FCC Test Report (WLAN)

Report No.:	RFBECO-WTW-P21010839
FCC ID:	TLZ-CU488
Test Model:	AW-CU488
Received Date:	Feb. 04, 2021
Test Date:	Feb. 24 to Mar. 03, 2021
Issued Date:	Mar. 16, 2021
Applicant:	AzureWave Technologies, Inc.
Address:	8F., No.94, Baozhong Rd. , Xindian Dist., New Taipei City , Taiwan 231
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory
Lab Address:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
Test Location:	E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300, Taiwan
FCC Registration / Designation Number:	723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
RFBECO-WTW-P21010839	Original release.	Mar. 16, 2021

1 Certificate of Conformity

Product:	IEEE 802.11 a/b/g/n 1T1R WLAN and Bluetooth Low Energy Microcontroller Module
Brand:	AzureWave
Test Model:	AW-CU488
Sample Status:	Engineering sample
Applicant:	AzureWave Technologies, Inc.
Test Date:	Feb. 24 to Mar. 03, 2021
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 : Vivian Huang , **Date:** Mar. 16, 2021

Vivian Huang / Specialist

Approved by : , **Date:** Mar. 16, 2021

Clark Lin / Technical Manager

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 -13.87dB at 0.57578MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.4dB at 2387.25MHz, 2390.00MHz and 2483.50MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB 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.

Note:
1. For 2.4GHz band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A. Test Procedures refer to report 4.1.3.
2. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	1.9 dB
Conducted emissions	-	2.5 dB
Radiated Emissions up to 1 GHz	9kHz ~ 30MHz	3.1 dB
	30MHz ~ 1GHz	5.5 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.1 dB
	18GHz ~ 40GHz	5.3 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (WLAN)

Product	IEEE 802.11 a/b/g/n 1T1R WLAN and Bluetooth Low Energy Microcontroller Module
Brand	AzureWave
Test Model	AW-CU488
Status of EUT	Engineering sample
Power Supply Rating	3.3Vdc from host equipment
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11 Mbps 802.11a/g: up to 54 Mbps 802.11n: up to 72.2 Mbps
Operating Frequency	**2.4GHz:** 2.412 ~ 2.462 GHz **5GHz:** 5.18 ~ 5.24 GHz, 5.26 ~ 5.32 GHz, 5.50 ~ 5.70 GHz, 5.745 ~ 5.825 GHz
Number of Channel	**2.4GHz:** 802.11b, 802.11g, 802.11n (HT20): 11 **5GHz:** 802.11a, 802.11n (HT20): 24
Output Power	**2.4 GHz:** 490.908 mW **5.18 ~ 5.24 GHz:** 139.959 mW **5.26 ~ 5.32 GHz:** 74.989 mW **5.50 ~ 5.70 GHz:** 77.983 mW **5.745 ~ 5.825GHz:** 137.404 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Cable Supplied	NA

Note:

1. There are WLAN and Bluetooth technology used for the EUT.
2. The device of WLAN (2.4GHz), WLAN (5GHz) and Bluetooth technology cannot transmit simultaneously.
3. The antenna provided to the EUT, please refer to the following table:

Antenna No.	Brand	Model	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
1	LYNwave	ALX20M-222AAC	3.7	2.4~2.5	PIFA	none
			3.6	5.15~5.85		

4. The EUT incorporates a SISO function.

2.4GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11b	1TX	1RX
802.11g	1TX	1RX
802.11n (HT20)	1TX	1RX
5GHz Band		
MODULATION MODE	**TX & RX CONFIGURATION**	
802.11a	1TX	1RX
802.11n (HT20)	1TX	1RX

5. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.
6. The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

3.2 Description of Test Modes

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

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

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

Where **RE≥1G:** Radiated Emission above 1GHz & Bandedge Measurement **RE<1G:** Radiated Emission below 1GHz

PLC: Power Line Conducted Emission **APCM:** Antenna Port Conducted Measurement

Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-plane.**

Radiated Emission Test (Above 1GHz):

☒ 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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5

Radiated Emission Test (Below 1GHz):

☒ 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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	6	DSSS	DBPSK	1

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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	6	DSSS	DBPSK	1

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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5

Test Condition:

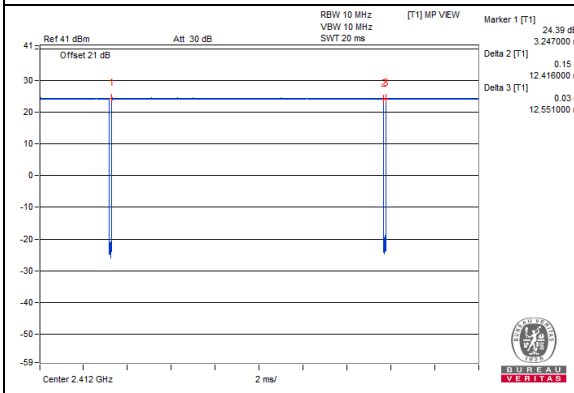
APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (System)	TESTED BY
RE≥1G	25deg. C, 69%RH	120Vac, 60Hz	Carter Lin
RE<1G	25deg. C, 66%RH	120Vac, 60Hz	Sampson Chen
PLC	25deg. C, 66%RH	120Vac, 60Hz	Sampon Chen
APCM	25deg. C, 60%RH	120Vac, 60Hz	Jyunchun Lin

3.3 Duty Cycle of Test Signal

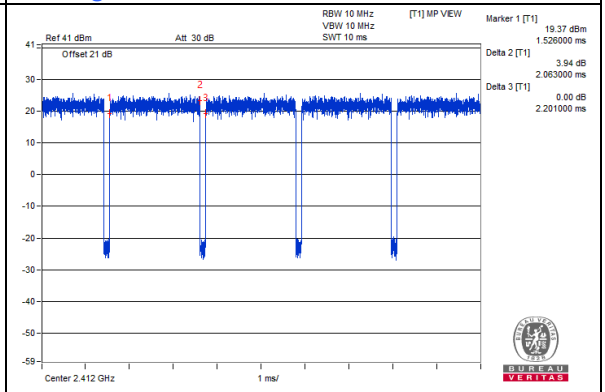
If duty cycle of test signal is ≥ 98 %, duty factor is not required.
If duty cycle of test signal is < 98%, duty factor shall be considered.

802.11b: Duty cycle = 12.416 ms/12.551 ms= 0.989
802.11g: Duty cycle = 2.063 ms/2.201 ms= 0.931, Duty factor = 10 * log (1/Duty cycle) = 0.28 dB
802.11n (HT20): Duty cycle = 1.918 ms /2.052 ms = 0.935, Duty factor = 10 * log (1/Duty cycle) = 0.29 dB

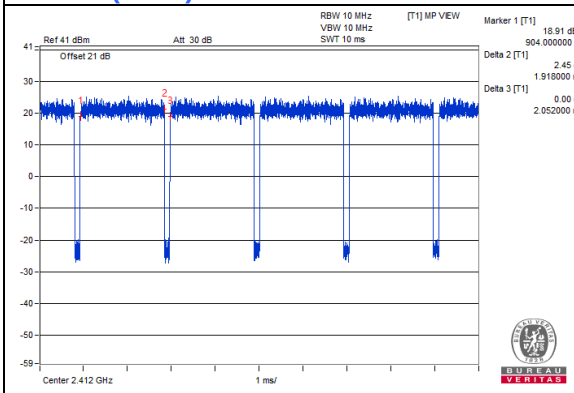
802.11b



802.11g



802.11n (HT20)



3.4 Description of Support Units

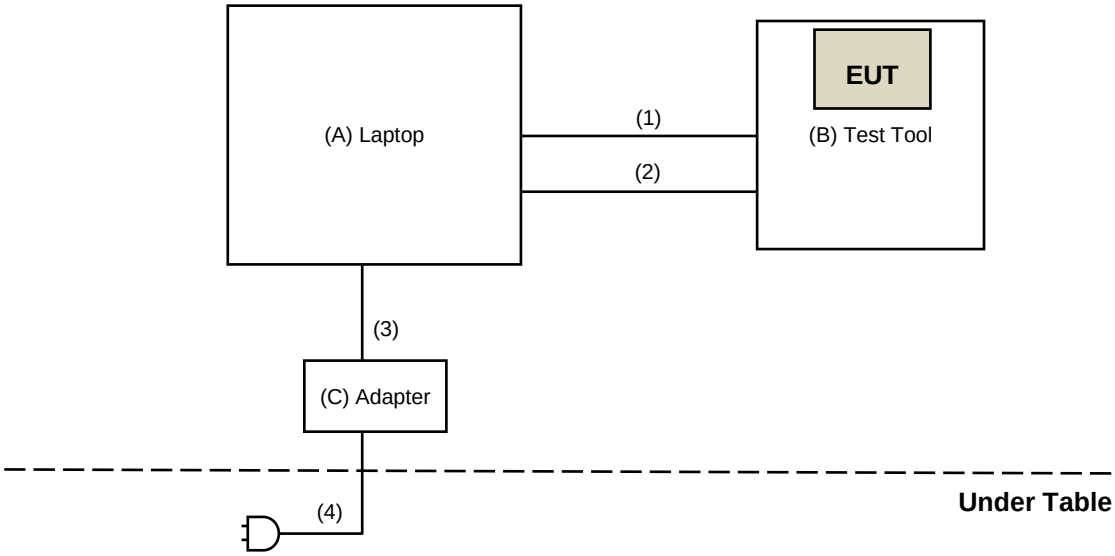
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Laptop	DELL	E6440	F9LYQ32	DoC	Provided by Lab
B.	Test Tool	AzureWave Technologies, Inc.	NA	NA	NA	Supplied by client
C.	Adapter	Lenovo	ADLX45YLC3D	NA	NA	Provided by Lab

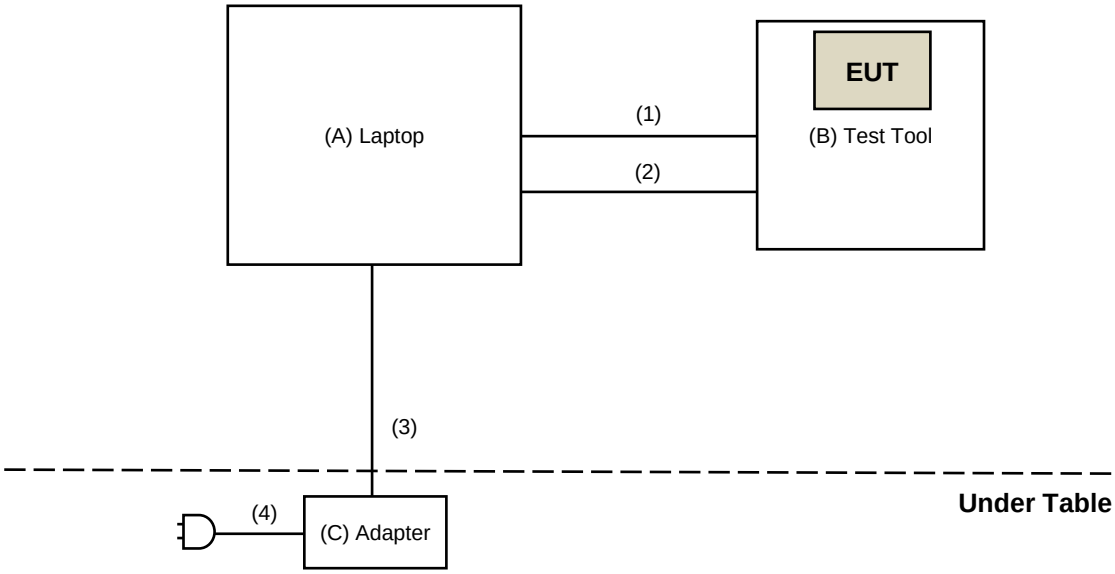
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB Cable	1	1.8	Yes	0	Provided by Lab
2.	USB Cable	1	1.8	Yes	0	Provided by Lab
3.	DC Cable	1	1.8	No	0	Provided by Lab
4.	AC Cable	1	1	No	0	Provided by Lab

3.4.1 Configuration of System under Test

For AC Power Conducted Emissions test:



For Radiated Emissions test:



3.5 General Description of Applied Standards and references

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

Test standard:

FCC Part 15, Subpart C (15.247)
ANSI C63.10-2013

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

References Test Guidance :

KDB 558074 D01 15.247 Meas Guidance v05r02

All test items have been performed as a reference to the above KDB test guidance.

