

FCC Test Report

Report No.: RF170314C20

FCC ID: ZQAT40

Test Model: A0063

Received Date: Mar. 14, 2017

Test Date: Mar. 23, 2017 ~ Aug. 25, 2017

Issued Date: Aug. 25, 2017

Applicant: Nest Labs Inc.

Address: 3400 Hillview Ave, Palo Alto, CA 94304

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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(R.O.C)

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Release Control Record

Issue No.	Description	Date Issued
RF170314C20	Original Release	Aug. 25, 2017

1 Certificate of Conformity

Product: Nest Thermostat E

Brand: Nest

Test Model: A0063

Sample Status: Production Unit

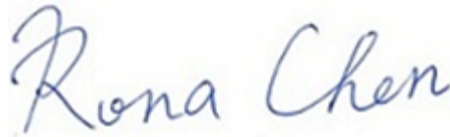
Applicant: Nest Labs Inc.

Test Date: Mar. 23, 2017 ~ Aug. 25, 2017

Standards: 47 CFR FCC Part 15, Subpart C (Section 15.247)
ANSI C63.10:2013

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by :



Date:

Aug. 25, 2017

Rona Chen / Specialist

Approved by :



Date:

Aug. 25, 2017

David Huang / Project Engineer

2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -15.17 dB at 0.16535 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.07 dB at 2386.32 MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6 dB Bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	No antenna connector is used.

2.1 Measurement Uncertainty

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

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

Measurement	Frequency	Expanded Uncertainty (k=2) (\pm)
Conducted Emissions at mains ports	150 kHz ~ 30 MHz	2.44 dB
Radiated Emissions up to 1 GHz	30 MHz ~ 200 MHz	2.93 dB
	200 MHz ~ 1000 MHz	2.95 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	2.26 dB
	18 GHz ~ 40 GHz	1.94 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Nest Thermostat E
Brand	Nest
Test Model	A0063
Status of EUT	Production Unit
Power Supply Rating	3.7 Vdc (Li-ion battery) 24 Vac (Home System Breaker Box)
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11.0 / 5.5 / 2.0 / 1.0 Mbps 802.11g: 54.0 / 48.0 / 36.0 / 24.0 / 18.0 / 12.0 / 9.0 / 6.0 Mbps 802.11n: up to MCS7
Operating Frequency	2412 ~ 2462 MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20)
Output Power	271.019 mW
Antenna Type	IFA antenna with 0.85 dBi gain
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

- The EUT provides 1 completed transmitter and 1 receiver.

Modulation Mode	TX Function
802.11b	1TX
802.11g	1TX
802.11n (HT20)	1TX

- The EUT contains following accessory devices.

Product	Brand	Model	Description
Battery	ATL	N/A	3.7 Vdc, 570 mAh

- The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE \geq 1G	RE<1G	PLC	APCM	
A	√	√	√	√	EUT with USB Charger
B	-	√	-	√	EUT with Home System Breaker Box

Where **RE \geq 1G**: Radiated Emission above 1 GHz **RE<1G**: Radiated Emission below 1 GHz
PLC: Power Line Conducted Emission **APCM**: Antenna Port Conducted Measurement

NOTE: 1. The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Z-plane**.
 2. The EUT had been verified Mode A and Mode B. And Mode A had the worse result. Therefore, Mode A was chosen for all test, Mode B was tested on RE<1G test and PLC test.
 3. "-" means no effect.

Radiated Emission Test (Above 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	MCS0

Radiated Emission Test (Below 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A, B	802.11b	1 to 11	1	DSSS	DBPSK	1.0

Power Line Conducted Emission Test:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A, B	802.11b	1 to 11	1	DSSS	DBPSK	1.0

Bandedge Measurement:

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	802.11b	1 to 11	1, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 11	OFDM	BPSK	6.0
A	802.11n (HT20)	1 to 11	1, 11	OFDM	BPSK	MCS0

Antenna Port Conducted Measurement:

- This item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).
- Following channel(s) was (were) selected for the final test as listed below.

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
A	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
A	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
A	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	MCS0

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE≥1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
RE<1G	25 deg. C, 65 % RH	120 Vac, 60 Hz	Gavin Wu
PLC	25 deg. C, 65 % RH	120 Vac, 60 Hz	Han Wu
APCM	25 deg. C, 65 % RH	3.7 Vdc	Wayne Lin

3.3 Duty Cycle of Test Signal

802.11b: Duty cycle = $4.038/4.288 = 0.942$, Duty factor = $10 * \log(1/0.942) = 0.26$

802.11g: Duty cycle = $0.668/0.918 = 0.728$, Duty factor = $10 * \log(1/0.728) = 1.38$

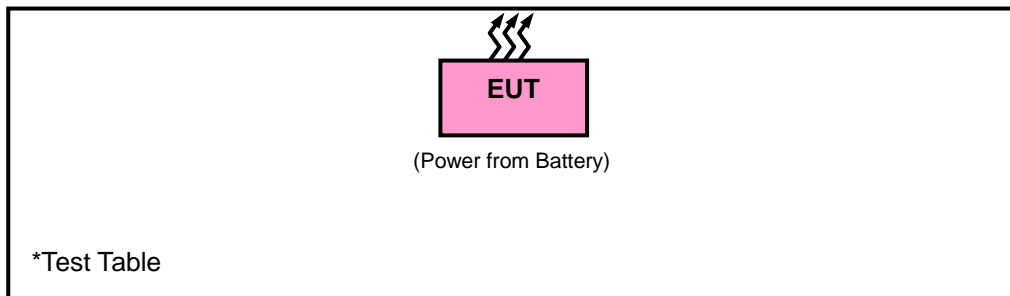
802.11n (HT20): Duty cycle = $0.632/0.885 = 0.714$, Duty factor = $10 * \log(1/0.714) = 1.46$



3.4 Description of Support Units

The EUT has been tested as an independent unit together with other necessary accessories or support units.

3.4.1 Configuration of System under Test



3.5 General Description of Applied Standards

The EUT is a RF Product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (15.247)

558074 D01 DTS Meas Guidance v04

ANSI C63.10-2013

All test items have been performed and recorded as per the above standards.

NOTE: The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC).
The test report has been issued separately.

4 Test Types and Results

4.1 Radiated Emission and Bandedge Measurement

4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20 dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/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

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20 dB under any condition of modulation.

4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver Agilent	N9038A	MY51210203	Feb. 17, 2017	Feb. 16, 2018
Spectrum Analyzer Agilent	N9010A	MY52220314	Dec. 16, 2016	Dec. 15, 2017
Spectrum Analyzer ROHDE & SCHWARZ	FSU43	101261	Dec. 13, 2016	Dec. 12, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-472	Dec. 26, 2016	Dec. 27, 2017
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-969	Dec. 12, 2016	Dec. 13, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	9170-480	Dec. 14, 2016	Dec. 13, 2017
Fixed Attenuator Mini-Circuits	BW-N10W5+	NA	Jul. 08, 2016	Jul. 07, 2017
Fixed Attenuator Woken	MDCS18N-10	MDCS18N-10-01	Apr. 17, 2017	Apr. 16, 2018
Loop Antenna	EM-6879	269	Aug. 11, 2016	Aug. 10, 2017
Loop Antenna TESEQ	HLA 6121	45745	May 19, 2017	May 18, 2018
Preamplifier EMCI	EMC 012645	980115	Oct. 21, 2016	Oct. 20, 2017
Preamplifier EMCI	EMC 184045	980116	Oct. 21, 2016	Oct. 20, 2017
Preamplifier EMCI	EMC 330H	980112	Oct. 21, 2016	Oct. 20, 2017
Power Meter Anritsu	ML2495A	1232002	Sep. 08, 2016	Sep. 07, 2017
Power Sensor Anritsu	MA2411B	1207325	Sep. 08, 2016	Sep. 07, 2017
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	309219/4 2950114	Oct. 21, 2016	Oct. 20, 2017
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	250130/4	Oct. 21, 2016	Oct. 20, 2017
RF Coaxial Cable Worken	8D-FB	Cable-Ch10-01	Oct. 21, 2016	Oct. 20, 2017
Software BV ADT	E3 6.120103	NA	NA	NA
Antenna Tower MF	MFA-440H	NA	NA	NA
Turn Table MF	MFT-201SS	NA	NA	NA
Antenna Tower & Turn Table Controller MF	MF-7802	NA	NA	NA

- Note:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
 2. The test was performed in HwaYa Chamber 10.
 3. The horn antenna and preamplifier (model: EMC 184045) are used only for the measurement of emission frequency above 1 GHz if tested.
 4. The FCC Site Registration No. is TW2021.
 5. The IC Site Registration No. is IC7450F-10.

4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 1 GHz) / 1.5 meters (for above 1 GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detected function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz & 360 KHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1 GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 1/T for Average (Duty cycle < 98 %) for Average detection at frequency above 1 GHz.
4. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz (Duty cycle ≥ 98 %) for Average detection (AV) at frequency above 1 GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

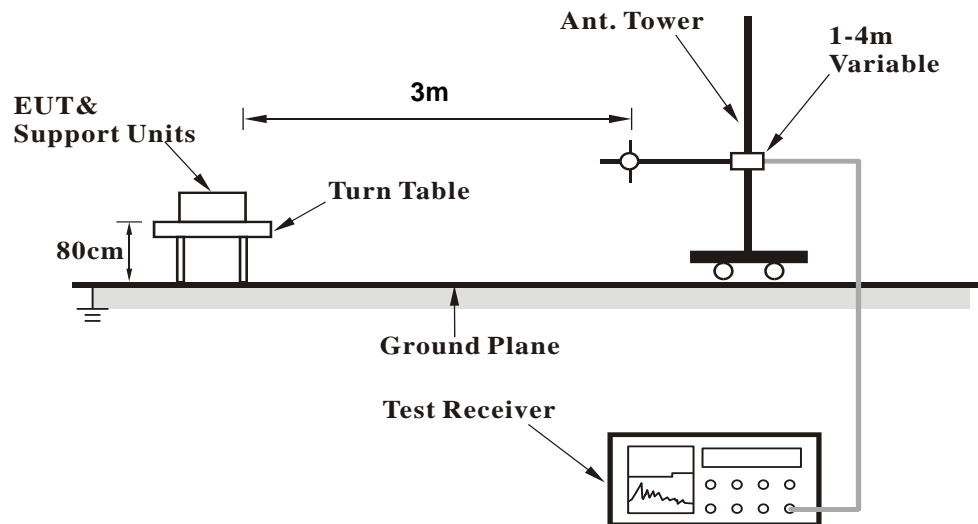
Test Setting			
Bandedge Emissions	RBW / VBW		
(Non-restricted Band)	100k / 300k		
(Restricted Band)	802.11b	Average: 1M / 1k	Peak: 1M / 3M
	802.11g	Average: 1M / 3k	
	802.11n (20MHz)	Average: 1M / 3k	

4.1.4 Deviation from Test Standard

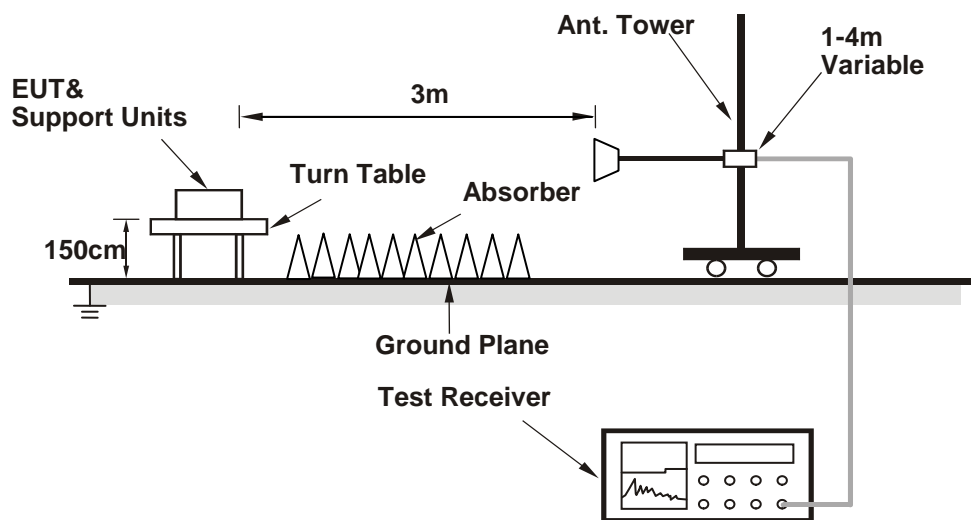
No deviation.

4.1.5 Test Set Up

<Frequency Range below 1 GHz>



<Frequency Range above 1 GHz>



For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.1.6 EUT Operating Conditions

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.1.7 Test Results

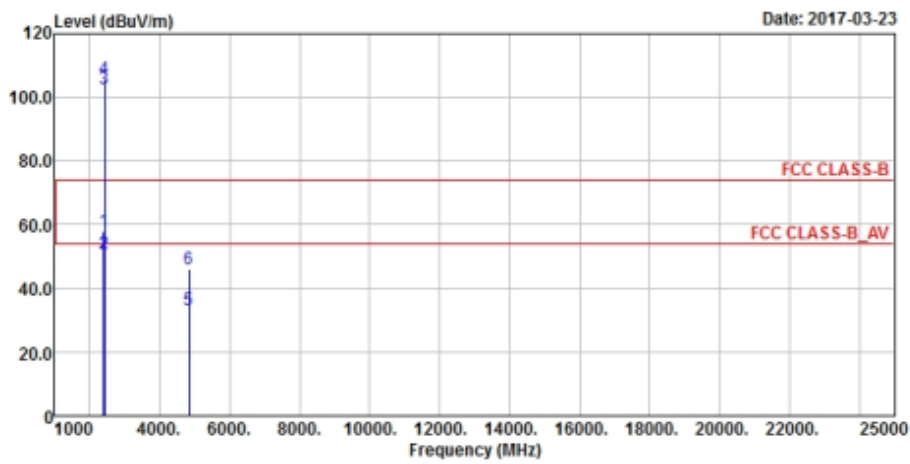
Above 1 GHz Data :

Mode A

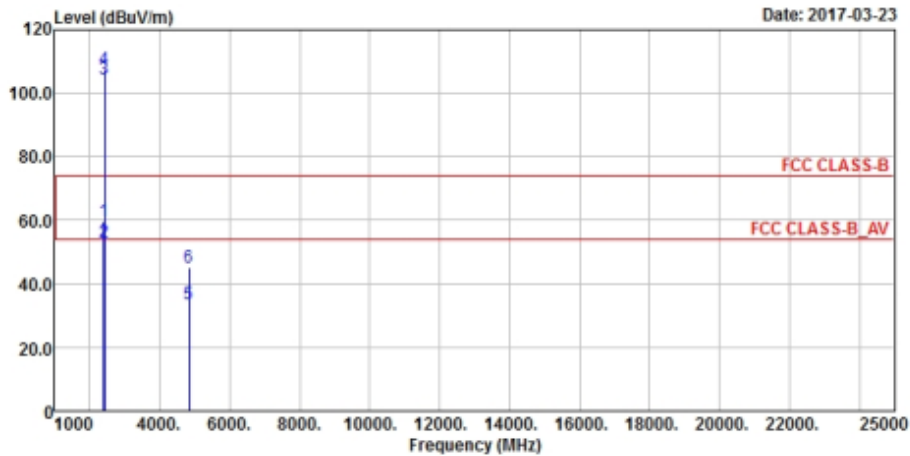
802.11b

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Horizontal



Vertical



Antennal Polarity & Test Distance: Horizontal at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2385.6	58.08	64.59	74	-15.92	26.91	4.08	37.5	214	6	Peak
#2389.5	51.05	57.56	54	-2.95	26.91	4.08	37.5	214	6	Average
2412	102.71	109.18			26.96	4.09	37.52	214	6	Average
2412	105.98	112.45			26.96	4.09	37.52	214	6	Peak
4824	33.06	48.36	54	-20.94	30.99	6.79	53.08	210	178	Average
4824	46.15	61.45	74	-27.85	30.99	6.79	53.08	210	178	Peak

