

FCC Test Report

Report No.: RFBIBJ-WTW-P22010912-1

FCC ID: HBW-GDOCAMF1

Test Model: GDOCAMF1

Received Date: Feb. 16, 2022

Test Date: Feb. 17 ~ Apr. 14, 2022

Issued Date: May 04, 2022

Applicant: The Chamberlain Group Inc.

Address: 300 Windsor Drive Oak Brook, IL 60523

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

Lab Address: No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

Test Location (1): No.19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City
33383, Taiwan

Test Location (2): No. 70, Wenming Rd., Guishan Dist., Taoyuan City 333, Taiwan

FCC Registration / 788550 / TW0003

Designation Number: 281270 / TW0032



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Table of Contents

Release Control Record	4
1 Certificate of Conformity	5
2 Summary of Test Results	6
2.1 Measurement Uncertainty	6
2.2 Modification Record	6
3 General Information	7
3.1 General Description of EUT	7
3.2 Description of Test Modes	9
3.2.1 Test Mode Applicability and Tested Channel Detail	10
3.3 Duty Cycle of Test Signal	12
3.4 Description of Support Units	13
3.4.1 Configuration of System under Test	13
3.5 General Description of Applied Standards and References	13
4 Test Types and Results	14
4.1 Radiated Emission and Bandedge Measurement	14
4.1.1 Limits of Radiated Emission and Bandedge Measurement	14
4.1.2 Test Instruments	15
4.1.3 Test Procedures	16
4.1.4 Deviation from Test Standard	16
4.1.5 Test Set Up	17
4.1.6 EUT Operating Conditions	18
4.1.7 Test Results	19
4.2 Conducted Emission Measurement	33
4.2.1 Limits of Conducted Emission Measurement	33
4.2.2 Test Instruments	33
4.2.3 Test Procedures	34
4.2.4 Deviation from Test Standard	34
4.2.5 Test Setup	34
4.2.6 EUT Operating Conditions	34
4.2.7 Test Results	35
4.3 6 dB Bandwidth Measurement	37
4.3.1 Limits of 6 dB Bandwidth Measurement	37
4.3.2 Test Setup	37
4.3.3 Test Instruments	37
4.3.4 Test Procedure	37
4.3.5 Deviation from Test Standard	37
4.3.6 EUT Operating Conditions	37
4.3.7 Test Results	38
4.4 Occupied Bandwidth Measurement	40
4.4.1 Test Setup	40
4.4.2 Test Instruments	40
4.4.3 Test Procedure	40
4.4.4 Deviation from Test Standard	40
4.4.5 EUT Operating Conditions	40
4.4.6 Test Results	41
4.5 Conducted Output Power Measurement	43
4.5.1 Limits of Conducted Output Power Measurement	43
4.5.2 Test Setup	43
4.5.3 Test Instruments	43
4.5.4 Test Procedures	43
4.5.5 Deviation from Test Standard	43
4.5.6 EUT Operating Conditions	43
4.5.7 Test Results	44

4.6	Power Spectral Density Measurement	45
4.6.1	Limits of Power Spectral Density Measurement.....	45
4.6.2	Test Setup.....	45
4.6.3	Test Instruments	45
4.6.4	Test Procedure	45
4.6.5	Deviation from Test Standard	45
4.6.6	EUT Operating Condition	45
4.6.7	Test Results	46
4.7	Conducted Out of Band Emission Measurement	48
4.7.1	Limits of Conducted Out of Band Emission Measurement.....	48
4.7.2	Test Setup.....	48
4.7.3	Test Instruments	48
4.7.4	Test Procedure	48
4.7.5	Deviation from Test Standard	48
4.7.6	EUT Operating Condition	48
4.7.7	Test Results	49
5	Pictures of Test Arrangements.....	53
	Annex A- Band Edge Measurement	54
	Appendix – Information of the Testing Laboratories	58

Release Control Record

Issue No.	Description	Date Issued
RFBIBJ-WTW-P22010912-1	Original Release	May 04, 2022

1 Certificate of Conformity

Product: Camera Module

Brand: Chamberlain

Test Model: GDOCAMF1

Sample Status: Engineering Sample

Applicant: The Chamberlain Group Inc.

Test Date: Feb. 17 ~ Apr. 14, 2022

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 RF characteristics under the conditions specified in this report.

Prepared by : Gina Liu, **Date:** May 04, 2022
Gina Liu / Specialist

Approved by : Jeremy Lin, **Date:** May 04, 2022
Jeremy Lin / 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 -15.15 dB at 4.31000 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.57 dB at 2483.50 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.
---	Occupied Bandwidth Measurement	Pass	Reference only
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	Antenna connector is ipex not a standard connector.

Note:

- For 2.4G 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.
- 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	150 kHz ~ 30 MHz	2.79 dB
Radiated Emissions up to 1 GHz	9 kHz ~ 30 MHz	3.00 dB
	30 MHz ~ 200 MHz	2.91 dB
	200 MHz ~ 1000 MHz	2.93 dB
Radiated Emissions above 1 GHz	1 GHz ~ 18 GHz	1.76 dB
	18 GHz ~ 40 GHz	1.77 dB

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT

Product	Camera Module
Brand	Chamberlain
Test Model	GDOCAMF1
Status of EUT	Engineering Sample
Power Supply Rating	Input: 100-240 Vac, 50-60 Hz, 0.3 A (from power board) Output: 5.0 Vdc, 1.0 A
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 150.0 Mbps
Operating Frequency	2412 ~ 2462 MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40)
Output Power	83.753 mW
Antenna Type	PCB antenna with 4.3 dBi gain
Antenna Connector	ipex(MHF)
Accessory Device	N/A
Data Cable Supplied	N/A

Note:

- There're 2 SKU for the EUT listed as below.

SKU	Model	Part number	Description
1	GDOCAMF1	EVT RTK	Audio Amplifier-Realtek_ALC105-VF-CGT
2		EVT TI	Audio Amplifier-TI_TPA2011D1YFFR
* After pre-tested all the modes and found SKU 1 was the worst. Therefore only SKU 1 was for the final test and presented in the test			

- The EUT incorporates a SISO function.

Modulation Mode	Tx Function
802.11b	1TX
802.11g	1TX
802.11n (HT20)	1TX
802.11n (HT40)	1TX

3. Power setting is as below:

802.11b		802.11g		802.11n (HT20)		802.11n (HT40)	
Channel	Power Setting	Channel	Power Setting	Channel	Power Setting	Channel	Power Setting
1	42	1	44	1	43	3	43
6	42	6	48	6	46	6	46
11	42	11	43	11	42	9	42

4. 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.

5. The above EUT information is declared by manufacturer and for more detailed features description, please refers 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		

7 channels are provided for 802.11n (HT40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	7	2442
4	2427	8	2447
5	2432	9	2452
6	2437		

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

NOTE: "-" 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)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

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)
-	802.11b	1 to 11	11	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)
-	802.11b	1 to 11	11	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)
-	802.11b	1 to 11	1, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 9	3, 9	OFDM	BPSK	13.5

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.

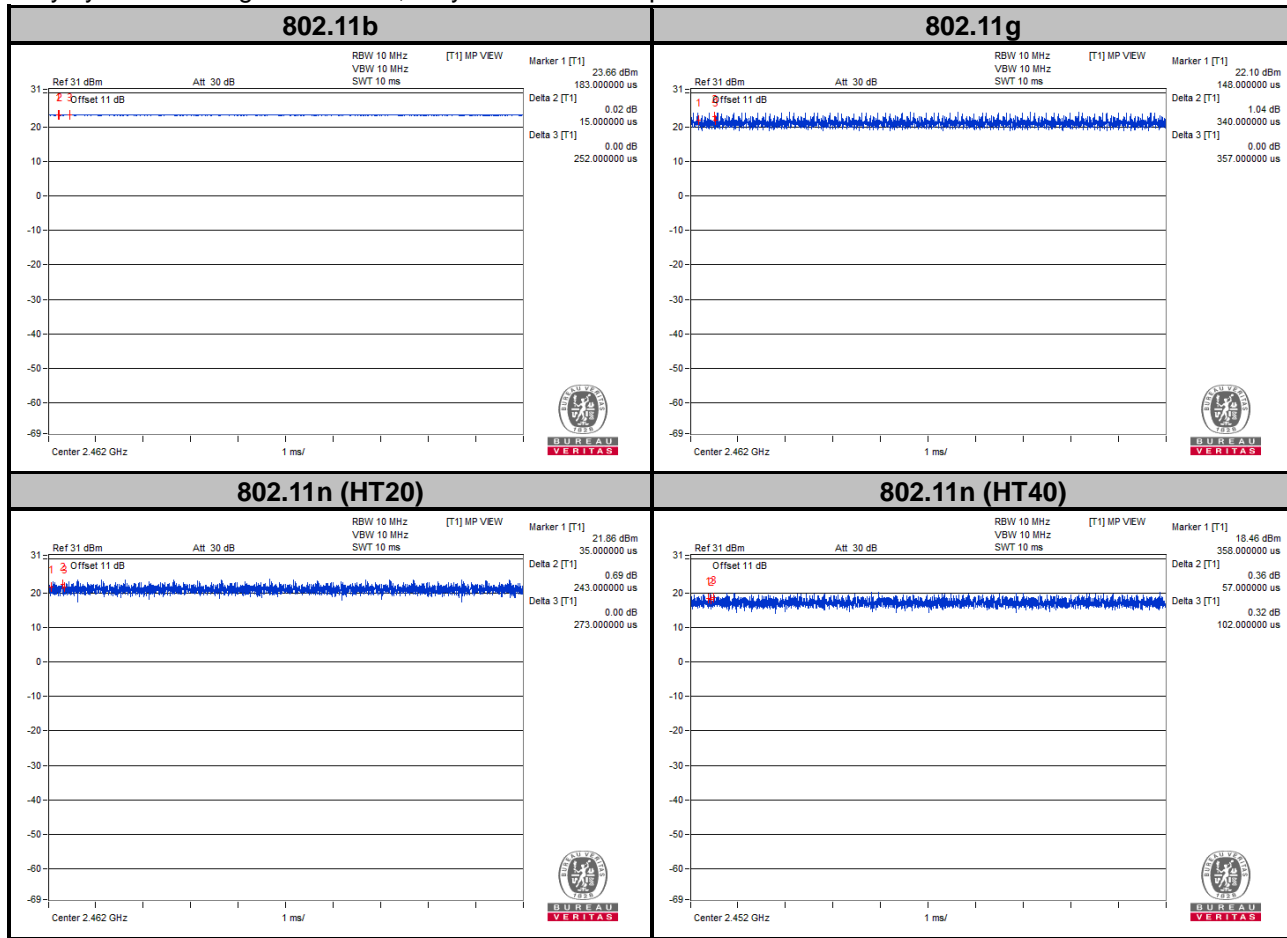
EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

Test Condition:

Applicable To	Environmental Conditions	Input Power	Tested by
RE \geq 1G	22 deg. C, 68 % RH	120 Vac, 60 Hz	Tim Chen
RE<1G	23 deg. C, 68 % RH	120 Vac, 60 Hz	Raymond Lee
PLC	23 deg. C, 69 % RH	120 Vac, 60 Hz	Raymond Lee
APCM	25 deg. C, 60 % RH	120 Vac, 60 Hz	Chun Wu

3.3 Duty Cycle of Test Sinal

Duty cycle of test signal is 100 %, duty factor is not required.