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 20dB 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 1000MHz, 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 20dB under any condition of modulation.

4.1.2 Test Instruments

For Radiated Emission & Bandedge test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY51210202	Dec. 01, 2020	Nov. 30, 2021
Pre-Amplifier EMCI	EMC001340	980142	May 25, 2020	May 24, 2021
Loop Antenna Electro-Metrics	EM-6879	264	Sep. 17, 2020	Sep. 16, 2021
RF Cable	5D-FB	LOOPCAB-001	Jan. 07, 2021	Jan. 06, 2022
RF Cable	5D-FB	LOOPCAB-002	Jan. 07, 2021	Jan. 06, 2022
Pre-Amplifier EMCI	EMC330N	980701	Mar. 11, 2020	Mar. 10, 2021
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 06, 2020	Nov. 05, 2021
RF Cable	8D	966-6-1	Apr. 04, 2020	Apr. 03, 2021
RF Cable	8D	966-4-2	Mar. 18, 2020	Mar. 17, 2021
RF Cable	8D	966-4-3	Mar. 18, 2020	Mar. 17, 2021
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-ATT5-03	Jan. 11, 2021	Jan. 10, 2022
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Nov. 22, 2020	Nov. 21, 2021
Pre-Amplifier EMCI	EMC 12630 SE	980638	Apr. 08, 2020	Apr. 07, 2021
RF Cable	EMC104-SM-SM-1200	160922	Dec. 25, 2020	Dec. 24, 2021
RF Cable	EMC104-SM-SM-2000	180502	Apr. 29, 2020	Apr. 28, 2021
RF Cable	EMC104-SM-SM-6000	180418	Apr. 29, 2020	Apr. 28, 2021
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 11, 2021	Jan. 10, 2022
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 22, 2020	Nov. 21, 2021
RF Cable	EMC102-KM-KM-1200	160924	Jan. 11, 2021	Jan. 10, 2022
RF Cable	EMC-KM-KM-4000	200214	Mar. 11, 2020	Mar. 10, 2021
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	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 966 Chamber No. 4.
3. Tested Date: Feb. 24 to Mar. 03, 2021

For other test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	100964	May 29, 2020	May 28, 2021
Power meter Anritsu	ML2495A	1529002	July 22, 2020	July 21, 2021
Power sensor Anritsu	MA2411B	1339443	July 22, 2020	July 21, 2021
Fixed Attenuator Mini-Circuits	MDCS18N-10	MDCS18N-10-01	Apr. 14, 2020	Apr. 13, 2021
Software	ADT_RF Test Software V6.6.5.4	NA	NA	NA

NOTE:
1. The test was performed in Oven room 2.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. Tested Date: Mar. 03, 2021

4.1.3 Test Procedures

For Radiated emission below 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case 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.

Note:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

For Radiated emission above 30MHz

a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) 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 detects 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:

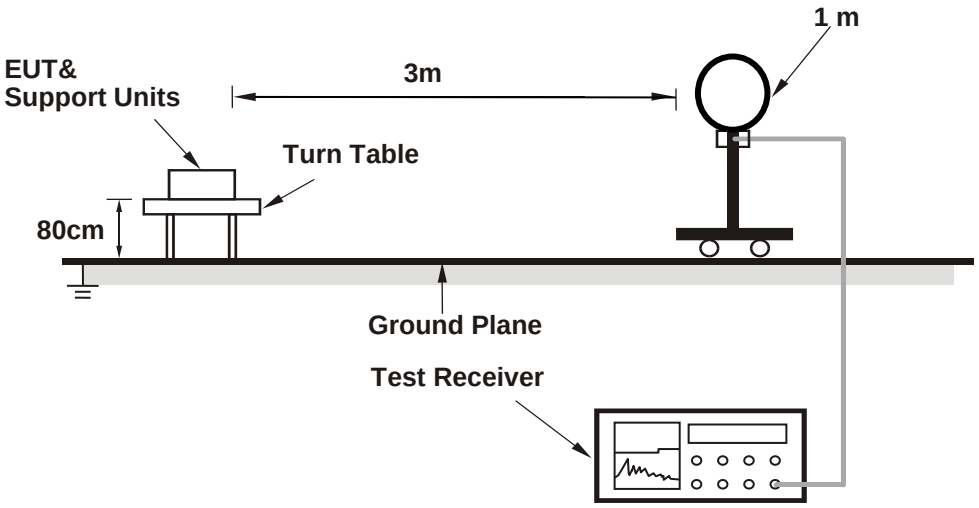
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

4.1.4 Deviation from Test Standard

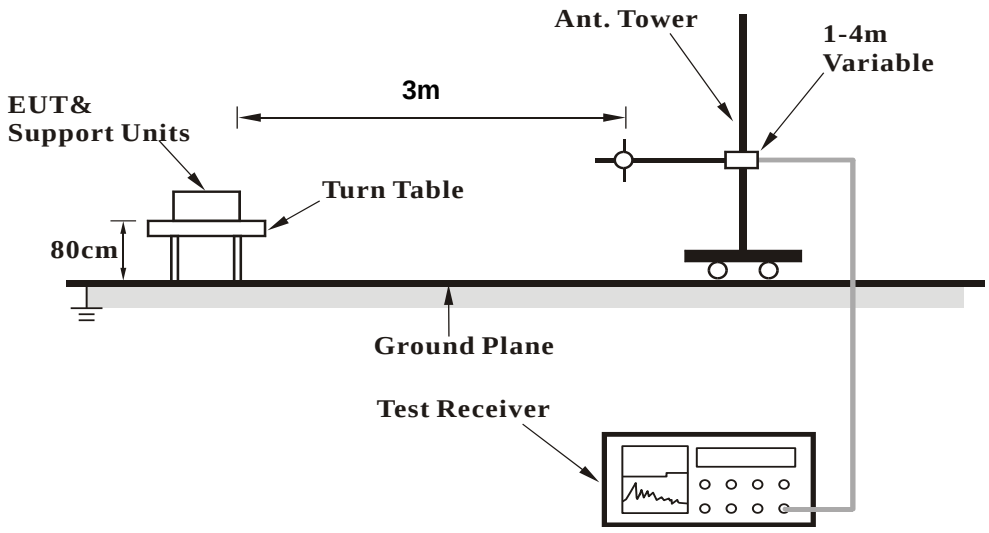
No deviation.

4.1.5 Test Setup

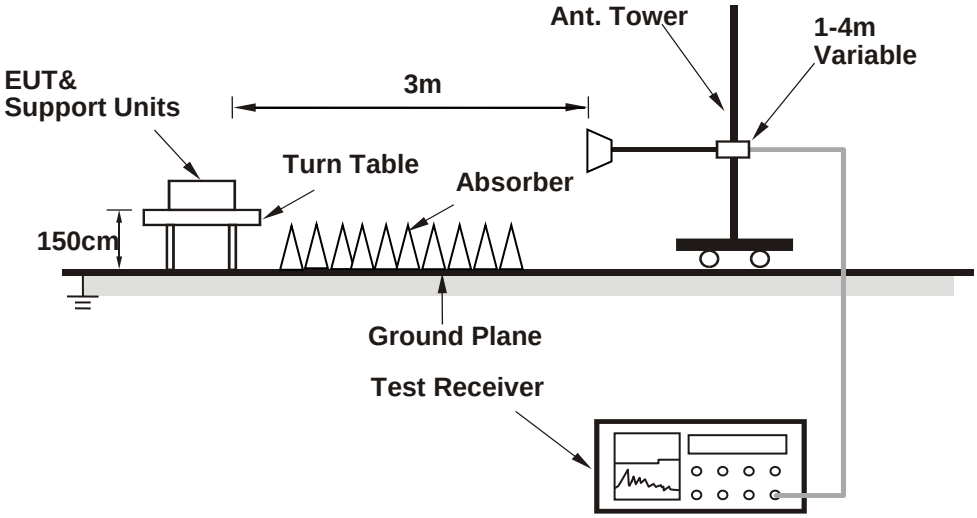
For Radiated emission below 30MHz



For Radiated emission 30MHz to 1GHz



For Radiated emission above 1GHz



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

4.1.6 EUT Operating Conditions

a. Placed the EUT on the testing table.
b. Controlling software (AmebaD_mptool_2V1) has been activated to set the EUT under transmission condition continuously.

4.1.7 Test Results

ABOVE 1GHz DATA

RF Mode	TX 802.11b	**Channel**	CH 1：2412 MHz
Frequency Range	1GHz ~ 25GHz	**Detector Function**	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	2387.25	61.1 PK	74.0	-12.9	1.96 H	201	65.5	-4.4
2	**2387.25**	**53.6 AV**	**54.0**	**-0.4**	**1.96 H**	**201**	**58.0**	**-4.4**
3	*2412.00	113.5 PK			1.96 H	201	117.9	-4.4
4	*2412.00	112.0 AV			1.96 H	201	116.4	-4.4
5	4824.00	39.8 PK	74.0	-34.2	2.54 H	307	39.7	0.1
6	4824.00	36.6 AV	54.0	-17.4	2.54 H	307	36.5	0.1
Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	2387.21	60.3 PK	74.0	-13.7	2.08 V	267	64.7	-4.4
2	2387.21	52.0 AV	54.0	-2.0	2.08 V	267	56.4	-4.4
3	*2412.00	109.8 PK			2.08 V	267	114.2	-4.4
4	*2412.00	107.3 AV			2.08 V	267	111.7	-4.4
5	4824.00	47.1 PK	74.0	-26.9	1.41 V	342	47.0	0.1
6	4824.00	45.6 AV	54.0	-8.4	1.41 V	342	45.5	0.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

RF Mode	TX 802.11b	Channel	CH 6：2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	56.5 PK	74.0	-17.5	1.93 H	202	61.0	-4.5
2	2390.00	44.1 AV	54.0	-9.9	1.93 H	202	48.6	-4.5
3	*2437.00	113.7 PK			1.93 H	202	118.1	-4.4
4	*2437.00	112.7 AV			1.93 H	202	117.1	-4.4
5	2483.50	59.2 PK	74.0	-14.8	1.93 H	202	63.7	-4.5
6	2483.50	45.3 AV	54.0	-8.7	1.93 H	202	49.8	-4.5
7	4874.00	40.0 PK	74.0	-34.0	2.58 H	307	39.9	0.1
8	4874.00	36.5 AV	54.0	-17.5	2.58 H	307	36.4	0.1
9	7311.00	48.9 PK	74.0	-25.1	2.15 H	300	42.6	6.3
10	7311.00	43.7 AV	54.0	-10.3	2.15 H	300	37.4	6.3
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	55.6 PK	74.0	-18.4	2.13 V	257	60.1	-4.5
2	2390.00	42.1 AV	54.0	-11.9	2.13 V	257	46.6	-4.5
3	*2437.00	110.8 PK			2.13 V	257	115.2	-4.4
4	*2437.00	108.3 AV			2.13 V	257	112.7	-4.4
5	2483.50	58.1 PK	74.0	-15.9	2.13 V	257	62.6	-4.5
6	2483.50	43.2 AV	54.0	-10.8	2.13 V	257	47.7	-4.5
7	4874.00	47.1 PK	74.0	-26.9	1.37 V	331	47.0	0.1
8	4874.00	45.8 AV	54.0	-8.2	1.37 V	331	45.7	0.1
9	7311.00	51.4 PK	74.0	-22.6	1.85 V	344	45.1	6.3
10	7311.00	47.6 AV	54.0	-6.4	1.85 V	344	41.3	6.3