Antennal Polarity & Test Distance: Vertical at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2385.69	59.69	66.2	74	-14.31	26.91	4.08	37.5	235	163	Peak
#2389.5	52.93	59.44	54	-1.07	26.91	4.08	37.5	235	163	Average
2412	104.5	110.97			26.96	4.09	37.52	235	163	Average
2412	107.75	114.22			26.96	4.09	37.52	235	163	Peak
4824	33.65	48.95	54	-20.35	30.99	6.79	53.08	200	85	Average
4824	45.11	60.41	74	-28.89	30.99	6.79	53.08	200	85	Peak

Remarks:

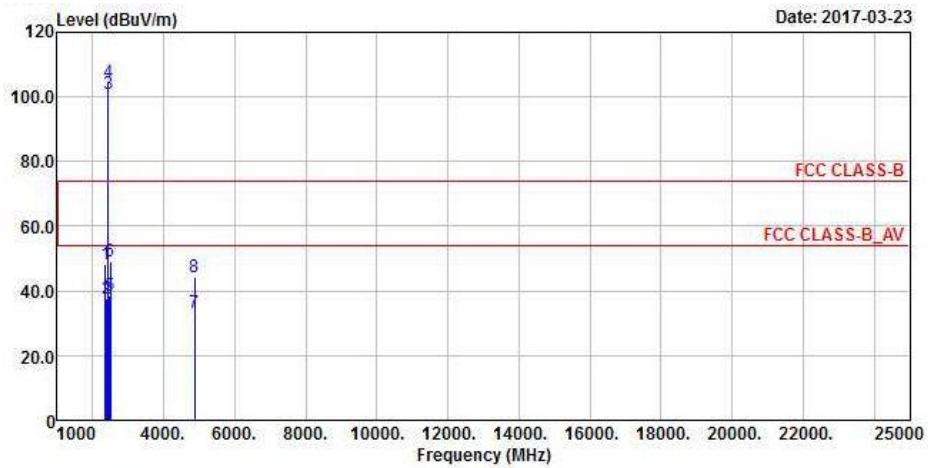
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.
- #: Per Section 13.3.1 of KDB 558074, the Integration method was used to determine compliance with the out-of-band emissions limits.



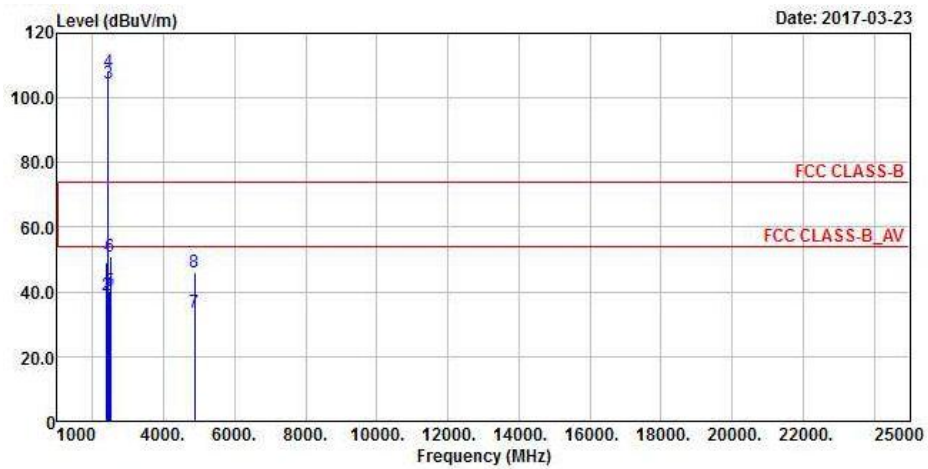
Remarks: Read Level = Channel Power+ Preamp Factor

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Horizontal



Vertical



Antennal Polarity & Test Distance: Horizontal at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2358.33	48.29	54.92	74	-25.71	26.81	4.05	37.49	181	86	Peak
2389.92	37.57	44.1	54	-16.43	26.91	4.08	37.52	181	86	Average
2437	101.12	107.4			27.06	4.12	37.46	181	86	Average
2437	104.57	110.85			27.06	4.12	37.46	181	86	Peak
2483.68	38.6	44.62	54	-15.4	27.15	4.15	37.32	181	86	Average
2494.36	49.31	55.2	74	-24.69	27.2	4.16	37.25	181	86	Peak
4874	33.36	48.5	54	-20.64	31.06	6.85	53.05	210	171	Average
4874	44.38	59.52	74	-29.62	31.06	6.85	53.05	210	171	Peak

Antennal Polarity & Test Distance: Vertical at 3 m

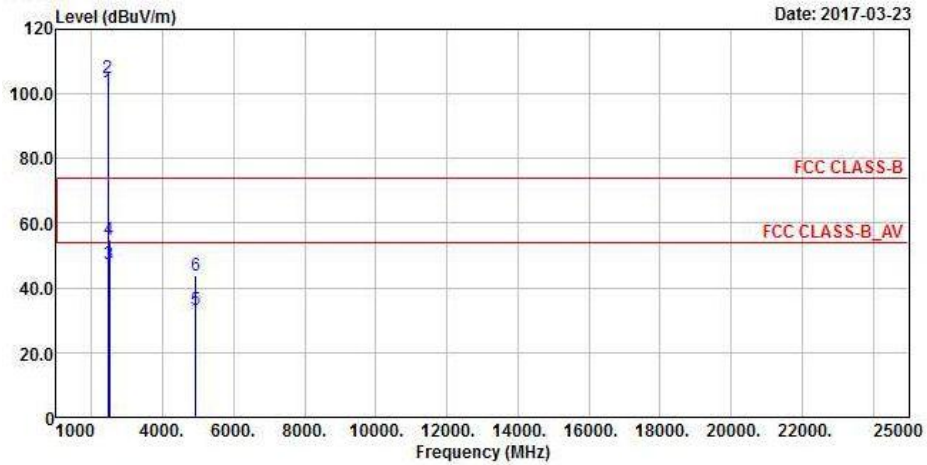
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2388.66	49.16	55.67	74	-24.84	26.91	4.08	37.5	202	309	Peak
2389.83	38.76	45.29	54	-15.24	26.91	4.08	37.52	202	309	Average
2437	104.57	110.85			27.06	4.12	37.46	202	309	Average
2437	107.89	114.17			27.06	4.12	37.46	202	309	Peak
2483.64	40.15	46.17	54	-13.85	27.15	4.15	37.32	202	309	Average
2494	51.13	57.02	74	-22.87	27.2	4.16	37.25	202	309	Peak
4874	33.72	48.86	54	-20.28	31.06	6.85	53.05	200	88	Average
4874	45.93	61.07	74	-28.07	31.06	6.85	53.05	200	88	Peak

Remarks:

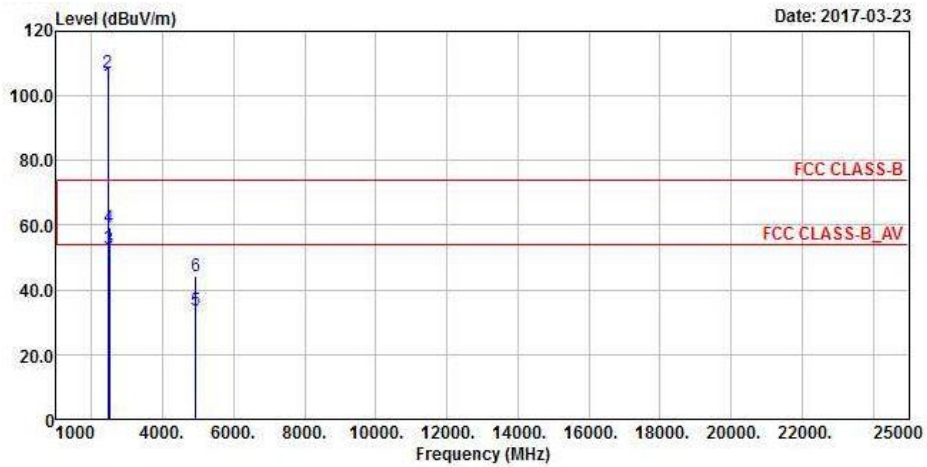
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Horizontal



Vertical



Antennal Polarity & Test Distance: Horizontal at 3 m

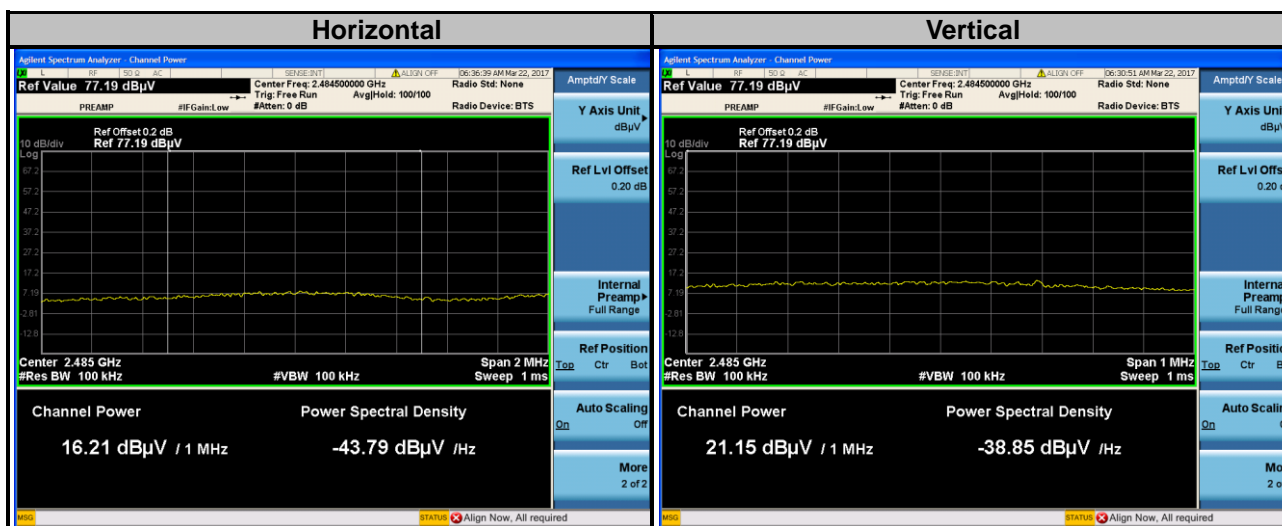
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	101.12	107.28			27.1	4.13	37.39	213	7	Average
2462	104.96	111.12			27.1	4.13	37.39	213	7	Peak
#2484.5	47.57	53.53	54	-6.43	27.2	4.16	37.32	213	7	Average
2487.92	54.91	60.87	74	-19.09	27.2	4.16	37.32	213	7	Peak
4924	33.11	48.14	54	-20.89	31.12	6.88	53.03	205	195	Average
4924	43.78	58.81	74	-30.22	31.12	6.88	53.03	205	195	Peak

Antennal Polarity & Test Distance: Vertical at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	103.79	109.95			27.1	4.13	37.39	235	173	Average
2462	106.96	113.12			27.1	4.13	37.39	235	173	Peak
#2484.5	52.61	58.57	54	-1.39	27.2	4.16	37.32	235	173	Average
2488.4	59.3	65.26	74	-14.7	27.2	4.16	37.32	235	173	Peak
4924	33.7	48.73	54	-20.3	31.12	6.88	53.03	199	89	Average
4924	44.22	59.25	74	-29.78	31.12	6.88	53.03	199	89	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.
- #: Per Section 13.3.1 of KDB 558074, the Integration method was used to determine compliance with the out-of-band emissions limits.

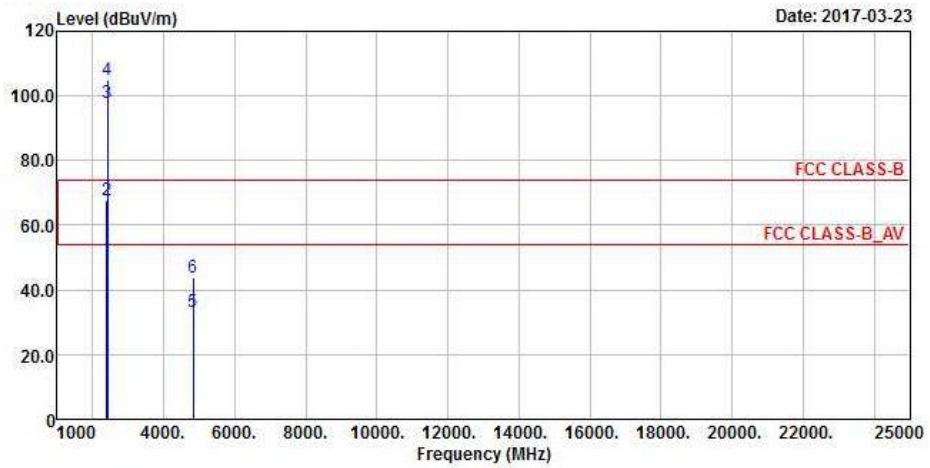


Remarks: Read Level = Channel Power+ Preamp Factor

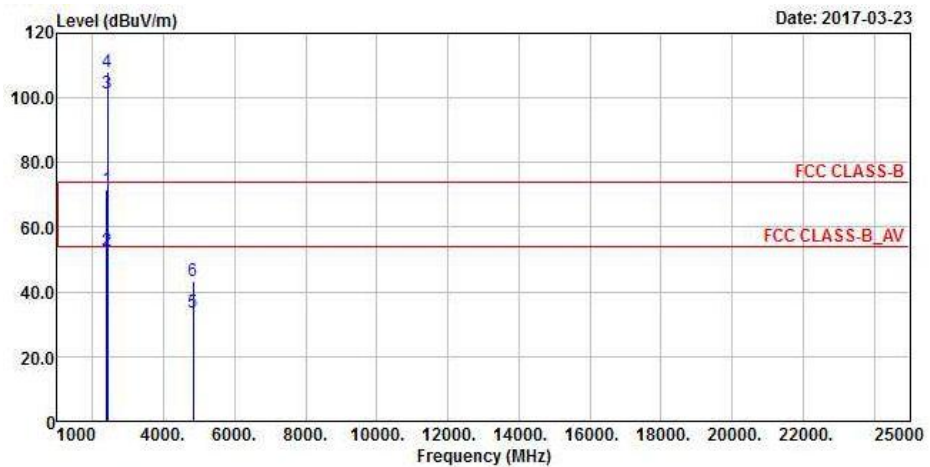
802.11g

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Horizontal



Vertical



Antennal Polarity & Test Distance: Horizontal at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.83	49.54	56.07	54	-4.46	26.91	4.08	37.52	213	10	Average
#2389.83	67.79	74.32	74	-6.21	26.91	4.08	37.52	213	10	Peak
2412	97.84	104.31			26.96	4.09	37.52	213	10	Average
2412	104.97	111.44			26.96	4.09	37.52	213	10	Peak
4824	33.15	48.45	54	-20.85	30.99	6.79	53.08	211	180	Average
4824	44.03	59.33	74	-29.97	30.99	6.79	53.08	211	180	Peak

Antennal Polarity & Test Distance: Vertical at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.02	71.57	78.08	74	-2.43	26.91	4.08	37.5	234	181	Peak
#2389.74	52.7	59.21	54	-1.3	26.91	4.08	37.5	234	181	Average
2412	101.23	107.7			26.96	4.09	37.52	234	181	Average
2412	107.9	114.37			26.96	4.09	37.52	234	181	Peak
4824	33.55	48.85	54	-20.45	30.99	6.79	53.08	200	88	Average
4824	43.47	58.77	74	-30.53	30.99	6.79	53.08	200	88	Peak

Remarks:

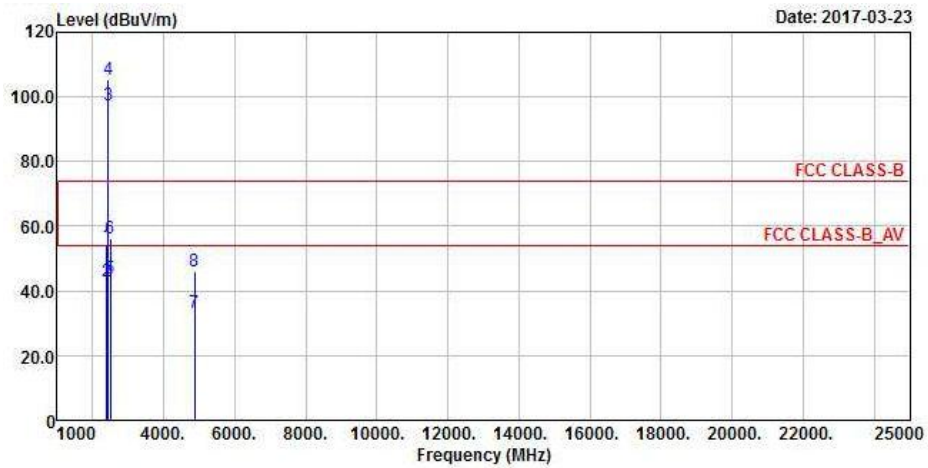
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.
- #: Per Section 13.3.1 of KDB 558074, the Integration method was used to determine compliance with the out-of-band emissions limits.



