FCC Test Report (2.4GHz WLAN)

Report No.:	RFBEMI-WTW-P21070045
FCC ID:	NOIKBN778
Test Model:	N778
Received Date:	2021/7/1
Test Date:	2021/7/30 ~ 2021/8/25
Issued Date:	2021/9/30
Applicant:	NETRONIX, INC.
Address:	No 945, Boai St, Jubei City. Hsinchu, 30265 Taiwan
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

This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.

Table of Contents

Release Control Record

Issue No.	Description	Date Issued
RFBEMI-WTW-P21070045	Original release.	2021/9/30

1 Certificate of Conformity

Product:	Electronic Display Device
Brand:	Rakuten kobo
Test Model:	N778
Sample Status:	Engineering sample
Applicant:	NETRONIX, INC.
Test Date:	2021/7/30 ~ 2021/8/25
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:** 2021/9/30

Vivian Huang / Specialist

Approved by : , **Date:** 2021/9/30

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 -9.99 dB at 0.16562 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.3 dB at 2390.00 MHz.
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 2.4 GHz band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A.
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	5.4 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	5.0 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 (2.4GHz WLAN)

Product	Electronic Display Device
Brand	Rakuten kobo
Test Model	N778
Status of EUT	Engineering sample
Power Supply Rating	3.7 Vdc from battery or 5 Vdc from USB interface
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 802.11g: up to 54 Mbps 802.11n: up to 72.2 Mbps
Operating Frequency	2.412 ~ 2.462 GHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20): 11
Output Power	232.274 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Cable Supplied	USB Cable x1 (Shielded, 1.0m)

Note:

1. There are WLAN and Bluetooth technology used for the EUT.
2. Simultaneously transmission condition.

Condition	Technology	
1	WLAN (2.4GHz)	Bluetooth
2	WLAN (5GHz)	Bluetooth
Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.		

3. Two eMMC provided to the EUT, please refer to the following table:

No.	Model	Remark
1	EMMC32G-TX29-GA8A	1st source eMMC
2	MKEMF032GZ1E-C	2nd source eMMC
Note: From the above eMMCs, the worst case was found in **No. 1**. Therefore only the test data of the mode was recorded in this report.		

4. The antenna provided to the EUT, please refer to the following table:

Brand	Model	Antenna Net Gain (dBi)	Frequency Range (GHz)	Antenna Type	Connector Type
INPAQ	ACM3-3216-P1-CC-S	0.6	2.4~2.4835	Chip Antenna	None
		2	5.15~5.85		

5. The EUT was pre-tested under the following modes:

Radiated Emission test	
Test Mode	Description
Mode A	Battery mode
Mode B	USB Adapter mode
Mode C	Battery mode with Leather sheath
Mode D	**USB Adapter mode with Leather sheath**
Note: From the above modes, the worst case was found in **Mode D**. Therefore only the test data of the mode was recorded in this report.	
AC Power Conducted Emission test	
Test Mode	Description
Mode A	Power from laptop mode
Mode B	Power from USB Adapter mode
Mode C	**Power from USB Adapter mode with Leather sheath**
Note: From the above modes, the worst case was found in **Mode C**. Therefore only the test data of the mode was recorded in this report.	

6. 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

7. The power setting are list as below:

802.11b		**802.11g**		**802.11n (HT20)**	
Fre. (MHz)	**Power Setting**	**Fre. (MHz)**	**Power Setting**	**Fre. (MHz)**	**Power Setting**
2412	34	2412	46	2412	44
2437	34	2437	47	2437	47
2462	34	2462	41	2462	40

8. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.
9. 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 (MHz)	Channel	Frequency (MHz)
1	2412	7	2442
2	2417	8	2447
3	2422	9	2452
4	2427	10	2457
5	2432	11	2462
6	2437		

3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE≥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 **X-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)
802.11g	1 to 11	6	OFDM	BPSK	6

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)
802.11g	1 to 11	6	OFDM	BPSK	6

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.

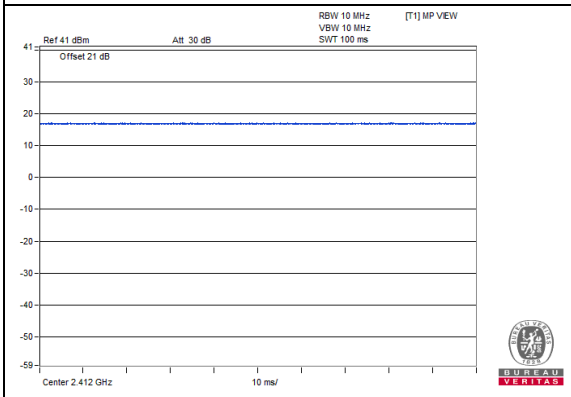
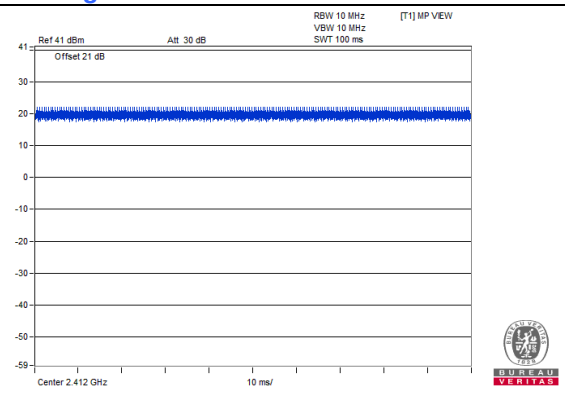
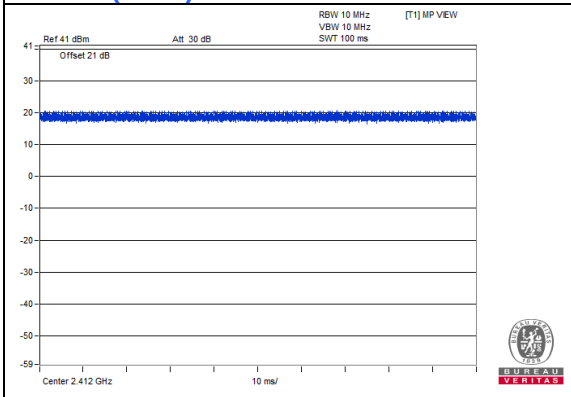
Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5

Test Condition:

Applicable To	Environmental Conditions	Input Power (System)	Tested By
RE≥1G	25deg. C, 65%RH	120Vac, 60Hz	Tom Yang
RE<1G	25deg. C, 70%RH	120Vac, 60Hz	Tom Yang
PLC	21deg. C, 68%RH	120Vac, 60Hz	Ian Chang
APCM	25deg. C, 60%RH	120Vac, 60Hz	Kevin Ko

3.3 Duty Cycle of Test Signal

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

802.11b	802.11g
	
802.11n (HT20)	
	

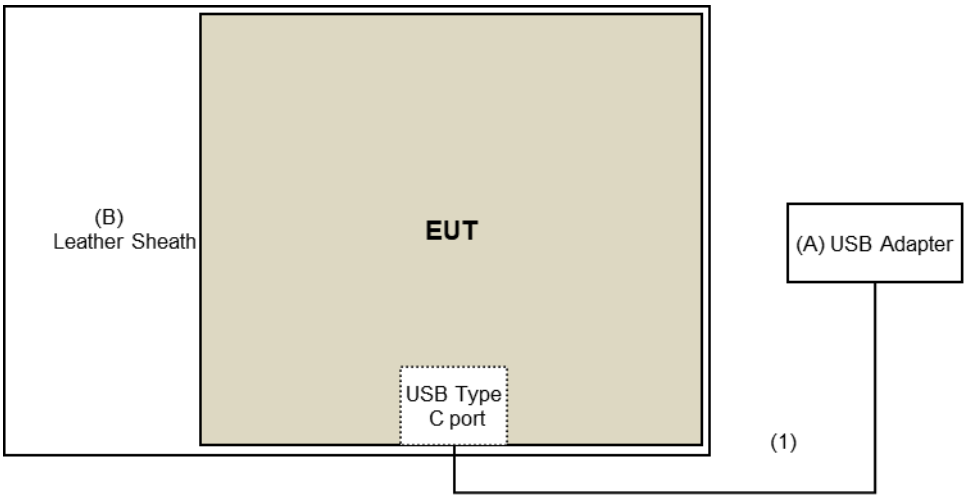
3.4 Description of Support Units

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.	USB Adapter	ASUS	EXA1205UA	NA	NA	Provided by Lab
B.	Leather Sheath	Rakuten kobo	N779	NA	NA	Supplied by client

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB Type A To USB Type C Cable	1	1	Yes	0	Supplied by client

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 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 test:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Agilent	N9038A	MY50010156	2021/7/22	2022/7/21
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Pre_Amplifier EMCI	EMC001340	980142	2021/5/24	2022/5/23
LOOP ANTENNA Electro-Metrics	EM-6879	264	2021/3/5	2022/3/4
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-001	2021/1/7	2022/1/6
RF Coaxial Cable JYEBO	5D-FB	LOOPCAB-002	2021/1/7	2022/1/6
Pre_Amplifier Mini-Circuits	ZFL-1000VH2	QA0838008	2020/10/20	2021/10/19
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	2020/11/5	2021/11/4
RF Coaxial Cable COMMATE/PEWC	8D	966-3-1	2021/3/16	2022/3/15
RF Coaxial Cable COMMATE/PEWC	8D	966-3-2	2021/3/16	2022/3/15
RF Coaxial Cable COMMATE/PEWC	8D	966-3-3	2021/3/16	2022/3/15
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	2020/9/24	2021/9/23
Horn Antenna Schwarzbeck	BBHA9120-D	9120D-406	2020/11/22	2021/11/21
Pre_Amplifier EMCI	EMC12630SE	980384	2021/1/11	2022/1/10
RF Coaxial Cable EMCI	EMC104-SM-SM-1500	180504	2021/4/26	2022/4/25
RF Coaxial Cable EMCI	EMC104-SM-SM-2000	180601	2021/6/8	2022/6/7
RF Coaxial Cable EMCI	EMC104-SM-SM-6000	210201	2021/5/13	2022/5/12
Fix tool for Boresight antenna tower LIOW GUU	FBA-01	FBA_SIP01	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. 3.
3. Tested Date: 2021/7/30 ~ 2021/8/13