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

RF Mode	TX 802.11b	Channel	CH 11：2462 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	112.5 PK			2.10 H	204	116.9	-4.4
2	*2462.00	110.0 AV			2.10 H	204	114.4	-4.4
3	2483.50	60.0 PK	74.0	-14.0	2.10 H	204	64.5	-4.5
4	2483.50	53.4 AV	54.0	-0.6	2.10 H	204	57.9	-4.5
5	4924.00	39.9 PK	74.0	-34.1	2.58 H	316	39.6	0.3
6	4924.00	36.3 AV	54.0	-17.7	2.58 H	316	36.0	0.3
7	7386.00	48.9 PK	74.0	-25.1	2.17 H	315	42.3	6.6
8	7386.00	43.9 AV	54.0	-10.1	2.17 H	315	37.3	6.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	109.1 PK			2.02 V	261	113.5	-4.4
2	*2462.00	106.4 AV			2.02 V	261	110.8	-4.4
3	2483.50	58.6 PK	74.0	-15.4	2.02 V	261	63.1	-4.5
4	2483.50	48.9 AV	54.0	-5.1	2.02 V	261	53.4	-4.5
5	4924.00	47.5 PK	74.0	-26.5	1.43 V	333	47.2	0.3
6	4924.00	46.0 AV	54.0	-8.0	1.43 V	333	45.7	0.3
7	7386.00	51.3 PK	74.0	-22.7	1.90 V	330	44.7	6.6
8	7386.00	47.4 AV	54.0	-6.6	1.90 V	330	40.8	6.6

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

RF Mode	TX 802.11g	Channel	CH 1：2412 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	**2390.00**	**73.6 PK**	**74.0**	**-0.4**	**1.98 H**	**201**	**78.1**	**-4.5**
2	2390.00	52.9 AV	54.0	-1.1	1.98 H	201	57.4	-4.5
3	*2412.00	112.5 PK			1.98 H	201	116.9	-4.4
4	*2412.00	102.2 AV			1.98 H	201	106.6	-4.4
5	4824.00	35.4 PK	74.0	-38.6	2.56 H	319	35.3	0.1
6	4824.00	32.1 AV	54.0	-21.9	2.56 H	319	32.0	0.1
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	67.8 PK	74.0	-6.2	1.98 V	268	72.3	-4.5
2	2390.00	51.8 AV	54.0	-2.2	1.98 V	268	56.3	-4.5
3	*2412.00	108.7 PK			1.98 V	268	113.1	-4.4
4	*2412.00	99.3 AV			1.98 V	268	103.7	-4.4
5	4824.00	42.1 PK	74.0	-31.9	1.40 V	325	42.0	0.1
6	4824.00	39.4 AV	54.0	-14.6	1.40 V	325	39.3	0.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

RF Mode	TX 802.11g	Channel	CH 6：2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	64.1 PK	74.0	-9.9	1.96 H	202	68.6	-4.5
2	2390.00	49.6 AV	54.0	-4.4	1.96 H	202	54.1	-4.5
3	*2437.00	116.4 PK			1.96 H	202	120.8	-4.4
4	*2437.00	106.6 AV			1.96 H	202	111.0	-4.4
5	2483.50	68.0 PK	74.0	-6.0	1.96 H	202	72.5	-4.5
6	2483.50	52.8 AV	54.0	-1.2	1.96 H	202	57.3	-4.5
7	4874.00	35.5 PK	74.0	-38.5	2.59 H	315	35.4	0.1
8	4874.00	32.2 AV	54.0	-21.8	2.59 H	315	32.1	0.1
9	7311.00	41.2 PK	74.0	-32.8	2.18 H	315	34.9	6.3
10	7311.00	36.8 AV	54.0	-17.2	2.18 H	315	30.5	6.3
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	62.9 PK	74.0	-11.1	1.97 V	256	67.4	-4.5
2	2390.00	48.1 AV	54.0	-5.9	1.97 V	256	52.6	-4.5
3	*2437.00	113.3 PK			1.97 V	256	117.7	-4.4
4	*2437.00	102.9 AV			1.97 V	256	107.3	-4.4
5	2483.50	67.1 PK	74.0	-6.9	1.97 V	256	71.6	-4.5
6	2483.50	51.4 AV	54.0	-2.6	1.97 V	256	55.9	-4.5
7	4874.00	41.9 PK	74.0	-32.1	1.40 V	328	41.8	0.1
8	4874.00	39.1 AV	54.0	-14.9	1.40 V	328	39.0	0.1
9	7311.00	45.8 PK	74.0	-28.2	1.88 V	328	39.5	6.3
10	7311.00	41.1 AV	54.0	-12.9	1.88 V	328	34.8	6.3

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

RF Mode	TX 802.11g	Channel	CH 11：2462 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	110.5 PK			2.08 H	203	114.9	-4.4
2	*2462.00	100.6 AV			2.08 H	203	105.0	-4.4
3	2483.50	71.2 PK	74.0	-2.8	2.08 H	203	75.7	-4.5
4	2483.50	53.3 AV	54.0	-0.7	2.08 H	203	57.8	-4.5
5	4924.00	35.4 PK	74.0	-38.6	2.54 H	332	35.1	0.3
6	4924.00	32.1 AV	54.0	-21.9	2.54 H	332	31.8	0.3
7	7386.00	41.4 PK	74.0	-32.6	2.11 H	304	34.8	6.6
8	7386.00	36.9 AV	54.0	-17.1	2.11 H	304	30.3	6.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	106.4 PK			2.00 V	263	110.8	-4.4
2	*2462.00	97.3 AV			2.00 V	263	101.7	-4.4
3	2483.50	69.0 PK	74.0	-5.0	2.00 V	263	73.5	-4.5
4	2483.50	51.0 AV	54.0	-3.0	2.00 V	263	55.5	-4.5
5	4924.00	41.9 PK	74.0	-32.1	1.33 V	316	41.6	0.3
6	4924.00	39.0 AV	54.0	-15.0	1.33 V	316	38.7	0.3
7	7386.00	45.9 PK	74.0	-28.1	1.88 V	342	39.3	6.6
8	7386.00	41.1 AV	54.0	-12.9	1.88 V	342	34.5	6.6

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

RF Mode	TX 802.11n (HT20)	Channel	CH 1：2412 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	71.3 PK	74.0	-2.7	1.98 H	201	75.8	-4.5
2	2390.00	53.3 AV	54.0	-0.7	1.98 H	201	57.8	-4.5
3	*2412.00	111.5 PK			1.98 H	201	115.9	-4.4
4	*2412.00	102.0 AV			1.98 H	201	106.4	-4.4
5	4824.00	35.7 PK	74.0	-38.3	2.56 H	327	35.6	0.1
6	4824.00	32.3 AV	54.0	-21.7	2.56 H	327	32.2	0.1
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	69.9 PK	74.0	-4.1	1.94 V	272	74.4	-4.5
2	2390.00	49.9 AV	54.0	-4.1	1.94 V	272	54.4	-4.5
3	*2412.00	107.7 PK			1.94 V	272	112.1	-4.4
4	*2412.00	98.5 AV			1.94 V	272	102.9	-4.4
5	4824.00	42.0 PK	74.0	-32.0	1.34 V	316	41.9	0.1
6	4824.00	39.0 AV	54.0	-15.0	1.34 V	316	38.9	0.1

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

RF Mode	TX 802.11n (HT20)	Channel	CH 6：2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	67.0 PK	74.0	-7.0	1.99 H	202	71.5	-4.5
2	2390.00	50.8 AV	54.0	-3.2	1.99 H	202	55.3	-4.5
3	*2437.00	116.6 PK			1.99 H	202	121.0	-4.4
4	*2437.00	106.3 AV			1.99 H	202	110.7	-4.4
5	2483.50	68.3 PK	74.0	-5.7	1.99 H	202	72.8	-4.5
6	2483.50	53.4 AV	54.0	-0.6	1.99 H	202	57.9	-4.5
7	4874.00	35.9 PK	74.0	-38.1	2.53 H	331	35.8	0.1
8	4874.00	32.3 AV	54.0	-21.7	2.53 H	331	32.2	0.1
9	7311.00	41.5 PK	74.0	-32.5	2.16 H	310	35.2	6.3
10	7311.00	37.1 AV	54.0	-16.9	2.16 H	310	30.8	6.3
Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	2390.00	65.9 PK	74.0	-8.1	1.89 V	262	70.4	-4.5
2	2390.00	49.1 AV	54.0	-4.9	1.89 V	262	53.6	-4.5
3	*2437.00	112.6 PK			1.89 V	262	117.0	-4.4
4	*2437.00	102.4 AV			1.89 V	262	106.8	-4.4
5	2483.50	66.9 PK	74.0	-7.1	1.89 V	262	71.4	-4.5
6	2483.50	52.4 AV	54.0	-1.6	1.89 V	262	56.9	-4.5
7	4874.00	41.7 PK	74.0	-32.3	1.34 V	339	41.6	0.1
8	4874.00	39.2 AV	54.0	-14.8	1.34 V	339	39.1	0.1
9	7311.00	46.0 PK	74.0	-28.0	1.91 V	344	39.7	6.3
10	7311.00	41.5 AV	54.0	-12.5	1.91 V	344	35.2	6.3

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

RF Mode	TX 802.11n (HT20)	Channel	CH 11：2462 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function	Peak (PK) Average (AV)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	109.9 PK			2.00 H	202	114.3	-4.4
2	*2462.00	100.2 AV			2.00 H	202	104.6	-4.4
3	2483.50	73.3 PK	74.0	-0.7	2.00 H	202	77.8	-4.5
4	**2483.50**	**53.6 AV**	**54.0**	**-0.4**	**2.00 H**	**202**	**58.1**	**-4.5**
5	4924.00	36.1 PK	74.0	-37.9	2.59 H	317	35.8	0.3
6	4924.00	32.7 AV	54.0	-21.3	2.59 H	317	32.4	0.3
7	7386.00	41.2 PK	74.0	-32.8	2.19 H	319	34.6	6.6
8	7386.00	36.6 AV	54.0	-17.4	2.19 H	319	30.0	6.6
Antenna Polarity & Test Distance : Vertical at 3 m								
No	**Frequency (MHz)**	**Emission Level (dBuV/m)**	**Limit (dBuV/m)**	**Margin (dB)**	**Antenna Height (m)**	**Table Angle (Degree)**	**Raw Value (dBuV)**	**Correction Factor (dB/m)**
1	*2462.00	105.8 PK			1.98 V	267	110.2	-4.4
2	*2462.00	96.5 AV			1.98 V	267	100.9	-4.4
3	2483.50	68.6 PK	74.0	-5.4	1.98 V	267	73.1	-4.5
4	2483.50	50.3 AV	54.0	-3.7	1.98 V	267	54.8	-4.5
5	4924.00	41.7 PK	74.0	-32.3	1.39 V	316	41.4	0.3
6	4924.00	38.9 AV	54.0	-15.1	1.39 V	316	38.6	0.3
7	7386.00	46.0 PK	74.0	-28.0	1.80 V	349	39.4	6.6
8	7386.00	41.1 AV	54.0	-12.9	1.80 V	349	34.5	6.6

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit.
5. " * ": Fundamental frequency.

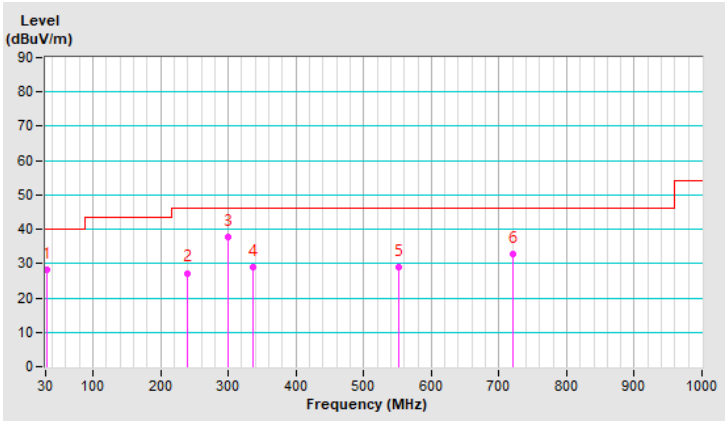
Below 1GHz Data:

RF Mode	TX 802.11b	Channel	CH 6：2437 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	32.38	28.1 QP	40.0	-11.9	1.50 H	100	41.8	-13.7
2	240.00	27.3 QP	46.0	-18.7	1.00 H	267	41.5	-14.2
3	299.20	37.6 QP	46.0	-8.4	2.00 H	215	49.6	-12.0
4	336.01	29.0 QP	46.0	-17.0	1.00 H	200	40.1	-11.1
5	552.01	29.1 QP	46.0	-16.9	1.50 H	245	35.3	-6.2
6	720.01	32.9 QP	46.0	-13.1	2.00 H	329	36.1	-3.2

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.