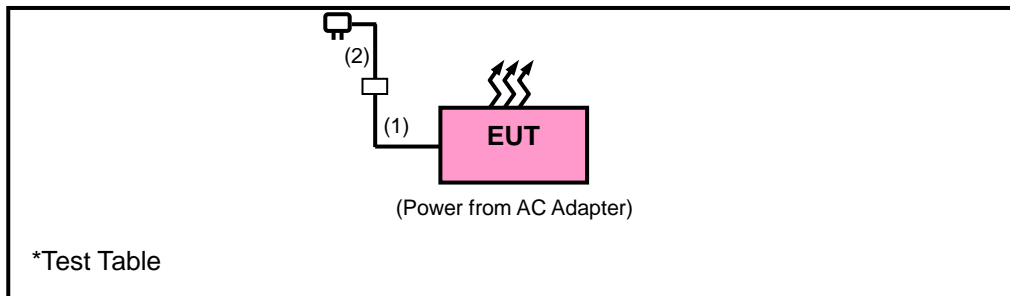


3.4 Description of Support Units

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	Cable Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	AC power cable	1	0.5	N	0	Provided by client
2.	AC power extension socket	1	2.0	N	0	-

3.4.1 Configuration of System under 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 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 30 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.	Cal. Date	Cal. Due
Test Receiver KEYSIGHT	N9038B	MY60180019	Jan. 27, 2022	Jan. 26, 2023
Spectrum Analyzer KEYSIGHT	N9020B	MY60110513	Dec. 24, 2021	Dec. 23, 2022
BILOG Antenna SCHWARZBECK	VULB9168	9168-1214	Oct. 27, 2021	Oct. 26, 2022
HORN Antenna RF SPIN	DRH18-E	210101A18E	Nov. 14, 2021	Nov. 13, 2022
HORN Antenna SCHWARZBECK	BBHA 9170	9170-1049	Nov. 14, 2021	Nov. 13, 2022
Loop Antenna TESEQ	HLA 6121	45745	Jul. 21, 2021	Jul. 20, 2022
Preamplifier EMCI	EMC330N	980798	Jan. 17, 2022	Jan. 16, 2023
Preamplifier EMCI	EMC118A45SE	980809	Dec. 30, 2021	Dec. 29, 2022
Preamplifier EMCI	EMC184045SE	980786	Jan. 17, 2022	Jan. 16, 2023
RF signal cable EMCI	EMC104-SM-SM-(9000+3000+1000)	201244+ 201232+ 210103	Jan. 17, 2022	Jan. 16, 2023
RF signal cable EMCI	EMCCFD400-NM-NM-(9000+3000+500)	201251+ 201249+ 201248	Jan. 17, 2022	Jan. 16, 2023
RF signal cable EMCI	EMC101G-KM-KM-(5000+3000+2000)	201261+201258+ 201255	Jan. 17, 2022	Jan. 16, 2023
Software BV ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower Max-Full	MFA-515BSN	NA	NA	NA
Turn Table Max-Full	MFT-201SS	NA	NA	NA
Turn Table Controller Max-Full	MF-7802BS	MF780208676	NA	NA
Wideband Power Sensor KEYSIGHT	N1923A	MY58020002	Jan. 17, 2022	Jan. 16, 2023
Peak Power Analyzer KEYSIGHT	8990B	MY51000485	Jan. 18, 2022	Jan. 17, 2023

- 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 WM Chamber 9.

4.1.3 Test Procedures

For Radiated Emission below 30 MHz

- 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 9 kHz at frequency below 30 MHz.

For Radiated Emission above 30 MHz

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30 MHz ~ 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:

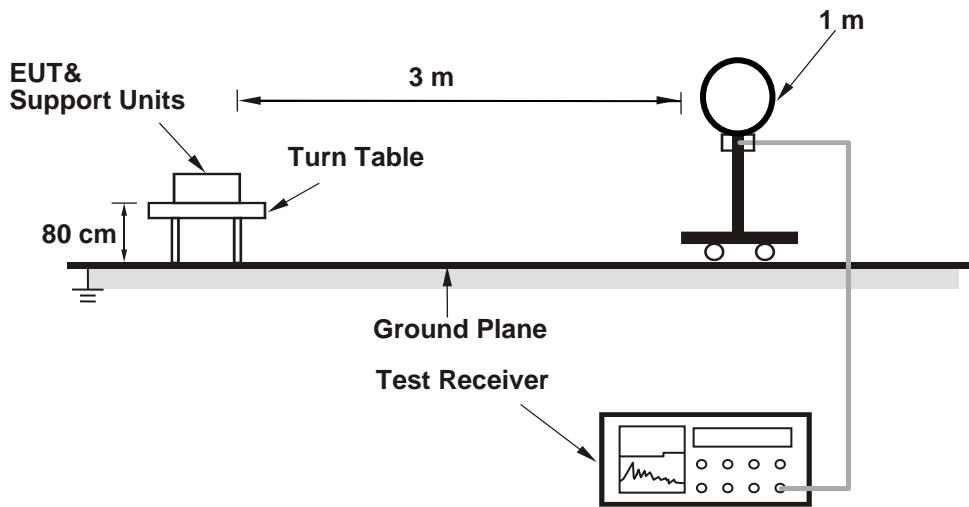
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) or Peak detection (PK) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK)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

4.1.4 Deviation from Test Standard

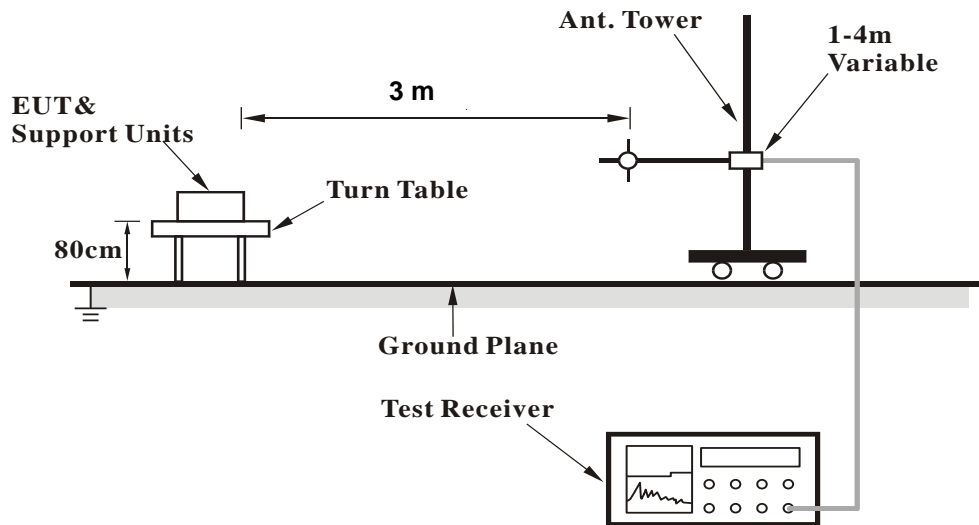
No deviation.

4.1.5 Test Set Up

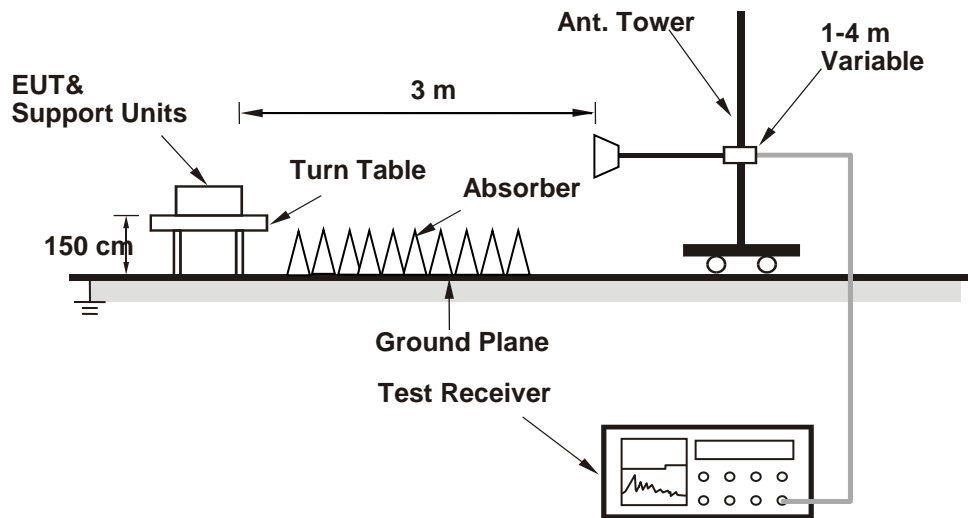
<Radiated Emission below 30 MHz>



<Radiated Emission 30 MHz to 1 GHz>



<Radiated Emission above 1 GHz>



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

4.1.7 Test Results

Above 1 GHz Data :

RF Mode	TX 802.11b	Channel	CH 1 : 2412 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 10 Hz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 68% RH
Tested By	Tim Chen	Test Date	2022/4/13

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	59.62 PK	74.00	-14.38	1.32 H	28	27.58	32.04
2	2390.00	49.13 AV	54.00	-4.87	1.32 H	28	17.09	32.04
3	*2412.00	108.60 PK			1.32 H	28	76.59	32.01
4	*2412.00	106.00 AV			1.32 H	28	73.99	32.01
5	4824.00	51.28 PK	74.00	-22.72	1.18 H	355	48.12	3.16
6	4824.00	44.28 AV	54.00	-9.72	1.18 H	355	41.12	3.16

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	56.40 PK	74.00	-17.60	1.28 V	121	24.36	32.04
2	2390.00	46.89 AV	54.00	-7.11	1.28 V	121	14.85	32.04
3	*2412.00	105.67 PK			1.28 V	121	73.66	32.01
4	*2412.00	103.12 AV			1.28 V	121	71.11	32.01
5	4824.00	51.29 PK	74.00	-22.71	1.18 V	360	48.13	3.16
6	4824.00	43.90 AV	54.00	-10.10	1.18 V	360	40.74	3.16

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 & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 10 Hz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 68% RH
Tested By	Tim Chen	Test Date	2022/4/13

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	*2437.00	108.09 PK			1.24 H	32	76.13	31.96
2	*2437.00	105.53 AV			1.24 H	32	73.57	31.96
3	4874.00	50.65 PK	74.00	-23.35	1.00 H	305	47.44	3.21
4	4874.00	43.32 AV	54.00	-10.68	1.00 H	305	40.11	3.21

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	*2437.00	105.82 PK			2.94 V	46	73.86	31.96
2	*2437.00	103.09 AV			2.94 V	46	71.13	31.96
3	4874.00	50.03 PK	74.00	-23.97	1.63 V	9	46.82	3.21
4	4874.00	41.73 AV	54.00	-12.27	1.63 V	9	38.52	3.21

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 & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 10 Hz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 68% RH
Tested By	Tim Chen	Test Date	2022/4/13

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	108.05 PK			1.14 H	12	76.09	31.96
2	*2462.00	105.47 AV			1.14 H	12	73.51	31.96
3	2483.50	60.25 PK	74.00	-13.75	1.14 H	12	28.24	32.01
4	2483.50	49.15 AV	54.00	-4.85	1.14 H	12	17.14	32.01
5	4924.00	51.60 PK	74.00	-22.40	1.21 H	351	48.36	3.24
6	4924.00	44.53 AV	54.00	-9.47	1.21 H	351	41.29	3.24

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	104.53 PK			2.24 V	33	72.57	31.96
2	*2462.00	102.10 AV			2.24 V	33	70.14	31.96
3	2483.50	58.95 PK	74.00	-15.05	2.24 V	33	26.94	32.01
4	2483.50	47.77 AV	54.00	-6.23	2.24 V	33	15.76	32.01
5	4924.00	51.45 PK	74.00	-22.55	1.12 V	347	48.21	3.24
6	4924.00	44.08 AV	54.00	-9.92	1.12 V	347	40.84	3.24

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 & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 10 Hz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 68% RH
Tested By	Tim Chen	Test Date	2022/4/14

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	67.96 PK	74.00	-6.04	1.04 H	36	35.92	32.04
2	2390.00	52.89 AV	54.00	-1.11	1.04 H	36	20.85	32.04
3	*2412.00	108.13 PK			1.04 H	36	76.12	32.01
4	*2412.00	101.40 AV			1.04 H	36	69.39	32.01
5	4824.00	48.19 PK	74.00	-25.81	1.52 H	66	45.03	3.16
6	4824.00	38.32 AV	54.00	-15.68	1.52 H	66	35.16	3.16

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	62.62 PK	74.00	-11.38	1.31 V	127	30.58	32.04
2	2390.00	49.25 AV	54.00	-4.75	1.31 V	127	17.21	32.04
3	*2412.00	104.33 PK			1.31 V	127	72.32	32.01
4	*2412.00	97.54 AV			1.31 V	127	65.53	32.01
5	4824.00	48.39 PK	74.00	-25.61	1.05 V	157	45.23	3.16
6	4824.00	37.35 AV	54.00	-16.65	1.05 V	157	34.19	3.16

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 & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 10 Hz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 68% RH
Tested By	Tim Chen	Test Date	2022/4/14

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	*2437.00	110.01 PK			1.02 H	41	78.05	31.96
2	*2437.00	103.20 AV			1.02 H	41	71.24	31.96
3	4874.00	49.99 PK	74.00	-24.01	2.01 H	134	46.78	3.21
4	4874.00	39.75 AV	54.00	-14.25	2.01 H	134	36.54	3.21

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	*2437.00	107.09 PK			1.11 V	104	75.13	31.96
2	*2437.00	100.52 AV			1.11 V	104	68.56	31.96
3	4874.00	48.49 PK	74.00	-25.51	1.25 V	216	45.28	3.21
4	4874.00	38.95 AV	54.00	-15.05	1.25 V	216	35.74	3.21

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 & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 10 Hz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 68% RH
Tested By	Tim Chen	Test Date	2022/4/14

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	108.71 PK			1.02 H	43	76.75	31.96
2	*2462.00	101.21 AV			1.02 H	43	69.25	31.96
3	2483.50	68.12 PK	74.00	-5.88	1.02 H	43	36.11	32.01
4	2483.50	53.39 AV	54.00	-0.61	1.02 H	43	21.38	32.01
5	4924.00	49.69 PK	74.00	-24.31	1.73 H	133	46.45	3.24
6	4924.00	39.62 AV	54.00	-14.38	1.73 H	133	36.38	3.24