For other test items:

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	101516	2021/3/8	2022/3/7
Power Meter Anritsu	ML2495A	1529002	2021/6/21	2022/6/20
Pulse Power Sensor Anritsu	MA2411B	1339443	2021/5/31	2022/5/30
Attenuator WOKEN	MDCS18N-10	MDCS18N-10-01	2021/4/13	2022/4/12
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: 2021/8/17

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:

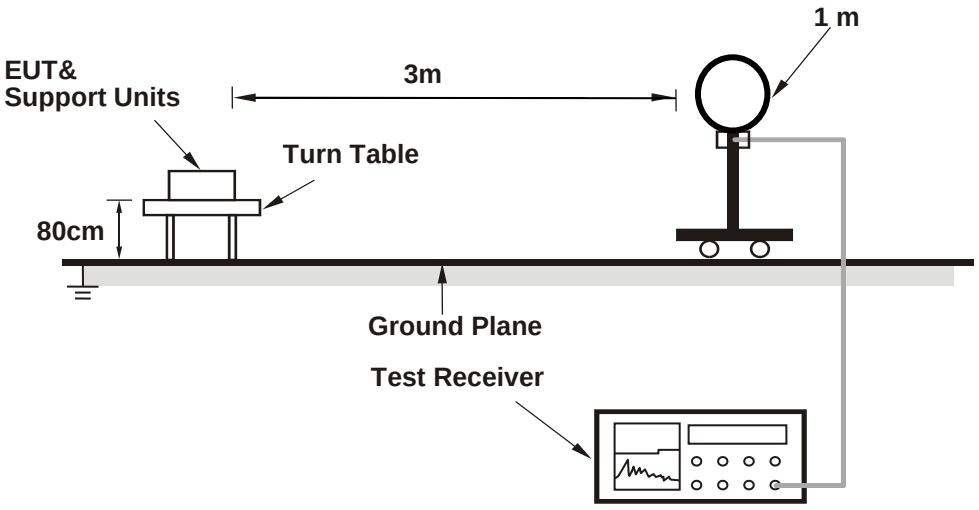
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
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

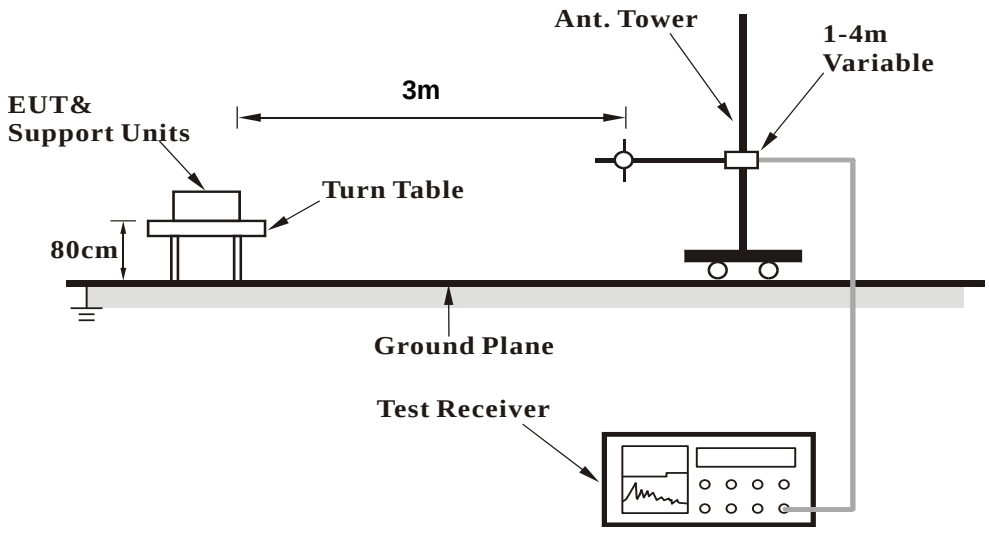
No deviation.

4.1.5 Test Setup

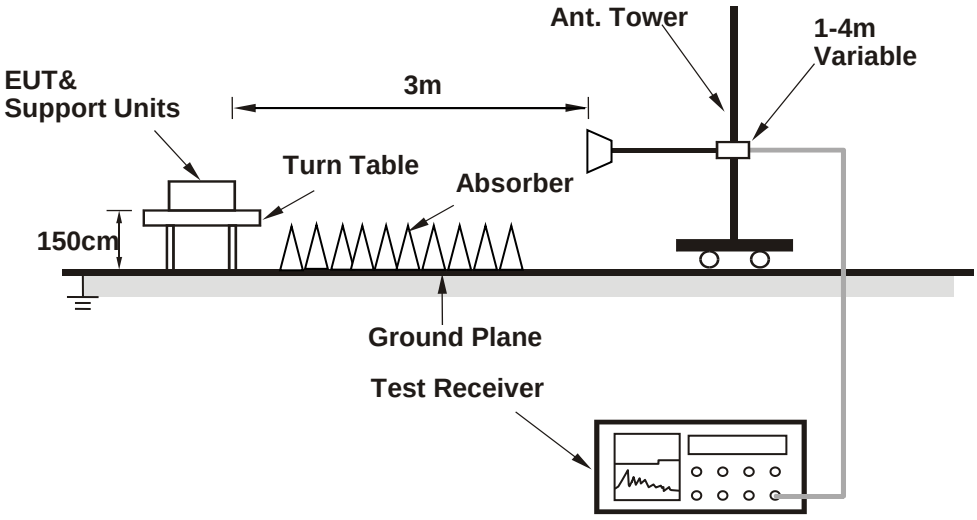
For Radiated emission below 30MHz



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 (Tera Term paste N778_Wifi SOP command) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

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	2385.90	58.4 PK	74.0	-15.6	1.49 H	112	59.6	-1.2
2	2385.90	53.4 AV	54.0	-0.6	1.49 H	112	54.6	-1.2
3	*2412.00	103.7 PK			1.49 H	112	104.9	-1.2
4	*2412.00	101.4 AV			1.49 H	112	102.6	-1.2
5	4824.00	51.2 PK	74.0	-22.8	3.54 H	46	47.5	3.7
6	4824.00	46.1 AV	54.0	-7.9	3.54 H	46	42.4	3.7
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	2385.90	56.2 PK	74.0	-17.8	3.41 V	52	57.4	-1.2
2	2385.90	50.5 AV	54.0	-3.5	3.41 V	52	51.7	-1.2
3	*2412.00	102.8 PK			3.41 V	52	104.0	-1.2
4	*2412.00	100.4 AV			3.41 V	52	101.6	-1.2
5	4824.00	55.3 PK	74.0	-18.7	1.33 V	294	51.6	3.7
6	4824.00	52.2 AV	54.0	-1.8	1.33 V	294	48.5	3.7

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	55.9 PK	74.0	-18.1	1.48 H	114	57.1	-1.2
2	2390.00	44.6 AV	54.0	-9.4	1.48 H	114	45.8	-1.2
3	*2437.00	105.2 PK			1.48 H	114	106.4	-1.2
4	*2437.00	103.2 AV			1.48 H	114	104.4	-1.2
5	2483.50	56.5 PK	74.0	-17.5	1.48 H	114	57.7	-1.2
6	2483.50	45.2 AV	54.0	-8.8	1.48 H	114	46.4	-1.2
7	4874.00	51.9 PK	74.0	-22.1	3.48 H	56	48.1	3.8
8	4874.00	48.0 AV	54.0	-6.0	3.48 H	56	44.2	3.8
9	7311.00	44.9 PK	74.0	-29.1	2.31 H	114	35.2	9.7
10	7311.00	34.6 AV	54.0	-19.4	2.31 H	114	24.9	9.7
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	54.6 PK	74.0	-19.4	3.36 V	53	55.8	-1.2
2	2390.00	43.4 AV	54.0	-10.6	3.36 V	53	44.6	-1.2
3	*2437.00	104.0 PK			3.36 V	53	105.2	-1.2
4	*2437.00	102.0 AV			3.36 V	53	103.2	-1.2
5	2483.50	55.1 PK	74.0	-18.9	3.36 V	53	56.3	-1.2
6	2483.50	43.7 AV	54.0	-10.3	3.36 V	53	44.9	-1.2
7	4874.00	56.3 PK	74.0	-17.7	1.08 V	308	52.5	3.8
8	**4874.00**	**53.7 AV**	**54.0**	**-0.3**	**1.08 V**	**308**	**49.9**	**3.8**
9	7311.00	44.7 PK	74.0	-29.3	1.71 V	255	35.0	9.7
10	7311.00	33.8 AV	54.0	-20.2	1.71 V	255	24.1	9.7

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	101.8 PK			1.46 H	113	103.0	-1.2
2	*2462.00	99.5 AV			1.46 H	113	100.7	-1.2
3	2488.90	59.6 PK	74.0	-14.4	1.46 H	113	60.8	-1.2
4	**2488.90**	**53.7 AV**	**54.0**	**-0.3**	**1.46 H**	**113**	**54.9**	**-1.2**
5	4924.00	50.5 PK	74.0	-23.5	3.36 H	55	46.6	3.9
6	4924.00	45.5 AV	54.0	-8.5	3.36 H	55	41.6	3.9
7	7386.00	45.3 PK	74.0	-28.7	2.35 H	118	35.6	9.7
8	7386.00	34.7 AV	54.0	-19.3	2.35 H	118	25.0	9.7
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	100.3 PK			3.40 V	55	101.5	-1.2
2	*2462.00	98.3 AV			3.40 V	55	99.5	-1.2
3	2490.50	57.4 PK	74.0	-16.6	3.40 V	55	58.6	-1.2
4	2490.50	51.2 AV	54.0	-2.8	3.40 V	55	52.4	-1.2
5	4924.00	55.0 PK	74.0	-19.0	1.15 V	312	51.1	3.9
6	4924.00	52.7 AV	54.0	-1.3	1.15 V	312	48.8	3.9
7	7386.00	45.3 PK	74.0	-28.7	1.70 V	268	35.6	9.7
8	7386.00	34.3 AV	54.0	-19.7	1.70 V	268	24.6	9.7