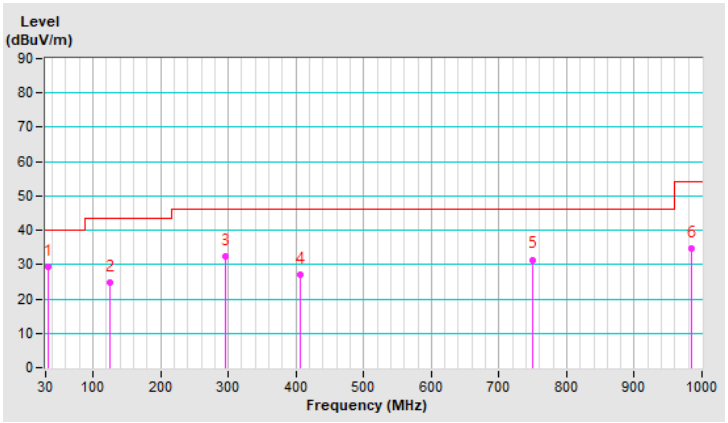


RF Mode	TX 802.11b	Channel	CH 6：2437 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

Antenna Polarity & Test Distance : Vertical at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	34.28	29.4 QP	40.0	-10.6	1.00 V	20	42.9	-13.5
2	125.63	24.9 QP	43.5	-18.6	1.00 V	118	39.2	-14.3
3	296.64	32.4 QP	46.0	-13.6	2.00 V	100	44.5	-12.1
4	406.34	27.2 QP	46.0	-18.8	1.50 V	50	36.6	-9.4
5	750.52	31.5 QP	46.0	-14.5	2.50 V	156	33.7	-2.2
6	984.02	34.5 QP	54.0	-19.5	1.00 V	204	33.2	1.3

Remarks:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit of frequency range 30MHz~1000MHz.
5. The emission levels were very low against the limit of frequency range 9kHz~30MHz: the amplitude of spurious emissions attenuated more than 20 dB below the permissible value to be report.



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 0.50MHz.

4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Oct. 20, 2020	Oct. 19, 2021
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 27, 2020	Oct. 26, 2021
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 19, 2020	Mar. 18, 2021
50 ohms Terminator	50	3	Oct. 26, 2020	Oct. 25, 2021
RF Cable	5D-FB	COCCAB-001	Sep. 26, 2020	Sep. 25, 2021
Fixed attenuator EMCI	STI02-2200-10	005	Aug. 29, 2020	Aug. 28, 2021
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

Note:
1. The calibration interval of the above test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in Conduction 1.
3. Tested Date: Mar. 02, 2021

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/ 50uH of coupling impedance for the measuring instrument.

b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.

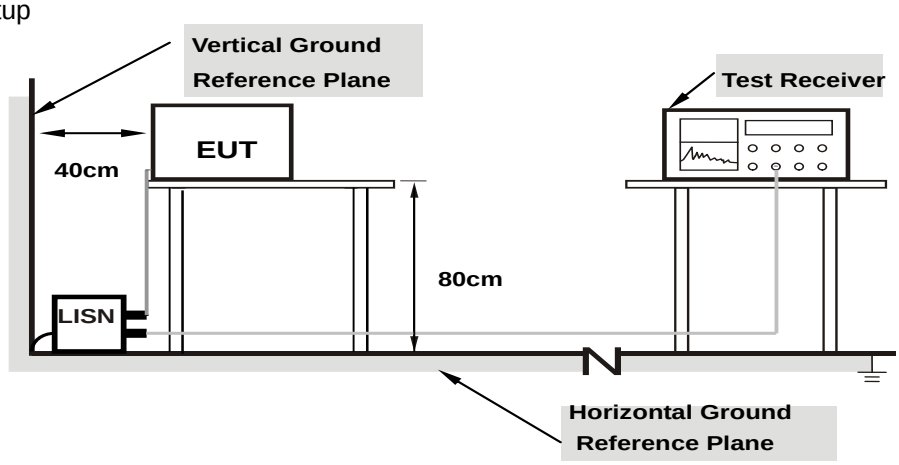
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

Note: The resolution bandwidth and video bandwidth of test receiver is 9kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15MHz-30MHz.

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

Same as 4.1.6.

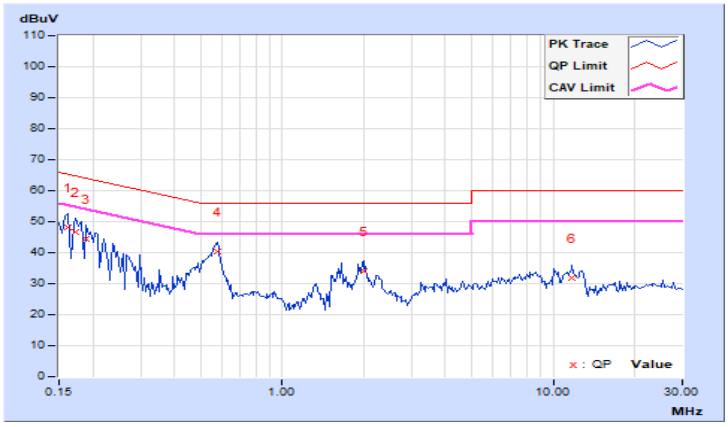
4.2.7 Test Results

RF Mode	TX 802.11b	Channel	CH 6：2437 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

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	0.16172	9.95	38.15	20.24	48.10	30.19	65.38	55.38	-17.28	-25.19
2	0.17344	9.96	36.83	20.83	46.79	30.79	64.79	54.79	-18.00	-24.00
3	0.18906	9.97	34.57	16.89	44.54	26.86	64.08	54.08	-19.54	-27.22
4	**0.57578**	**10.00**	**30.51**	**22.13**	**40.51**	**32.13**	**56.00**	**46.00**	**-15.49**	**-13.87**
5	2.01563	10.07	23.84	14.10	33.91	24.17	56.00	46.00	-22.09	-21.83
6	11.76172	10.64	21.21	17.90	31.85	28.54	60.00	50.00	-28.15	-21.46

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

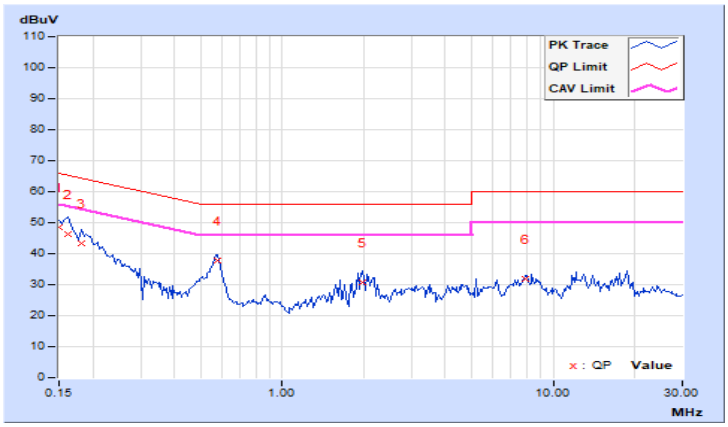


RF Mode	TX 802.11b	Channel	CH 6：2437 MHz
Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

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	0.15000	9.92	38.61	23.45	48.53	33.37	66.00	56.00	-17.47	-22.63
2	0.16172	9.93	36.48	19.21	46.41	29.14	65.38	55.38	-18.97	-26.24
3	0.18125	9.94	33.53	18.72	43.47	28.66	64.43	54.43	-20.96	-25.77
4	0.57969	9.97	27.82	19.57	37.79	29.54	56.00	46.00	-18.21	-16.46
5	1.98047	10.04	20.54	6.40	30.58	16.44	56.00	46.00	-25.42	-29.56
6	7.87500	10.31	21.67	10.74	31.98	21.05	60.00	50.00	-28.02	-28.95

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

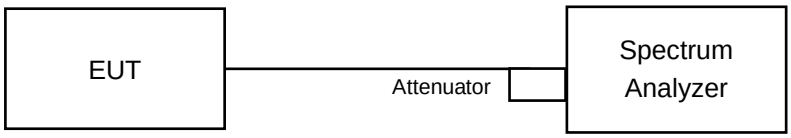


4.3 6dB Bandwidth Measurement

4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB 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

a. Set resolution bandwidth (RBW) = 100kHz
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. 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

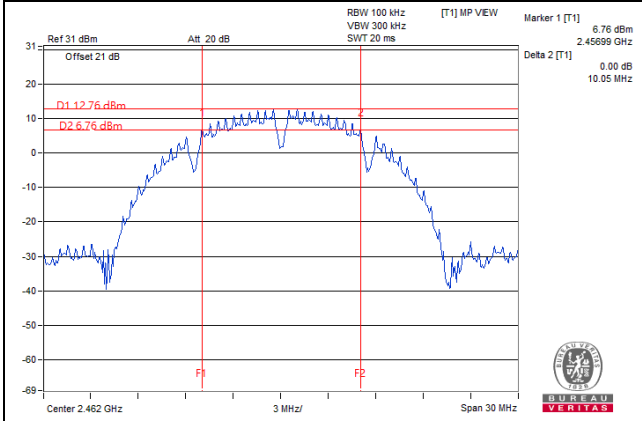
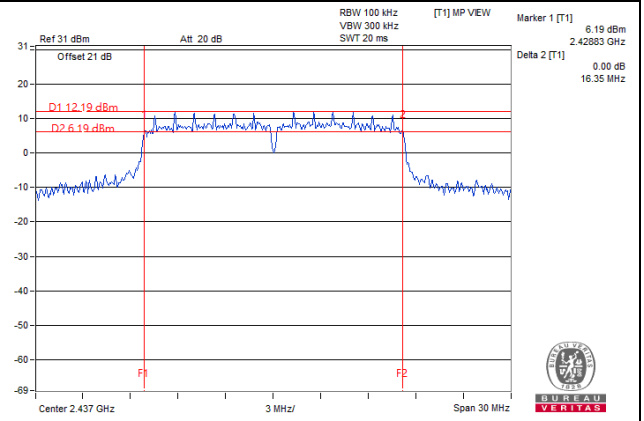
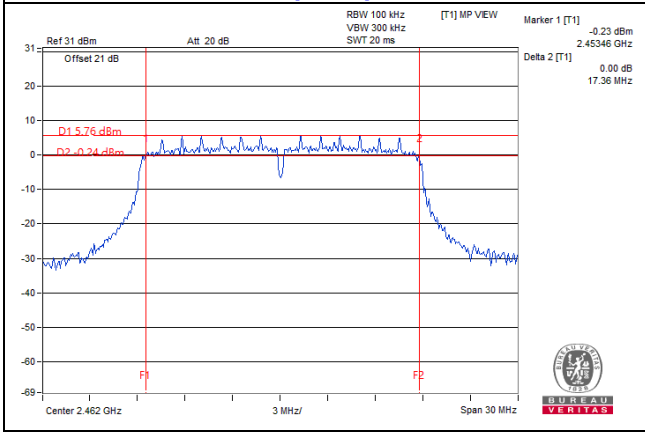
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	10.11	0.5	Pass
6	2437	10.11	0.5	Pass
11	2462	10.05	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.41	0.5	Pass
6	2437	16.35	0.5	Pass
11	2462	16.37	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	17.38	0.5	Pass
6	2437	17.38	0.5	Pass
11	2462	17.36	0.5	Pass

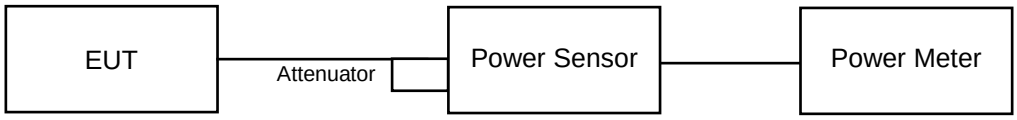
Spectrum Plot of Worst Value	
802.11b / CH11	**802.11g / CH6**
	
802.11n (HT20) / CH11	
	

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 (30dBm)

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.