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	105.59 PK			1.81 V	35	73.63	31.96
2	*2462.00	98.15 AV			1.81 V	35	66.19	31.96
3	2483.50	66.27 PK	74.00	-7.73	1.81 V	35	34.26	32.01
4	2483.50	52.40 AV	54.00	-1.60	1.81 V	35	20.39	32.01
5	4924.00	49.63 PK	74.00	-24.37	1.05 V	127	46.39	3.24
6	4924.00	39.58 AV	54.00	-14.42	1.05 V	127	36.34	3.24

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 & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 10 Hz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 68% RH
Tested By	Tim Chen	Test Date	2022/4/14

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	71.17 PK	74.00	-2.83	1.04 H	35	39.13	32.04
2	2390.00	52.97 AV	54.00	-1.03	1.04 H	35	20.93	32.04
3	*2412.00	107.63 PK			1.04 H	35	75.62	32.01
4	*2412.00	100.62 AV			1.04 H	35	68.61	32.01
5	4824.00	49.89 PK	74.00	-24.11	1.11 H	169	46.73	3.16
6	4824.00	41.58 AV	54.00	-12.42	1.11 H	169	38.42	3.16

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	67.30 PK	74.00	-6.70	1.31 V	127	35.26	32.04
2	2390.00	50.90 AV	54.00	-3.10	1.31 V	127	18.86	32.04
3	*2412.00	103.52 PK			1.31 V	127	71.51	32.01
4	*2412.00	96.64 AV			1.31 V	127	64.63	32.01
5	4824.00	49.19 PK	74.00	-24.81	1.02 V	157	46.03	3.16
6	4824.00	40.05 AV	54.00	-13.95	1.02 V	157	36.89	3.16

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 & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 10 Hz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 68% RH
Tested By	Tim Chen	Test Date	2022/4/14

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	*2437.00	108.90 PK			1.02 H	42	76.94	31.96
2	*2437.00	102.08 AV			1.02 H	42	70.12	31.96
3	4874.00	50.08 PK	74.00	-23.92	1.14 H	102	46.87	3.21
4	4874.00	41.60 AV	54.00	-12.40	1.14 H	102	38.39	3.21
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	*2437.00	105.13 PK			1.31 V	118	73.17	31.96
2	*2437.00	97.32 AV			1.31 V	118	65.36	31.96
3	4874.00	49.74 PK	74.00	-24.26	1.06 V	102	46.53	3.21
4	4874.00	41.08 AV	54.00	-12.92	1.06 V	102	37.87	3.21

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 & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 10 Hz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 68% RH
Tested By	Tim Chen	Test Date	2022/4/14

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	107.69 PK			1.13 H	36	75.73	31.96
2	*2462.00	100.25 AV			1.13 H	36	68.29	31.96
3	2483.50	68.74 PK	74.00	-5.26	1.13 H	36	36.73	32.01
4	2483.50	53.43 AV	54.00	-0.57	1.13 H	36	21.42	32.01
5	4924.00	49.78 PK	74.00	-24.22	1.67 H	234	46.54	3.24
6	4924.00	41.43 AV	54.00	-12.57	1.67 H	234	38.19	3.24

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	104.09 PK			1.84 V	34	72.13	31.96
2	*2462.00	96.59 AV			1.84 V	34	64.63	31.96
3	2483.50	64.89 PK	74.00	-9.11	1.84 V	34	32.88	32.01
4	2483.50	50.60 AV	54.00	-3.40	1.84 V	34	18.59	32.01
5	4924.00	49.62 PK	74.00	-24.38	1.27 V	278	46.38	3.24
6	4924.00	41.33 AV	54.00	-12.67	1.27 V	278	38.09	3.24

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 (HT40)	Channel	CH 3 : 2422 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 10 Hz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 68% RH
Tested By	Tim Chen	Test Date	2022/4/14

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	69.01 PK	74.00	-4.99	1.02 H	33	36.97	32.04
2	2390.00	52.86 AV	54.00	-1.14	1.02 H	33	20.82	32.04
3	*2422.00	105.24 PK			1.02 H	33	73.25	31.99
4	*2422.00	97.46 AV			1.02 H	33	65.47	31.99
5	4844.00	50.00 PK	74.00	-24.00	1.24 H	155	46.83	3.17
6	4844.00	40.23 AV	54.00	-13.77	1.24 H	155	37.06	3.17

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	64.96 PK	74.00	-9.04	1.22 V	142	32.92	32.04
2	2390.00	49.15 AV	54.00	-4.85	1.22 V	142	17.11	32.04
3	*2422.00	101.28 PK			1.22 V	142	69.29	31.99
4	*2422.00	93.62 AV			1.22 V	142	61.63	31.99
5	4844.00	49.92 PK	74.00	-24.08	1.15 V	188	46.75	3.17
6	4844.00	40.38 AV	54.00	-13.62	1.15 V	188	37.21	3.17

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 (HT40)	Channel	CH 6 : 2437 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 10 Hz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 68% RH
Tested By	Tim Chen	Test Date	2022/4/14

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	*2437.00	106.47 PK			1.02 H	41	74.51	31.96
2	*2437.00	98.85 AV			1.02 H	41	66.89	31.96
3	4874.00	49.93 PK	74.00	-24.07	1.82 H	204	46.72	3.21
4	4874.00	41.67 AV	54.00	-12.33	1.82 H	204	38.46	3.21

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	*2437.00	103.12 PK			1.82 V	36	71.16	31.96
2	*2437.00	95.37 AV			1.82 V	36	63.41	31.96
3	4874.00	49.50 PK	74.00	-24.50	1.66 V	247	46.29	3.21
4	4874.00	41.23 AV	54.00	-12.77	1.66 V	247	38.02	3.21

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 (HT40)	Channel	CH 9 : 2452 MHz
Frequency Range	1GHz ~ 25GHz	Detector Function & Bandwidth	(PK) RB = 1 MHz, VB = 3 MHz (AV) RB = 1 MHz, VB = 10 Hz
Input Power	120 Vac, 60 Hz	Environmental Conditions	22°C, 68% RH
Tested By	Tim Chen	Test Date	2022/4/14

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	*2452.00	104.82 PK			1.02 H	41	72.89	31.93
2	*2452.00	97.16 AV			1.02 H	41	65.23	31.93
3	2483.50	69.44 PK	74.00	-4.56	1.02 H	41	37.43	32.01
4	2483.50	53.22 AV	54.00	-0.78	1.02 H	41	21.21	32.01
5	4904.00	50.12 PK	74.00	-23.88	1.36 H	217	46.89	3.23
6	4904.00	40.65 AV	54.00	-13.35	1.36 H	217	37.42	3.23

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	*2452.00	101.01 PK			1.50 V	131	69.08	31.93
2	*2452.00	93.31 AV			1.50 V	131	61.38	31.93
3	2483.50	65.42 PK	74.00	-8.58	1.50 V	131	33.41	32.01
4	2483.50	50.25 AV	54.00	-3.75	1.50 V	131	18.24	32.01
5	4904.00	49.61 PK	74.00	-24.39	1.35 V	211	46.38	3.23
6	4904.00	40.28 AV	54.00	-13.72	1.35 V	211	37.05	3.23

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.

9 kHz ~ 1 GHz Worst-Case Data:

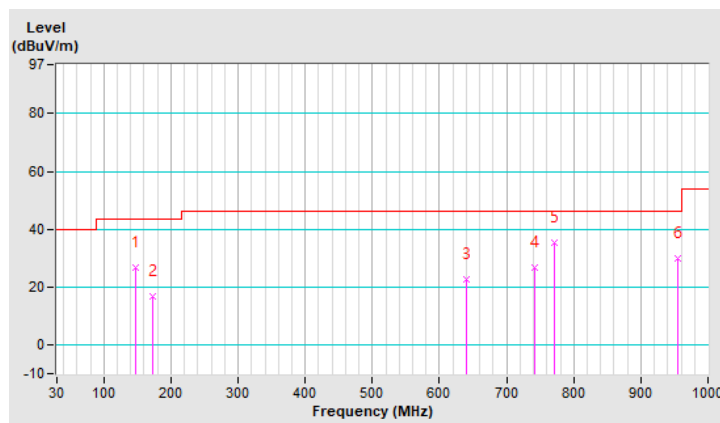
RF Mode	TX 802.11b	Channel	CH 11 : 2462 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	23°C, 68% RH
Tested By	Raymond Lee	Test Date	2022/2/17

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	148.09	26.63 QP	43.50	-16.87	1.99 H	240	44.79	-18.16
2	173.39	16.71 QP	43.50	-26.79	1.99 H	19	35.51	-18.80
3	640.12	22.69 QP	46.00	-23.31	1.49 H	340	32.46	-9.77
4	742.74	26.87 QP	46.00	-19.13	1.99 H	227	35.13	-8.26
5	770.86	35.52 QP	46.00	-10.48	1.00 H	259	43.54	-8.02
6	955.01	30.04 QP	46.00	-15.96	1.00 H	221	35.50	-5.46

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.

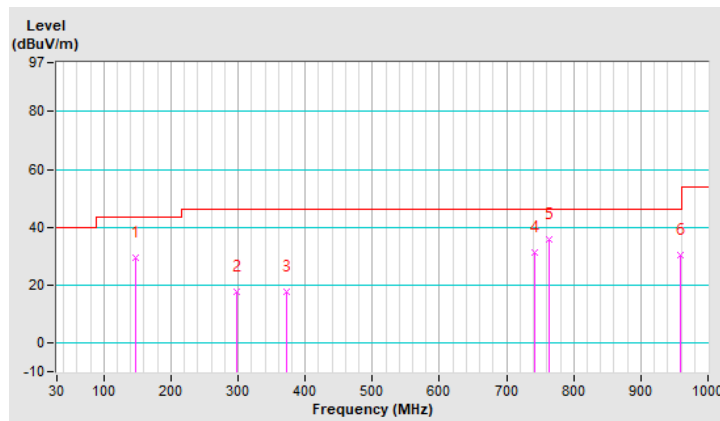


RF Mode	TX 802.11b	Channel	CH 11 : 2462 MHz
Frequency Range	30 MHz ~ 1 GHz	Detector Function & Bandwidth	(QP) RB = 120kHz
Input Power	120 Vac, 60 Hz	Environmental Conditions	23°C, 68% RH
Tested By	Raymond Lee	Test Date	2022/2/17

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	148.09	29.32 QP	43.50	-14.18	1.01 V	128	47.48	-18.16
2	297.10	17.58 QP	46.00	-28.42	2.00 V	18	35.11	-17.53
3	371.61	17.68 QP	46.00	-28.32	2.00 V	135	33.31	-15.63
4	742.74	31.21 QP	46.00	-14.79	1.51 V	118	39.47	-8.26
5	762.42	35.97 QP	46.00	-10.03	1.01 V	145	44.01	-8.04
6	959.23	30.41 QP	46.00	-15.59	2.00 V	113	35.72	-5.31

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 0.50 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	Dec. 03, 2021	Dec. 02, 2022
RF signal cable Woken	5D-FB	Cable-cond1-01	Jan. 15, 2022	Jan. 14, 2023
LISN/AMN ROHDE & SCHWARZ (EUT)	ENV216	101826	Mar. 14, 2022	Mar. 13, 2023
LISN/AMN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Sep. 07, 2021	Sep. 06, 2022
Software ADT	BV ADT_Cond_ V7.3.7.4	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 (Conduction 1).
 3. The VCCI Site Registration No. is C-12040.

4.2.3 Test Procedures

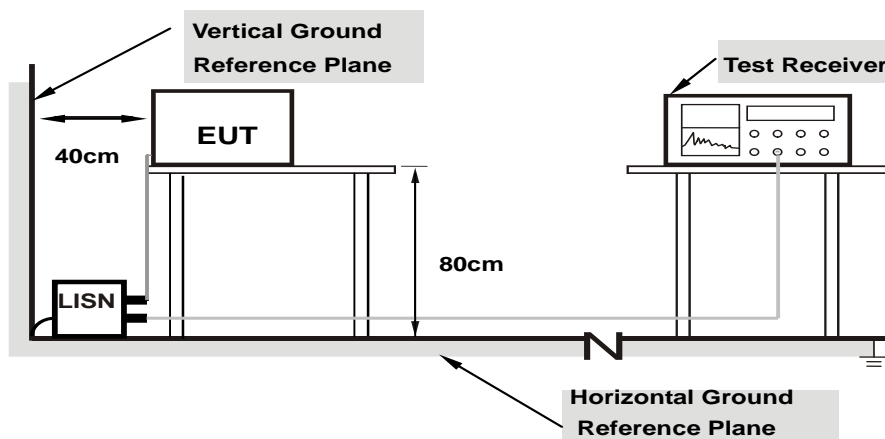
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/50 uH of coupling 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: The resolution bandwidth and video bandwidth of test receiver is 9 kHz for quasi-peak detection (QP) and average detection (AV) at frequency 0.15 MHz – 30 MHz.