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	65.5 PK	74.0	-8.5	1.50 H	111	66.7	-1.2
2	**2390.00**	**53.7 AV**	**54.0**	**-0.3**	**1.50 H**	**111**	**54.9**	**-1.2**
3	*2412.00	101.2 PK			1.50 H	111	102.4	-1.2
4	*2412.00	94.0 AV			1.50 H	111	95.2	-1.2
5	4824.00	47.9 PK	74.0	-26.1	2.88 H	257	44.2	3.7
6	4824.00	36.0 AV	54.0	-18.0	2.88 H	257	32.3	3.7
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	63.5 PK	74.0	-10.5	3.42 V	51	64.7	-1.2
2	2390.00	51.6 AV	54.0	-2.4	3.42 V	51	52.8	-1.2
3	*2412.00	99.6 PK			3.42 V	51	100.8	-1.2
4	*2412.00	92.7 AV			3.42 V	51	93.9	-1.2
5	4824.00	50.2 PK	74.0	-23.8	1.32 V	115	46.5	3.7
6	4824.00	39.2 AV	54.0	-14.8	1.32 V	115	35.5	3.7

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	60.7 PK	74.0	-13.3	1.48 H	114	61.9	-1.2
2	2390.00	49.5 AV	54.0	-4.5	1.48 H	114	50.7	-1.2
3	*2437.00	107.2 PK			1.48 H	114	108.4	-1.2
4	*2437.00	99.9 AV			1.48 H	114	101.1	-1.2
5	2483.50	67.0 PK	74.0	-7.0	1.48 H	114	68.2	-1.2
6	2483.50	53.6 AV	54.0	-0.4	1.48 H	114	54.8	-1.2
7	4874.00	51.9 PK	74.0	-22.1	3.03 H	241	48.1	3.8
8	4874.00	40.9 AV	54.0	-13.1	3.03 H	241	37.1	3.8
9	7311.00	45.2 PK	74.0	-28.8	2.29 H	129	35.5	9.7
10	7311.00	35.0 AV	54.0	-19.0	2.29 H	129	25.3	9.7
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	55.3 PK	74.0	-18.7	3.33 V	50	56.5	-1.2
2	2390.00	45.3 AV	54.0	-8.7	3.33 V	50	46.5	-1.2
3	*2437.00	106.2 PK			3.33 V	50	107.4	-1.2
4	*2437.00	98.8 AV			3.33 V	50	100.0	-1.2
5	2483.50	63.7 PK	74.0	-10.3	3.33 V	50	64.9	-1.2
6	2483.50	50.4 AV	54.0	-3.6	3.33 V	50	51.6	-1.2
7	4874.00	54.2 PK	74.0	-19.8	1.15 V	334	50.4	3.8
8	4874.00	43.0 AV	54.0	-11.0	1.15 V	334	39.2	3.8
9	7311.00	45.2 PK	74.0	-28.8	1.72 V	267	35.5	9.7
10	7311.00	34.1 AV	54.0	-19.9	1.72 V	267	24.4	9.7

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	99.0 PK			1.47 H	115	100.2	-1.2
2	*2462.00	92.1 AV			1.47 H	115	93.3	-1.2
3	2483.50	66.7 PK	74.0	-7.3	1.47 H	115	67.9	-1.2
4	2483.50	53.6 AV	54.0	-0.4	1.47 H	115	54.8	-1.2
5	4924.00	47.4 PK	74.0	-26.6	2.96 H	268	43.5	3.9
6	4924.00	36.4 AV	54.0	-17.6	2.96 H	268	32.5	3.9
7	7386.00	45.6 PK	74.0	-28.4	2.39 H	106	35.9	9.7
8	7386.00	35.2 AV	54.0	-18.8	2.39 H	106	25.5	9.7
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	97.8 PK			3.37 V	53	99.0	-1.2
2	*2462.00	90.4 AV			3.37 V	53	91.6	-1.2
3	2483.50	64.3 PK	74.0	-9.7	3.37 V	53	65.5	-1.2
4	2483.50	51.2 AV	54.0	-2.8	3.37 V	53	52.4	-1.2
5	4924.00	49.4 PK	74.0	-24.6	1.41 V	111	45.5	3.9
6	4924.00	38.9 AV	54.0	-15.1	1.41 V	111	35.0	3.9
7	7386.00	45.6 PK	74.0	-28.4	1.69 V	242	35.9	9.7
8	7386.00	34.4 AV	54.0	-19.6	1.69 V	242	24.7	9.7

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	67.7 PK	74.0	-6.3	1.49 H	114	68.9	-1.2
2	2390.00	53.4 AV	54.0	-0.6	1.49 H	114	54.6	-1.2
3	*2412.00	100.2 PK			1.49 H	114	101.4	-1.2
4	*2412.00	92.8 AV			1.49 H	114	94.0	-1.2
5	4824.00	48.2 PK	74.0	-25.8	2.98 H	261	44.5	3.7
6	4824.00	36.0 AV	54.0	-18.0	2.98 H	261	32.3	3.7
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	64.7 PK	74.0	-9.3	3.39 V	56	65.9	-1.2
2	2390.00	50.9 AV	54.0	-3.1	3.39 V	56	52.1	-1.2
3	*2412.00	98.3 PK			3.39 V	56	99.5	-1.2
4	*2412.00	90.2 AV			3.39 V	56	91.4	-1.2
5	4824.00	50.2 PK	74.0	-23.8	1.40 V	111	46.5	3.7
6	4824.00	39.3 AV	54.0	-14.7	1.40 V	111	35.6	3.7

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	63.6 PK	74.0	-10.4	1.48 H	114	64.8	-1.2
2	2390.00	49.3 AV	54.0	-4.7	1.48 H	114	50.5	-1.2
3	*2437.00	107.3 PK			1.48 H	114	108.5	-1.2
4	*2437.00	99.8 AV			1.48 H	114	101.0	-1.2
5	2483.50	68.9 PK	74.0	-5.1	1.48 H	114	70.1	-1.2
6	2483.50	53.5 AV	54.0	-0.5	1.48 H	114	54.7	-1.2
7	4874.00	52.0 PK	74.0	-22.0	2.98 H	261	48.2	3.8
8	4874.00	41.0 AV	54.0	-13.0	2.98 H	261	37.2	3.8
9	7311.00	45.0 PK	74.0	-29.0	2.24 H	136	35.3	9.7
10	7311.00	34.7 AV	54.0	-19.3	2.24 H	136	25.0	9.7
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	61.2 PK	74.0	-12.8	3.48 V	53	62.4	-1.2
2	2390.00	47.1 AV	54.0	-6.9	3.48 V	53	48.3	-1.2
3	*2437.00	105.7 PK			3.48 V	53	106.9	-1.2
4	*2437.00	97.7 AV			3.48 V	53	98.9	-1.2
5	2483.50	66.1 PK	74.0	-7.9	3.48 V	53	67.3	-1.2
6	2483.50	51.3 AV	54.0	-2.7	3.48 V	53	52.5	-1.2
7	4874.00	53.9 PK	74.0	-20.1	1.20 V	168	50.1	3.8
8	4874.00	43.4 AV	54.0	-10.6	1.20 V	168	39.6	3.8
9	7311.00	44.7 PK	74.0	-29.3	1.69 V	252	35.0	9.7
10	7311.00	33.6 AV	54.0	-20.4	1.69 V	252	23.9	9.7

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	97.9 PK			1.46 H	111	99.1	-1.2
2	*2462.00	91.2 AV			1.46 H	111	92.4	-1.2
3	2483.50	67.1 PK	74.0	-6.9	1.46 H	111	68.3	-1.2
4	2483.50	53.5 AV	54.0	-0.5	1.46 H	111	54.7	-1.2
5	4924.00	48.4 PK	74.0	-25.6	2.94 H	261	44.5	3.9
6	4924.00	36.1 AV	54.0	-17.9	2.94 H	261	32.2	3.9
7	7386.00	45.7 PK	74.0	-28.3	2.34 H	100	36.0	9.7
8	7386.00	35.2 AV	54.0	-18.8	2.34 H	100	25.5	9.7
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	95.4 PK			3.44 V	56	96.6	-1.2
2	*2462.00	89.2 AV			3.44 V	56	90.4	-1.2
3	2483.50	65.2 PK	74.0	-8.8	3.44 V	56	66.4	-1.2
4	2483.50	51.2 AV	54.0	-2.8	3.44 V	56	52.4	-1.2
5	4924.00	50.5 PK	74.0	-23.5	1.44 V	158	46.6	3.9
6	4924.00	39.5 AV	54.0	-14.5	1.44 V	158	35.6	3.9
7	7386.00	46.0 PK	74.0	-28.0	1.65 V	240	36.3	9.7
8	7386.00	34.6 AV	54.0	-19.4	1.65 V	240	24.9	9.7

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.