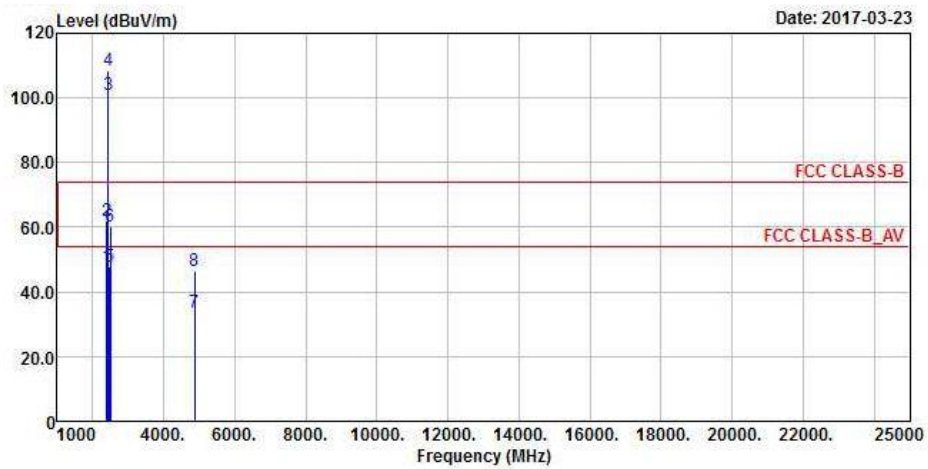
Remarks: Read Level = Channel Power+ Preamp Factor

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Horizontal



Vertical



Antennal Polarity & Test Distance: Horizontal at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2388.48	53.89	60.4	74	-20.11	26.91	4.08	37.5	179	88	Peak
2389.83	43.05	49.58	54	-10.95	26.91	4.08	37.52	179	88	Average
2437	97.39	103.67			27.06	4.12	37.46	179	88	Average
2437	105.3	111.58			27.06	4.12	37.46	179	88	Peak
2484.76	44	50.02	54	-10	27.15	4.15	37.32	179	88	Average
2485.76	56.02	62.04	74	-17.98	27.15	4.15	37.32	179	88	Peak
4874	33.08	48.22	54	-20.92	31.06	6.85	53.05	216	169	Average
4874	45.88	61.02	74	-28.12	31.06	6.85	53.05	216	169	Peak

Antennal Polarity & Test Distance: Vertical at 3 m

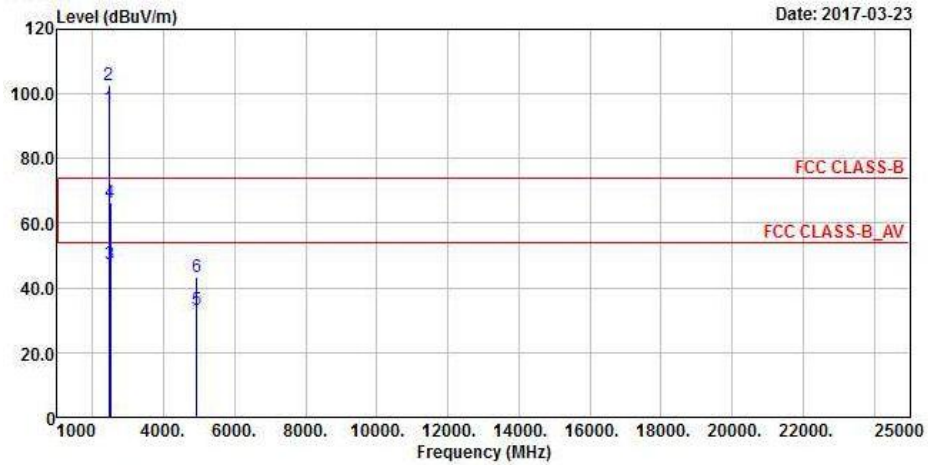
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.38	47.79	54.3	54	-6.21	26.91	4.08	37.5	204	311	Average
2389.74	61.91	68.42	74	-12.09	26.91	4.08	37.5	204	311	Peak
2437	100.9	107.18			27.06	4.12	37.46	204	311	Average
2437	108.57	114.85			27.06	4.12	37.46	204	311	Peak
2483.52	47.99	54.01	54	-6.01	27.15	4.15	37.32	204	311	Average
2484.2	60.4	66.42	74	-13.6	27.15	4.15	37.32	204	311	Peak
4874	33.46	48.6	54	-20.54	31.06	6.85	53.05	202	82	Average
4874	46.63	61.77	74	-27.37	31.06	6.85	53.05	202	82	Peak

Remarks:

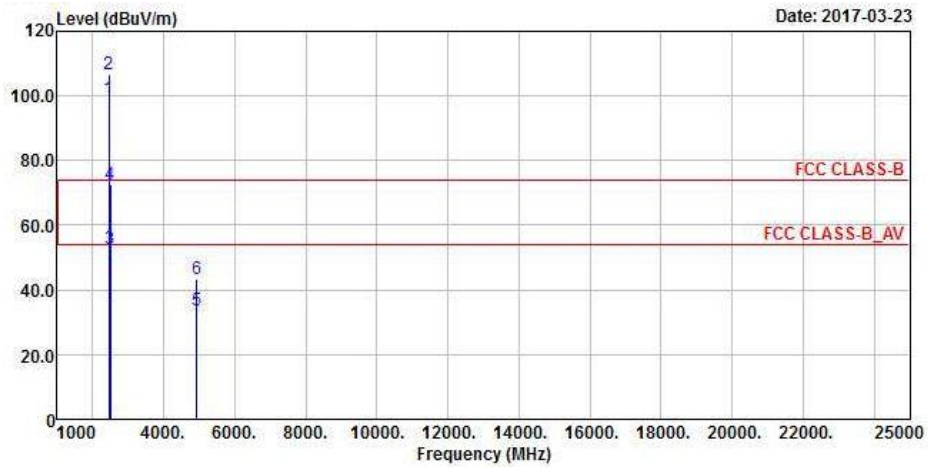
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Horizontal



Vertical



Antennal Polarity & Test Distance: Horizontal at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	95.55	101.71			27.1	4.13	37.39	213	10	Average
2462	102.86	109.02			27.1	4.13	37.39	213	10	Peak
#2483.6	47.51	53.53	54	-6.49	27.15	4.15	37.32	213	10	Average
2484.56	66.64	72.66	74	-7.36	27.15	4.15	37.32	213	10	Peak
4924	33.1	48.13	54	-20.9	31.12	6.88	53.03	205	175	Average
4924	43.2	58.23	74	-30.8	31.12	6.88	53.03	205	175	Peak

Antennal Polarity & Test Distance: Vertical at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	99.18	105.34			27.1	4.13	37.39	234	184	Average
2462	106.57	112.73			27.1	4.13	37.39	234	184	Peak
#2483.52	52.83	58.85	54	-1.17	27.15	4.15	37.32	234	184	Average
2485.68	72.65	78.67	74	-1.35	27.15	4.15	37.32	234	184	Peak
4924	33.81	48.84	54	-20.19	31.12	6.88	53.03	200	99	Average
4924	43.25	58.28	74	-30.75	31.12	6.88	53.03	200	99	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.
- #: Per Section 13.3.1 of KDB 558074, the Integration method was used to determine compliance with the out-of-band emissions limits.

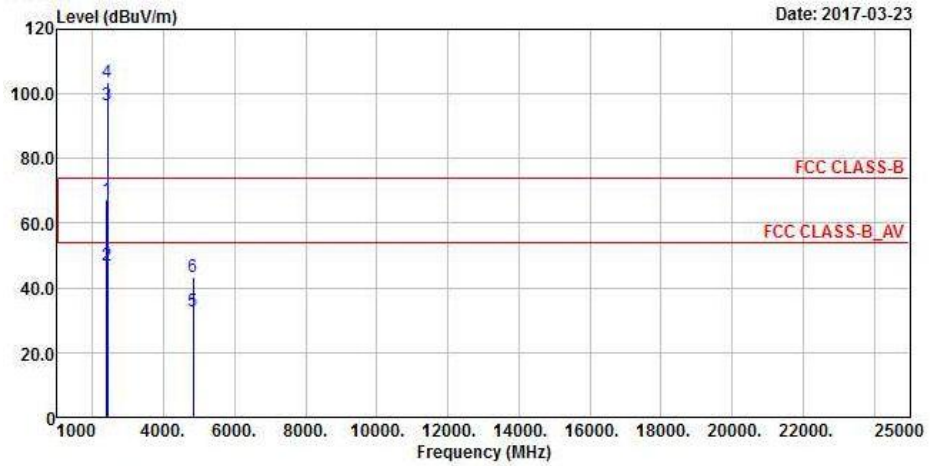


Remarks: Read Level = Channel Power+ Preamp Factor

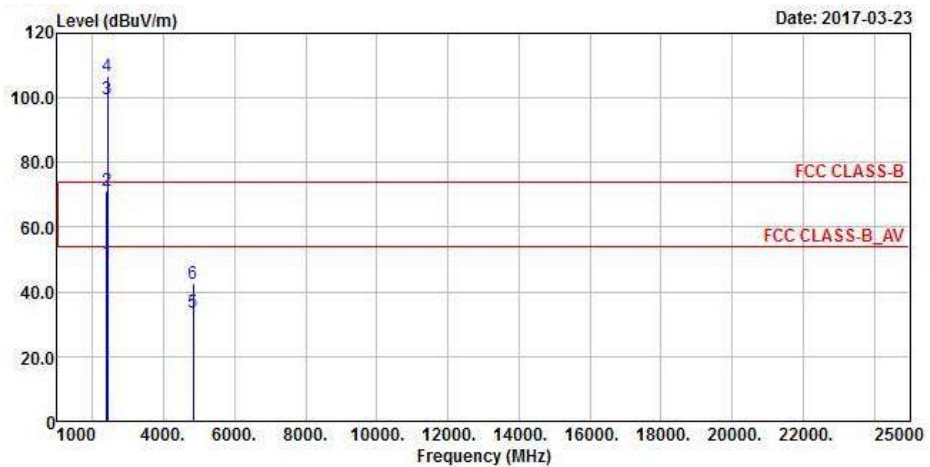
802.11n (HT20)

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Horizontal



Vertical



Antennal Polarity & Test Distance: Horizontal at 3 m

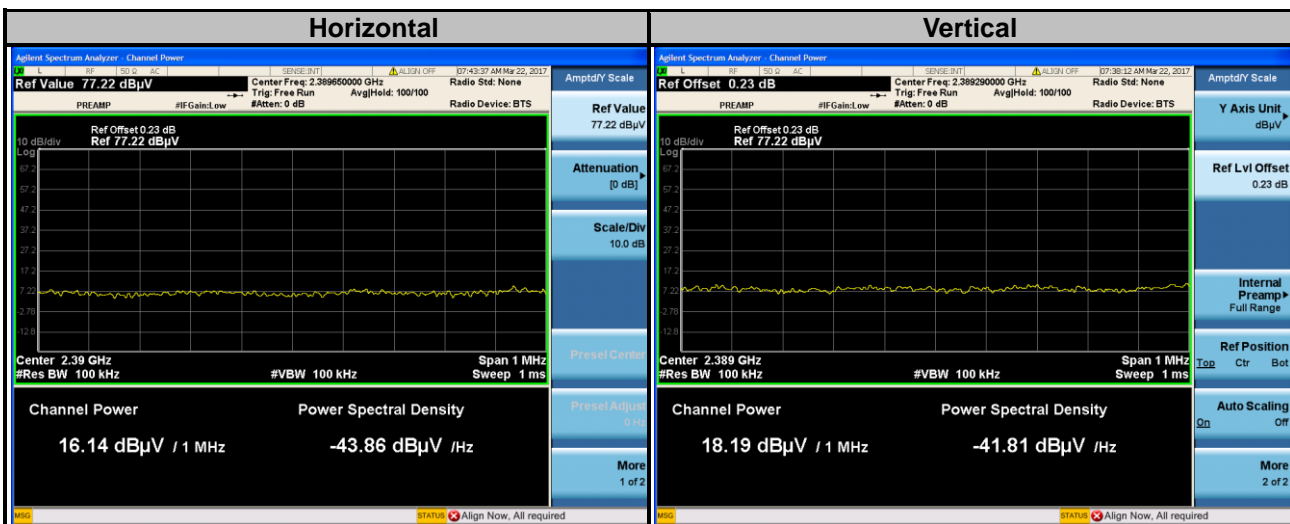
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2388.84	67.14	73.65	74	-6.86	26.91	4.08	37.5	214	5	Peak
#2389.65	47.13	53.64	54	-6.87	26.91	4.08	37.5	214	5	Average
2412	96.55	103.02			26.96	4.09	37.52	214	5	Average
2412	103.41	109.88			26.96	4.09	37.52	214	5	Peak
4824	32.82	48.12	54	-21.18	30.99	6.79	53.08	209	181	Average
4824	43.55	58.85	74	-30.45	30.99	6.79	53.08	209	181	Peak

Antennal Polarity & Test Distance: Vertical at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
#2389.29	49.18	55.69	54	-4.82	26.91	4.08	37.5	211	168	Average
2389.83	71.19	77.72	74	-2.81	26.91	4.08	37.52	211	168	Peak
2412	99.65	106.12			26.96	4.09	37.52	211	168	Average
2412	106.76	113.23			26.96	4.09	37.52	211	168	Peak
4824	33.45	48.75	54	-20.55	30.99	6.79	53.08	199	86	Average
4824	42.51	57.81	74	-31.49	30.99	6.79	53.08	199	86	Peak

Remarks:

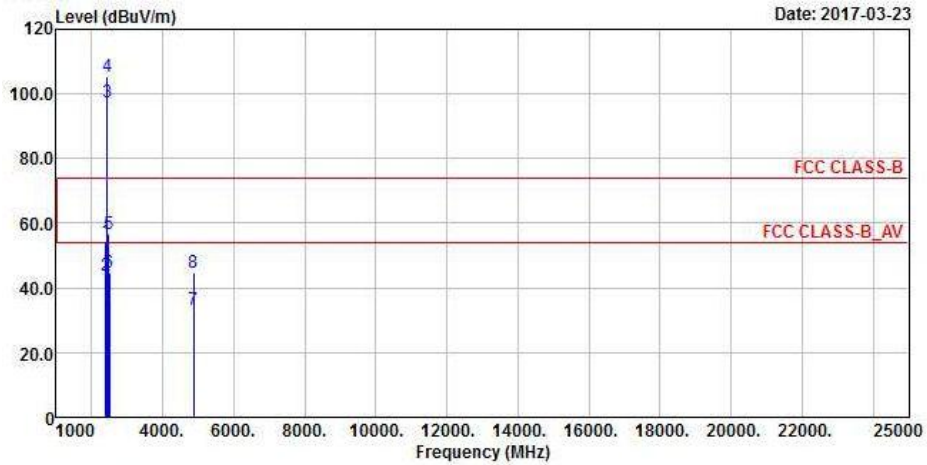
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2412 MHz: Fundamental frequency.
- #: Per Section 13.3.1 of KDB 558074, the Integration method was used to determine compliance with the out-of-band emissions limits.