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.

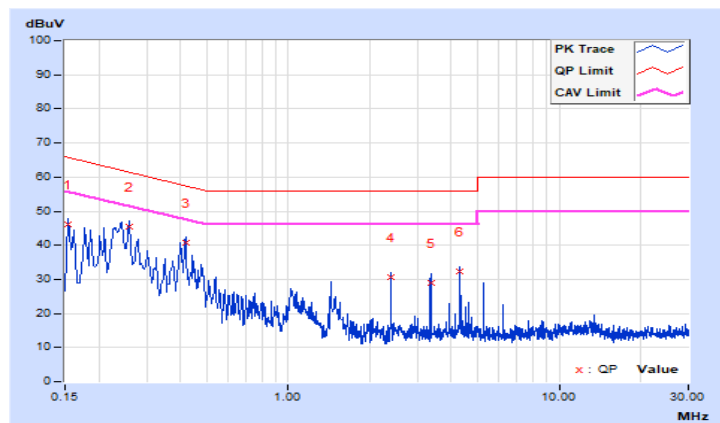
4.2.7 Test Results

Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23 °C, 69% RH
Tested by	Raymond Lee	Test Date	2022/2/18

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	9.77	36.45	17.48	46.22	27.25	65.78	55.78	-19.56	-28.53
2	0.25742	9.82	35.66	26.29	45.48	36.11	61.51	51.51	-16.03	-15.40
3	0.41799	9.87	30.84	18.44	40.71	28.31	57.49	47.49	-16.78	-19.18
4	2.39400	9.98	20.67	13.57	30.65	23.55	56.00	46.00	-25.35	-22.45
5	3.35400	10.00	19.01	11.27	29.01	21.27	56.00	46.00	-26.99	-24.73
6	4.31000	10.02	22.22	20.84	32.24	30.86	56.00	46.00	-23.76	-15.14

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

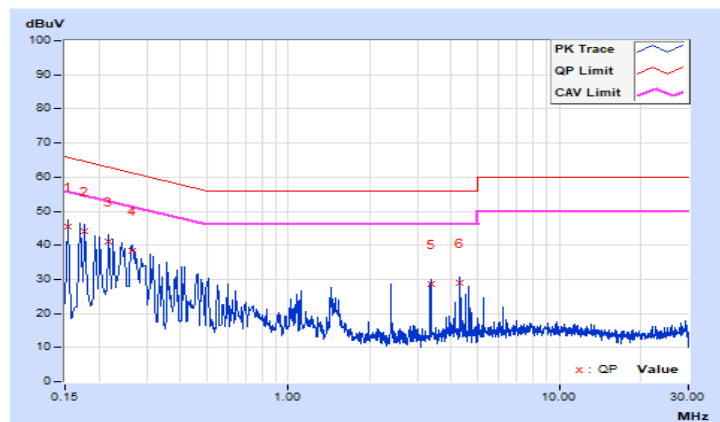


Frequency Range	150kHz ~ 30MHz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz
Input Power	120Vac, 60Hz	Environmental Conditions	23 °C, 69% RH
Tested by	Raymond Lee	Test Date	2022/2/18

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	0.15400	9.82	35.47	16.91	45.29	26.73	65.78	55.78	-20.49	-29.05
2	0.17800	9.84	34.16	14.82	44.00	24.66	64.58	54.58	-20.58	-29.92
3	0.21800	9.87	31.11	13.78	40.98	23.65	62.89	52.89	-21.91	-29.24
4	0.26429	9.89	28.35	13.12	38.24	23.01	61.30	51.30	-23.06	-28.29
5	3.35400	10.07	18.62	15.92	28.69	25.99	56.00	46.00	-27.31	-20.01
6	4.31400	10.10	18.85	18.32	28.95	28.42	56.00	46.00	-27.05	-17.58

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

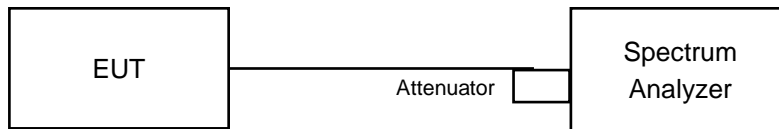


4.3 6 dB Bandwidth Measurement

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 Results

802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	10.12	0.5	Pass
6	2437	10.13	0.5	Pass
11	2462	10.12	0.5	Pass

802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.63	0.5	Pass
6	2437	16.56	0.5	Pass
11	2462	16.62	0.5	Pass

802.11n (HT20)

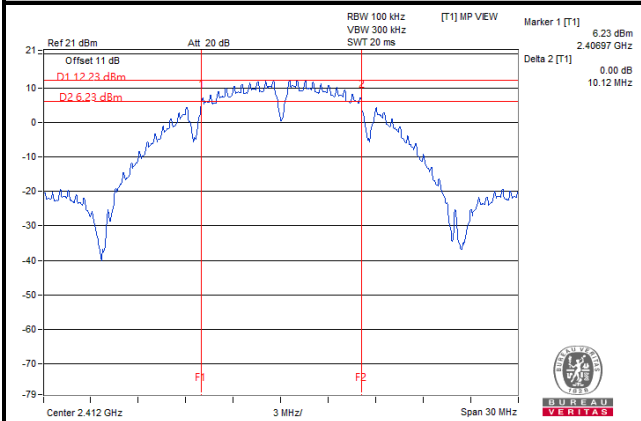
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	17.86	0.5	Pass
6	2437	17.87	0.5	Pass
11	2462	17.84	0.5	Pass

802.11n (HT40)

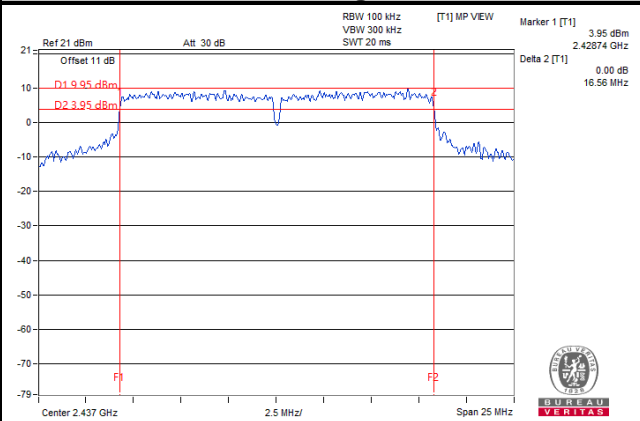
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
3	2422	36.63	0.5	Pass
6	2437	36.64	0.5	Pass
9	2452	36.64	0.5	Pass

Spectrum Plot of Worst Value

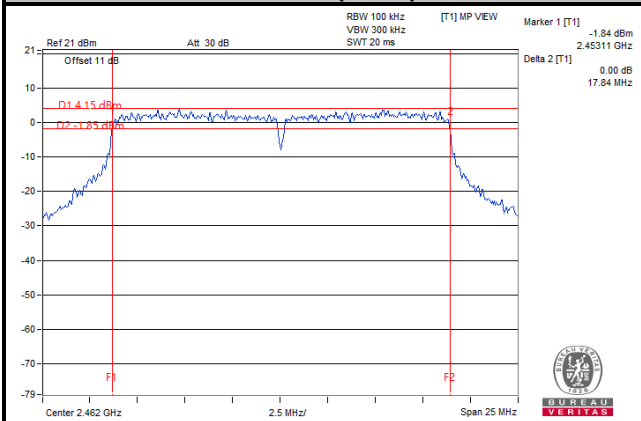
802.11b



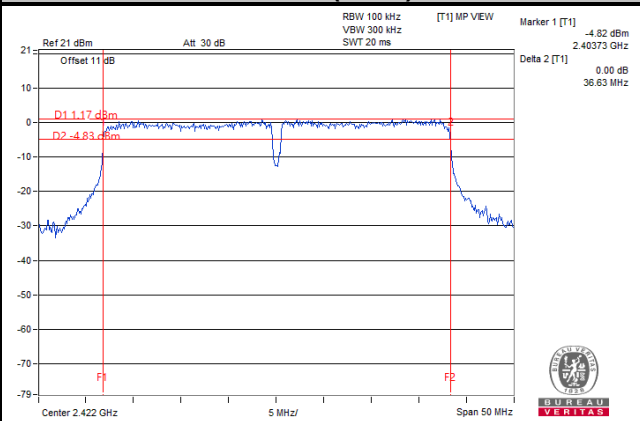
802.11g



802.11n (HT20)

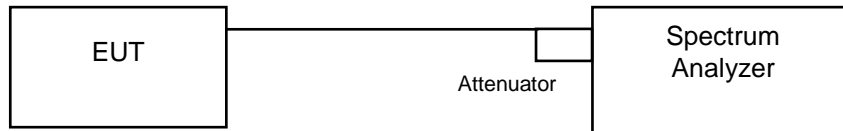


802.11n (HT40)



4.4 Occupied Bandwidth Measurement

4.4.1 Test Setup



4.4.2 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.4.3 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with resolution bandwidth in the range of 1 % to 5 % of the anticipated emission bandwidth, and a video bandwidth at least 3x the resolution bandwidth and set the detector to sampling. The width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5 % of the total mean power of a given emission.

4.4.4 Deviation from Test Standard

No deviation.

4.4.5 EUT Operating Conditions

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

4.4.6 Test Results

802.11b

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	Pass / Fail
1	2412	15.22	Pass
6	2437	15.00	Pass
11	2462	15.12	Pass

802.11g

Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	Pass / Fail
1	2412	16.95	Pass
6	2437	25.56	Pass
11	2462	17.04	Pass

802.11n (HT20)

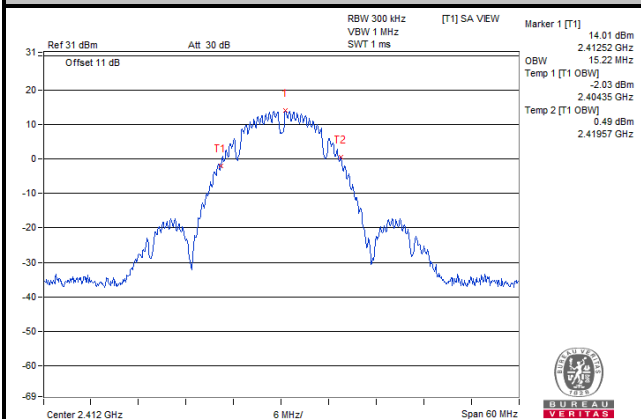
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	Pass / Fail
1	2412	18.17	Pass
6	2437	25.92	Pass
11	2462	18.12	Pass

802.11n (HT40)

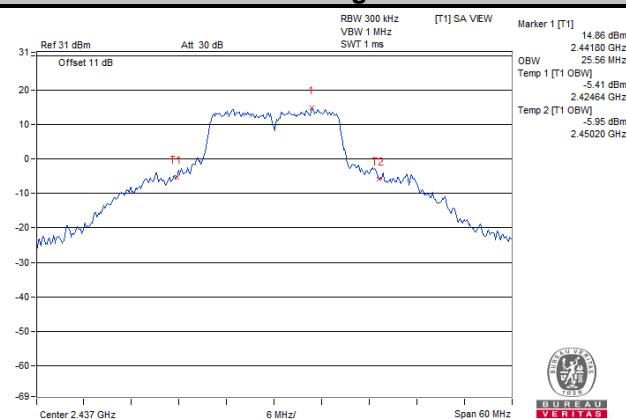
Channel	Frequency (MHz)	Occupied Bandwidth (MHz)	Pass / Fail
3	2422	37.20	Pass
6	2437	37.08	Pass
9	2452	37.32	Pass

Spectrum Plot of Worst Value

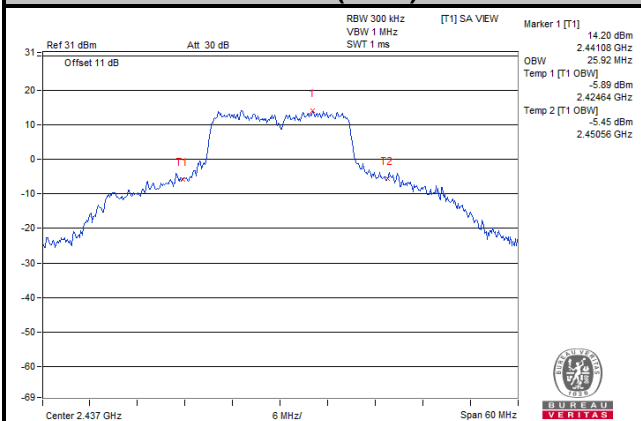
802.11b



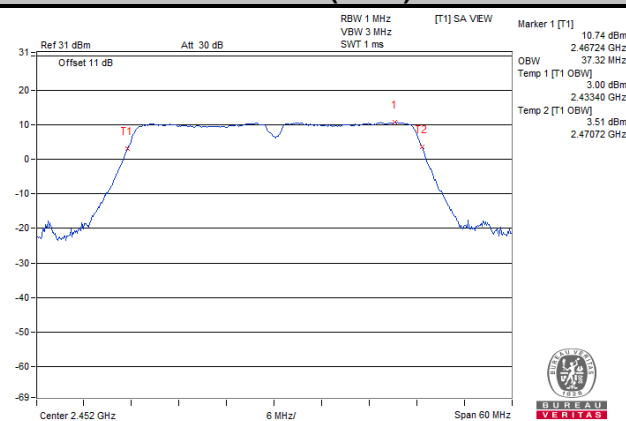
802.11g



802.11n (HT20)



802.11n (HT40)

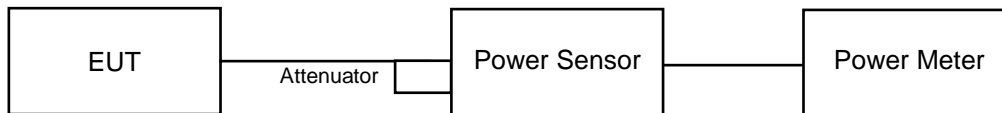


4.5 Conducted Output Power Measurement

4.5.1 Limits of Conducted Output Power Measurement

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

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.