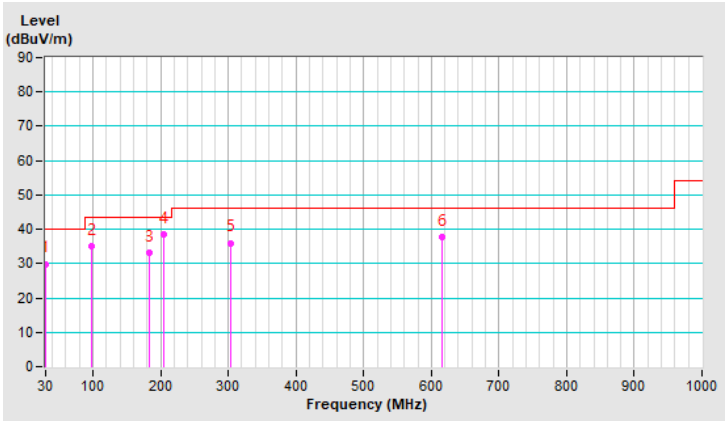
Below 1GHz Data:

RF Mode	TX 802.11g	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	30.19	29.9 QP	40.0	-10.1	3.00 H	0	39.2	-9.3
2	98.22	35.1 QP	43.5	-8.4	3.00 H	77	47.8	-12.7
3	182.63	33.2 QP	43.5	-10.3	1.00 H	87	42.6	-9.4
4	205.01	38.6 QP	43.5	-4.9	1.00 H	55	49.3	-10.7
5	303.78	36.0 QP	46.0	-10.0	1.00 H	298	42.4	-6.4
6	615.01	37.8 QP	46.0	-8.2	3.00 H	71	36.0	1.8

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.

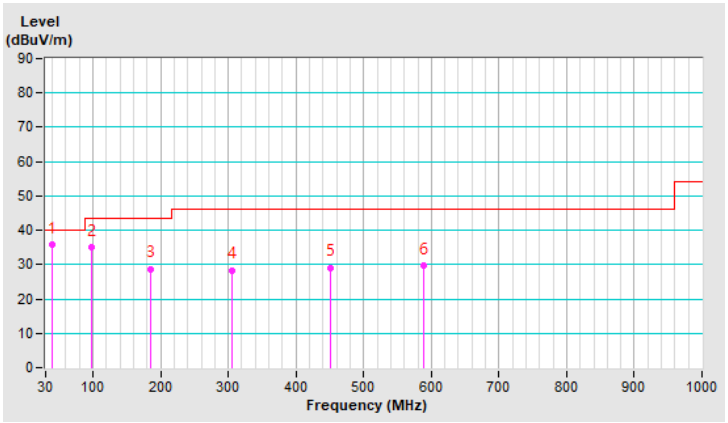


RF Mode	TX 802.11g	Channel	CH 6：2437 MHz
Frequency Range	9kHz ~ 1GHz	Detector Function	Quasi-Peak (QP)

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	39.00	35.9 QP	40.0	-4.1	1.00 V	65	44.4	-8.5
2	97.29	35.2 QP	43.5	-8.3	1.00 V	82	48.1	-12.9
3	184.81	28.8 QP	43.5	-14.7	1.00 V	289	38.5	-9.7
4	305.02	28.4 QP	46.0	-17.6	1.50 V	42	34.7	-6.3
5	451.00	29.2 QP	46.0	-16.8	1.50 V	334	31.2	-2.0
6	587.82	29.7 QP	46.0	-16.3	1.00 V	360	28.8	0.9

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	2020/10/20	2021/10/19
LISN R&S	ESH3-Z5	848773/004	2020/10/27	2021/10/26
LISN R & S	ESH3-Z5	835239/001	2021/3/26	2022/3/25
50 ohms Terminator	50	3	2020/10/26	2021/10/25
RF Coaxial Cable JYEBO	5D-FB	COCCAB-001	2020/9/26	2021/9/25
Fixed attenuator STI	STI02-2200-10	005	2020/8/29	2021/8/28
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: 2021/8/25

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.

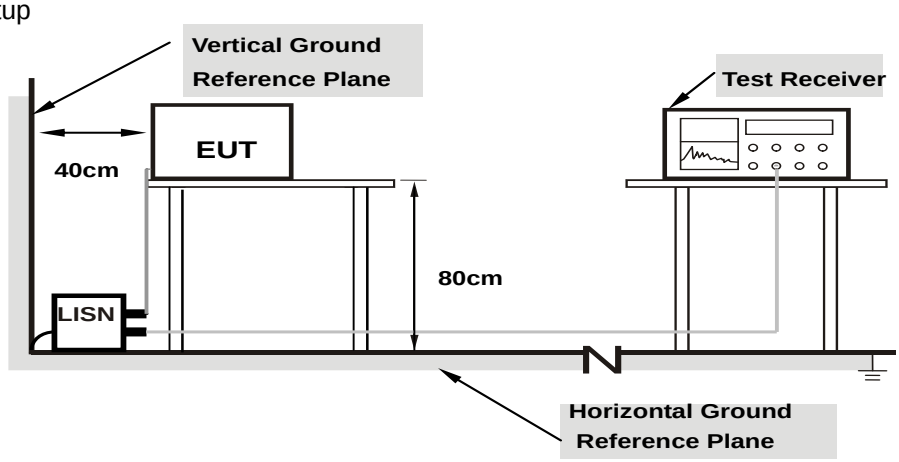
c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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.

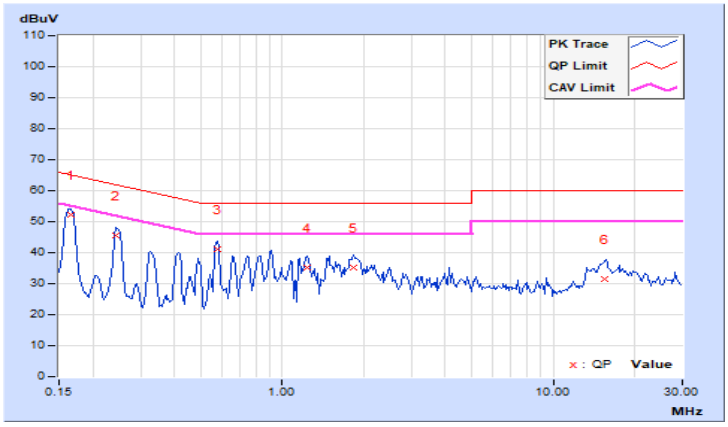
4.2.7 Test Results

RF Mode	TX 802.11g	Channel	CH 6：2437 MHz
Frequency Range	150kHz ~ 30Mz	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	**0.16562**	**9.98**	**42.35**	**35.21**	**52.33**	**45.19**	**65.18**	**55.18**	**-12.85**	**-9.99**
2	0.24375	10.01	35.68	26.29	45.69	36.30	61.97	51.97	-16.28	-15.67
3	0.57578	10.04	31.16	23.51	41.20	33.55	56.00	46.00	-14.80	-12.45
4	1.24219	10.08	25.25	13.86	35.33	23.94	56.00	46.00	-20.67	-22.06
5	1.83984	10.11	25.04	13.87	35.15	23.98	56.00	46.00	-20.85	-22.02
6	15.46875	11.13	20.35	13.30	31.48	24.43	60.00	50.00	-28.52	-25.57

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

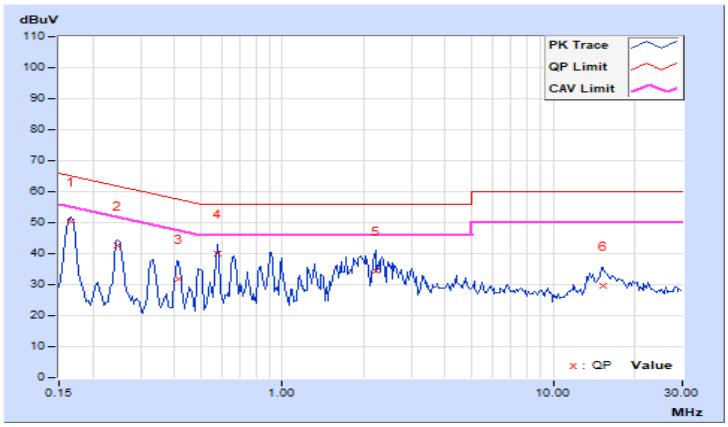


RF Mode	TX 802.11g	Channel	CH 6：2437 MHz
Frequency Range	150kHz ~ 30Mz	Detector Function & Resolution Bandwidth	Quasi-Peak (QP) / Average (AV), 9kHz

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	0.16562	9.97	40.56	30.93	50.53	40.90	65.18	55.18	-14.65	-14.28
2	0.24766	10.00	32.76	25.36	42.76	35.36	61.84	51.84	-19.08	-16.48
3	0.41469	10.02	21.93	18.72	31.95	28.74	57.55	47.55	-25.60	-18.81
4	0.57578	10.03	29.84	23.17	39.87	33.20	56.00	46.00	-16.13	-12.80
5	2.20703	10.14	24.27	14.93	34.41	25.07	56.00	46.00	-21.59	-20.93
6	15.20703	10.91	18.65	12.73	29.56	23.64	60.00	50.00	-30.44	-26.36