Average power sensor was used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

4.4.5 Deviation from Test Standard

No deviation.

4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

4.4.7 Test Results

FOR PEAK POWER

802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	307.61	24.88	30	Pass
6	2437	364.754	25.62	30	Pass
11	2462	258.226	24.12	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	413.048	26.16	30	Pass
6	2437	490.908	26.91	30	Pass
11	2462	362.243	25.59	30	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	414	26.17	30	Pass
6	2437	488.652	26.89	30	Pass
11	2462	363.915	25.61	30	Pass

FOR AVERAGE POWER

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	190.985	22.81
6	2437	239.883	23.80
11	2462	157.398	21.97

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	75.858	18.80
6	2437	212.324	23.27
11	2462	58.479	17.67

802.11n (HT20)

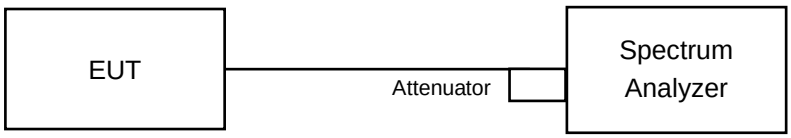
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	67.764	18.31
6	2437	190.985	22.81
11	2462	52.481	17.20

4.5 Power Spectral Density Measurement

4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz.

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 kHz ≤ RBW ≤ 100 kHz.
d. Set the VBW ≥ 3 × RBW.
e. Detector = peak.
f. Sweep time = auto couple.
g. Trace mode = max hold.
h. Allow trace to fully stabilize.
i. Use the peak marker function to determine the maximum amplitude level within the RBW.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Condition

Same as Item 4.3.6

4.5.7 Test Results

802.11b

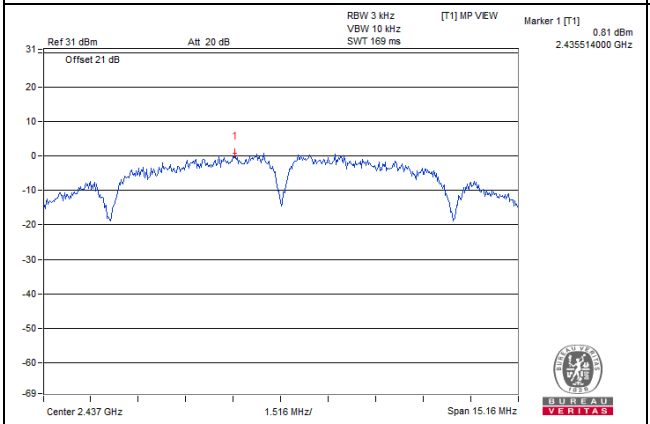
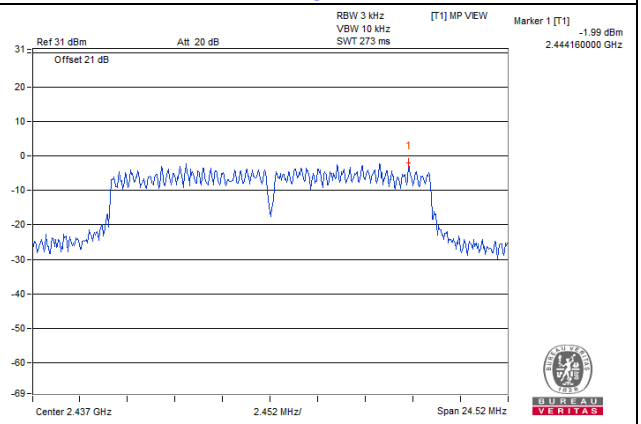
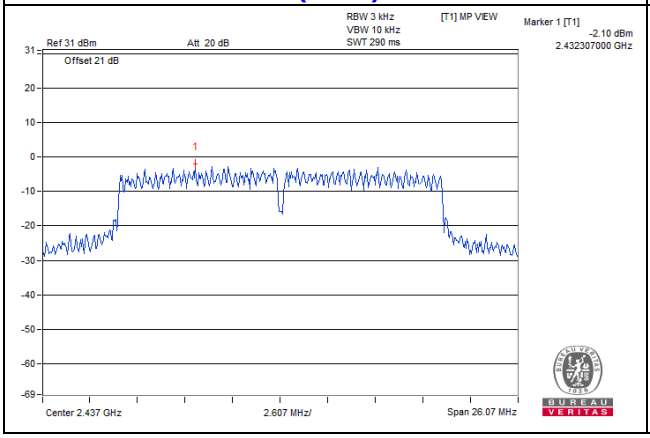
Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	0.18	8	Pass
6	2437	0.81	8	Pass
11	2462	-1.42	8	Pass

802.11g

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-5.65	8	Pass
6	2437	-1.99	8	Pass
11	2462	-7.72	8	Pass

802.11n (HT20)

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-7.34	8	Pass
6	2437	-2.10	8	Pass
11	2462	-7.69	8	Pass

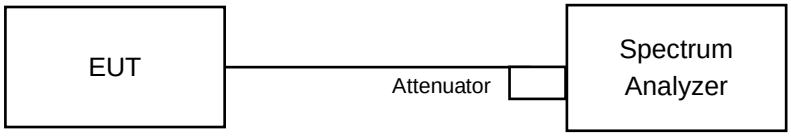
Spectrum Plot of Worst Value	
802.11b / CH6	**802.11g / CH6**
	
802.11n (HT20) / CH6	
	

4.6 Conducted Out of Band Emission Measurement

4.6.1 Limits of Conducted Out of Band Emission Measurement

Below 20dB of the highest emission level of operating band (in 100kHz 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 ≥ 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 OOBE