4.5.5 Deviation from Test Standard

No deviation.

4.5.6 EUT Operating Conditions

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

4.5.7 Test Results

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	72.277	18.59	30	Pass
6	2437	79.616	19.01	30	Pass
11	2462	83.753	19.23	30	Pass

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	40.926	16.12	30	Pass
6	2437	63.973	18.06	30	Pass
11	2462	45.814	16.61	30	Pass

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	34.995	15.44	30	Pass
6	2437	50.234	17.01	30	Pass
11	2462	41.783	16.21	30	Pass

802.11n (HT40)

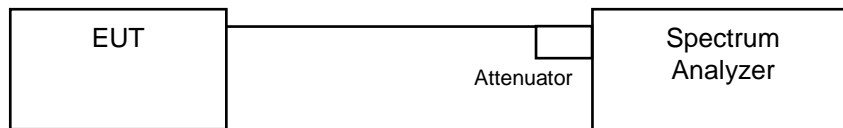
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
3	2422	36.813	15.66	30	Pass
6	2437	52.845	17.23	30	Pass
9	2452	38.726	15.88	30	Pass

4.6 Power Spectral Density Measurement

4.6.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8 dBm in any 3 kHz band during any time interval of continuous transmission.

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

For Average Power (Duty cycle $\geq 98\%$)

- a. Set instrument center frequency to DTS channel center frequency.
- b. Set span to at least 1.5 times the OBW.
- c. Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- d. Set VBW $\geq 3 \times \text{RBW}$.
- e. Detector = power averaging (RMS) or sample detector (when RMS not available).
- f. Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span}/\text{RBW}$.
- g. Sweep time = auto couple.
- h. Employ trace averaging (RMS) mode over a minimum of 100 traces.
- i. 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

802.11b

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
1	2412	-9.42	8	Pass
6	2437	-11.96	8	Pass
11	2462	-11.58	8	Pass

802.11g

Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
1	2412	-19.27	8	Pass
6	2437	-12.99	8	Pass
11	2462	-18.02	8	Pass

802.11n (HT20)

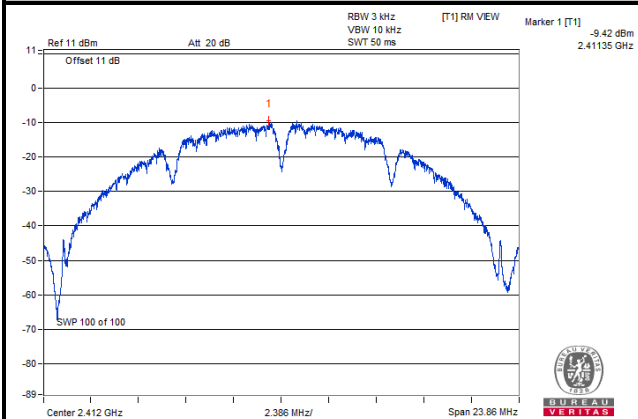
Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
1	2412	-17.18	8	Pass
6	2437	-13.82	8	Pass
11	2462	-18.10	8	Pass

802.11n (HT40)

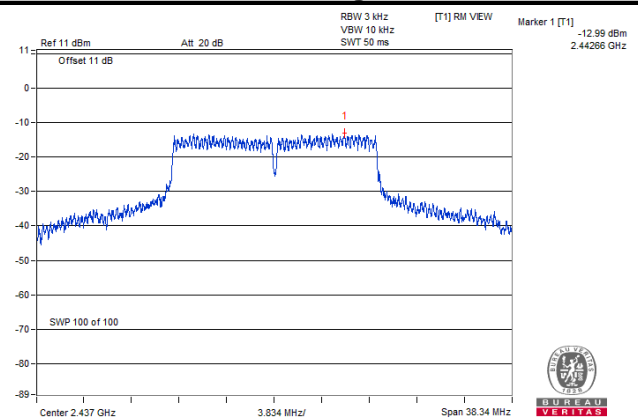
Channel	Frequency (MHz)	PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
3	2422	-21.08	8	Pass
6	2437	-21.49	8	Pass
9	2452	-22.31	8	Pass

Spectrum Plot of Worst Value

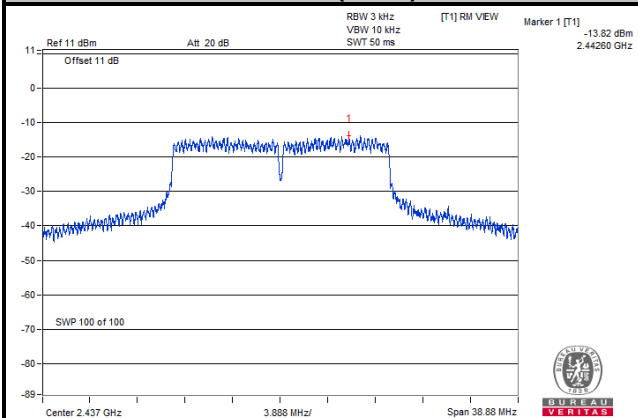
802.11b



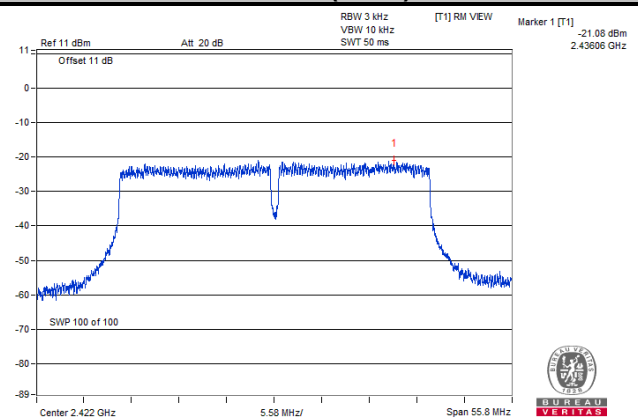
802.11g



802.11n (HT20)



802.11n (HT40)

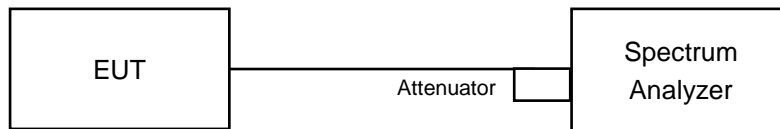


4.7 Conducted Out of Band Emission Measurement

4.7.1 Limits of Conducted Out of Band Emission Measurement

Below 30 dB of the highest emission level of operating band (in 100 kHz Resolution Bandwidth).

4.7.2 Test Setup



4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

4.7.4 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.

4.7.5 Deviation from Test Standard

No deviation.

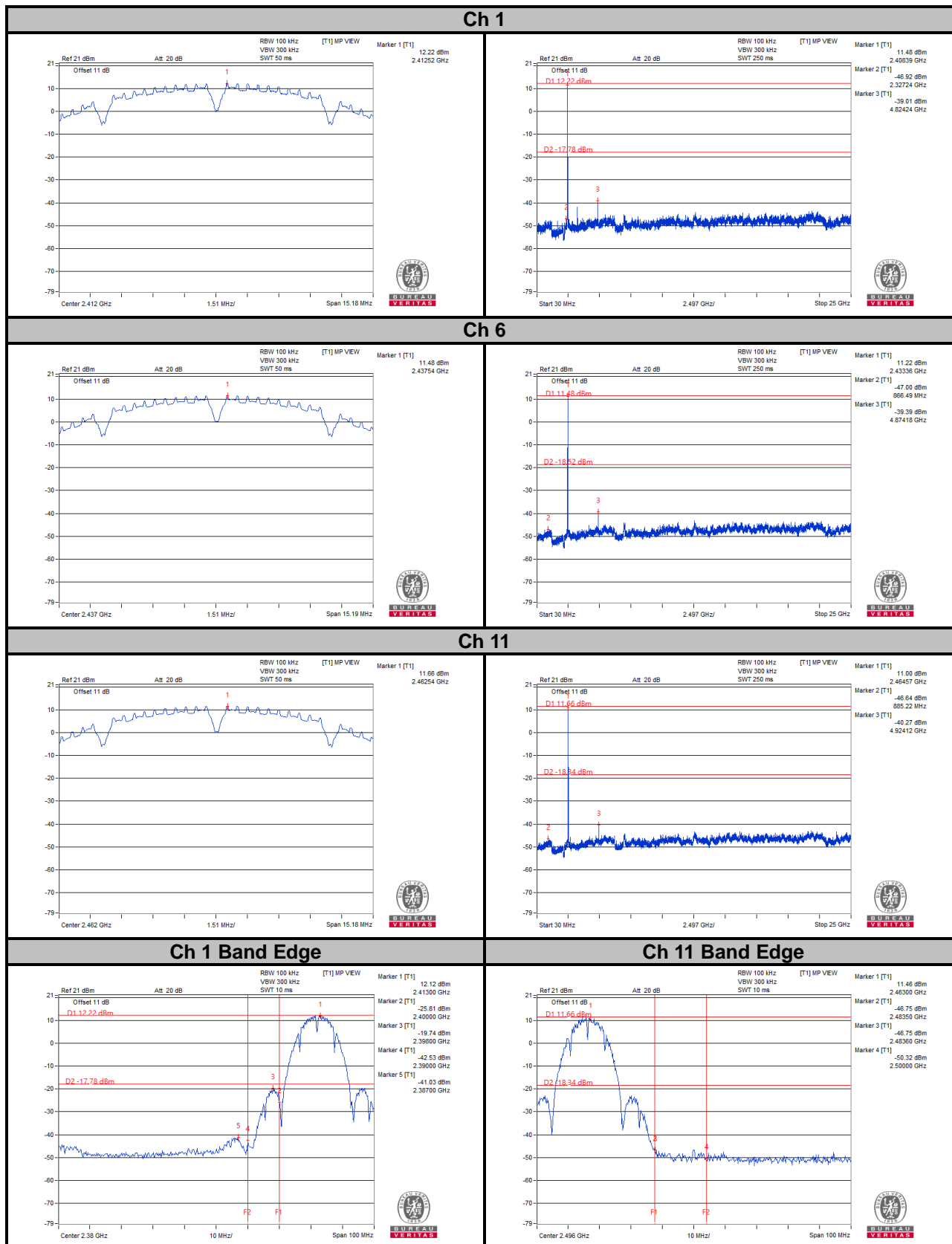
4.7.6 EUT Operating Condition

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

4.7.7 Test Results

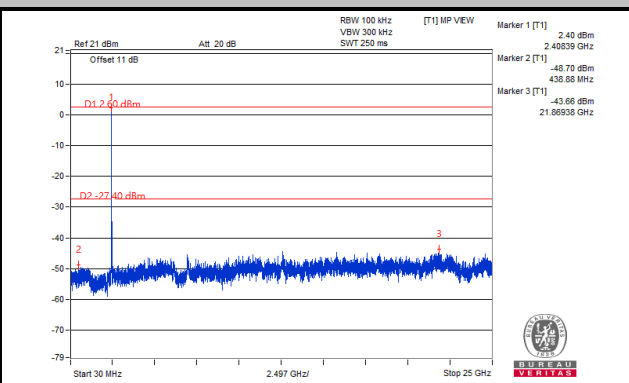
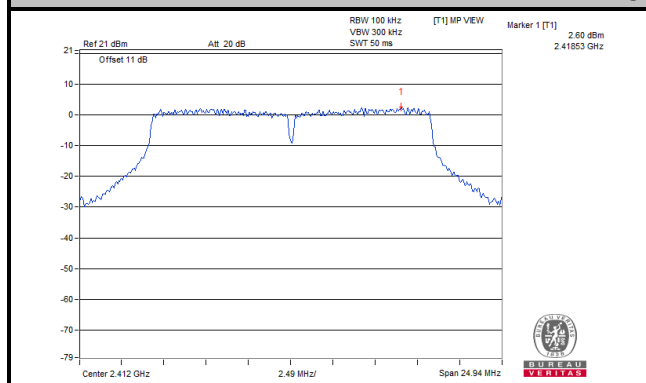
The spectrum plots are attached on the following images. D1 line indicates the highest level, and D2 line indicates the 30 dB offset below D1. It shows compliance with the requirement.

