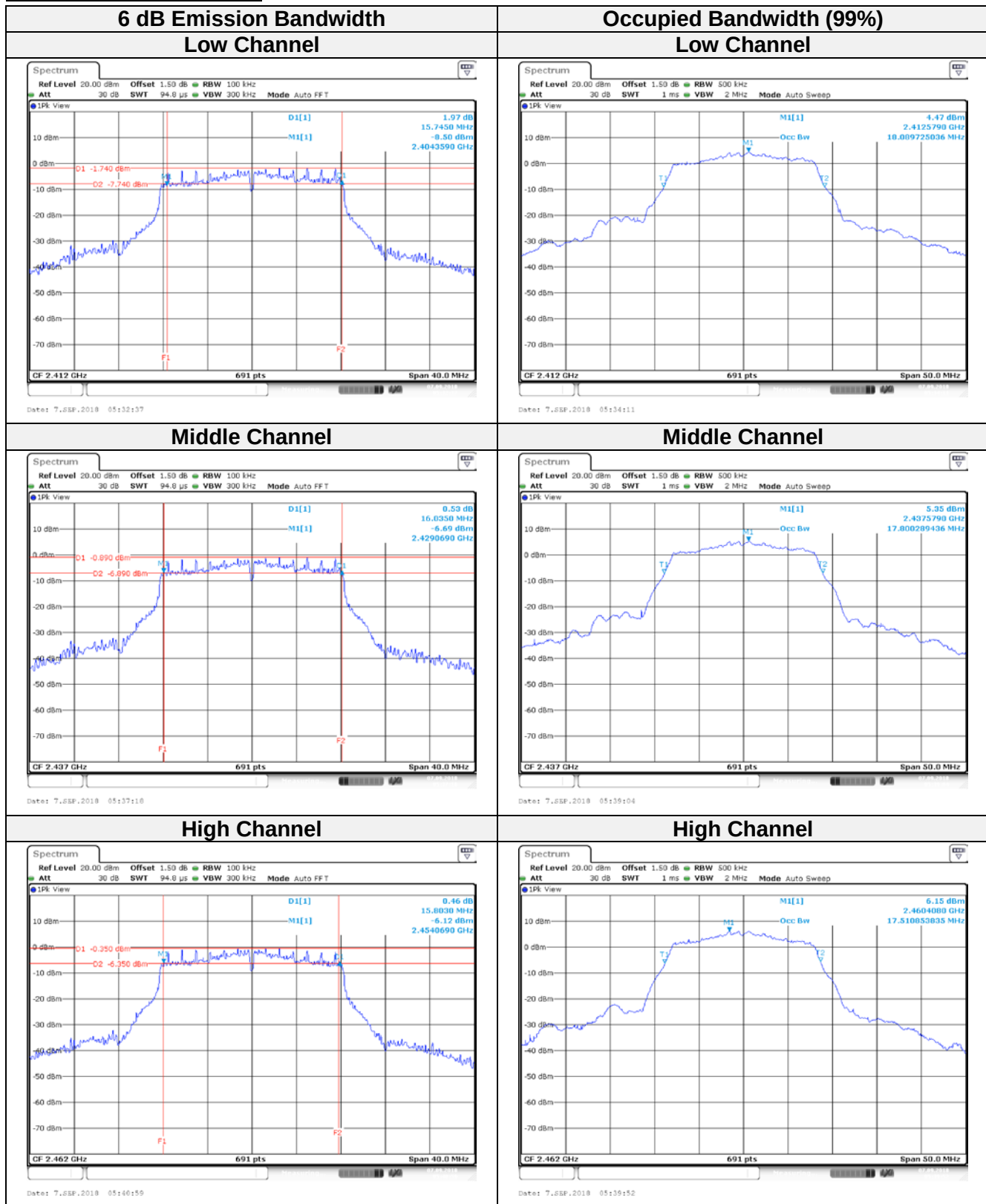
High Channel



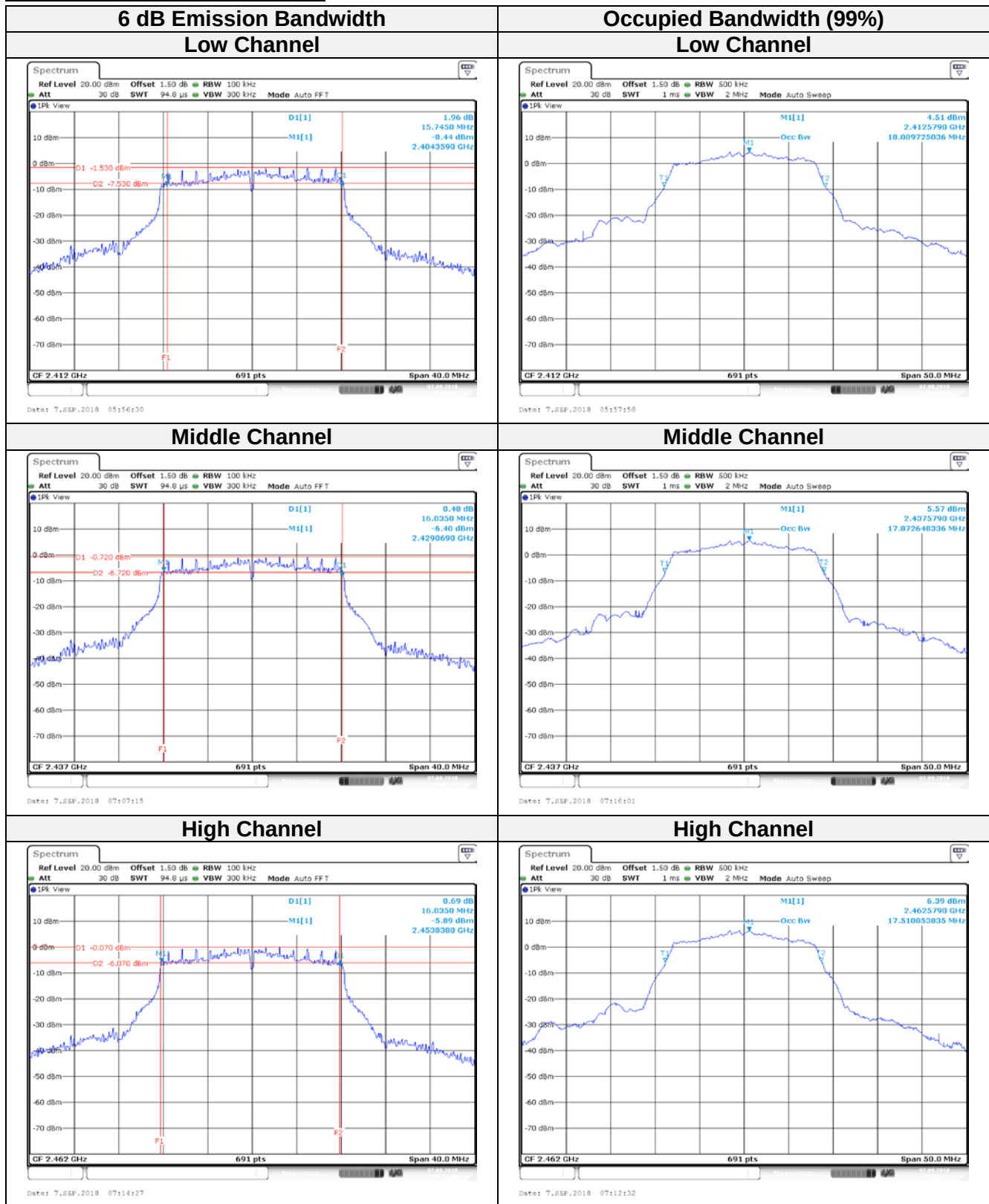