1. Set RBW = 100 kHz.
2. Set VBW ≥ 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

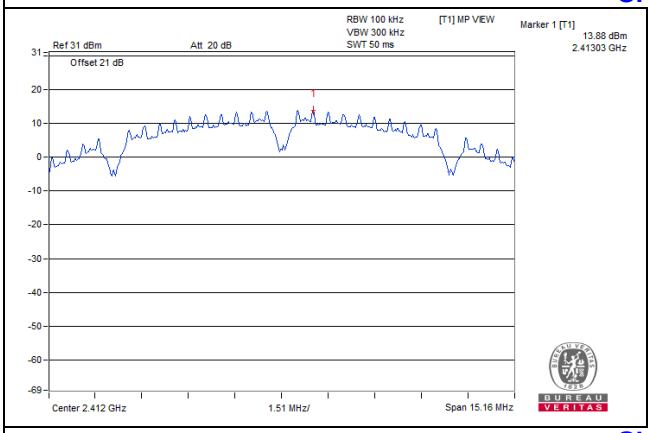
Same as Item 4.3.6

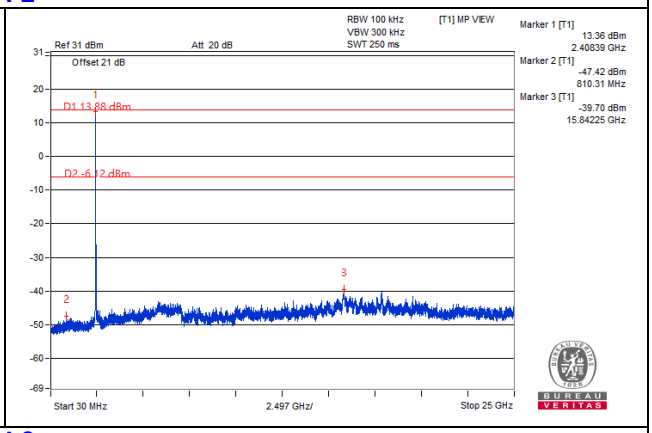
4.6.7 Test Results

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

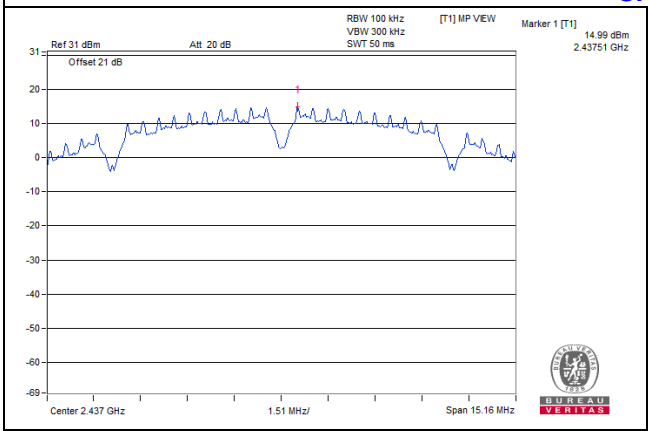
802.11b

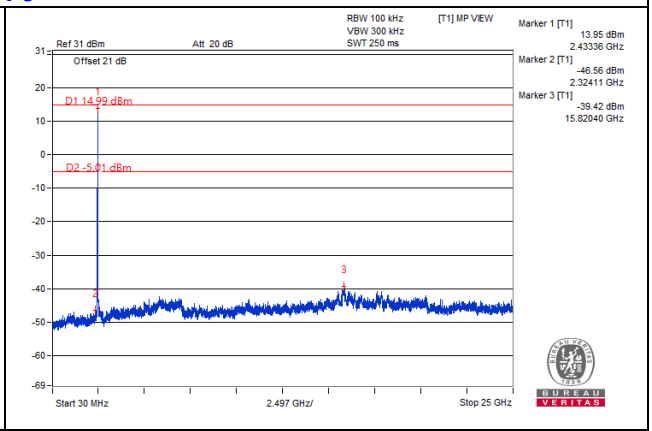
CH 1



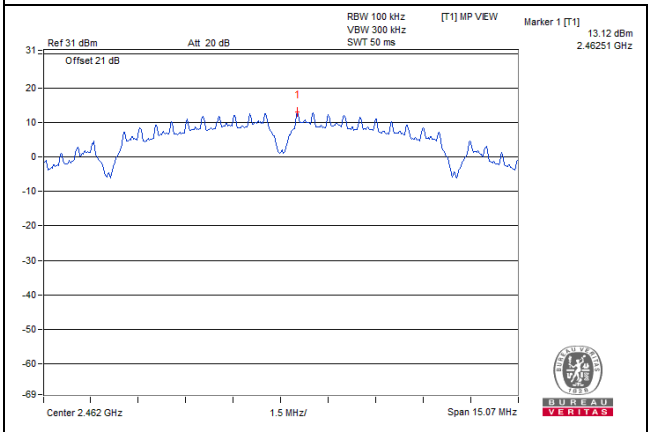


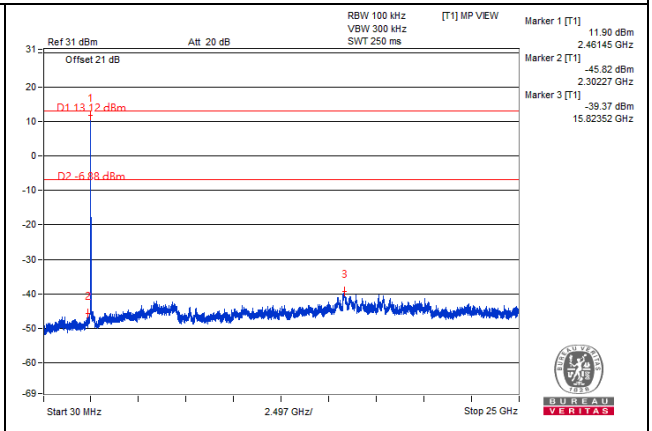
CH 6



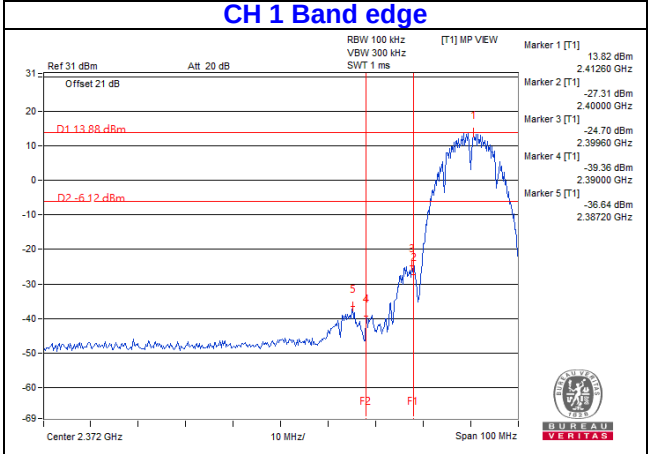


CH 11

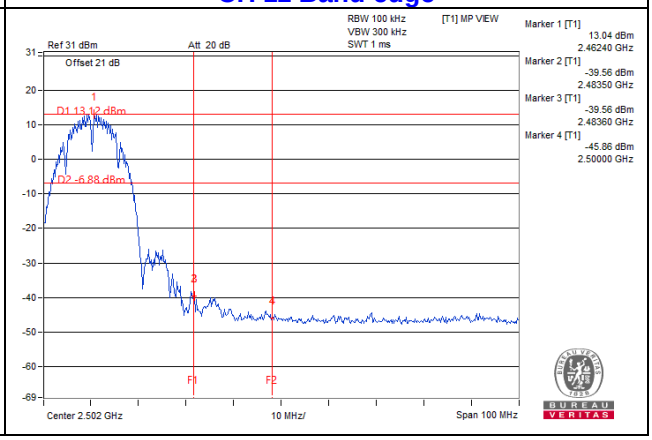




CH 1 Band edge

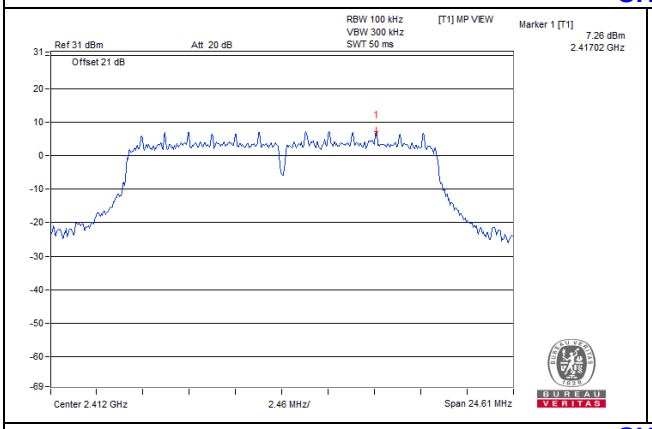


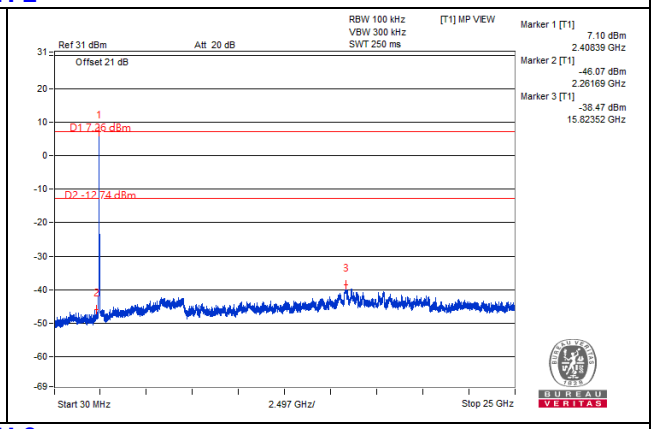
CH 11 Band edge



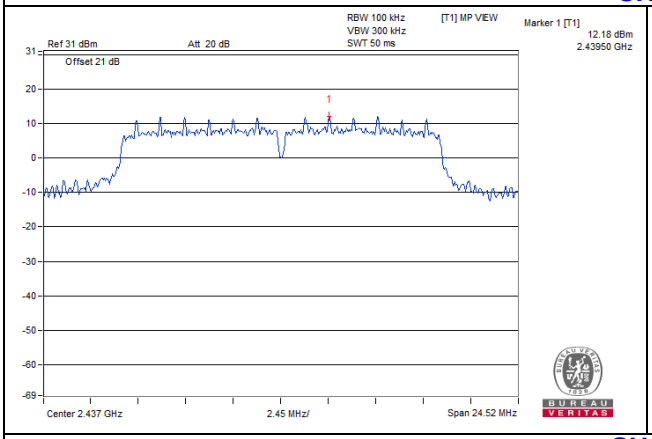
802.11g

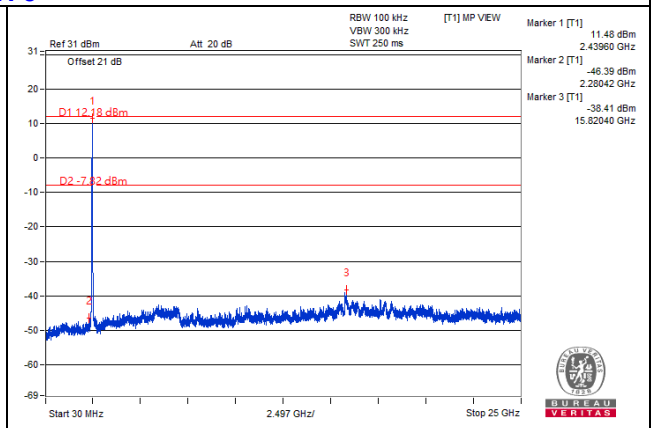
CH 1



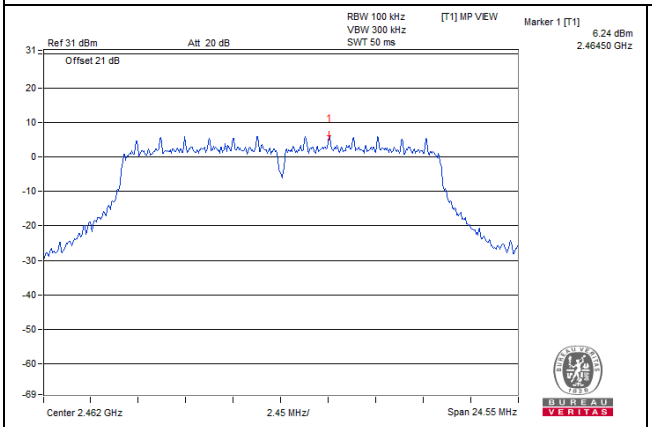


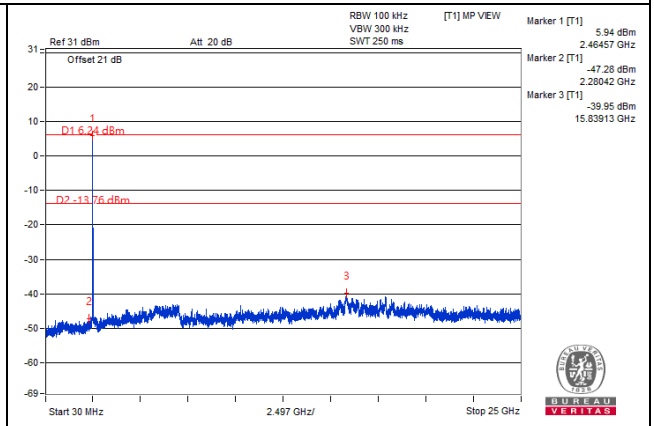
CH 6



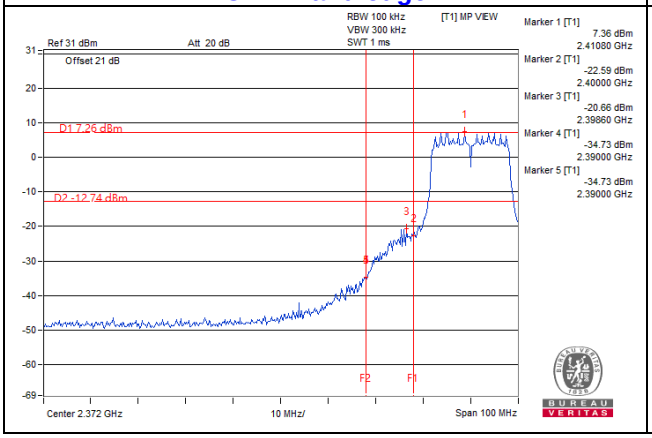


CH 11

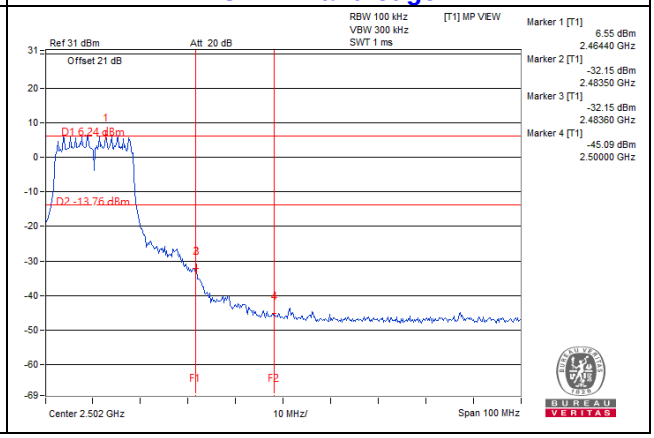




CH 1 Band edge

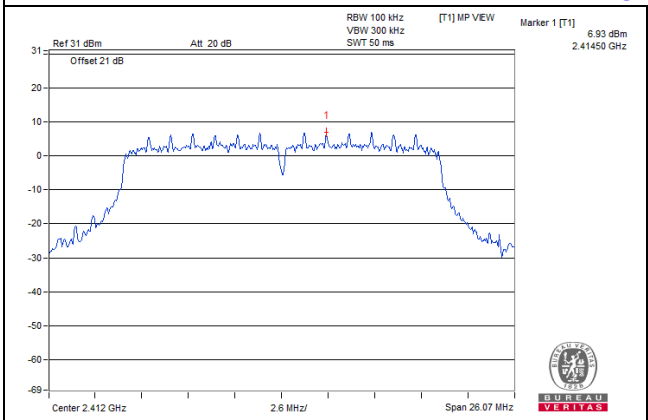


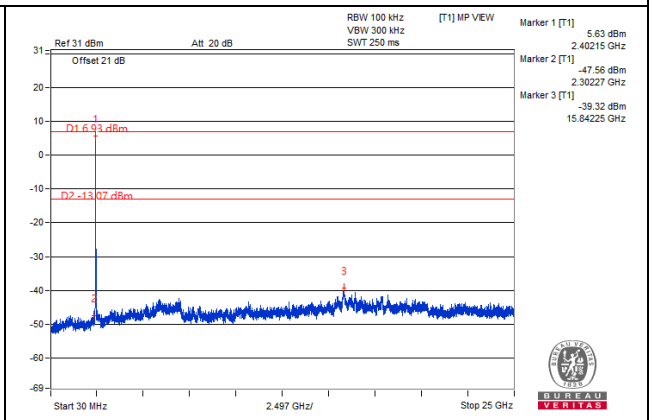
CH 11 Band edge



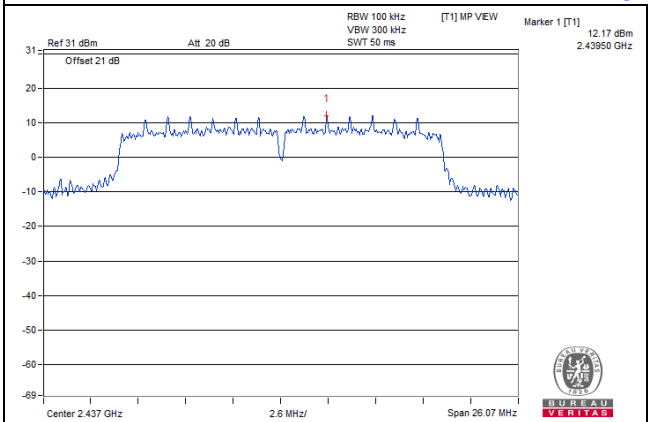
802.11n (HT20)