802.11b

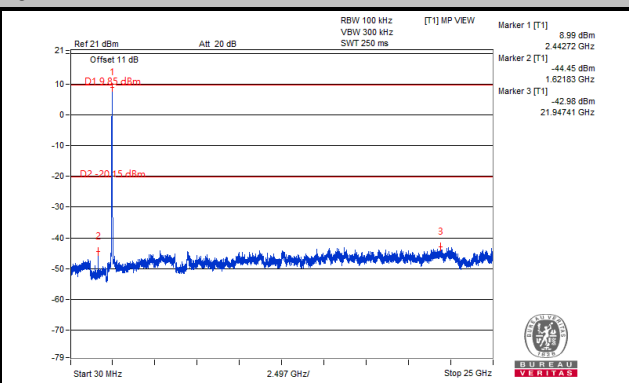
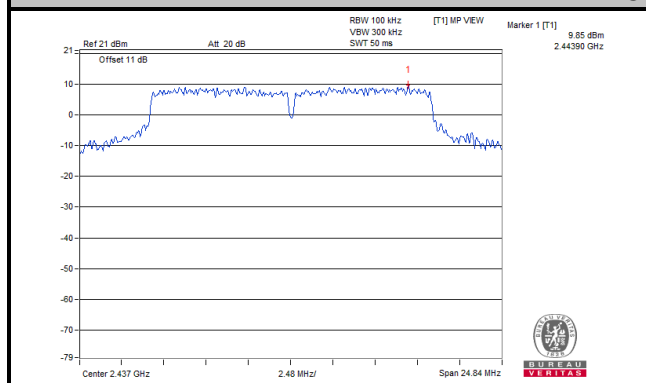


802.11g

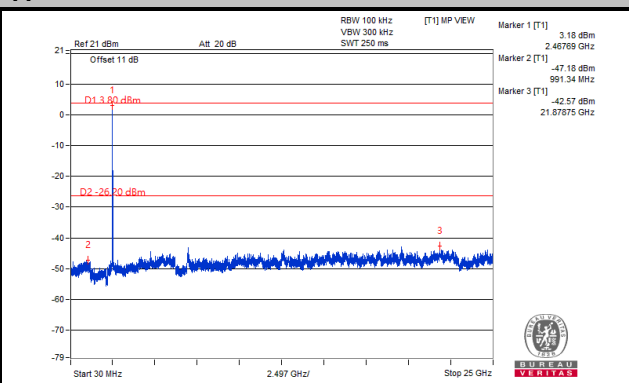
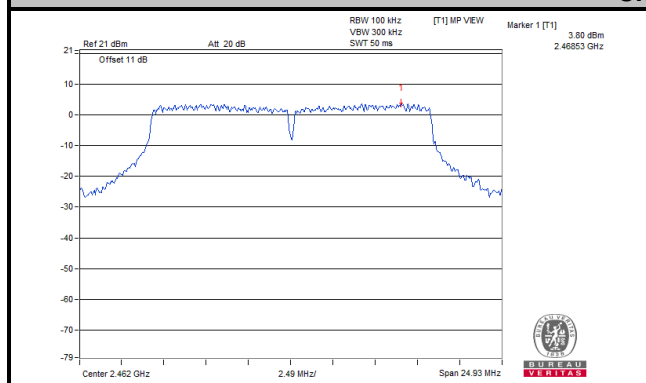
Ch 1



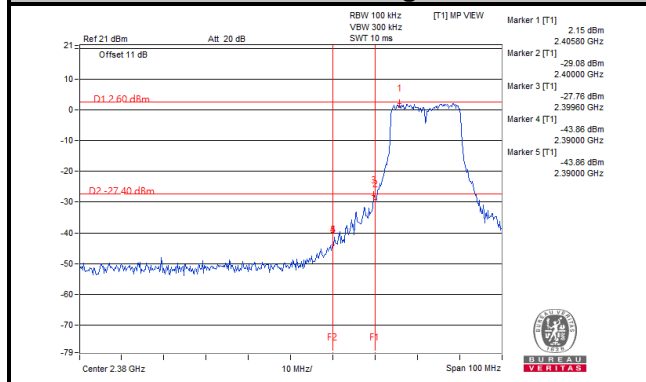
Ch 6



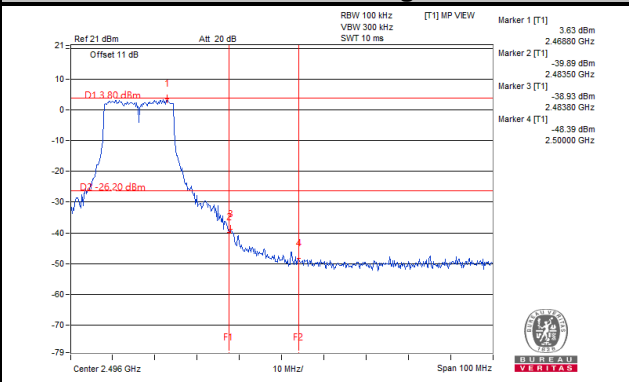
Ch 11



Ch 1 Band Edge

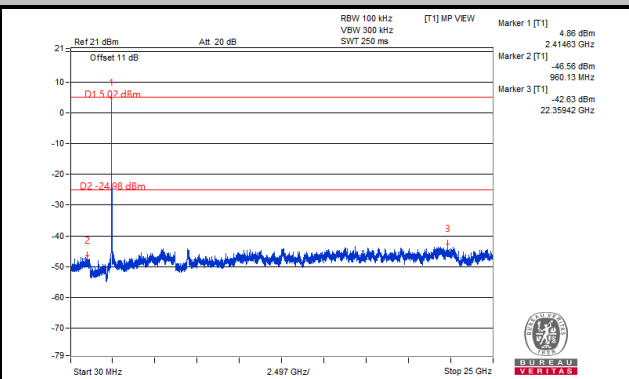
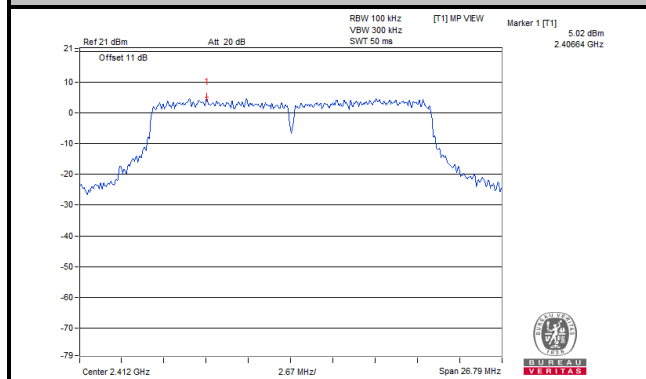


Ch 11 Band Edge

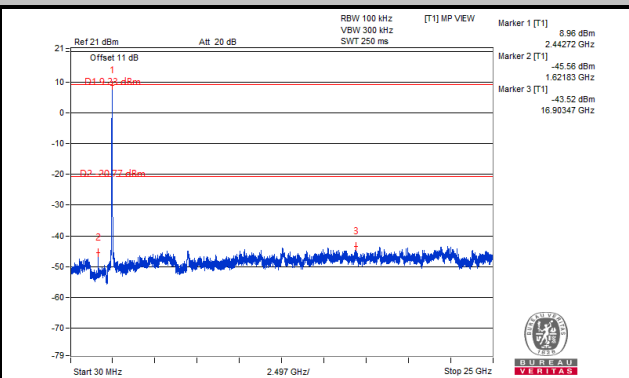
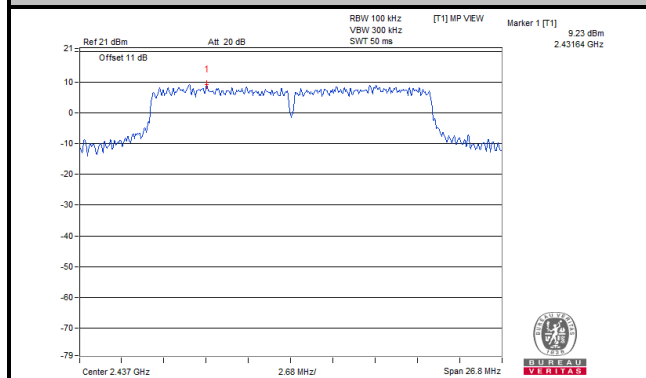


802.11n (HT20)

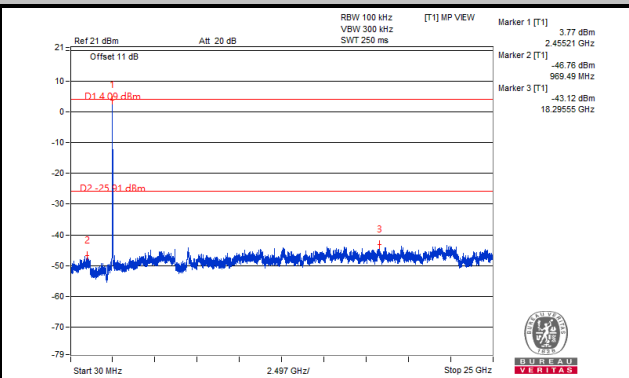
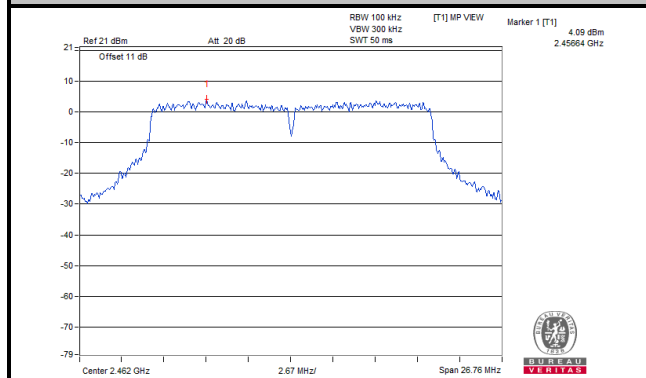
Ch 1



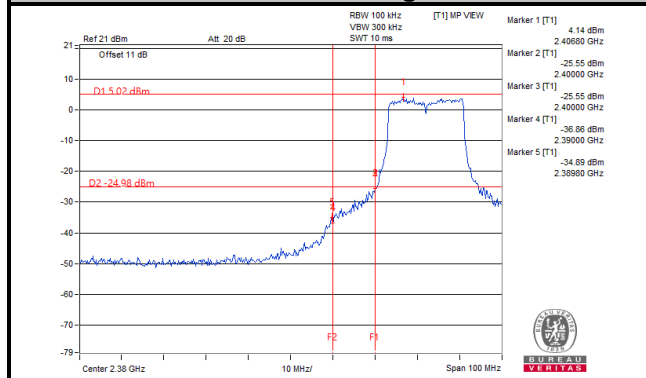
Ch 6



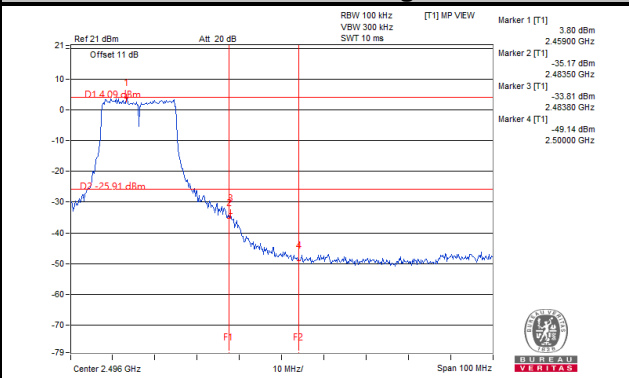
Ch 11



Ch 1 Band Edge

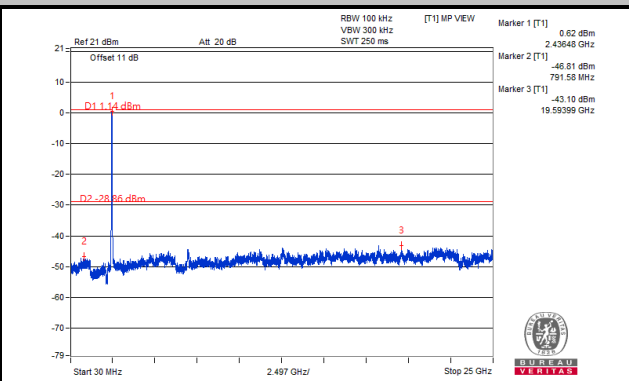
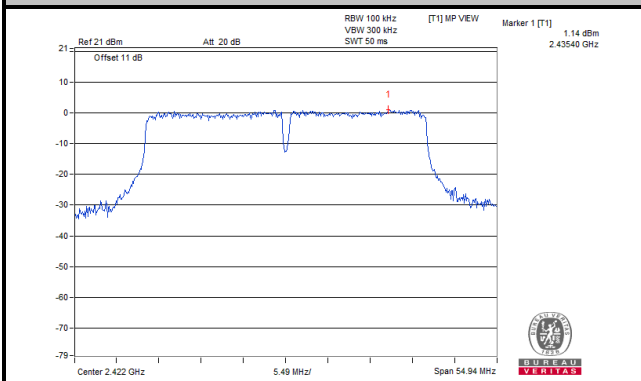