High Channel



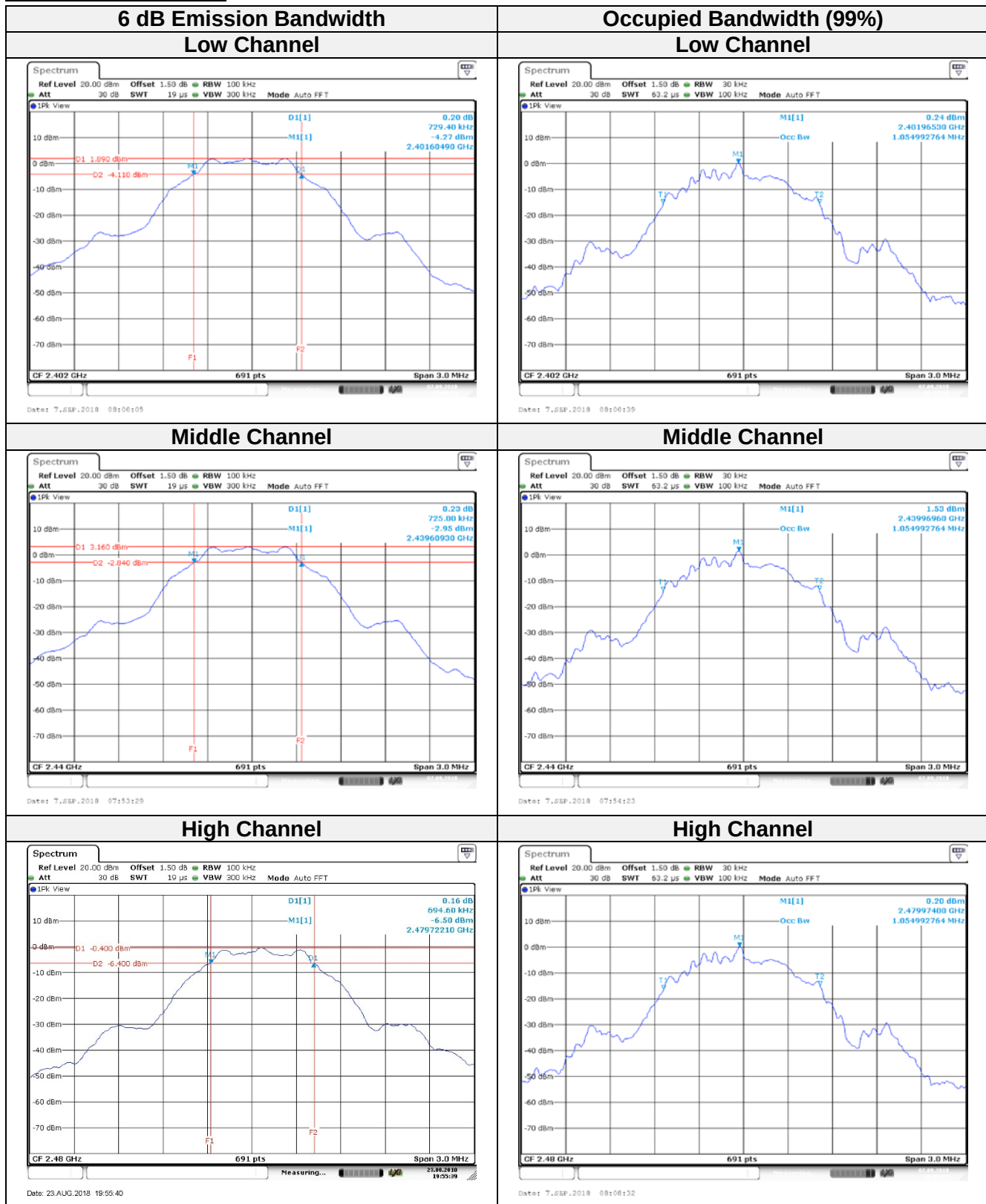
Wi-Fi G mode Low CH:



Wi-Fi HT N20 mode Low CH:



BLE mode Low 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
Power Sensor	KEYSIGHT	U2021XA	MY54080018	2018/03/07	2019/03/06
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).

9.4 Test Environmental Conditions

Temperature:	22.1 °C
Relative Humidity:	61.0 %
ATM Pressure:	1015 hPa

The testing was performed by Eric Lee from 2018-08-14 to 2018-09-07.

9.5 Test Results

Channel	Frequency (MHz)	Maximum peak Conducted Output Power (dBm)	Limit (dBm)	Result
B mode				
Low	2412	14.39	30	Compliance
Middle	2437	14.97	30	Compliance
High	2462	15.31	30	Compliance
G mode				
Low	2412	21.15	30	Compliance
Middle	2437	21.78	30	Compliance
High	2462	22.11	30	Compliance
N20 mode				
Low	2412	21.20	30	Compliance
Middle	2437	21.64	30	Compliance
High	2462	22.08	30	Compliance
BLE mode				
Low	2402	1.16	30	Compliance
Middle	2440	1.17	30	Compliance
High	2480	-0.65	30	Compliance

Channel	Frequency (MHz)	Average Output Power (dBm)	Limit (dBm)	Result
B mode				
Low	2412	11.38	30	Compliance
Middle	2437	11.84	30	Compliance
High	2462	12.27	30	Compliance
G mode				
Low	2412	10.42	30	Compliance
Middle	2437	11.22	30	Compliance
High	2462	11.68	30	Compliance
N20 mode				
Low	2412	10.48	30	Compliance
Middle	2437	10.98	30	Compliance
High	2462	11.62	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	FSU26	101140	2017/11/15	2018/11/14
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).

10.4 Test Environmental Conditions

Temperature:	22.1 °C
Relative Humidity:	61.0 %
ATM Pressure:	1015 hPa

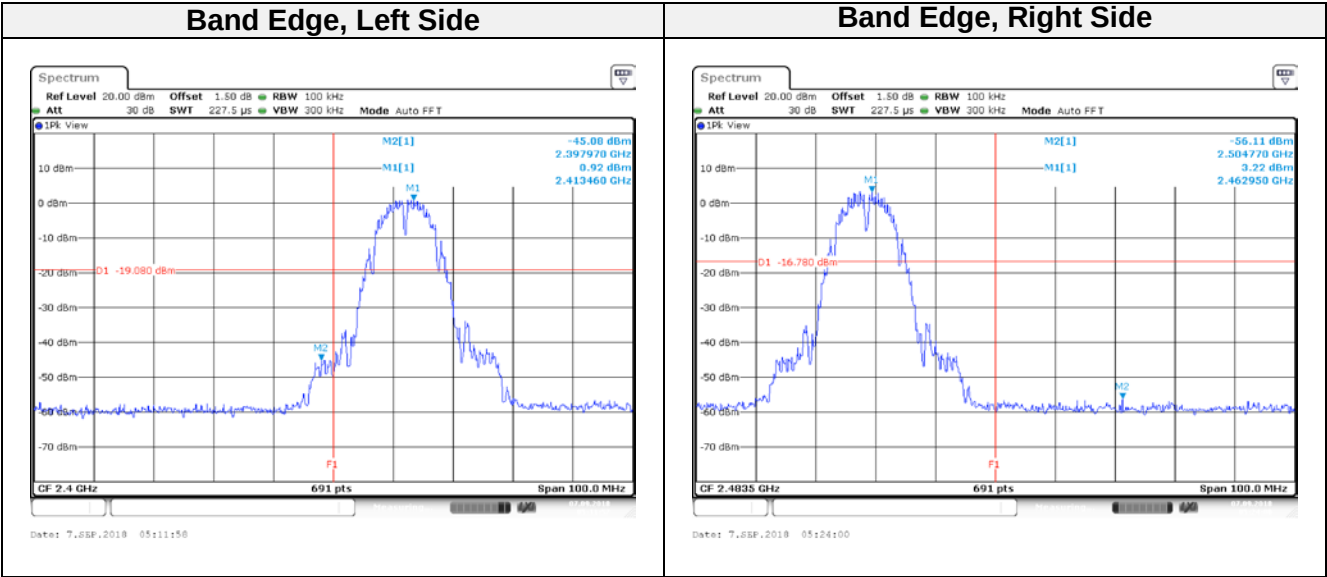
The testing was performed by Eric Lee from 2018-08-14 to 2018-09-07.