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

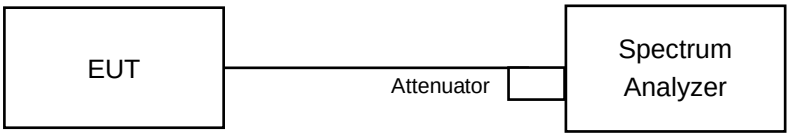


4.3 6dB Bandwidth Measurement

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

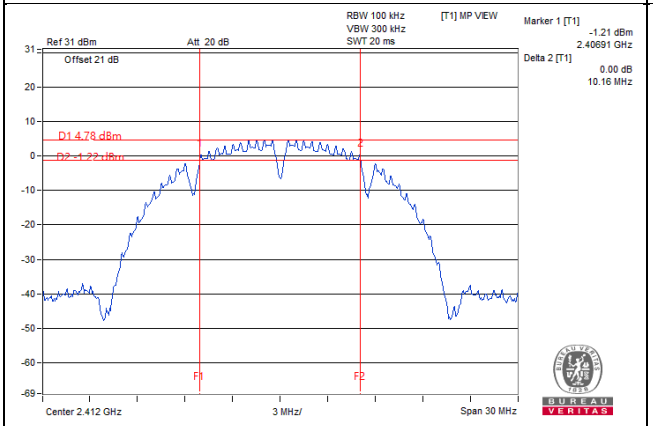
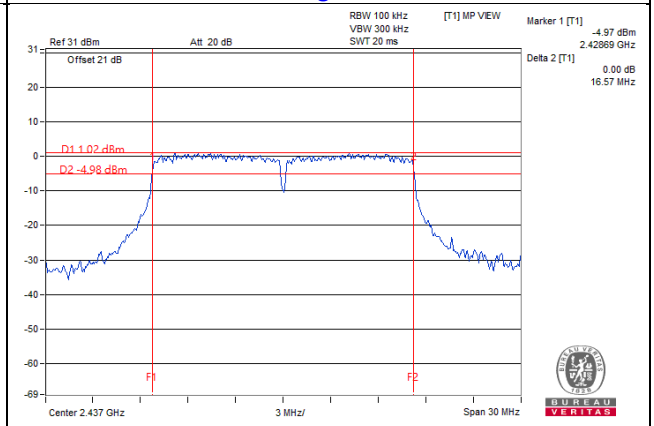
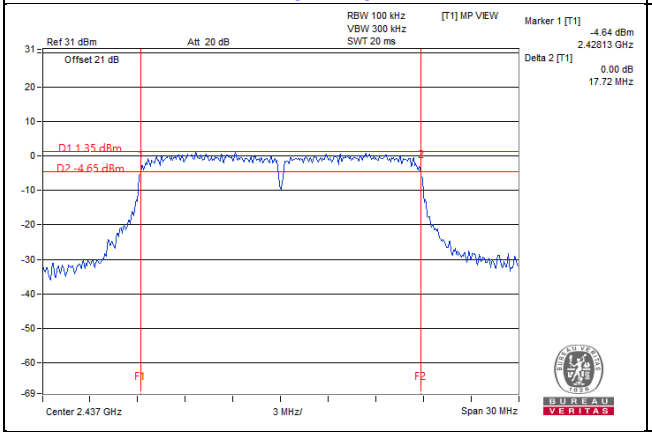
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	10.16	0.5	Pass
6	2437	10.16	0.5	Pass
11	2462	10.16	0.5	Pass

802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.57	0.5	Pass
6	2437	16.57	0.5	Pass
11	2462	16.54	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	17.71	0.5	Pass
6	2437	17.72	0.5	Pass
11	2462	17.7	0.5	Pass

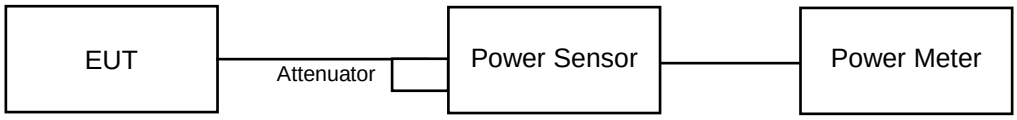
Spectrum Plot of Worst Value	
802.11b / CH1	**802.11g / CH11**
	
802.11n (HT20) / CH11	
	

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

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	53.088	17.25	30	Pass
6	2437	53.211	17.26	30	Pass
11	2462	52.119	17.17	30	Pass

802.11g

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	225.424	23.53	30	Pass
6	2437	232.274	23.66	30	Pass
11	2462	130.617	21.16	30	Pass

802.11n (HT20)

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	158.855	22.01	30	Pass
6	2437	191.867	22.83	30	Pass
11	2462	103.514	20.15	30	Pass

FOR AVERAGE POWER

802.11b

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	29.923	14.76
6	2437	30.061	14.78
11	2462	30.13	14.79

802.11g

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	29.04	14.63
6	2437	30.761	14.88
11	2462	15.74	11.97

802.11n (HT20)

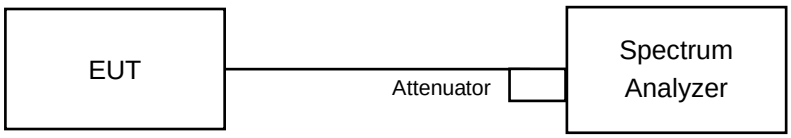
Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	22.646	13.55
6	2437	29.992	14.77
11	2462	13.804	11.40

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

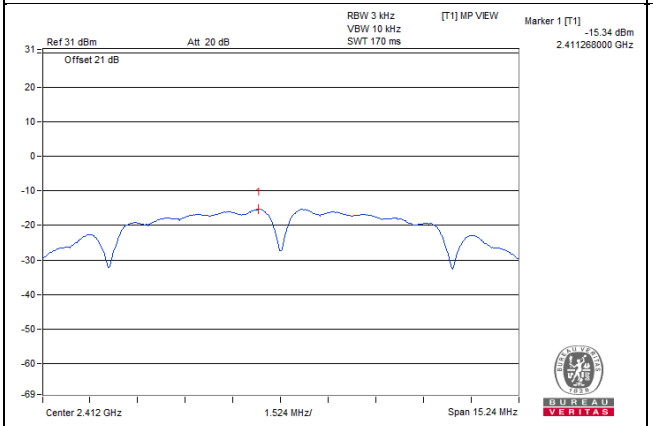
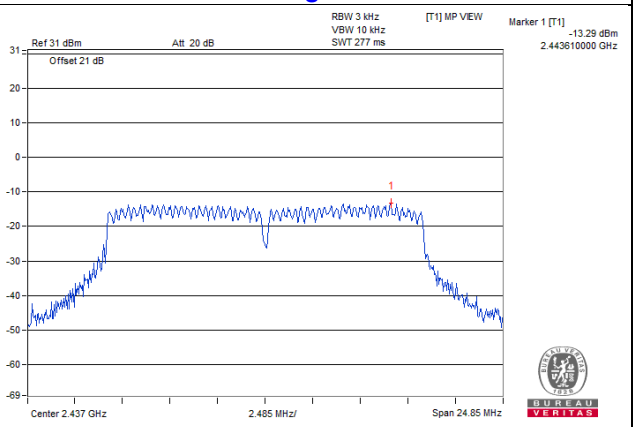
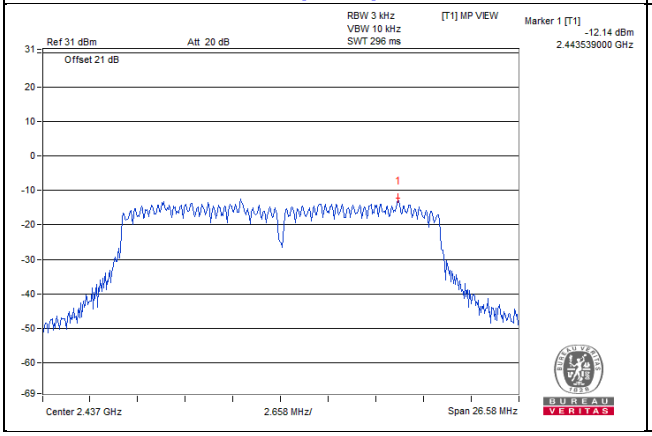
Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
1	2412	-15.34	8.00	Pass
6	2437	-15.52	8.00	Pass
11	2462	-15.61	8.00	Pass

802.11g

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
1	2412	-13.30	8.00	Pass
6	2437	-13.29	8.00	Pass
11	2462	-16.54	8.00	Pass

802.11n (HT20)

Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
1	2412	-13.68	8.00	Pass
6	2437	-12.14	8.00	Pass
11	2462	-15.54	8.00	Pass

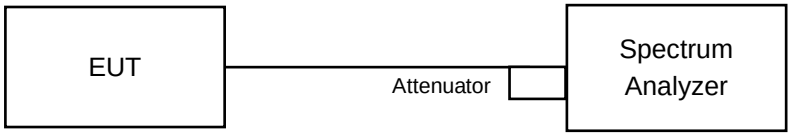
Spectrum Plot of Worst Value	
802.11b / CH11	**802.11g / CH6**
	
802.11n (HT20) / CH6	
	

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

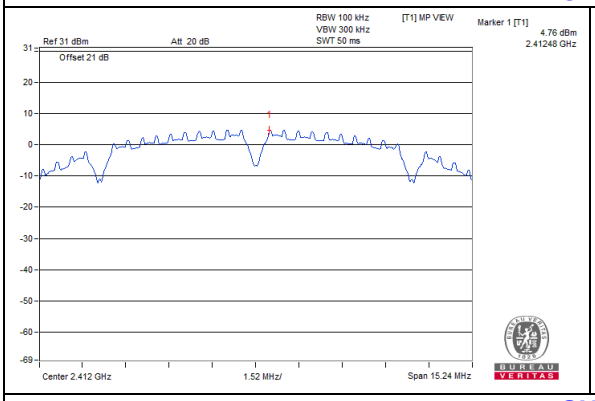
Same as Item 4.3.6

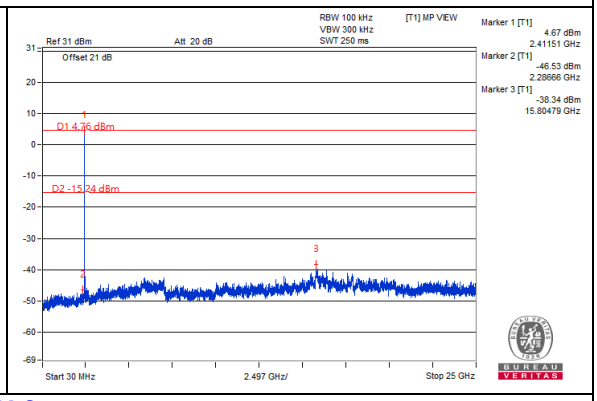
4.6.7 Test Results

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.