Ch 11 Band Edge

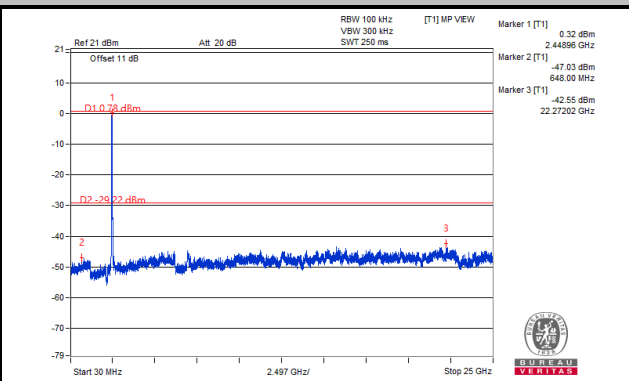
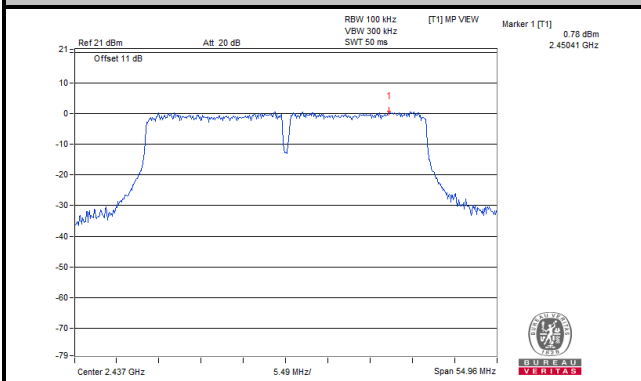


802.11n (HT40)

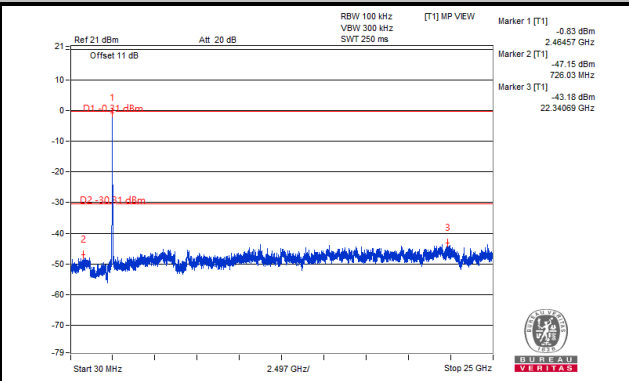
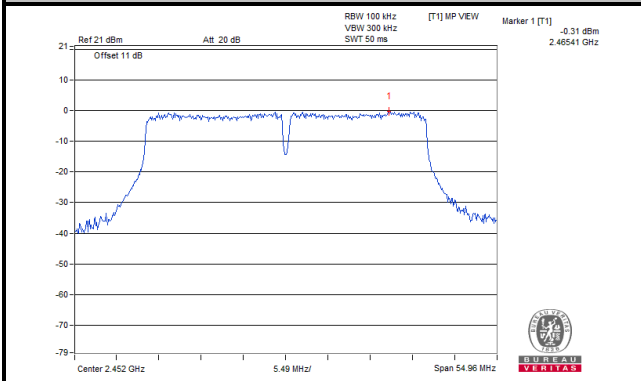
Ch 3