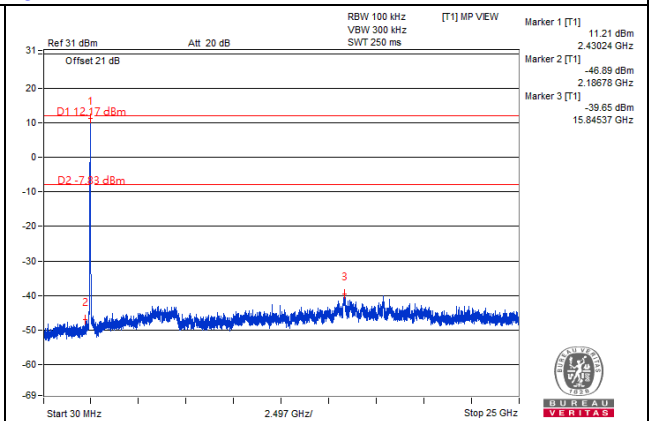
CH 1



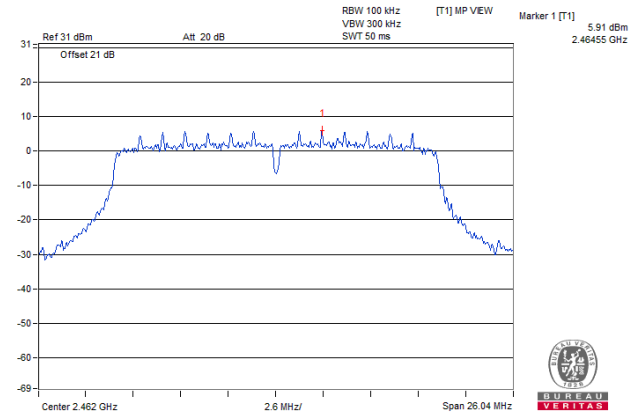


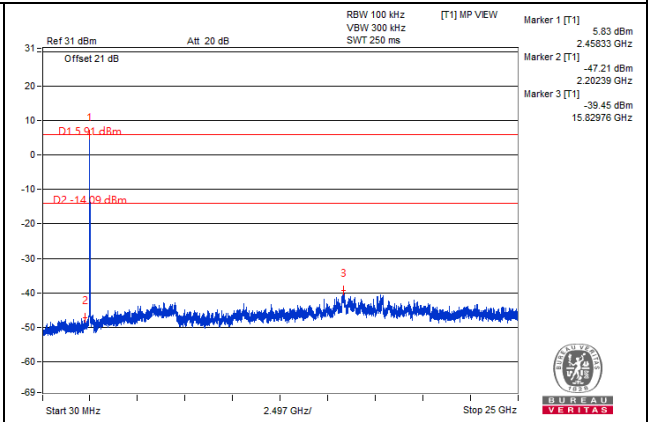
CH 6



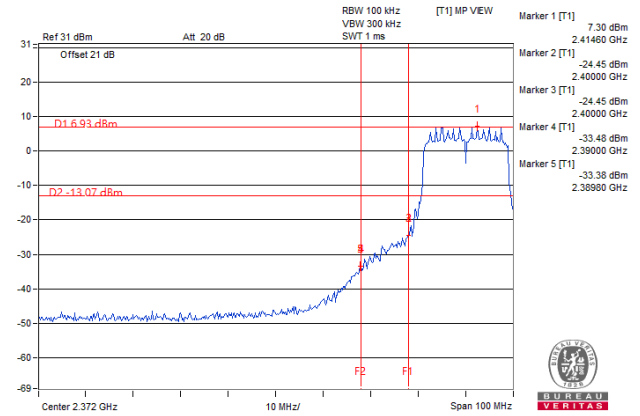


CH 11

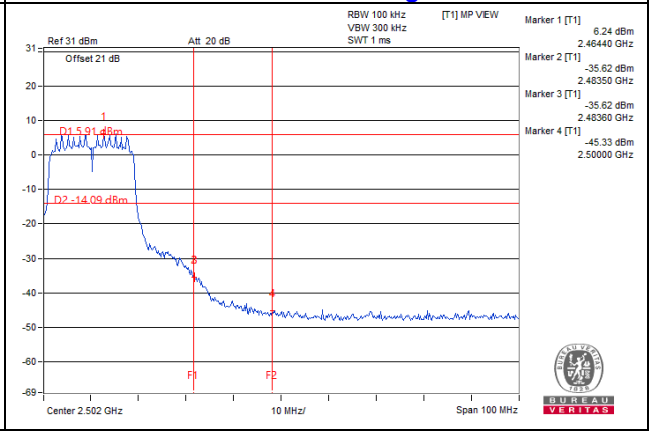




CH 1 Band edge



CH 11 Band edge



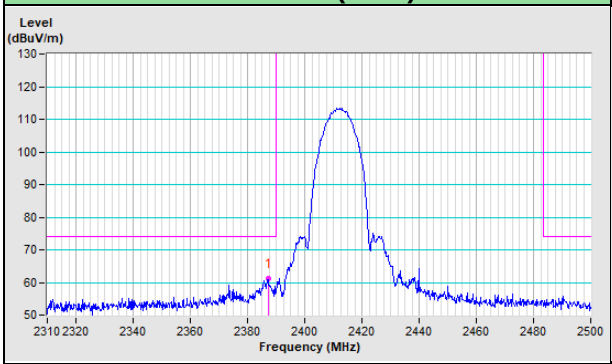
5 Pictures of Test Arrangements

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

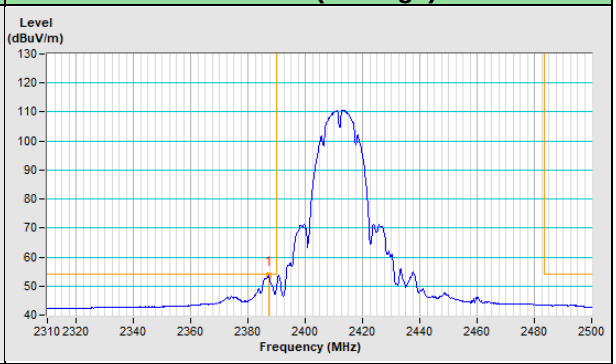
Annex A - Band-Edge Measurement

802.11b Channel 1

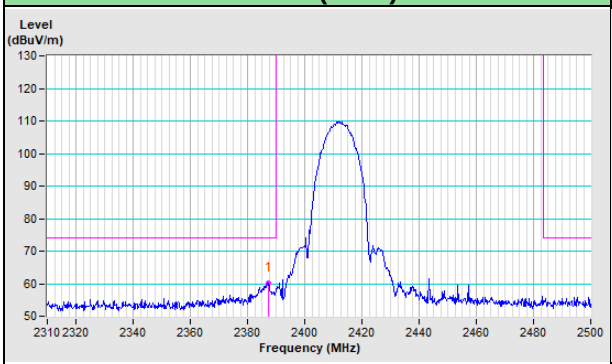
Horizontal (Peak)



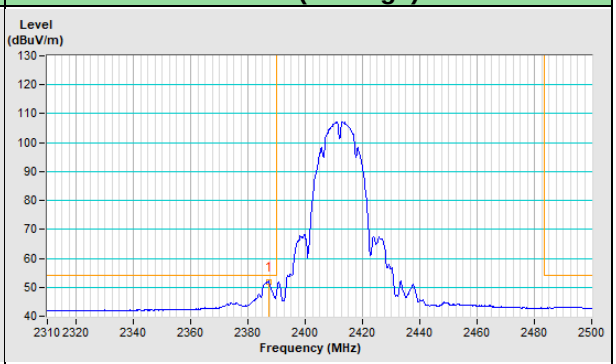
Horizontal (Average)



Vertical (Peak)

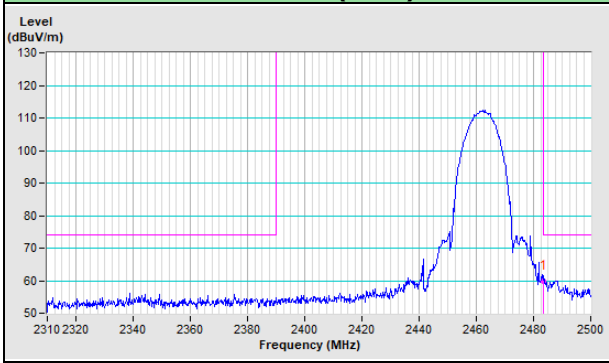


Vertical (Average)

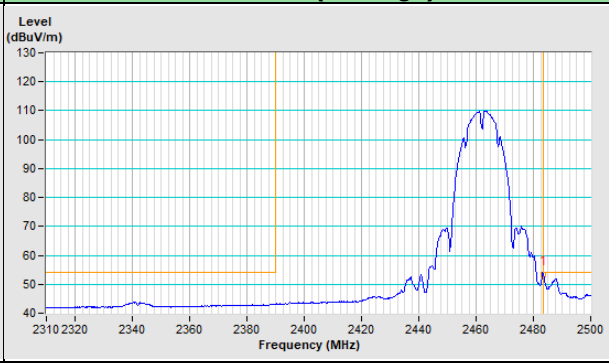


802.11b Channel 11

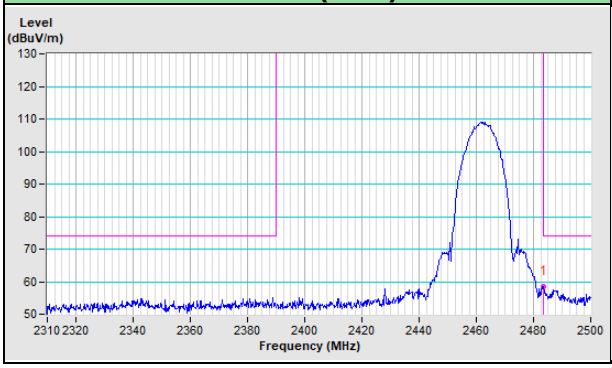
Horizontal (Peak)



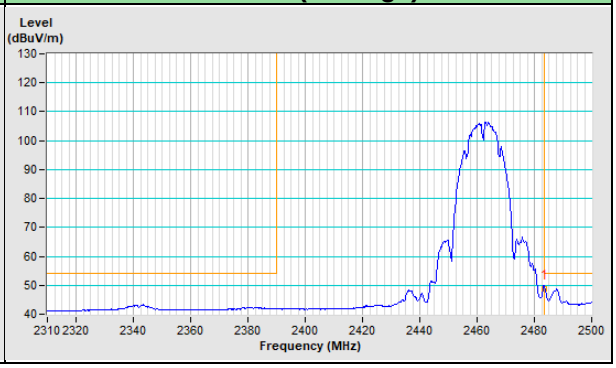
Horizontal (Average)



Vertical (Peak)

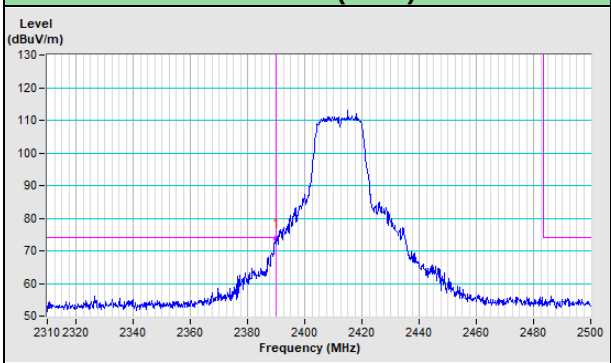


Vertical (Average)