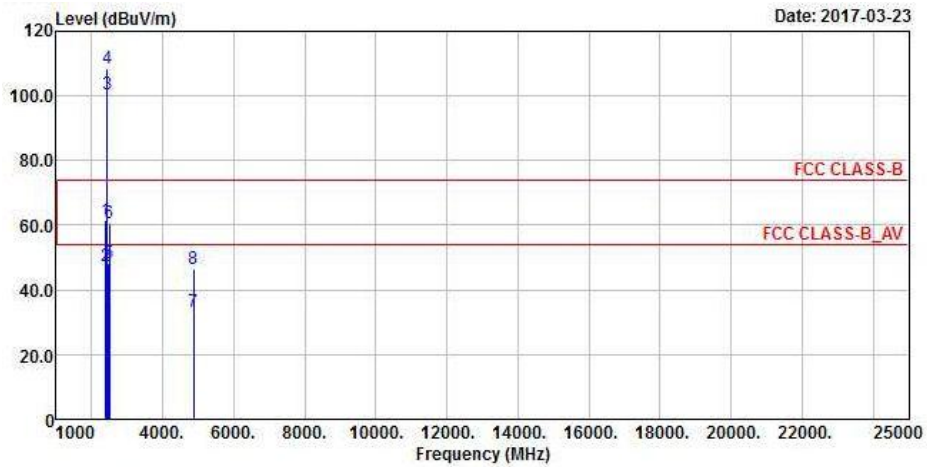
Remarks: Read Level = Channel Power+ Preamp Factor

EUT Test Condition		Measurement Detail	
Channel	Channel 6	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Horizontal



Vertical



Antennal Polarity & Test Distance: Horizontal at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2383.98	54.3	60.86	74	-19.7	26.86	4.08	37.5	180	87	Peak
2389.65	43.75	50.26	54	-10.25	26.91	4.08	37.5	180	87	Average
2437	97.47	103.75			27.06	4.12	37.46	180	87	Average
2437	105.34	111.62			27.06	4.12	37.46	180	87	Peak
2483.8	56.67	62.69	74	-17.33	27.15	4.15	37.32	180	87	Peak
2484.68	44.67	50.69	54	-9.33	27.15	4.15	37.32	180	87	Average
4874	33.2	48.34	54	-20.8	31.06	6.85	53.05	214	182	Average
4874	44.57	59.71	74	-29.43	31.06	6.85	53.05	214	182	Peak

Antennal Polarity & Test Distance: Vertical at 3 m

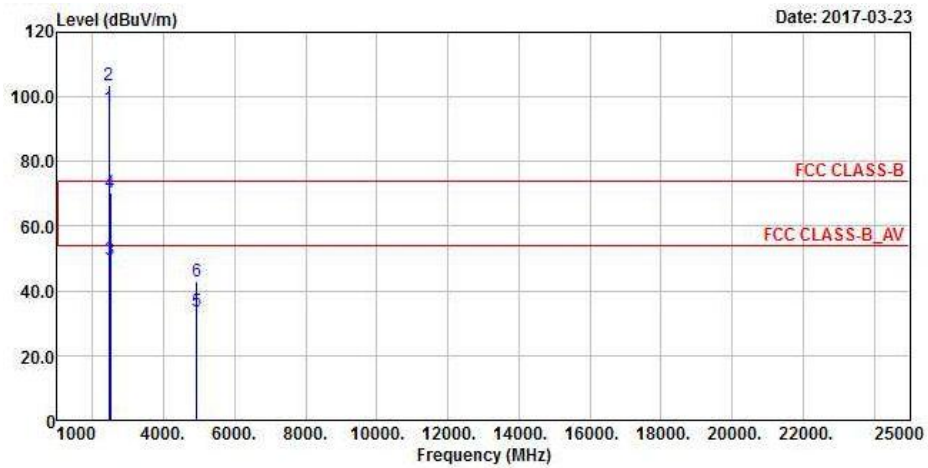
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2389.02	61.49	68	74	-12.51	26.91	4.08	37.5	203	308	Peak
2389.56	47.53	54.04	54	-6.47	26.91	4.08	37.5	203	308	Average
2437	100.61	106.89			27.06	4.12	37.46	203	308	Average
2437	108.38	114.66			27.06	4.12	37.46	203	308	Peak
2483.6	48.08	54.1	54	-5.92	27.15	4.15	37.32	203	308	Average
2484.36	60.67	66.69	74	-13.33	27.15	4.15	37.32	203	308	Peak
4874	33.33	48.47	54	-20.67	31.06	6.85	53.05	198	77	Average
4874	46.39	61.53	74	-27.61	31.06	6.85	53.05	198	77	Peak

Remarks:

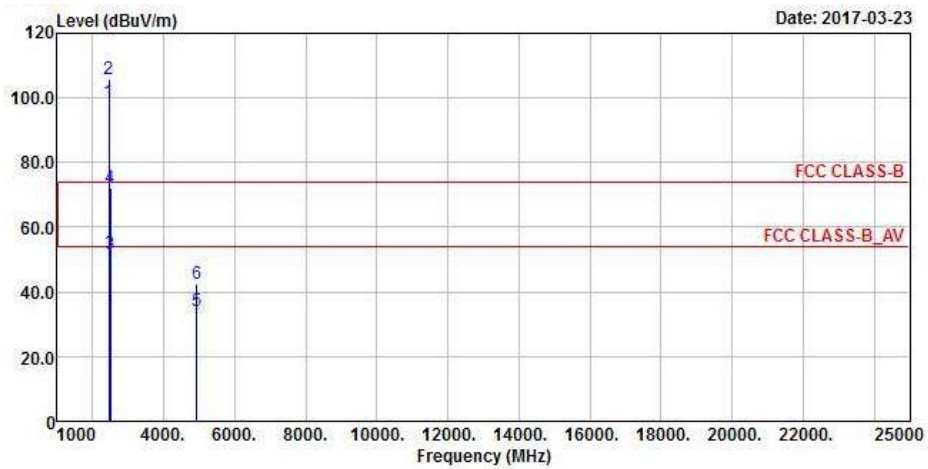
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2437 MHz: Fundamental frequency.

EUT Test Condition		Measurement Detail	
Channel	Channel 11	Frequency Range	1 GHz ~ 25 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Average (AV)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Horizontal



Vertical



Antennal Polarity & Test Distance: Horizontal at 3 m

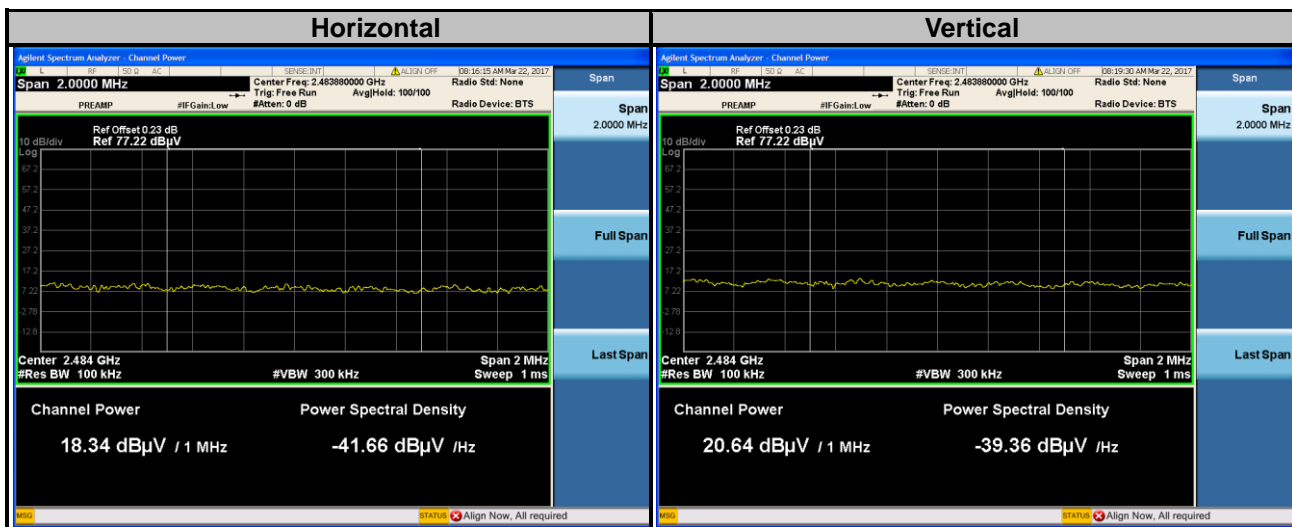
Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	96.57	102.73			27.1	4.13	37.39	210	6	Average
2462	103.54	109.7			27.1	4.13	37.39	210	6	Peak
2483.88	49.64	55.66	54	-4.36	27.15	4.15	37.32	210	6	Average
2484.72	70.55	76.57	74	-3.45	27.15	4.15	37.32	210	6	Peak
4924	33.47	48.5	54	-20.53	31.12	6.88	53.03	206	186	Average
4924	43.05	58.08	74	-30.95	31.12	6.88	53.03	206	186	Peak

Antennal Polarity & Test Distance: Vertical at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
2462	98.78	104.94			27.1	4.13	37.39	204	174	Average
2462	106	112.16			27.1	4.13	37.39	204	174	Peak
2483.6	51.94	57.96	54	-2.06	27.15	4.15	37.32	204	174	Average
2484.04	72.09	78.11	74	-1.91	27.15	4.15	37.32	204	174	Peak
4924	33.92	48.95	54	-20.08	31.12	6.88	53.03	199	86	Average
4924	42.62	57.65	74	-31.38	31.12	6.88	53.03	199	86	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value
- 2462 MHz: Fundamental frequency.
- #: Per Section 13.3.1 of KDB 558074, the Integration method was used to determine compliance with the out-of-band emissions limits.



Remarks: Read Level = Channel Power+ Preamp Factor

9 kHz ~ 30 MHz DATA:

The amplitude of spurious emissions attenuated more than 20 dB below the permissible value is not required to be report.

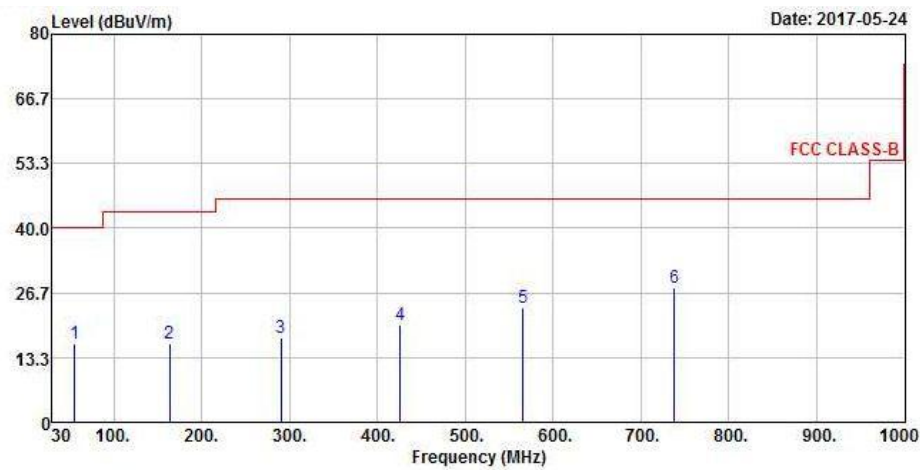
30 MHz ~ 1 GHz WORST-CASE DATA:

Mode A

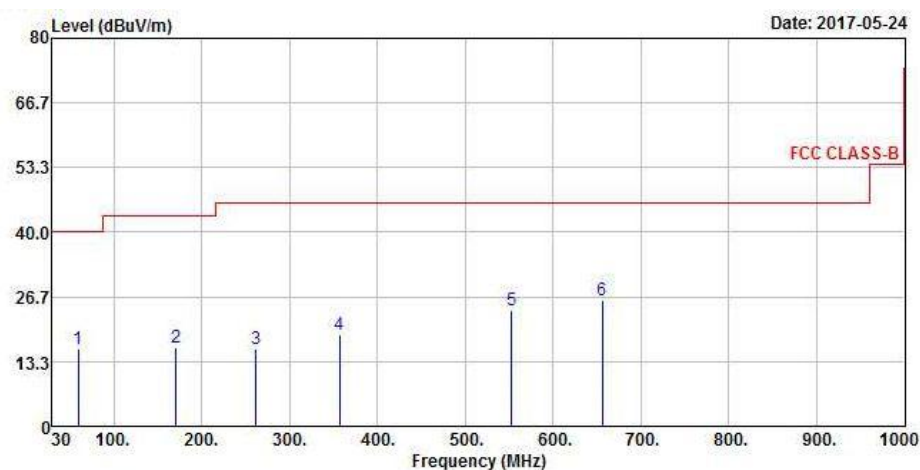
802.11b

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Horizontal



Vertical



Antennal Polarity & Test Distance: Horizontal at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
55.22	16.14	34.27	40	-23.86	12.45	0.75	31.33	117	312	Peak
163.86	16.19	34.54	43.5	-27.31	12.34	1.13	31.82	110	89	Peak
289.96	17.55	34.96	46	-28.45	12.65	1.61	31.67	134	1	Peak
425.76	20.16	34.39	46	-25.84	15.85	1.95	32.03	136	22	Peak
565.44	23.57	34.63	46	-22.43	18.81	2.2	32.07	116	344	Peak
738.1	27.7	35.33	46	-18.3	21.35	2.52	31.5	132	232	Peak

Antennal Polarity & Test Distance: Vertical at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
59.1	15.88	34.39	40	-24.12	12.04	0.8	31.35	109	92	Peak
170.65	16.24	35.14	43.5	-27.26	11.67	1.17	31.74	115	161	Peak
261.83	15.82	34.37	46	-30.18	11.82	1.52	31.89	118	333	Peak
356.89	18.77	34.61	46	-27.23	14.31	1.78	31.93	134	337	Peak
552.83	23.89	35.16	46	-22.11	18.53	2.18	31.98	112	30	Peak
655.65	25.92	35.25	46	-20.08	20.28	2.37	31.98	123	173	Peak

Remarks:

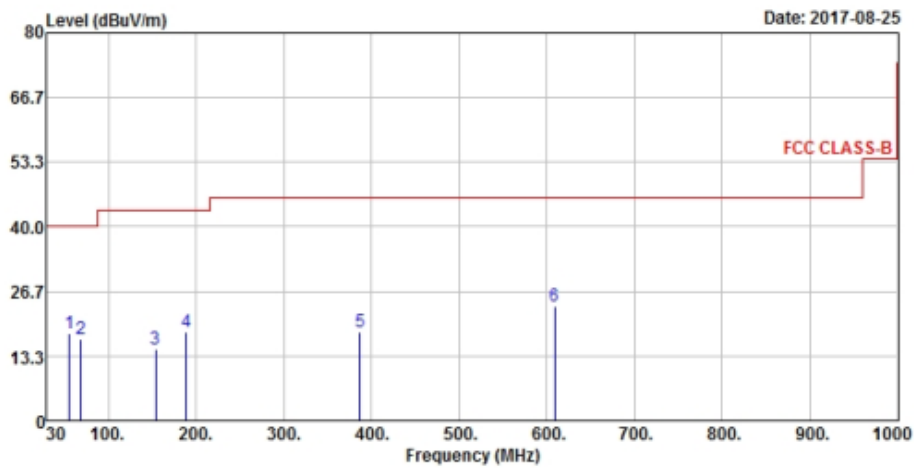
- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value