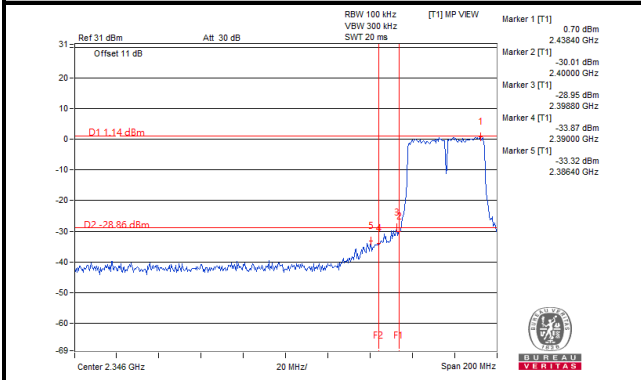
Ch 6



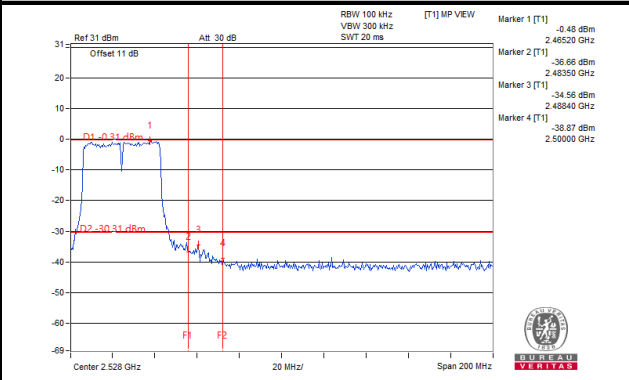
Ch 9



Ch 3 Band Edge



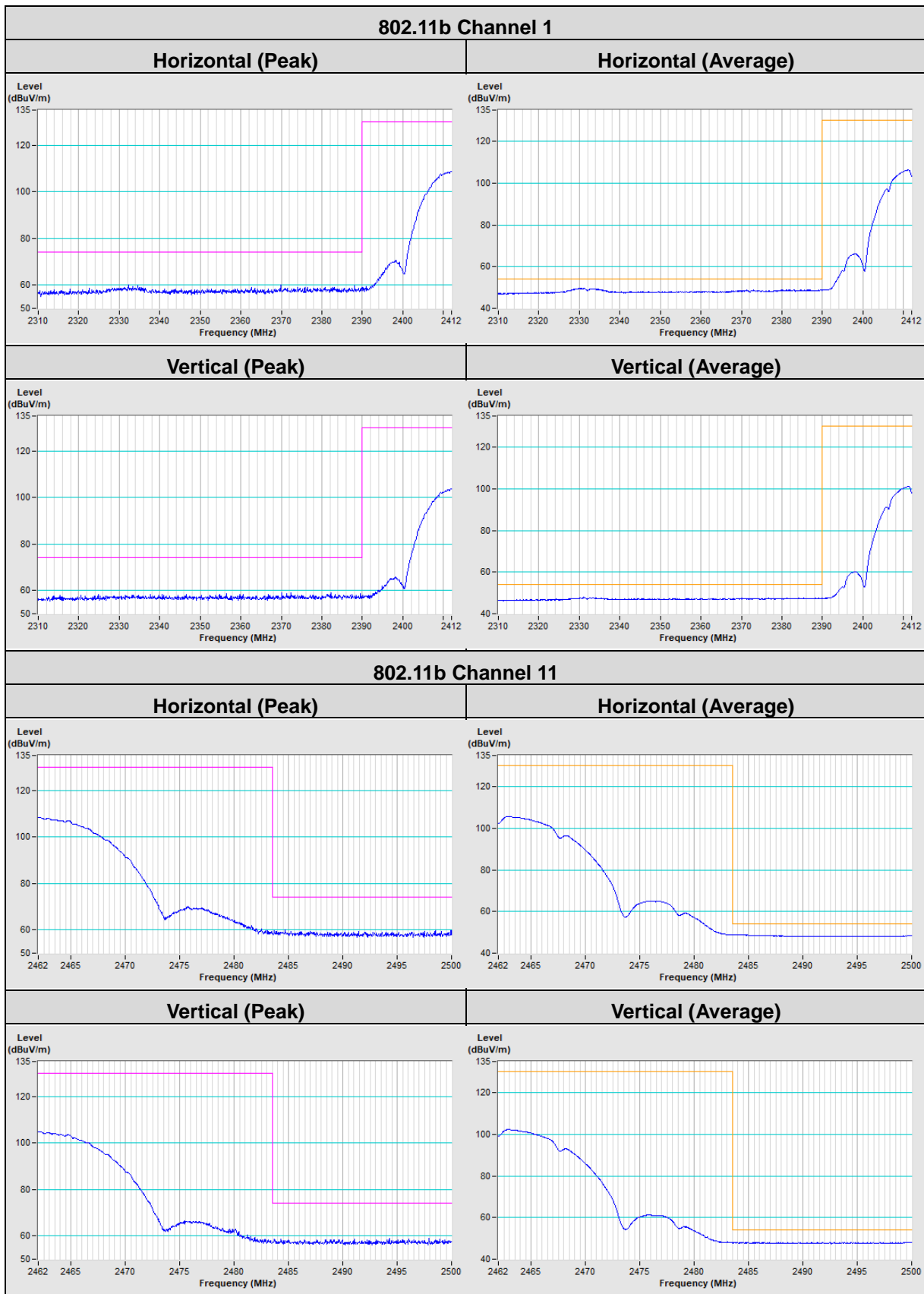
Ch 9 Band Edge

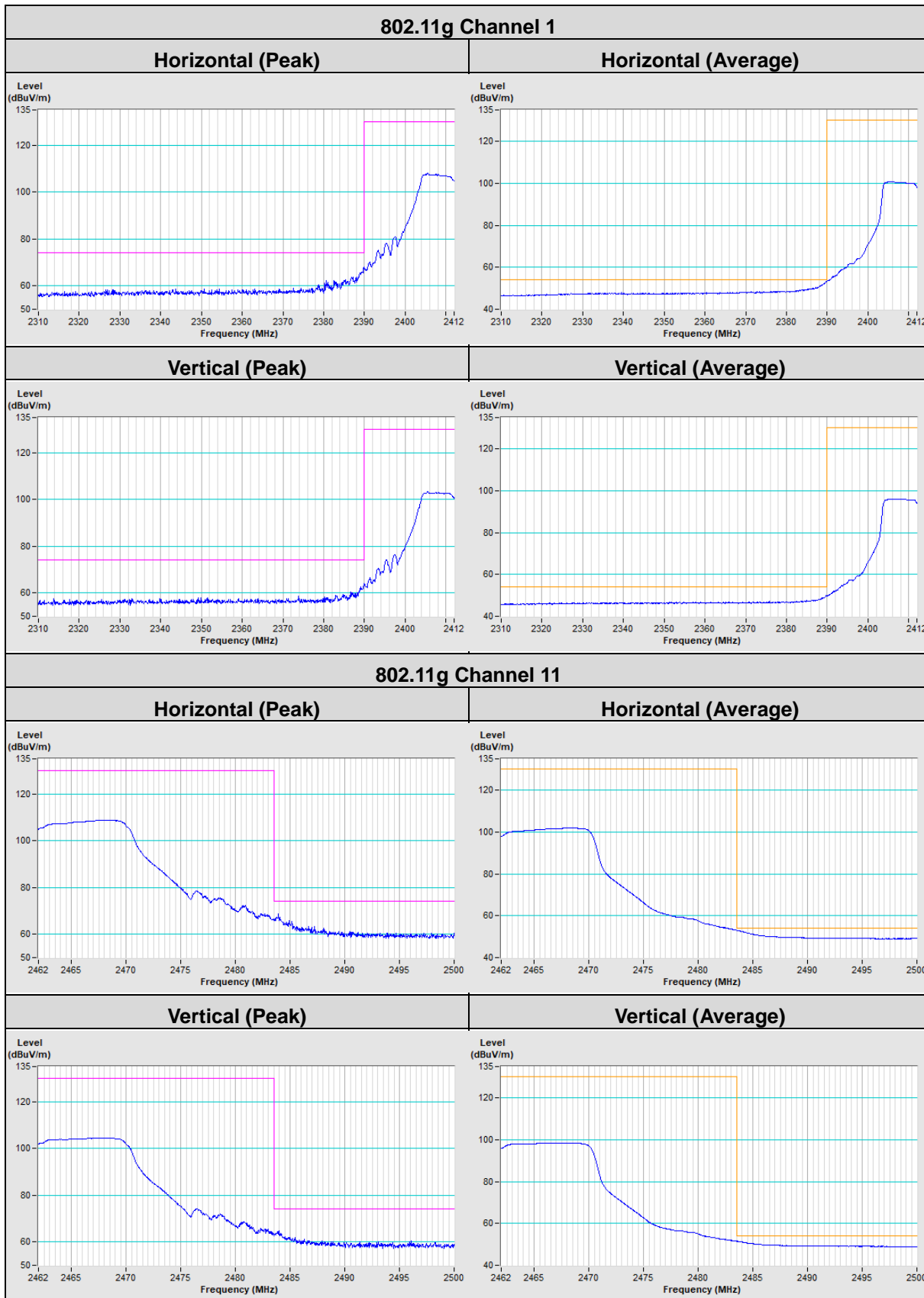


5 Pictures of Test Arrangements

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

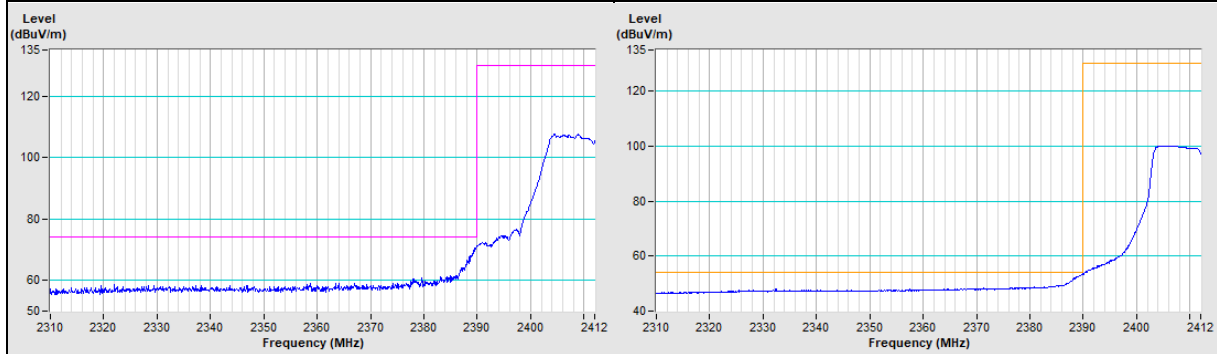
Annex A- Band Edge Measurement



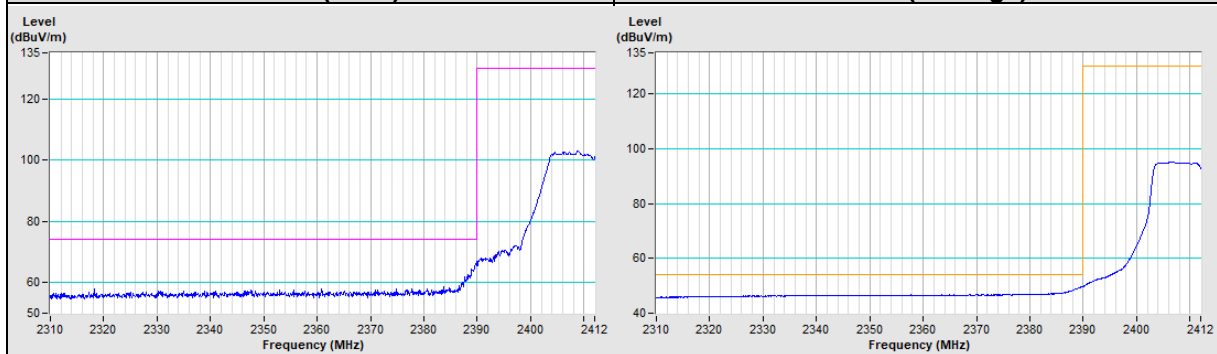


802.11n (HT20) Channel 1

Horizontal (Peak)	Horizontal (Average)
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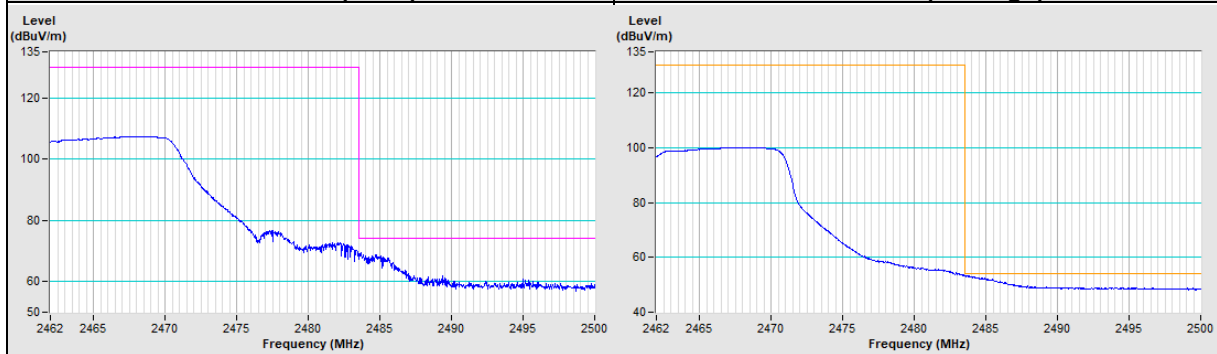


Vertical (Peak)	Vertical (Average)
------------------------	---------------------------

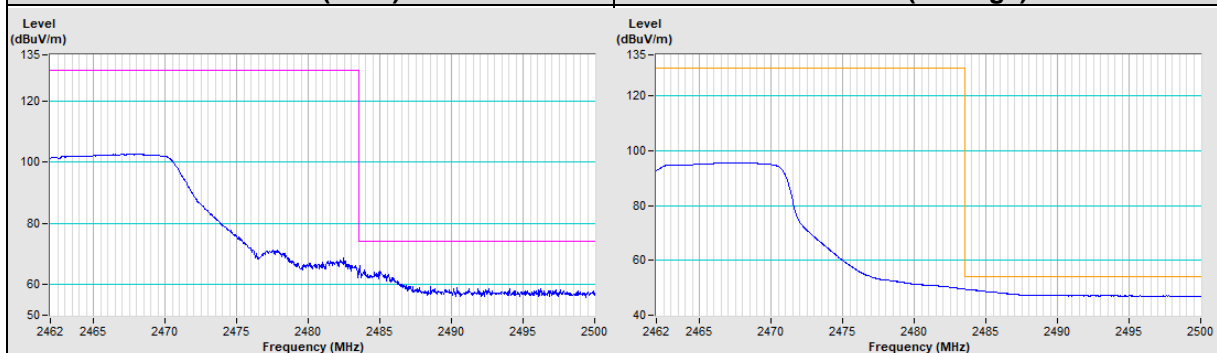


802.11n (HT20) Channel 11

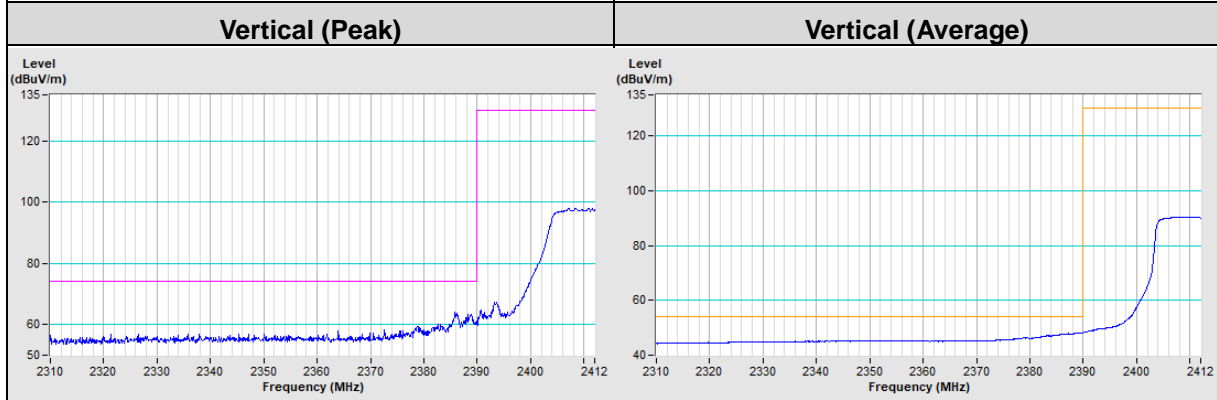
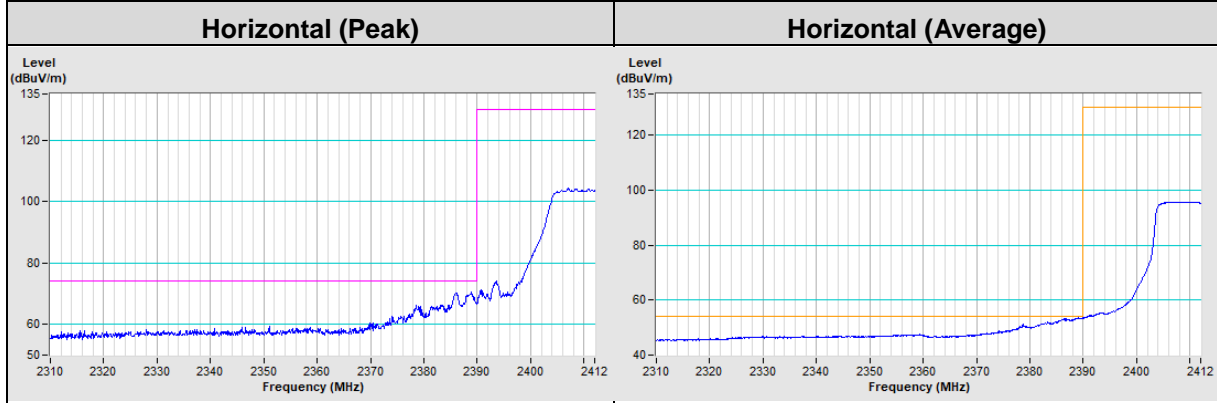
Horizontal (Peak)	Horizontal (Average)
--------------------------	-----------------------------



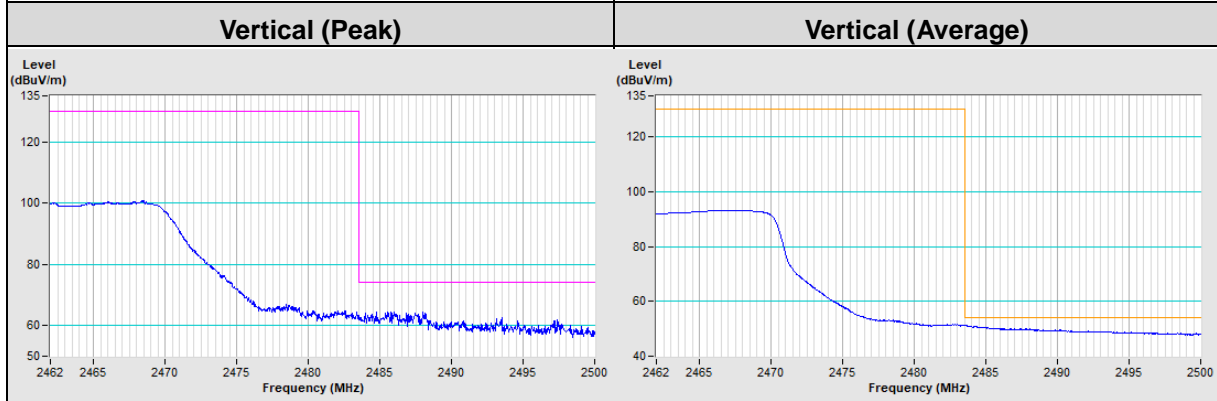
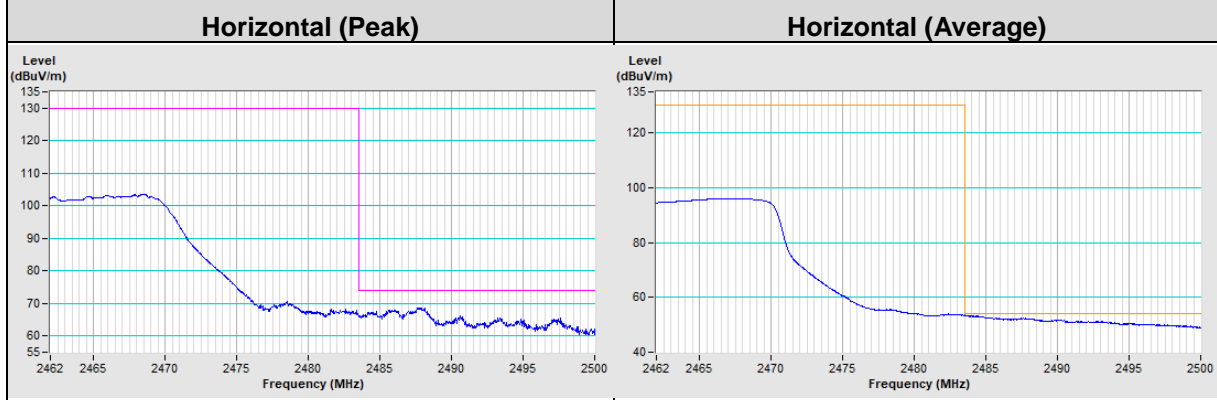
Vertical (Peak)	Vertical (Average)
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802.11n (HT40) Channel 3



802.11n (HT40) Channel 9



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:

Lin Kou EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

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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