10.5 Test Results

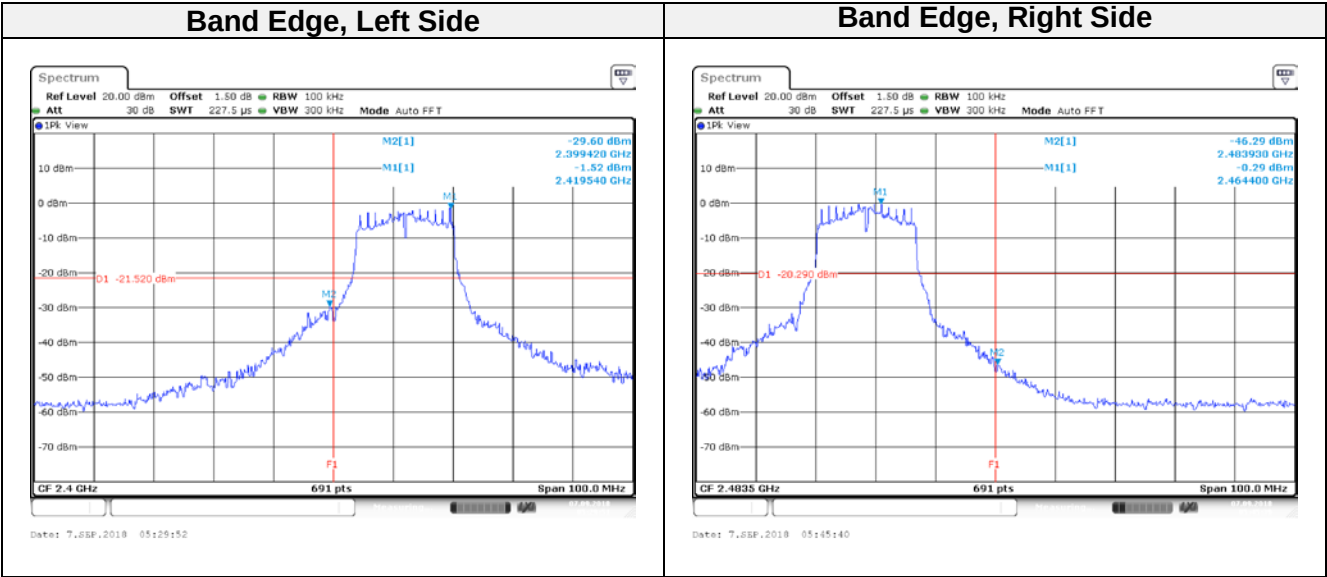
Channel	Frequency (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	RESULT
B mode				
Low	2412	44.16	≥ 20	PASS
High	2462	52.89	≥ 20	PASS
G mode				
Low	2412	28.08	≥ 20	PASS
High	2462	46.00	≥ 20	PASS
N20 mode				
Low	2412	28.18	≥ 20	PASS
High	2462	46.54	≥ 20	PASS
BLE mode				
Low	2402	52.41	≥ 20	PASS
High	2480	55.17	≥ 20	PASS

Please refer to the following plots

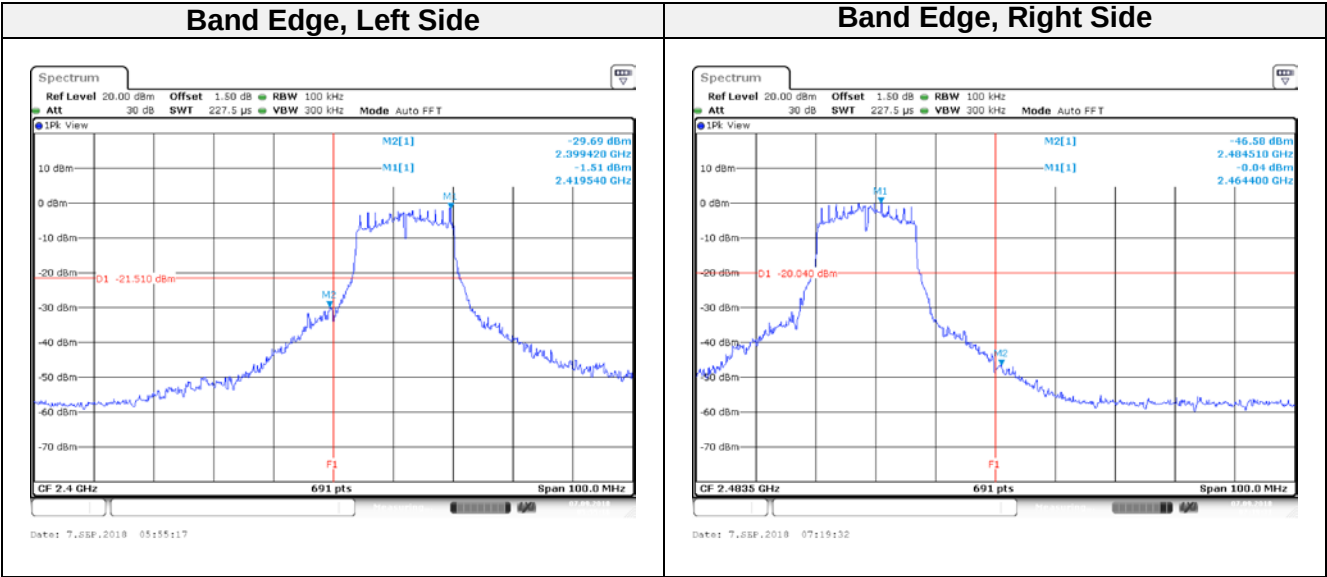
Wi-Fi B mode:



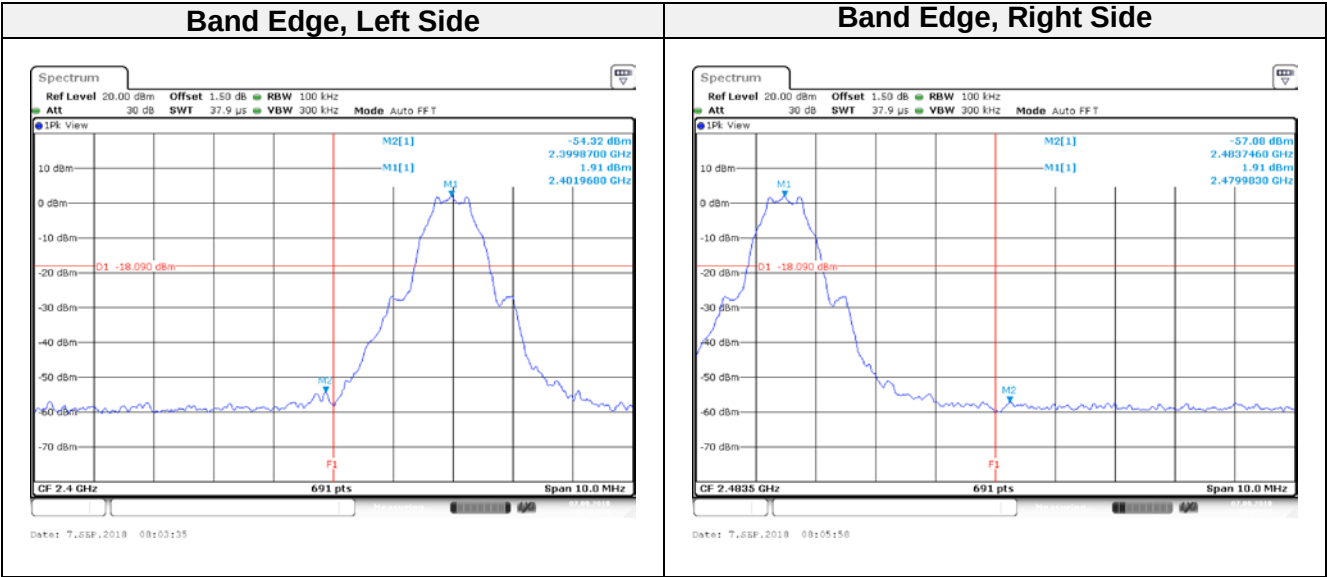
Wi-Fi G mode:



Wi-Fi N20 mode:



BLE mode:



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

- Set analyzer center frequency to DTS channel center frequency.
- Set the span to 1.5 times the DTS bandwidth.
- Set the RBW to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- Set the VBW $\geq [3 \times \text{RBW}]$.
- Detector = peak.
- Sweep time = auto couple.
- Trace mode = max hold.
- Allow trace to fully stabilize.
- Use the peak marker function to determine the maximum amplitude level within the RBW.
- 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	FSU26	101140	2017/11/15	2018/11/14
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).