Mode B

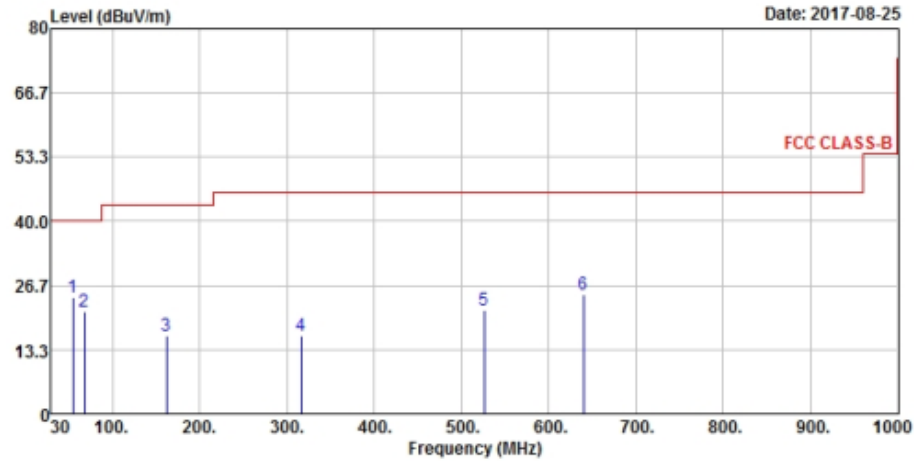
802.11b

EUT Test Condition		Measurement Detail	
Channel	Channel 1	Frequency Range	30 MHz ~ 1 GHz
Input Power	120 Vac, 60 Hz	Detector Function	Peak (PK) Quasi-peak (QP)
Environmental Conditions	25 deg. C, 65 % RH	Tested By	Gavin Wu

Horizontal



Vertical



Antennal Polarity & Test Distance: Horizontal at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
55.22	17.96	36.28	40	-22.04	12.45	0.56	31.33	129	118	Peak
68.8	16.72	36.97	40	-23.28	10.89	0.63	31.77	103	121	Peak
154.16	14.84	32.84	43.5	-28.66	12.72	1	31.72	137	28	Peak
189.08	18.35	38.75	43.5	-25.15	10.12	1.17	31.69	114	91	Peak
386.96	18.34	33.28	46	-27.66	15.03	2.04	32.01	108	107	Peak
609.09	23.64	33.08	46	-22.36	19.72	2.94	32.1	102	338	Peak

Antennal Polarity & Test Distance: Vertical at 3 m

Frequency (MHz)	Emission Level (dBuV/m)	Read Level (dBuV)	Limit (dBuV/m)	Margin (dB)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Antenna Height (cm)	Table Angle (Degree)	Remark
54.25	24.2	42.42	40	-15.8	12.56	0.55	31.33	100	316	Peak
67.83	21.26	41.36	40	-18.74	11	0.63	31.73	115	219	Peak
161.92	16.14	34.42	43.5	-27.36	12.54	1.03	31.85	138	8	Peak
316.15	16.13	32.98	46	-29.87	13.33	1.73	31.91	121	282	Peak
525.67	21.69	32.81	46	-24.31	17.91	2.61	31.64	102	123	Peak
640.13	24.65	33.58	46	-21.35	20.09	3.07	32.09	139	2	Peak

Remarks:

- Emission Level = Read Level + Antenna Factor + Cable Loss - Preamp Factor
Margin value = Emission level – Limit value

4.2 Conducted Emission Measurement

4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 21, 2016	Nov. 20, 2017
RF signal cable Woken	5D-FB	Cable-cond1-01	Dec. 22, 2016	Dec. 21, 2017
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Mar. 10, 2017	Mar. 09, 2018
LISN ROHDE & SCHWARZ (Peripheral)	ENV216	101196	Apr. 20, 2017	Apr. 19, 2018
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Shielded Room 1.

3. The VCCI Site Registration No. is C-2040.

4.2.3 Test Procedures

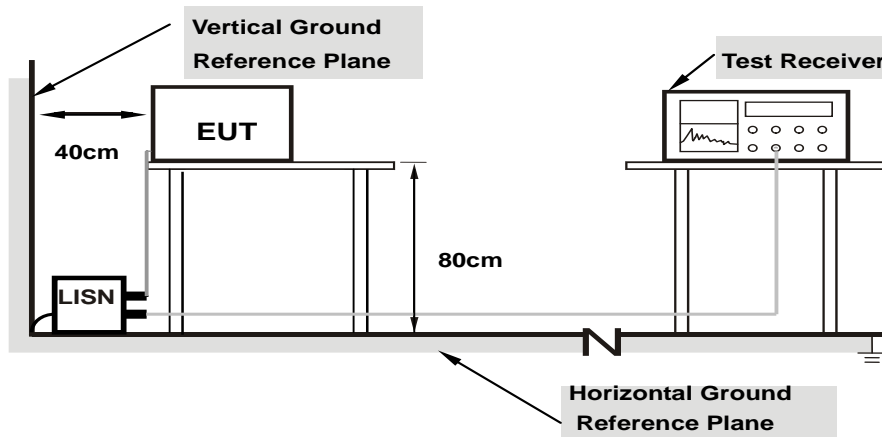
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150 kHz to 30 MHz was searched. Emission levels under (Limit – 20 dB) was not recorded.

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.2.4 Deviation from Test Standard

No deviation.

4.2.5 Test Setup



Note: 1. Support units were connected to second LISN.

For the actual test configuration, please refer to the attached file (Test Setup Photo).

4.2.6 EUT Operating Conditions

- a. Placed the EUT on a testing table.
- b. Use the software to control the EUT under transmission condition continuously at specific channel frequency.

4.2.7 Test Results

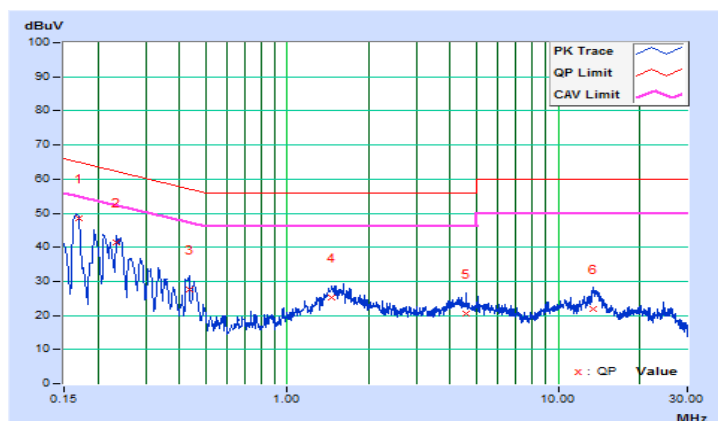
Mode A

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	26°C, 72%RH
Tested by	Han Wu	Test Date	2017/8/22

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.17000	10.35	38.13	22.11	48.48	32.46	64.96	54.96	-16.48	-22.50
2	0.23400	10.38	30.95	17.74	41.33	28.12	62.31	52.31	-20.98	-24.19
3	0.43400	10.40	17.29	7.27	27.69	17.67	57.18	47.18	-29.49	-29.51
4	1.46200	10.43	14.82	9.02	25.25	19.45	56.00	46.00	-30.75	-26.55
5	4.56200	10.59	9.92	5.08	20.51	15.67	56.00	46.00	-35.49	-30.33
6	13.41800	11.00	10.84	3.84	21.84	14.84	60.00	50.00	-38.16	-35.16

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

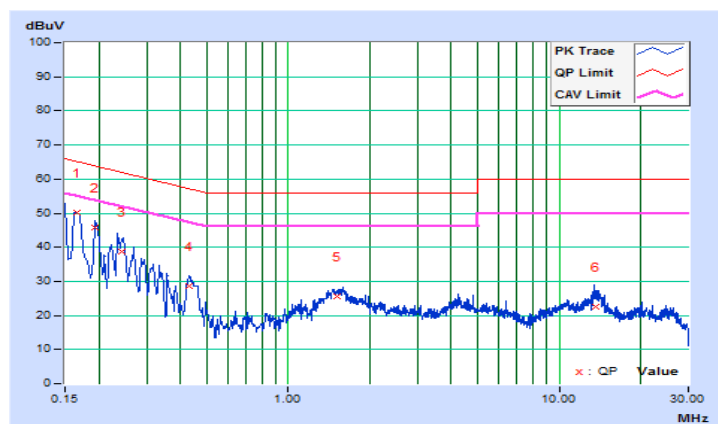


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	26°C, 72%RH
Tested by	Han Wu	Test Date	2017/8/22

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16535	10.12	39.90	25.58	50.02	35.70	65.19	55.19	-15.17	-19.49
2	0.19400	10.14	35.66	21.54	45.80	31.68	63.86	53.86	-18.06	-22.18
3	0.24356	10.14	28.67	13.42	38.81	23.56	61.97	51.97	-23.16	-28.41
4	0.43000	10.16	18.36	9.95	28.52	20.11	57.25	47.25	-28.73	-27.14
5	1.51000	10.20	15.33	9.43	25.53	19.63	56.00	46.00	-30.47	-26.37
6	13.58600	10.69	11.73	4.86	22.42	15.55	60.00	50.00	-37.58	-34.45

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value



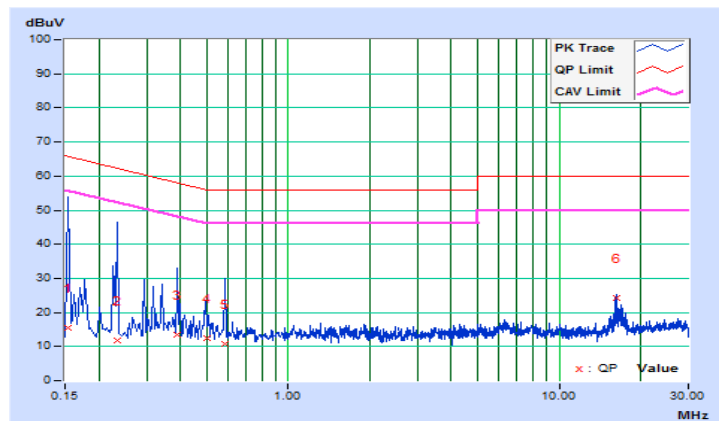
Mode B

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	26°C, 72%RH
Tested by	Han Wu	Test Date	2017/8/22

Phase Of Power : Line (L)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15400	10.35	5.21	-1.30	15.56	9.05	65.78	55.78	-50.22	-46.73
2	0.23400	10.38	1.42	-2.76	11.80	7.62	62.31	52.31	-50.51	-44.69
3	0.39000	10.40	3.02	-2.79	13.42	7.61	58.06	48.06	-44.64	-40.45
4	0.50000	10.40	2.03	-2.96	12.43	7.44	56.00	46.00	-43.57	-38.56
5	0.58600	10.40	0.43	-3.74	10.83	6.66	56.00	46.00	-45.17	-39.34
6	16.22600	11.15	12.98	11.69	24.13	22.84	60.00	50.00	-35.87	-27.16

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

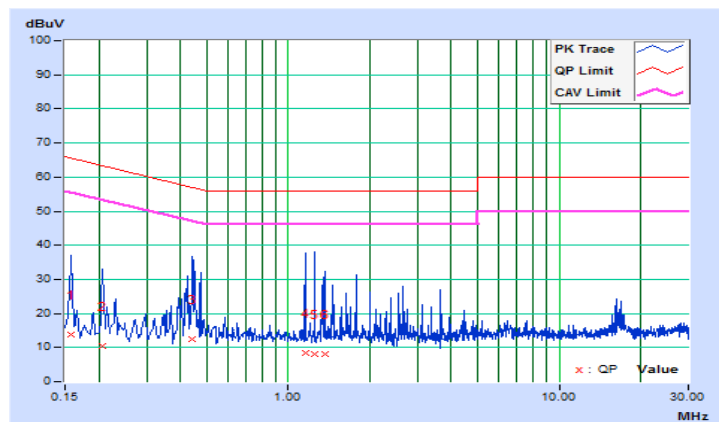


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	26°C, 72%RH
Tested by	Han Wu	Test Date	2017/8/22

Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15800	10.11	3.86	-1.84	13.97	8.27	65.57	55.57	-51.60	-47.30
2	0.20600	10.14	0.22	-3.24	10.36	6.90	63.37	53.37	-53.01	-46.47
3	0.44200	10.16	2.43	-3.08	12.59	7.08	57.02	47.02	-44.43	-39.94
4	1.15400	10.18	-1.70	-4.53	8.48	5.65	56.00	46.00	-47.52	-40.35
5	1.25000	10.19	-1.97	-4.57	8.22	5.62	56.00	46.00	-47.78	-40.38
6	1.36600	10.19	-1.97	-4.58	8.22	5.61	56.00	46.00	-47.78	-40.39

Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. The emission levels of other frequencies were very low against the limit.
3. Margin value = Emission level – Limit value
4. Correction factor = Insertion loss + Cable loss
5. Emission Level = Correction Factor + Reading Value

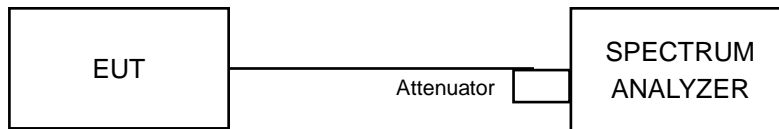


4.3 6 dB Bandwidth Measurement

4.3.1 Limits of 6 dB Bandwidth Measurement

The minimum of 6 dB Bandwidth Measurement is 0.5 MHz.

4.3.2 Test Setup



4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.3.4 Test Procedure

- Set resolution bandwidth (RBW) = 100 kHz
- Set the video bandwidth (VBW) $\geq 3 \times$ RBW, Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission

4.3.5 Deviation from Test Standard

No deviation.