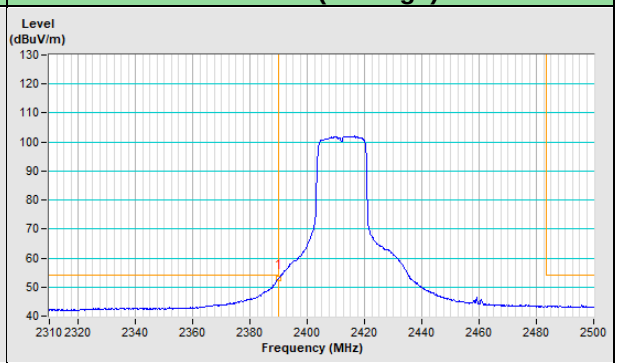


802.11g Channel 1

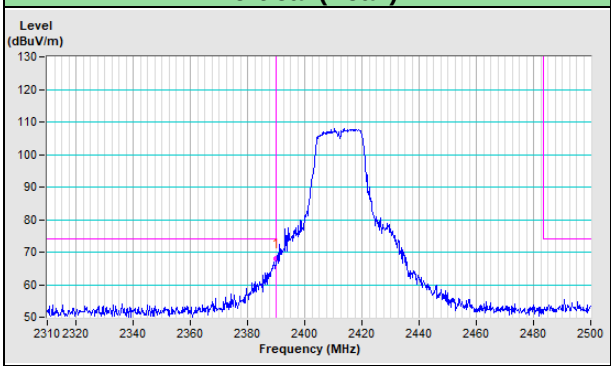
Horizontal (Peak)



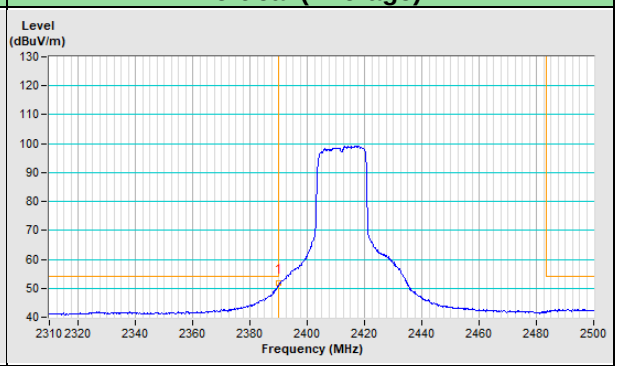
Horizontal (Average)



Vertical (Peak)

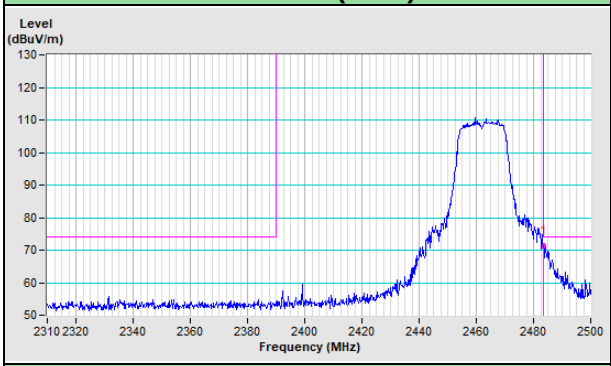


Vertical (Average)

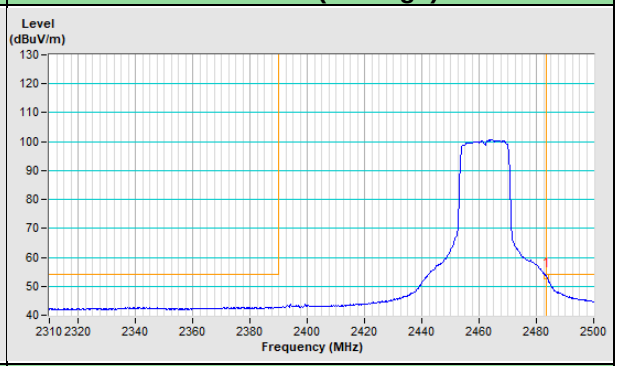


802.11g Channel 11

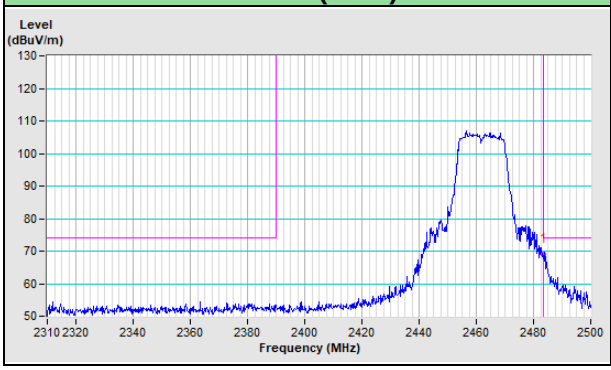
Horizontal (Peak)



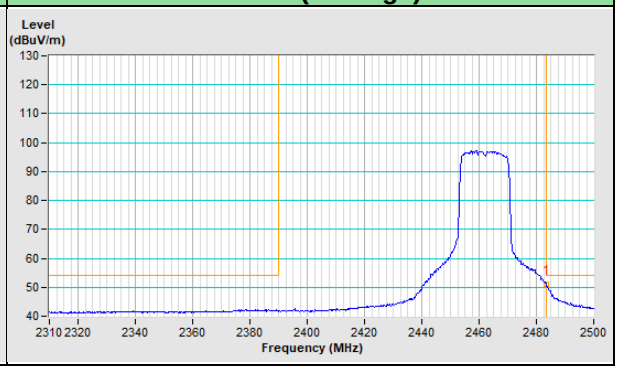
Horizontal (Average)



Vertical (Peak)

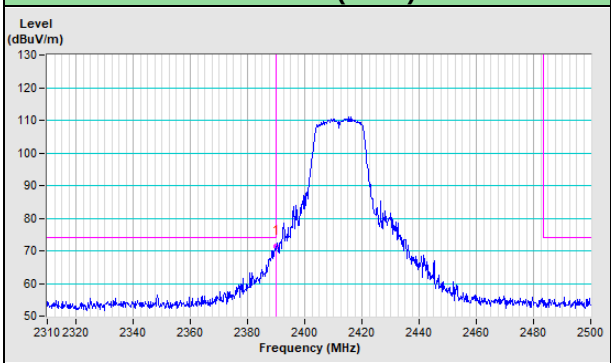


Vertical (Average)

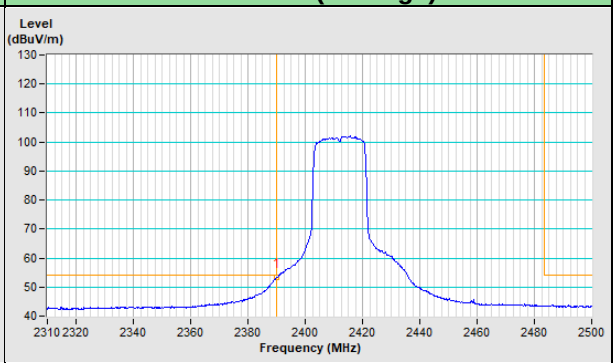


802.11n (HT20) Channel 1

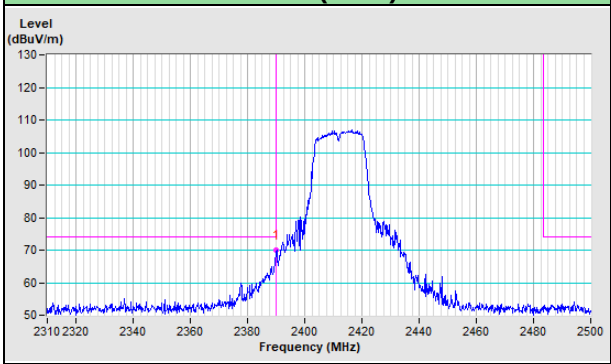
Horizontal (Peak)



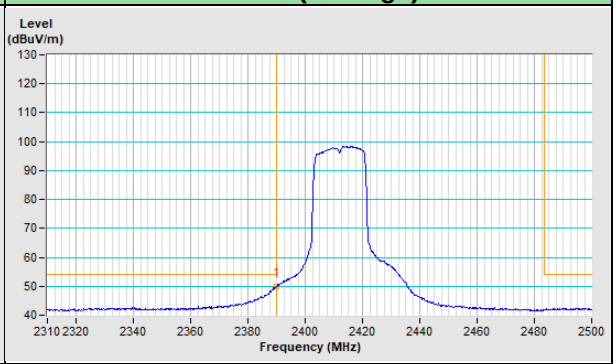
Horizontal (Average)



Vertical (Peak)

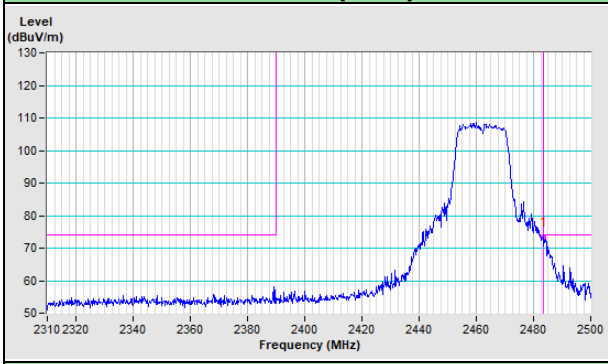


Vertical (Average)

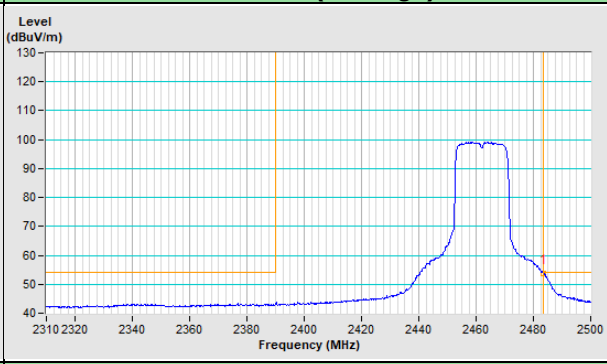


802.11n (HT20) Channel 11

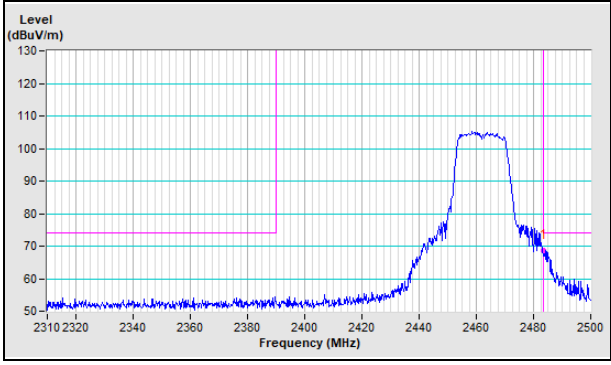
Horizontal (Peak)



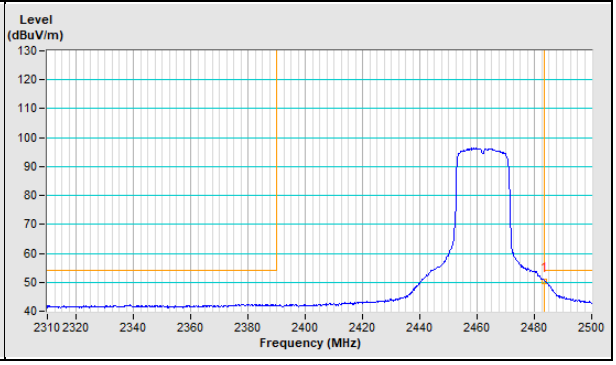
Horizontal (Average)



Vertical (Peak)



Vertical (Average)



Appendix – Information of 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 FCC recognized accredited test firms and accredited 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
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The address and road map of all our labs can be found in our web site also.

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