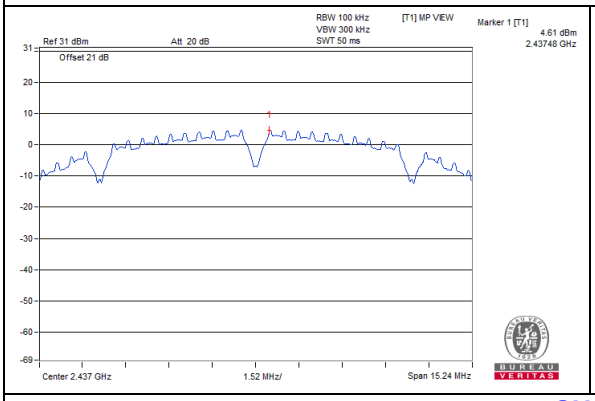
802.11b

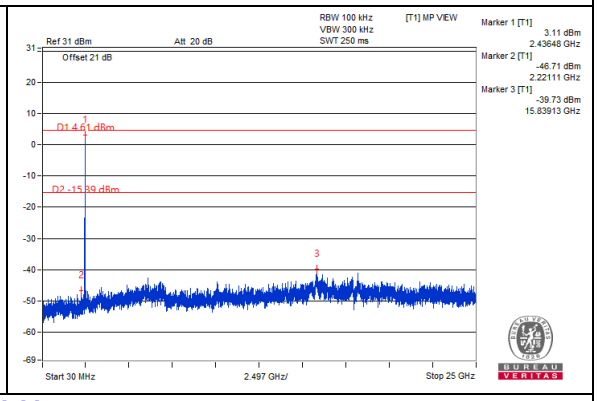
CH 1



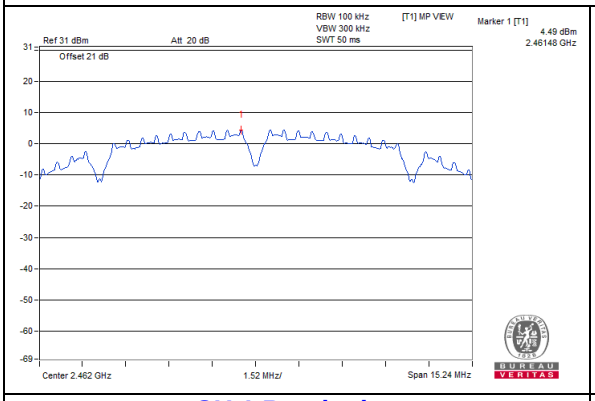


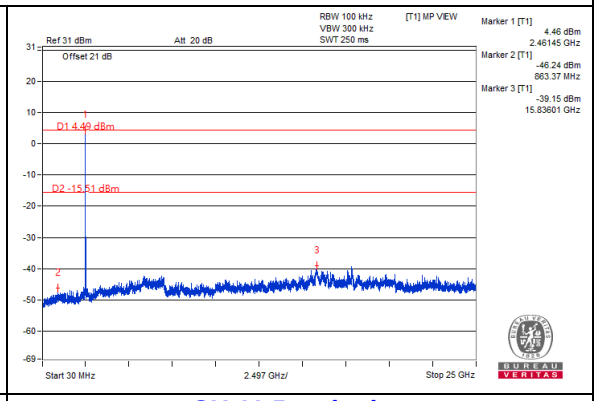
CH 6



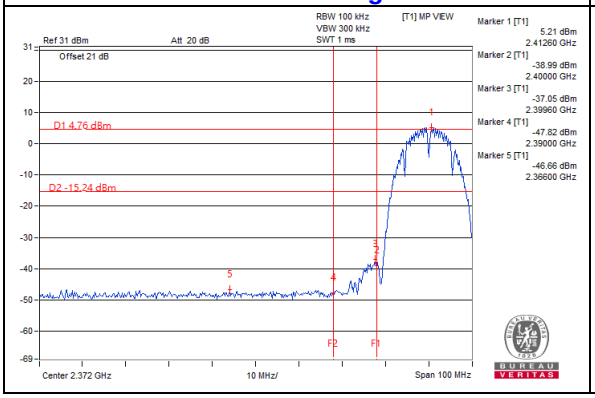


CH 11

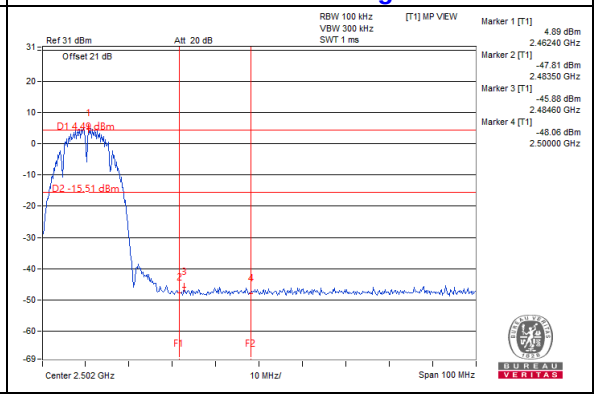




CH 1 Band edge

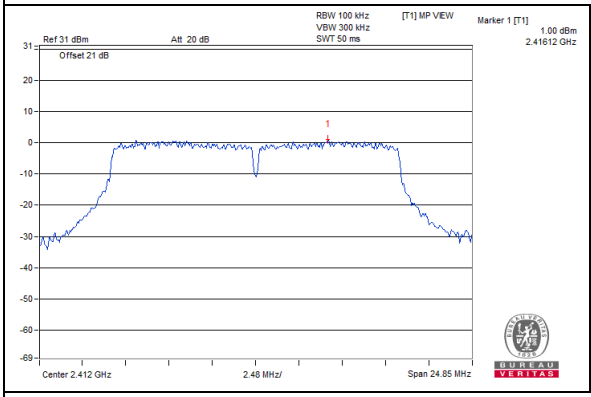


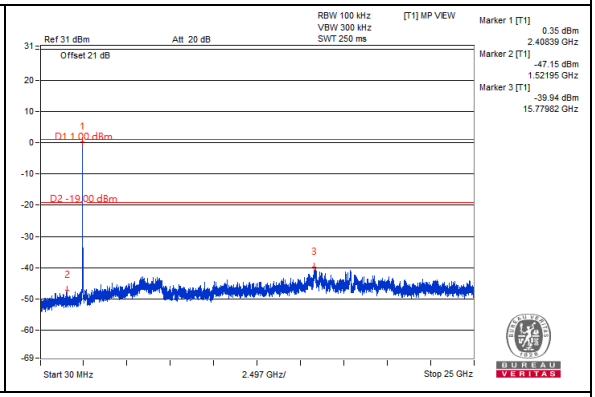
CH 11 Band edge



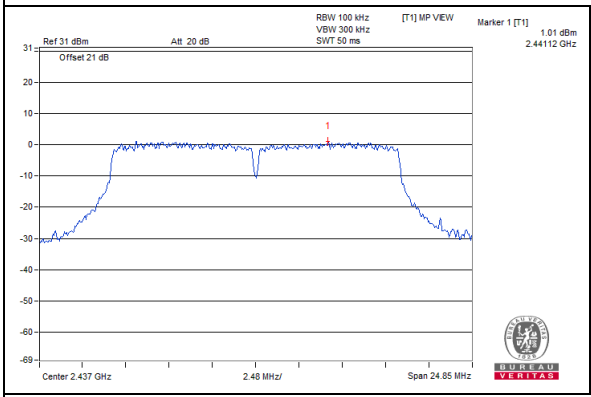
802.11g

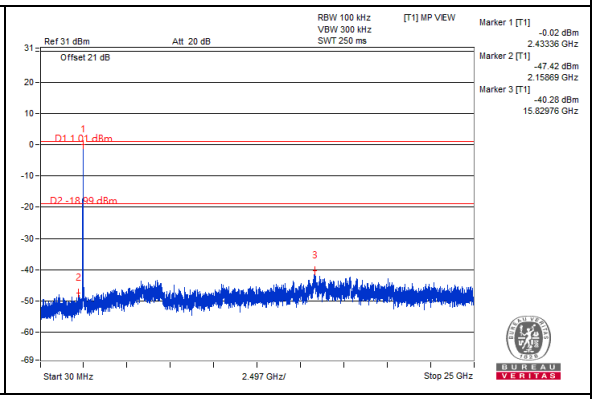
CH 1



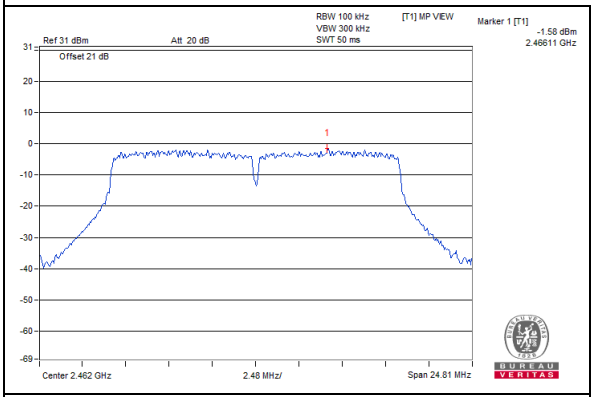


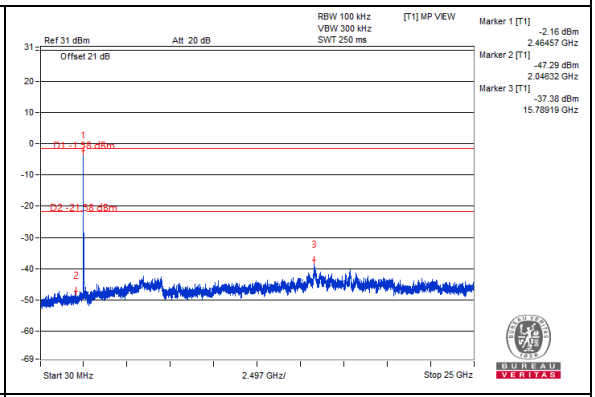
CH 6



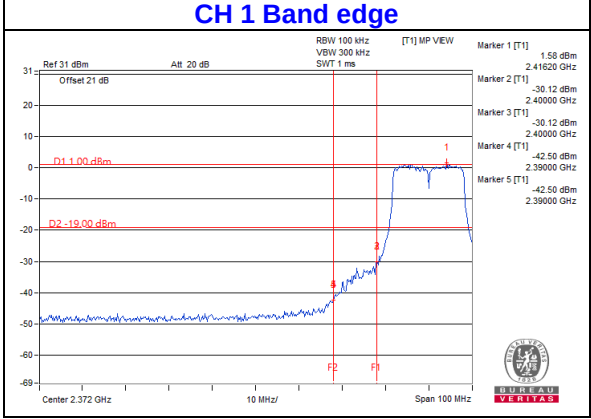


CH 11

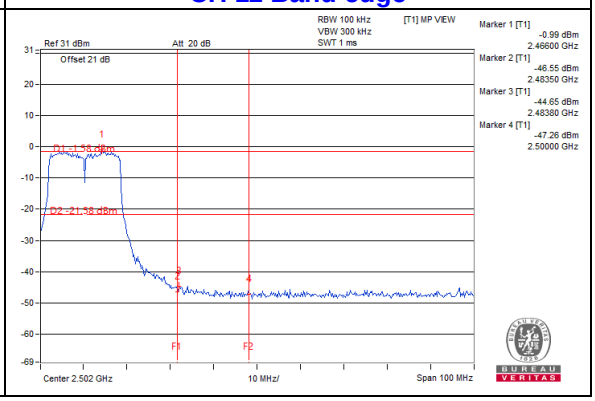




CH 1 Band edge