11.4 Test Environmental Conditions

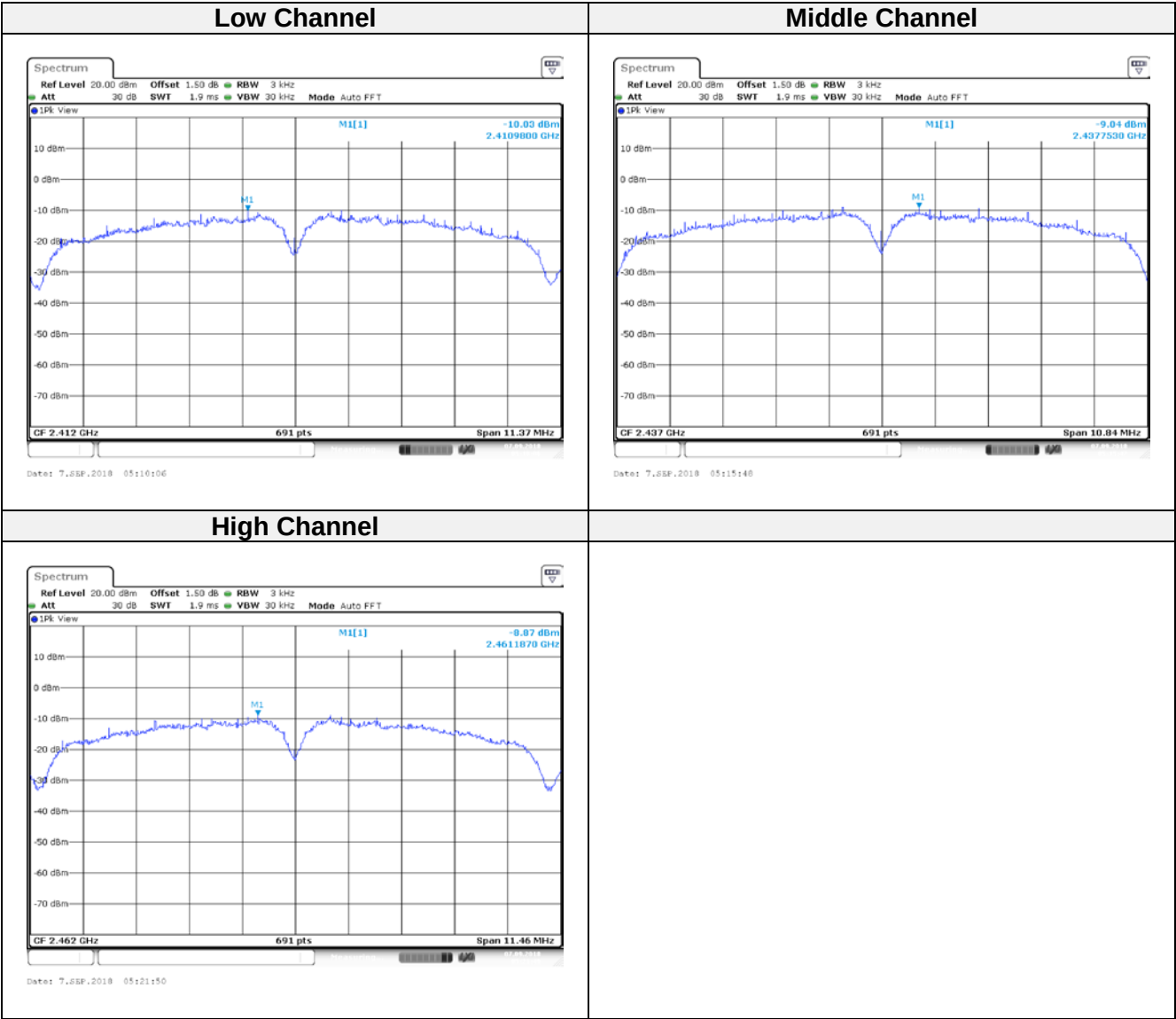
Temperature:	22.1 °C
Relative Humidity:	61.0 %
ATM Pressure:	1015 hPa

The testing was performed by Eric Lee from 2018-08-14 to 2018-09-07.