4.3.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.3.7 Test Result

802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	8.10	0.5	Pass
6	2437	8.07	0.5	Pass
11	2462	8.07	0.5	Pass

802.11g

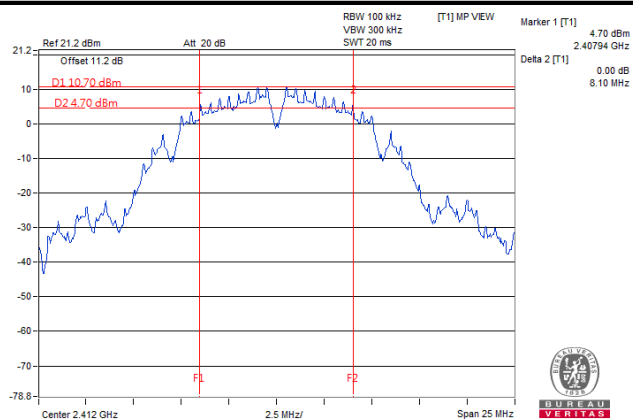
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	15.17	0.5	Pass
6	2437	15.17	0.5	Pass
11	2462	15.14	0.5	Pass

802.11n (HT20)

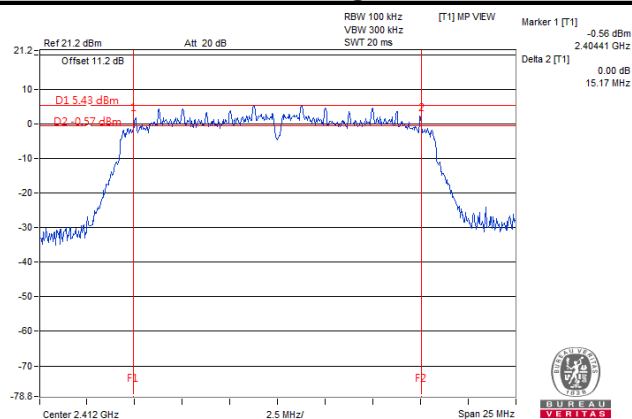
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	15.15	0.5	Pass
6	2437	15.17	0.5	Pass
11	2462	15.16	0.5	Pass

Spectrum Plot of Worst Value

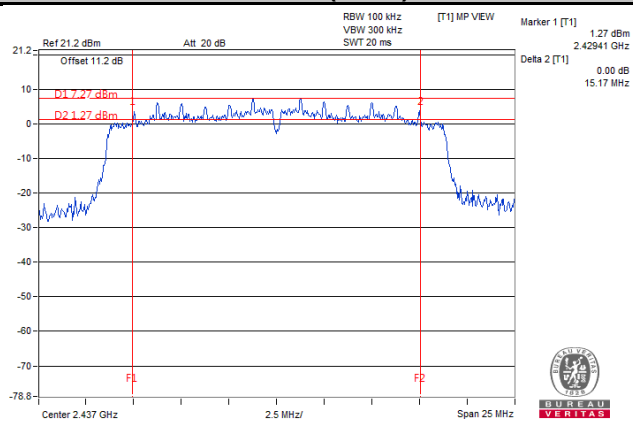
802.11b



802.11g



802.11n (HT20)

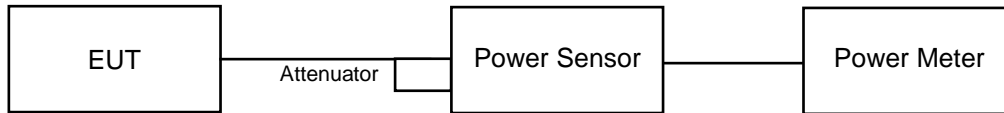


4.4 Conducted Output Power Measurement

4.4.1 Limits of Conducted Output Power Measurement

For systems using digital modulation in the 2400–2483.5 MHz bands: 1 Watt (30 dBm)

4.4.2 Test Setup



4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.4 Test Procedures

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.4.7 Test Results

<Peak Power>

802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	129.122	21.11	30	Pass
6	2437	124.165	20.94	30	Pass
11	2462	181.134	22.58	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	235.505	23.72	30	Pass
6	2437	258.226	24.12	30	Pass
11	2462	233.346	23.68	30	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	255.27	24.07	30	Pass
6	2437	271.019	24.33	30	Pass
11	2462	248.886	23.96	30	Pass

<Average Power (For Reference)>

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	63.533	18.03	30	Pass
6	2437	59.704	17.76	30	Pass
11	2462	94.189	19.74	30	Pass

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	38.194	15.82	30	Pass
6	2437	53.088	17.25	30	Pass
11	2462	37.67	15.76	30	Pass

802.11n (HT20)

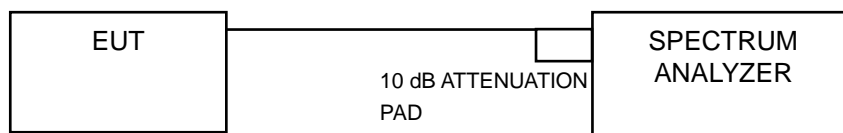
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	36.644	15.64	30	Pass
6	2437	52.966	17.24	30	Pass
11	2462	35.975	15.56	30	Pass

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8 dBm.

4.5.2 Test Setup



4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.5.4 Test Procedure

- 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: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d. Set the VBW $\geq 3 \times \text{RBW}$.
- 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.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

4.5.7 Test Results

802.11b

Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Pass / Fail
1	2412	-3.75	8	Pass
6	2437	-4.29	8	Pass
11	2462	-2.35	8	Pass

802.11g

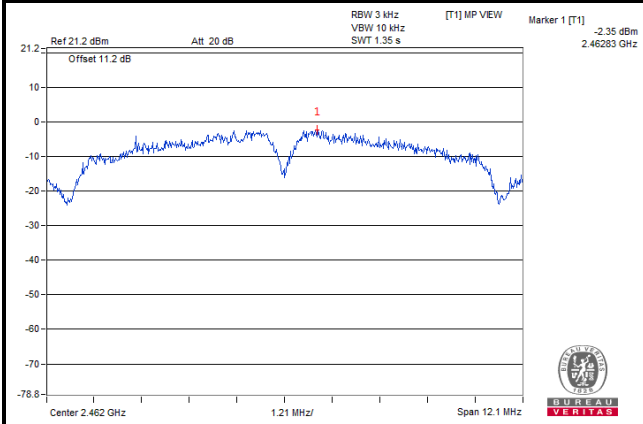
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Pass / Fail
1	2412	-9.26	8	Pass
6	2437	-7.97	8	Pass
11	2462	-9.26	8	Pass

802.11n (HT20)

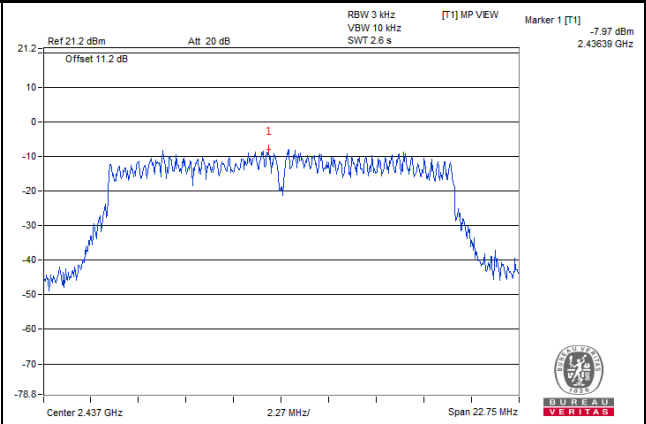
Channel	Frequency (MHz)	PSD (dBm)	Limit (dBm)	Pass / Fail
1	2412	-8.43	8	Pass
6	2437	-6.99	8	Pass
11	2462	-8.65	8	Pass

Spectrum Plot of Worst Value

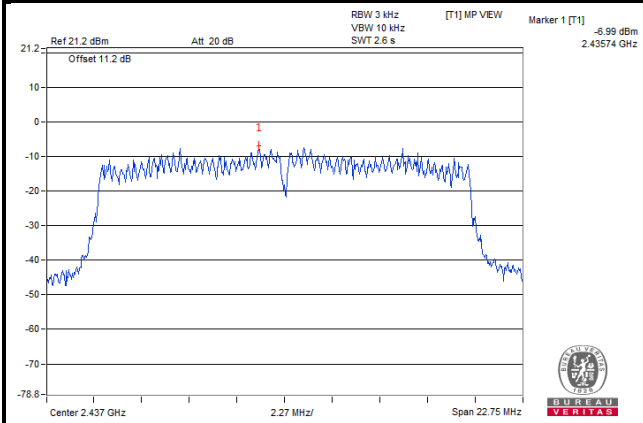
802.11b



802.11g



802.11n (HT20)

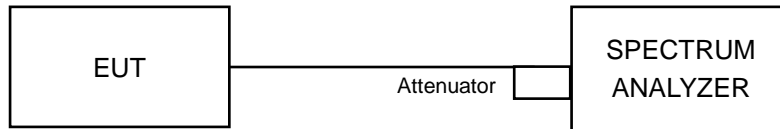


4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

Below 20 dB of the highest emission level of operating band (in 100 kHz Resolution Bandwidth).

4.6.2 Test Setup



4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.6.4 Test Procedure

MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW \geq 300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW \geq 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

4.6.5 Deviation from Test Standard

No deviation.

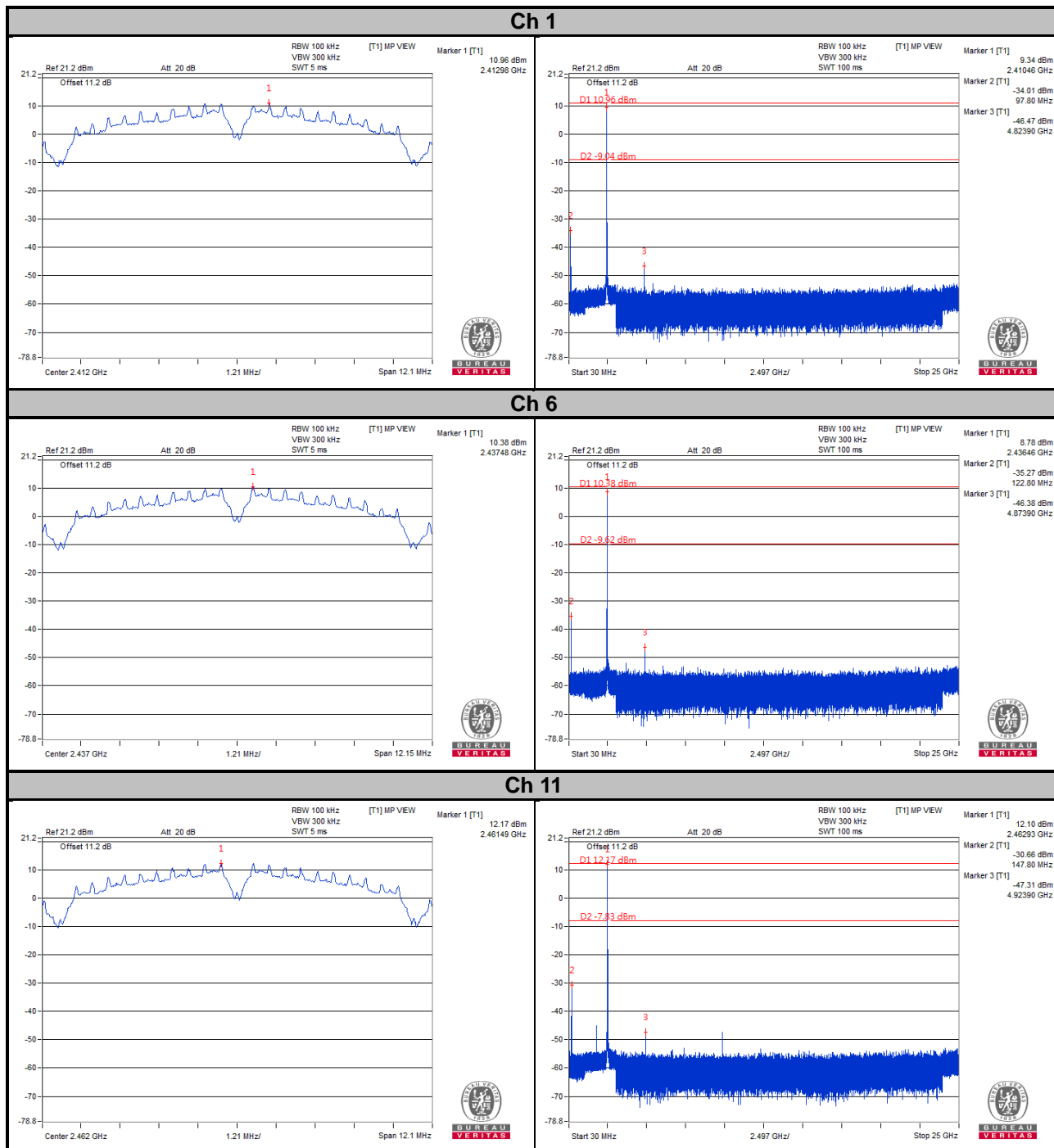
4.6.6 EUT Operating Condition

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

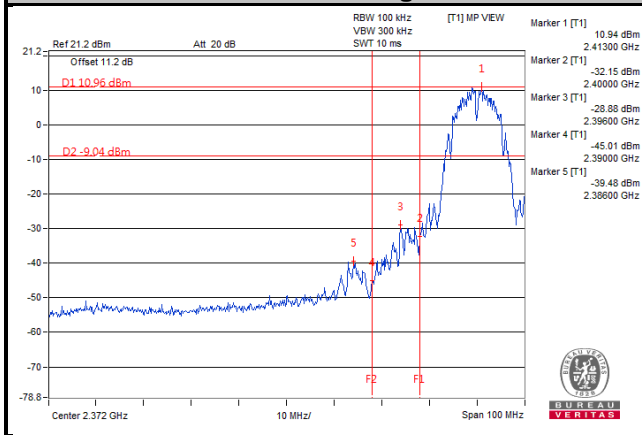
4.6.7 Test Results

The spectrum plots are attached on the following images. D1 line indicates the highest level, and D2 line indicates the 20 dB offset below D1. It shows compliance with the requirement.

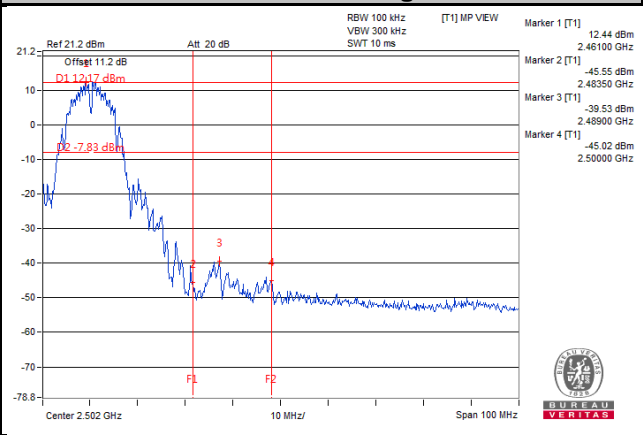
802.11b



Ch 1 Band Edge

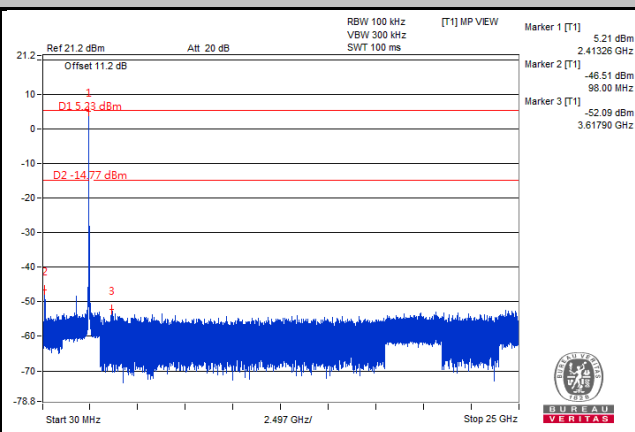
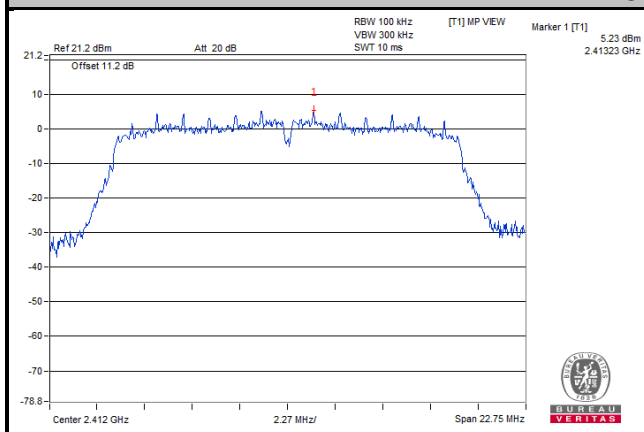