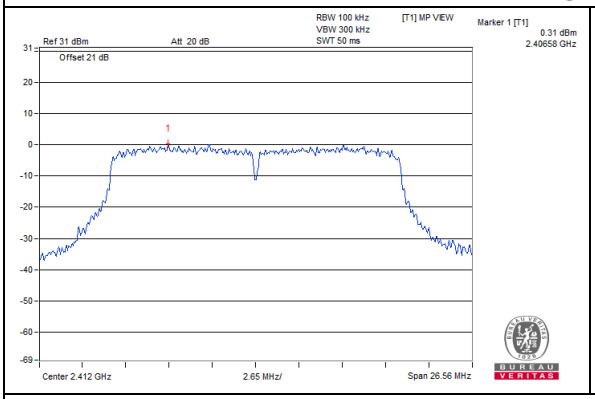


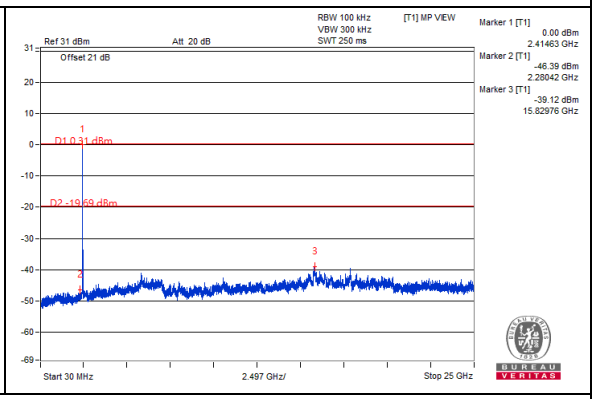
CH 11 Band edge



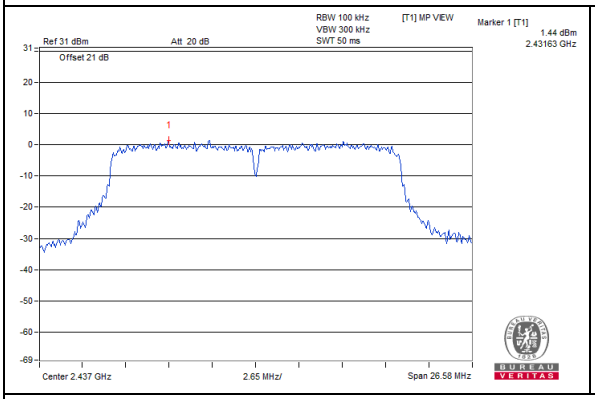
802.11n (HT20)

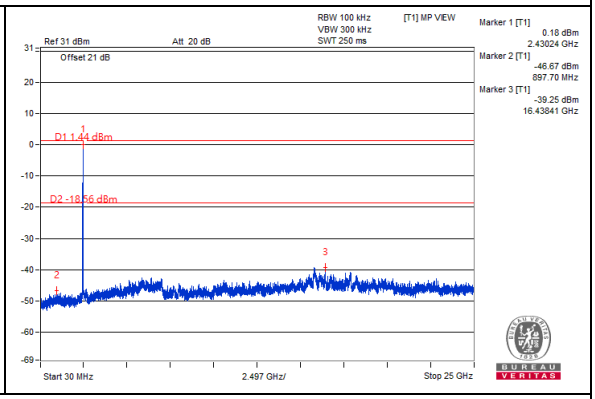
CH 1



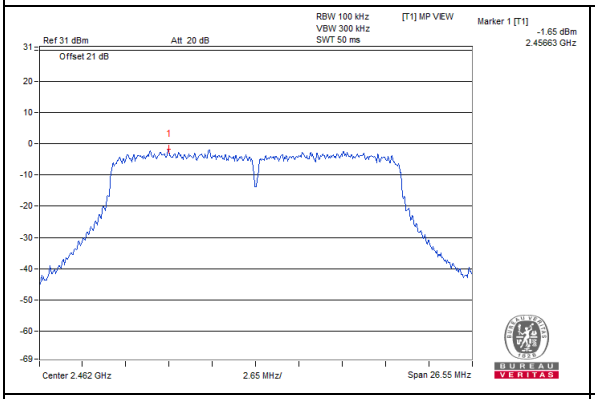


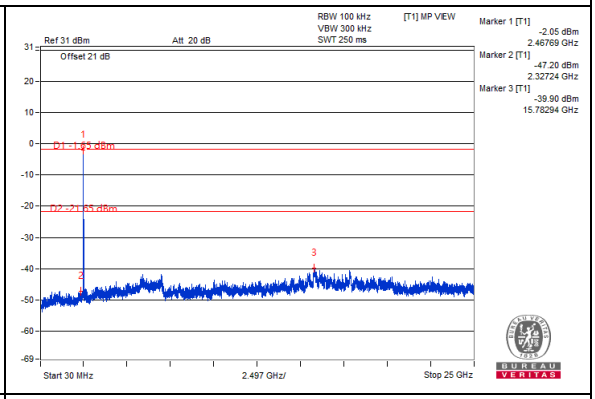
CH 6



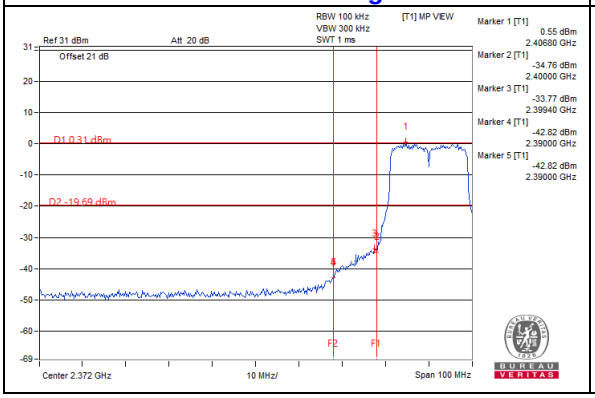


CH 11

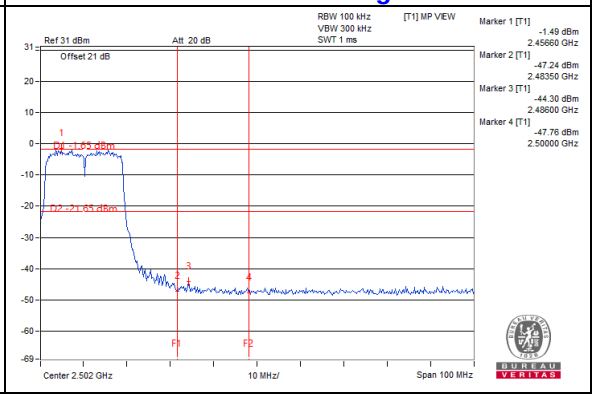




CH 1 Band edge



CH 11 Band edge



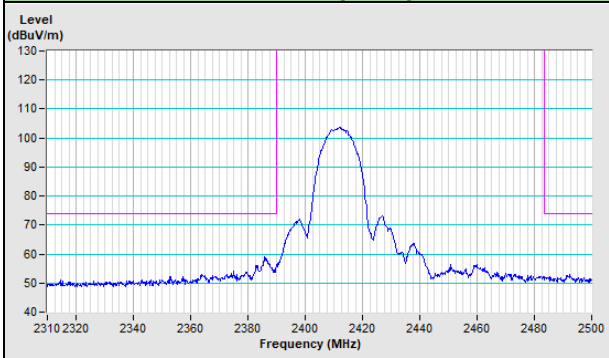
5 Pictures of Test Arrangements

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

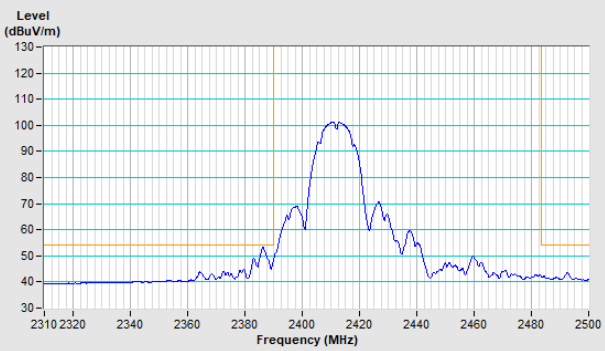
Annex A - Band-Edge Measurement

802.11b Channel 1

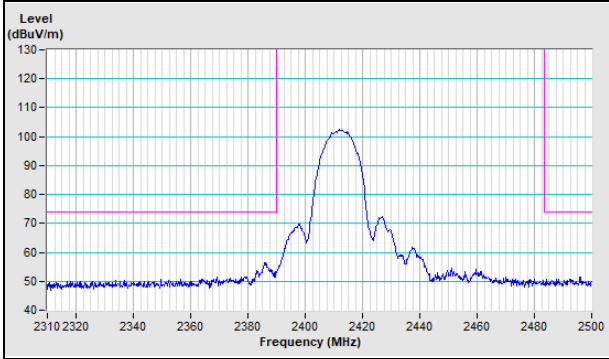
Horizontal (Peak)