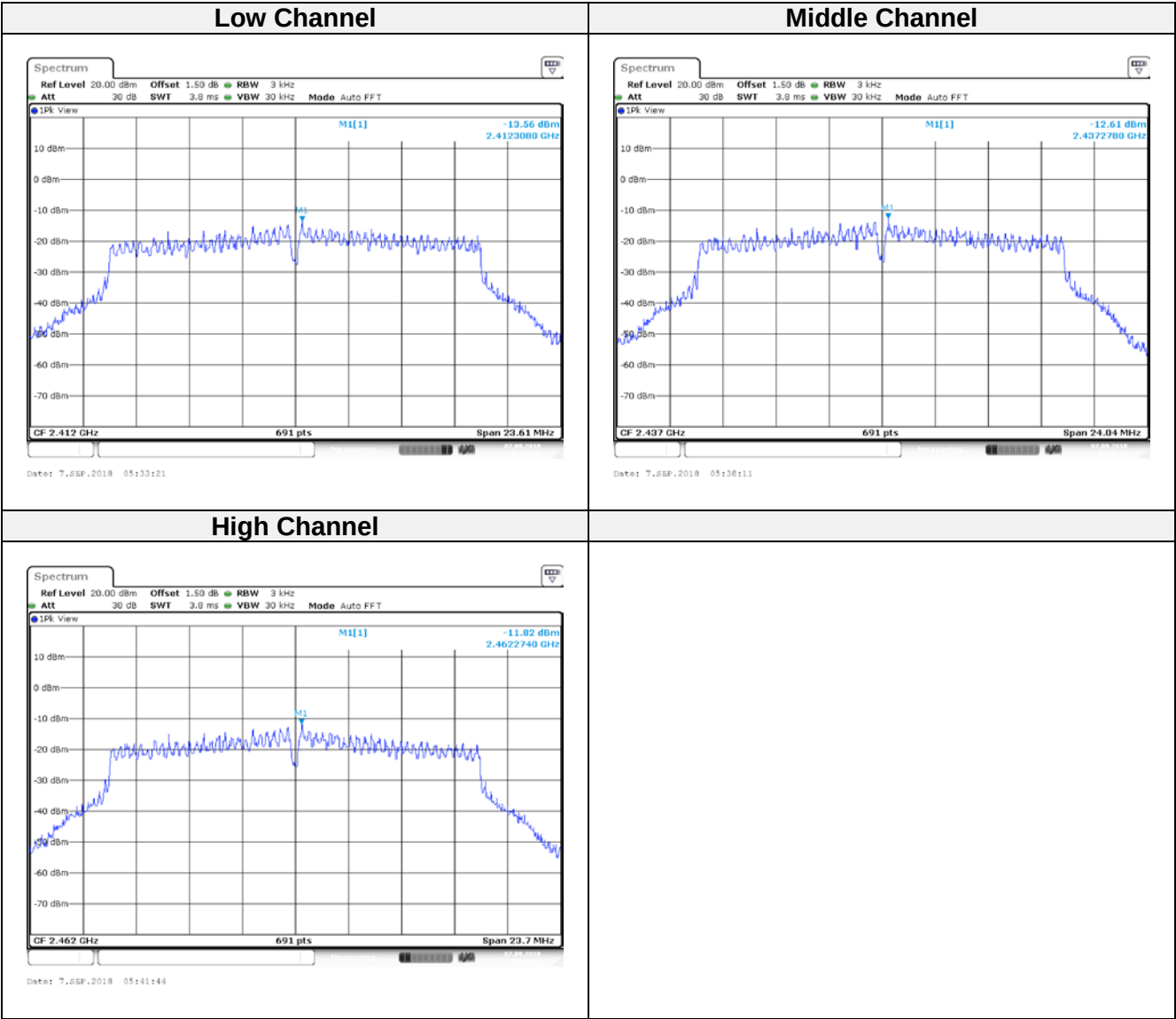
11.5 Test Results

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Result
B mode				
Low	2412	-10.03	8	Compliance
Middle	2437	-9.04	8	Compliance
High	2462	-8.87	8	Compliance
G mode				
Low	2412	-13.56	8	Compliance
Middle	2437	-12.61	8	Compliance
High	2462	-11.82	8	Compliance
N20 mode				
Low	2412	-13.51	8	Compliance
Middle	2437	-12.41	8	Compliance
High	2462	-11.56	8	Compliance
BLE mode				
Low	2402	-11.66	8	Compliance
Middle	2440	-10.33	8	Compliance
High	2480	-12.17	8	Compliance

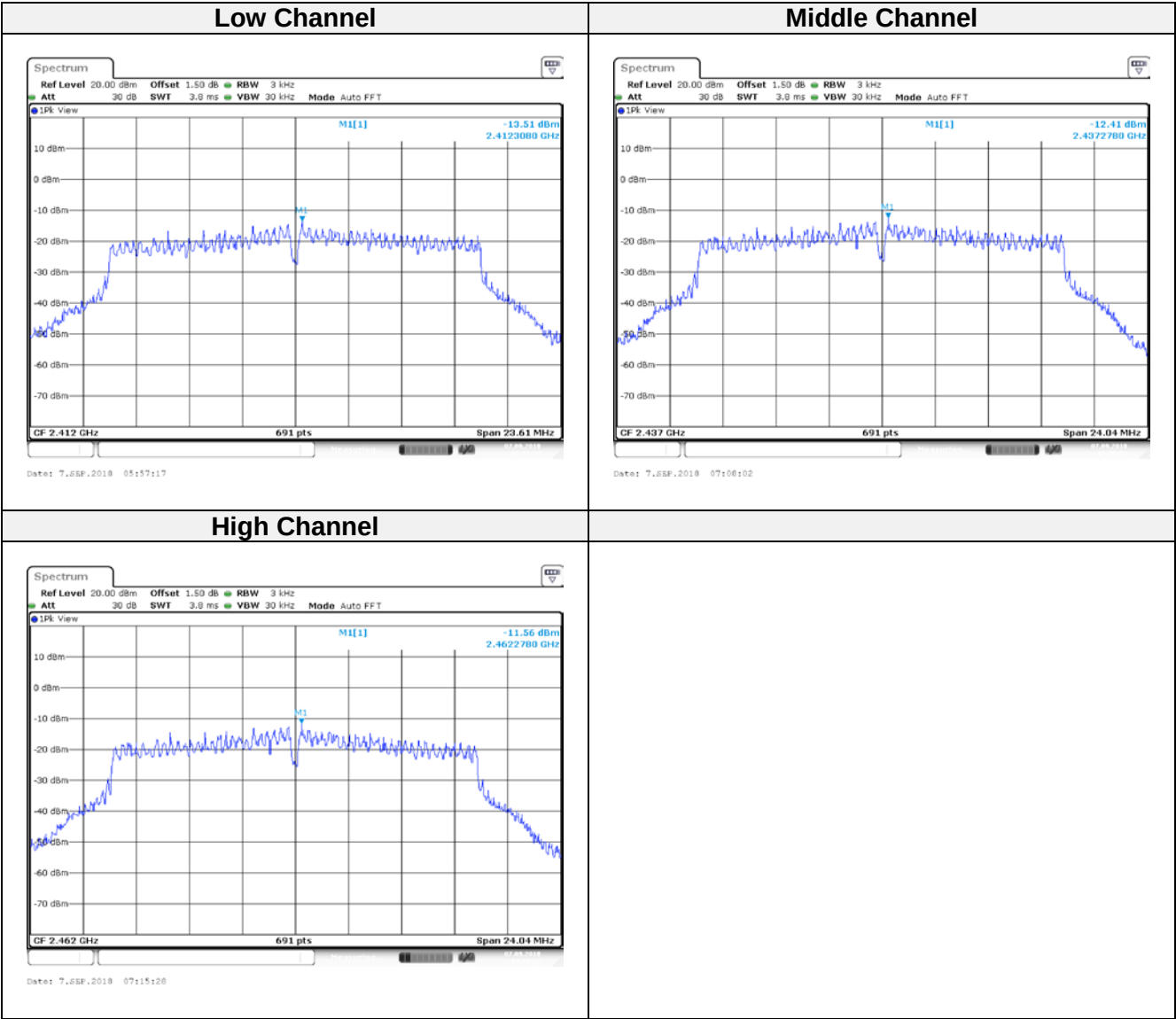
Wi-Fi B mode:



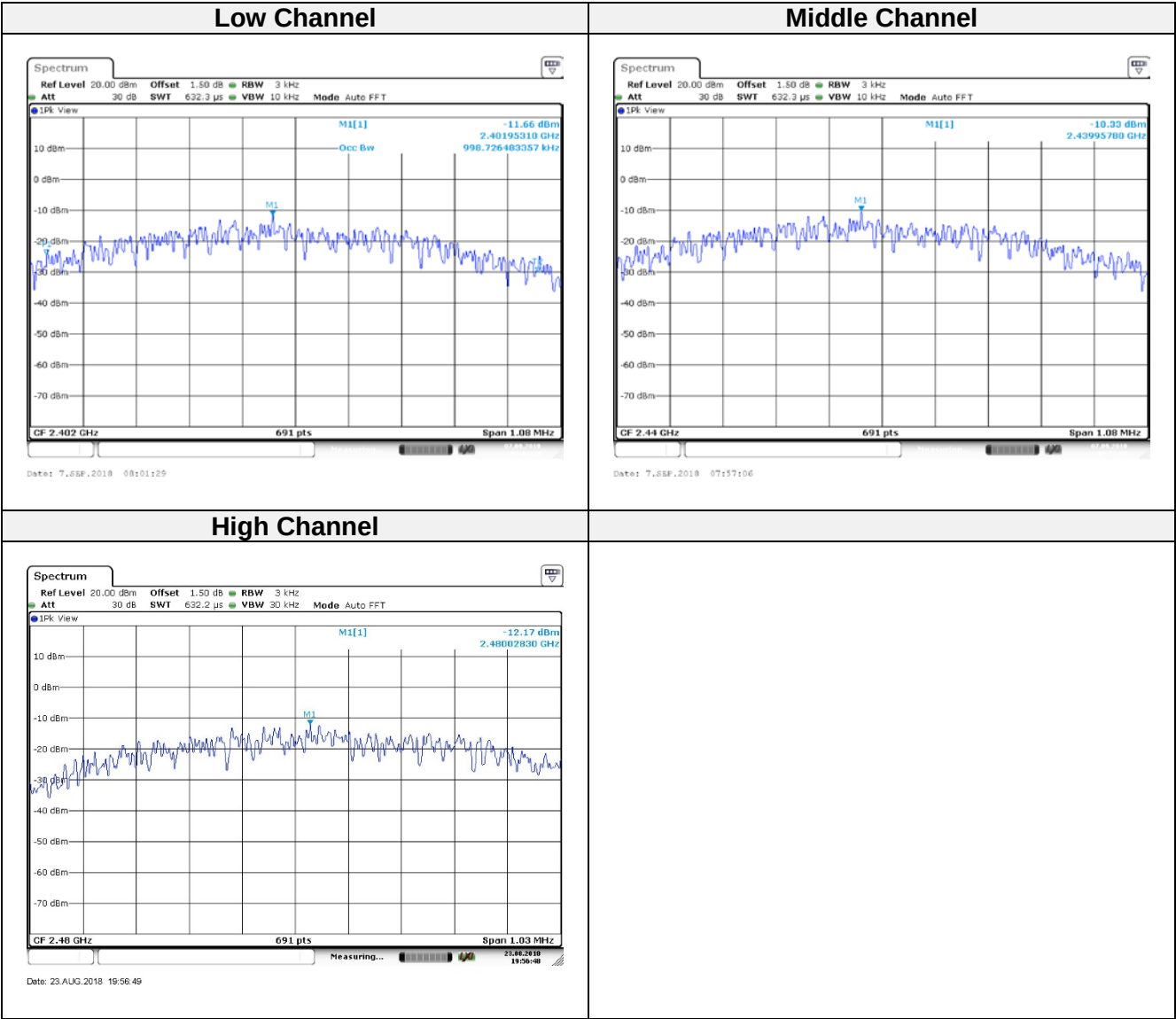
Wi-Fi G mode:



Wi-Fi N20 mode:



BLE mode:



----- END OF REPORT -----