Ch 11 Band Edge

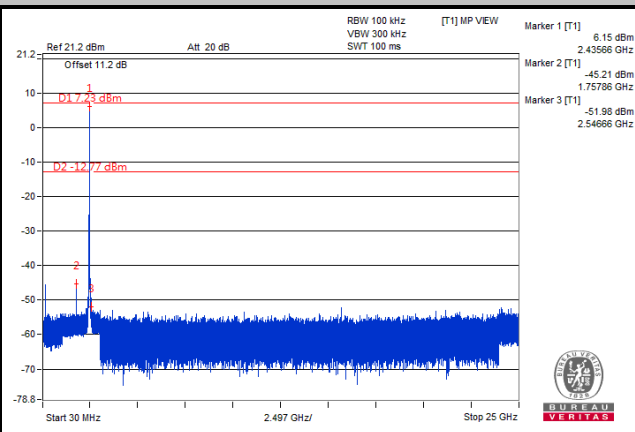
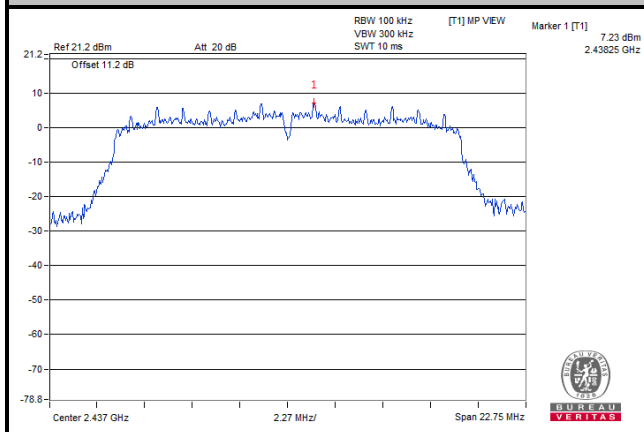


802.11g

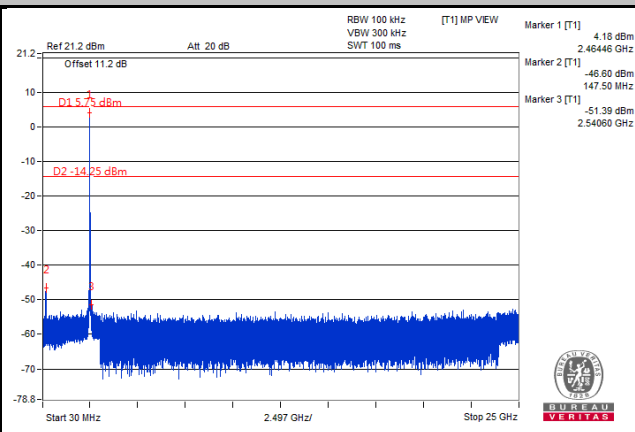
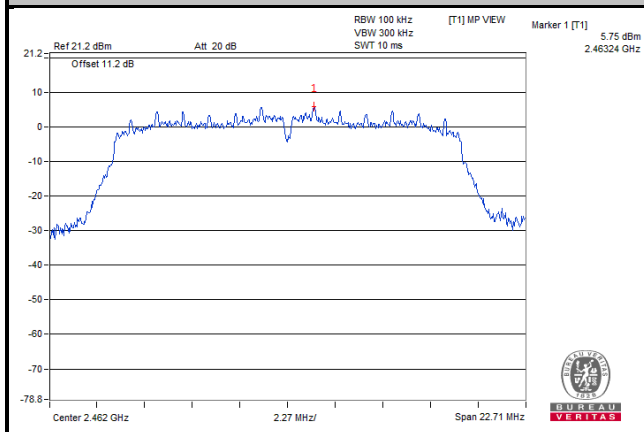
Ch 1



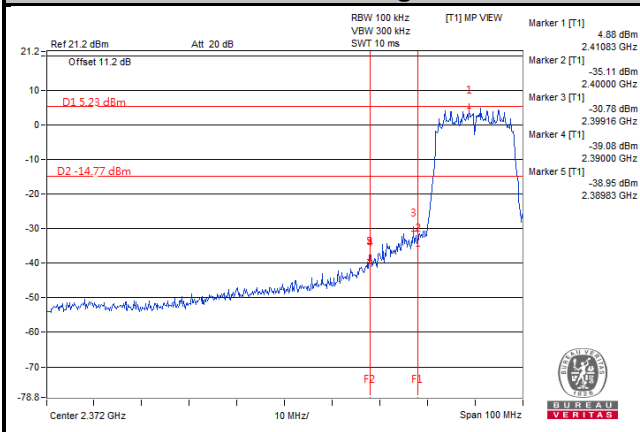
Ch 6



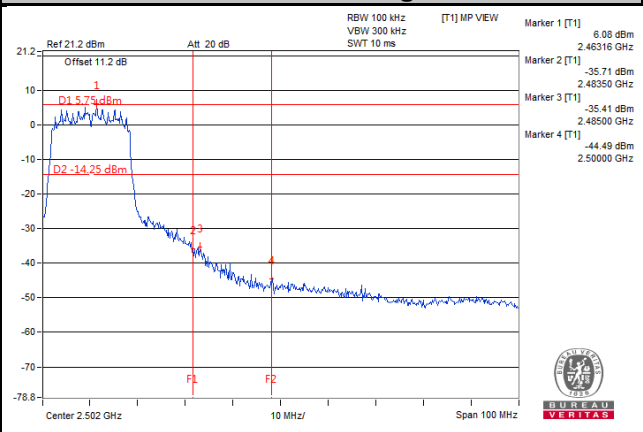
Ch 11



Ch 1 Band Edge

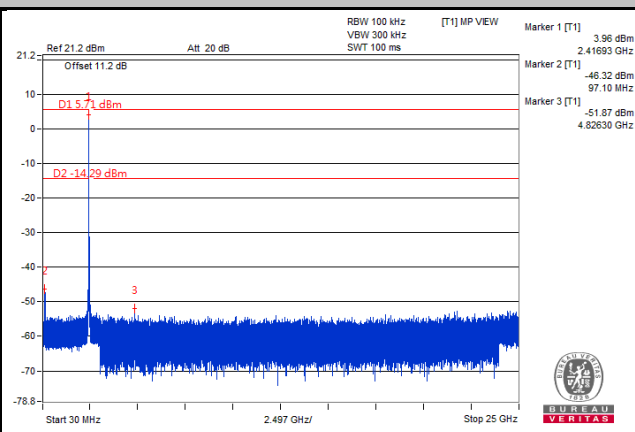
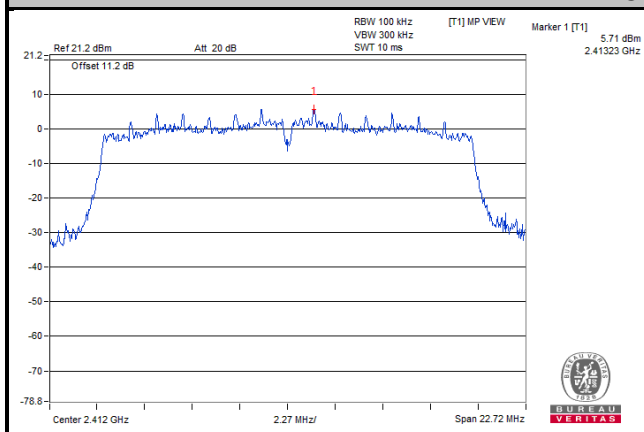


Ch 11 Band Edge

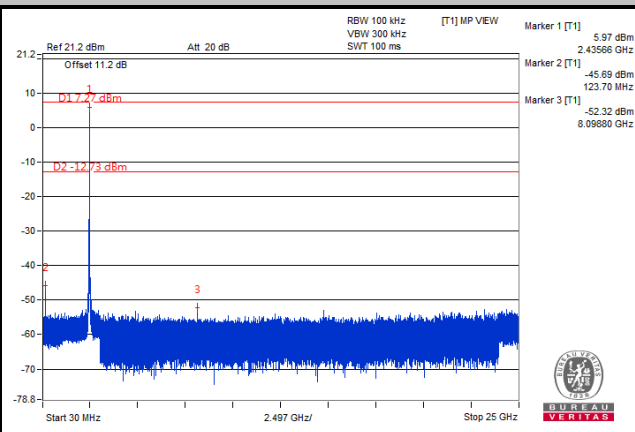
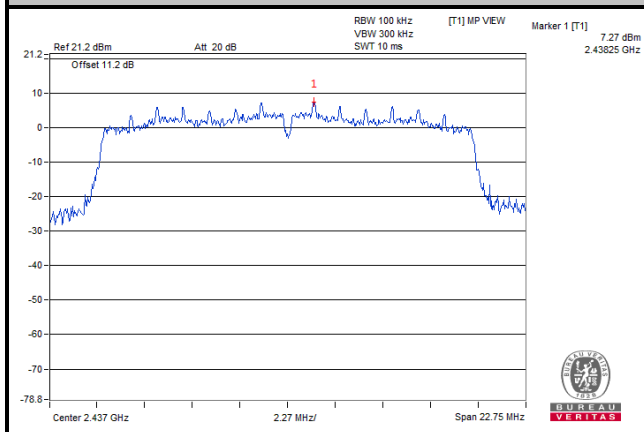


802.11n (HT20)

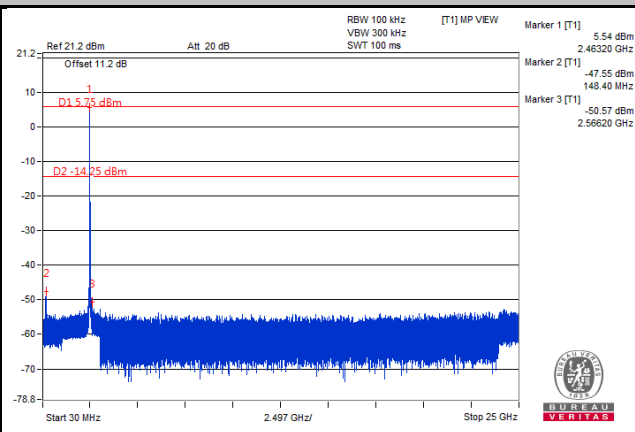
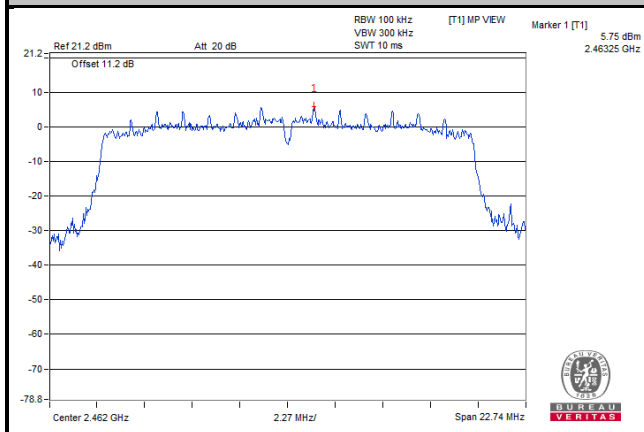
Ch 1



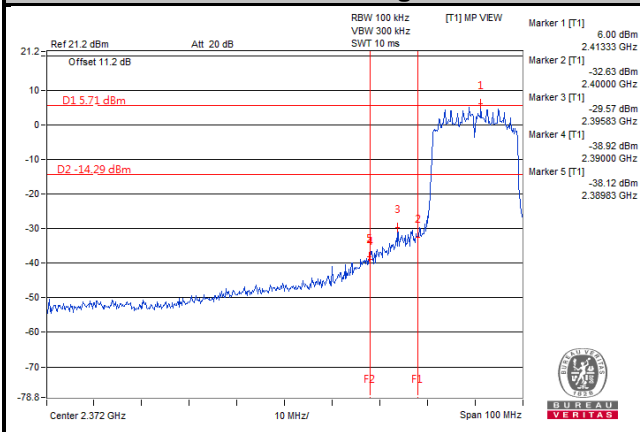
Ch 6



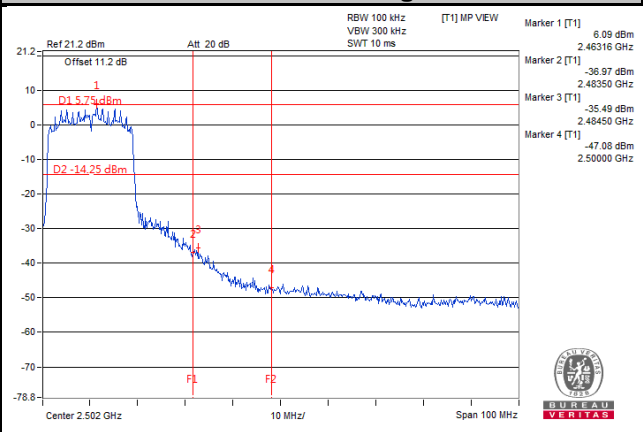
Ch 11



Ch 1 Band Edge



Ch 11 Band Edge

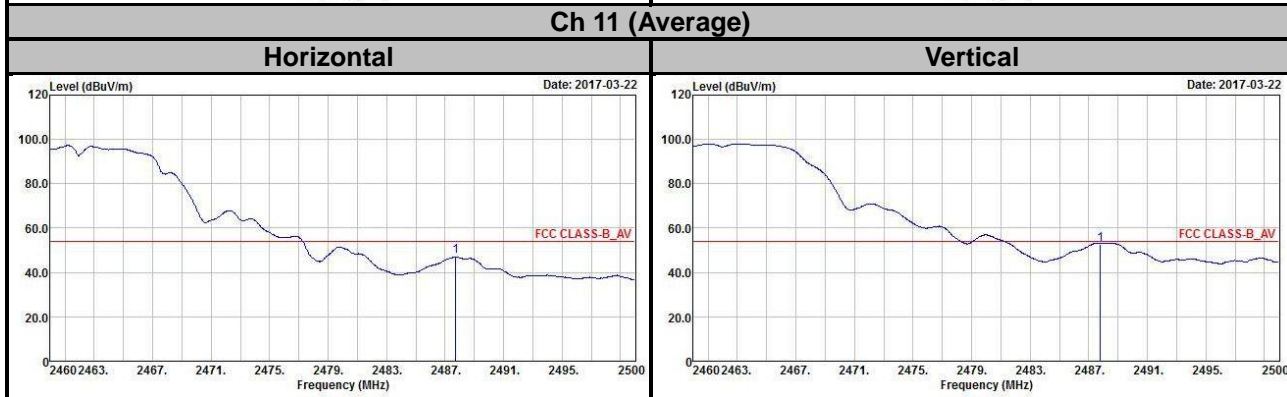
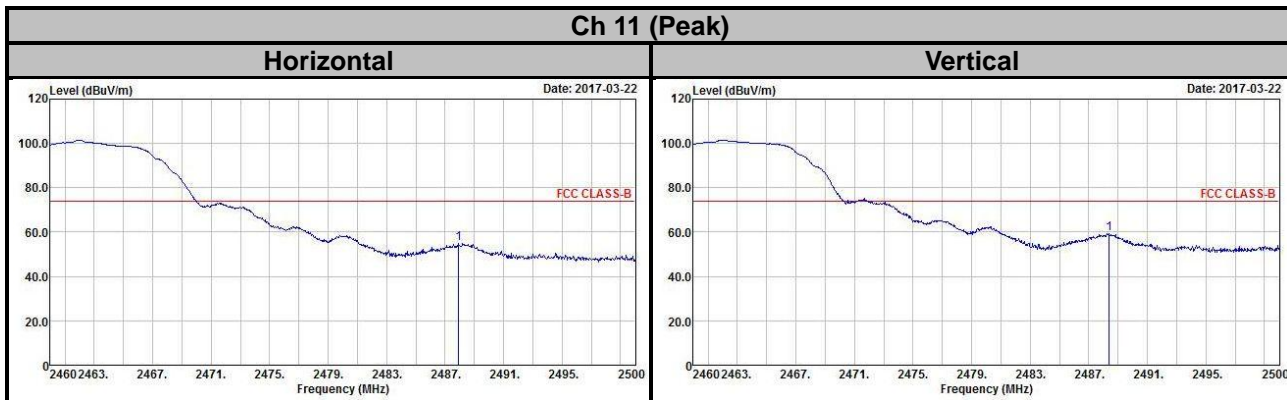
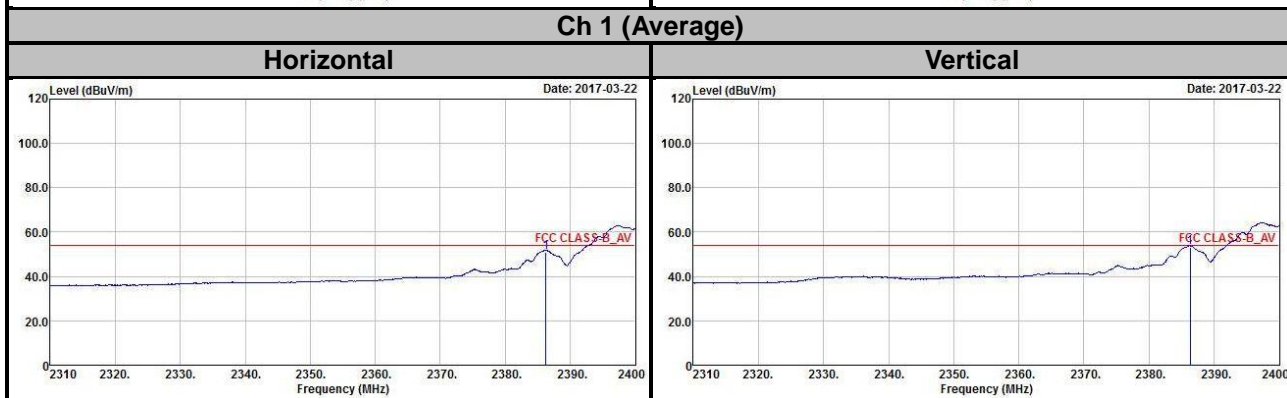
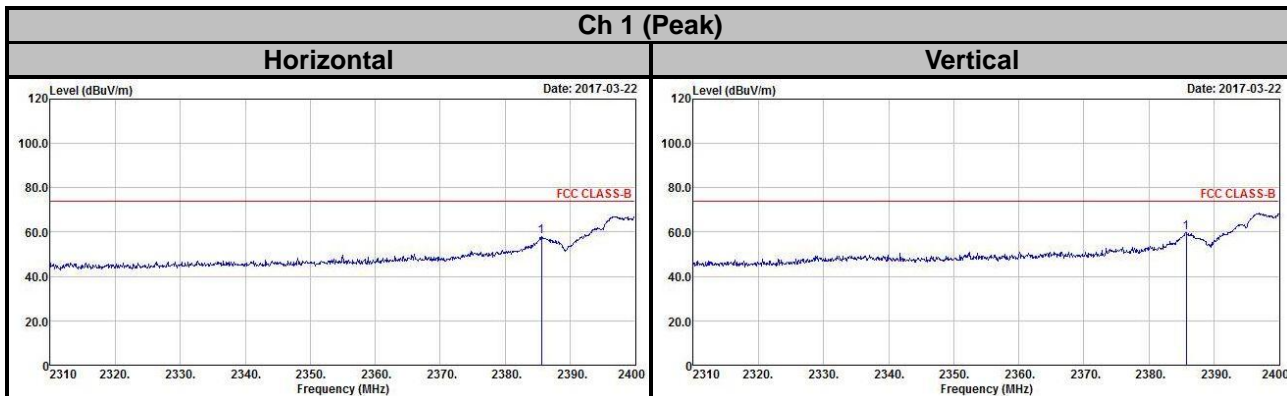


5 Pictures of Test Arrangements

Please refer to the attached file (Test Setup Photo).

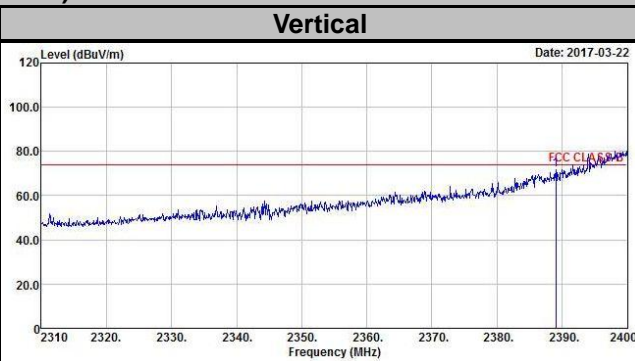
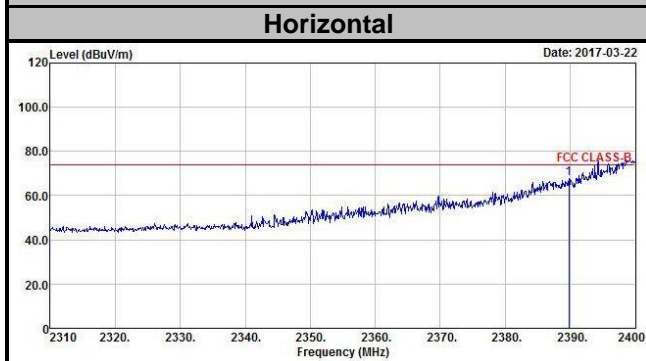
Annex A- Radiated Bandedge Plots

802.11b

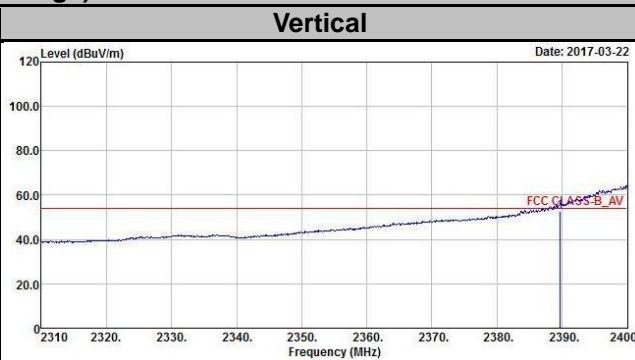
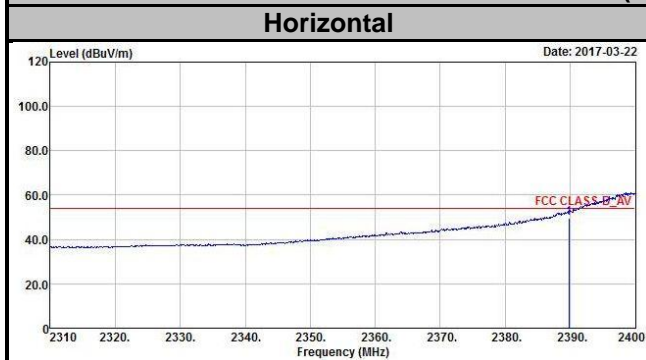


802.11g

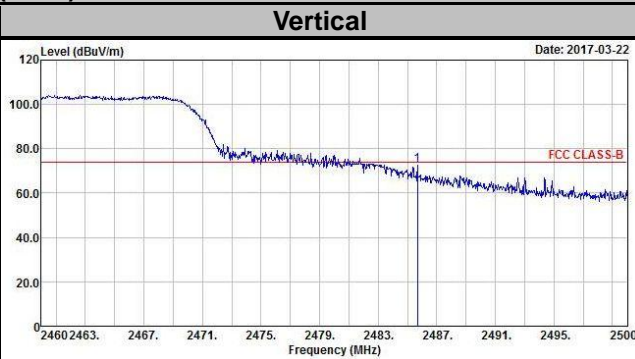
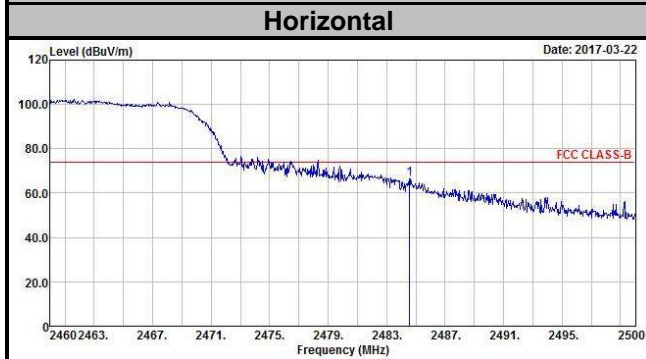
Ch 1 (Peak)



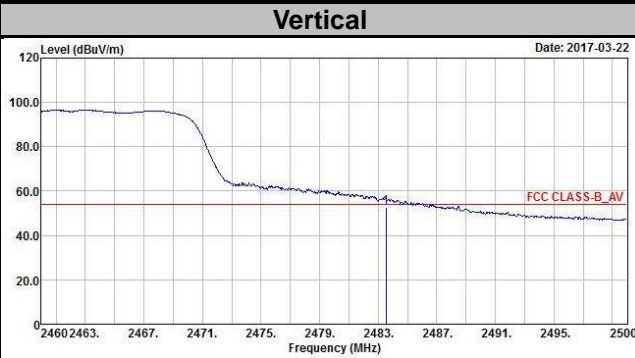
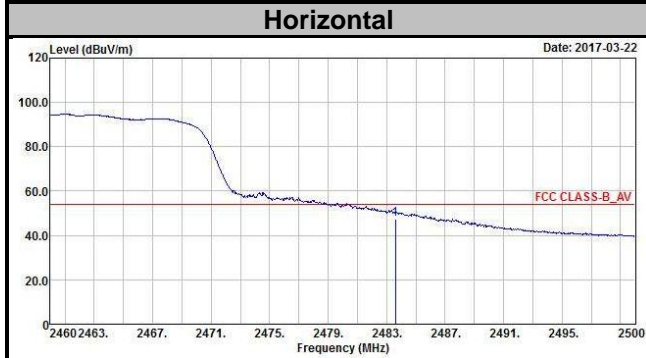
Ch 1 (Average)



Ch 11 (Peak)

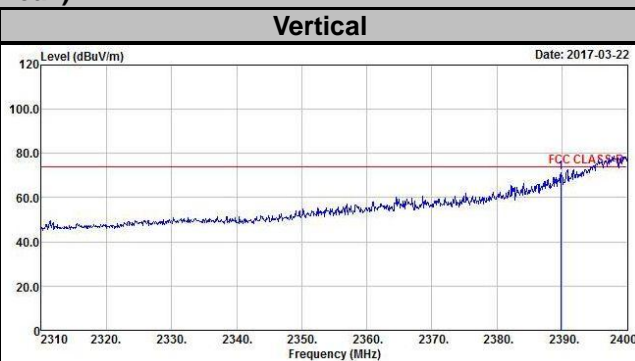
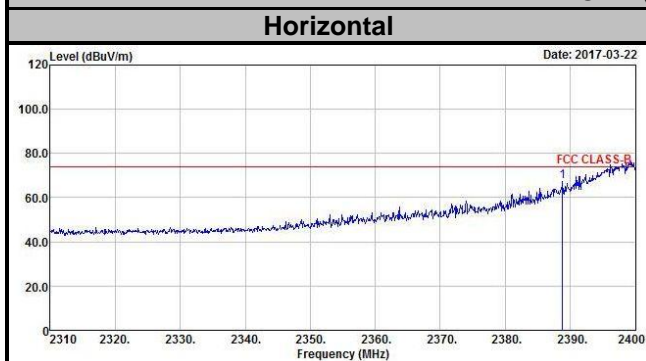


Ch 11 (Average)

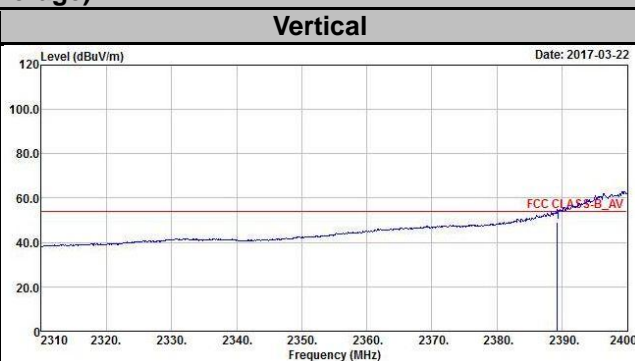
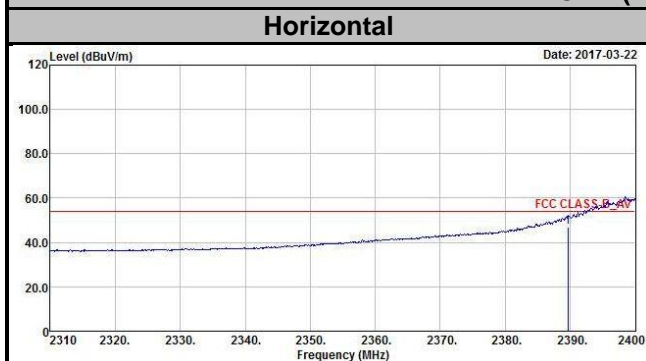


802.11n (HT20)

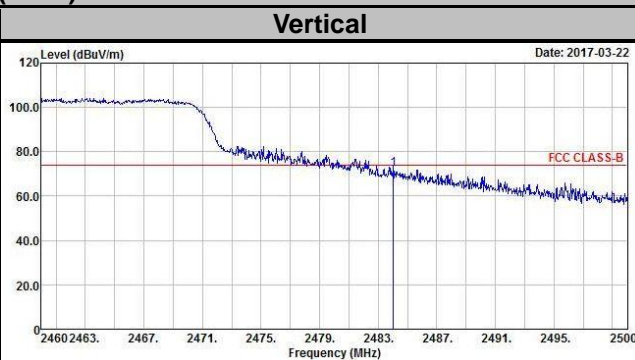
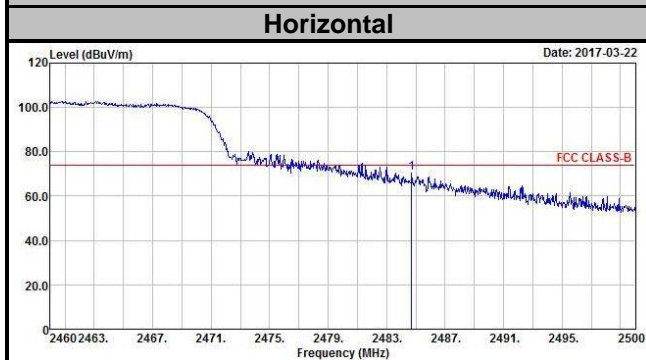
Ch 1 (Peak)



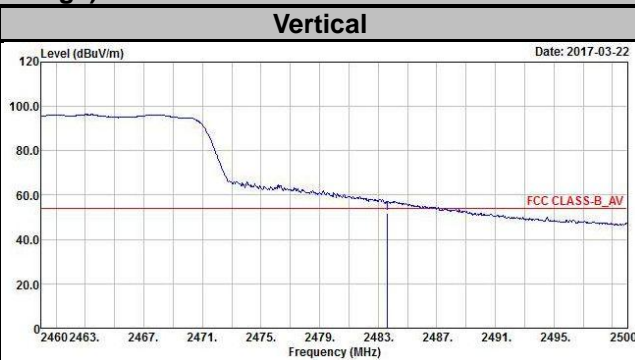
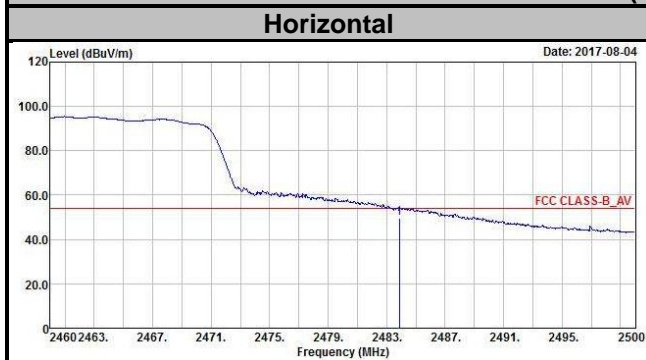
Ch 1 (Average)



Ch 11 (Peak)



Ch 11 (Average)



Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

The address and road map of all our labs can be found in our web site also.

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