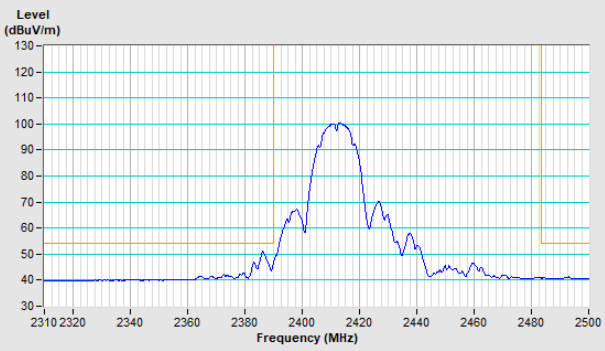
Horizontal (Average)



Vertical (Peak)

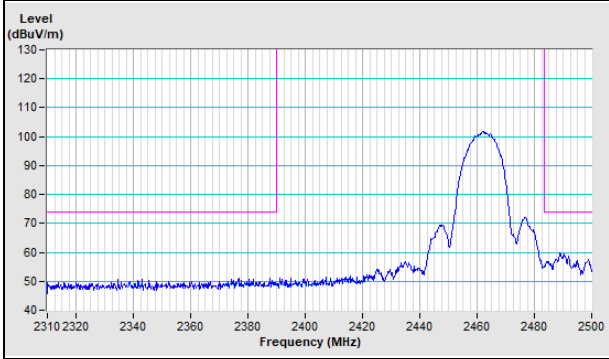


Vertical (Average)

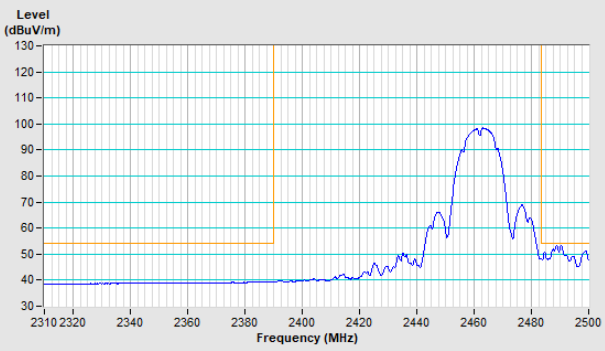


802.11b Channel 11

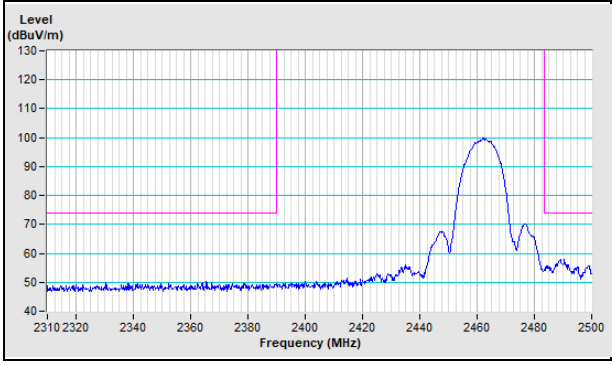
Horizontal (Peak)



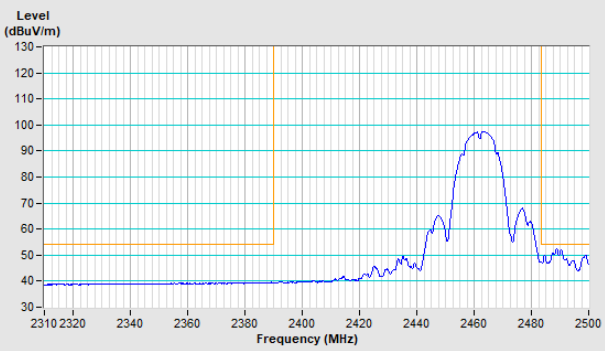
Horizontal (Average)



Vertical (Peak)

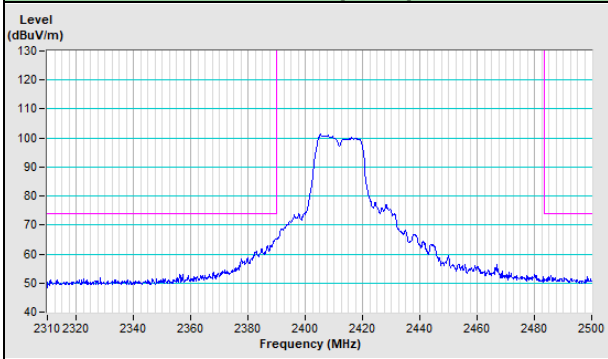


Vertical (Average)

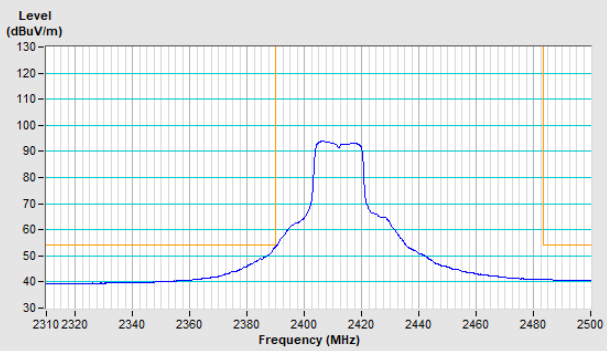


802.11g Channel 1

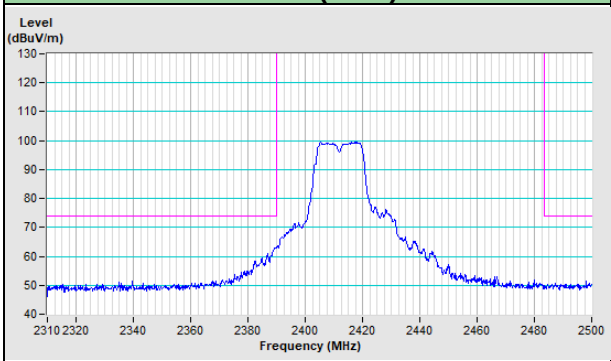
Horizontal (Peak)



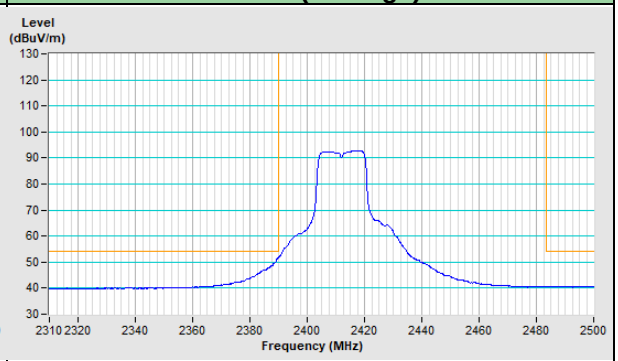
Horizontal (Average)



Vertical (Peak)

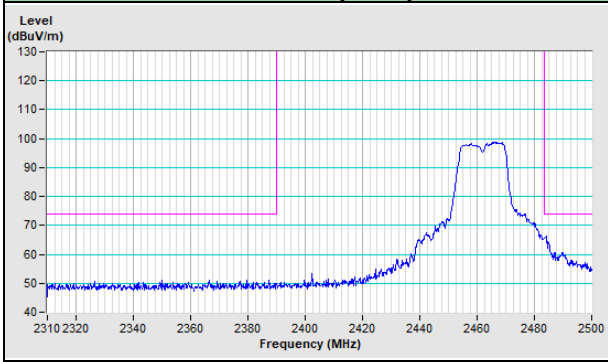


Vertical (Average)

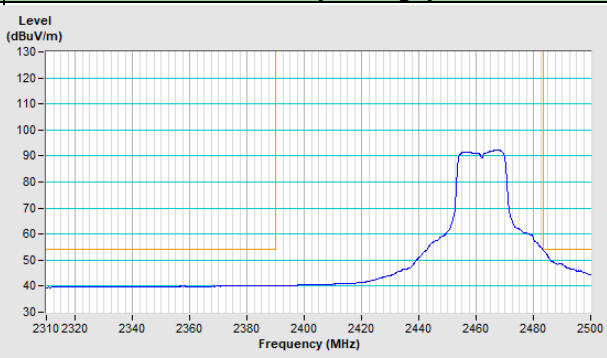


802.11g Channel 11

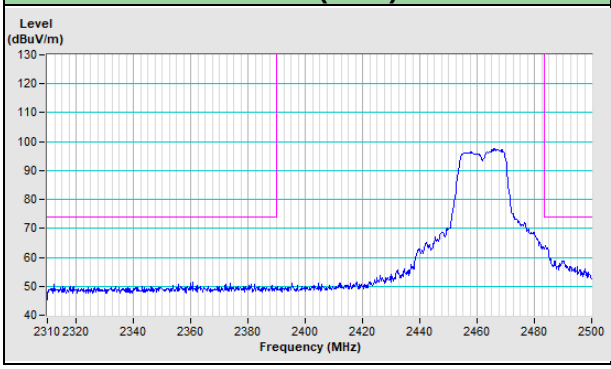
Horizontal (Peak)



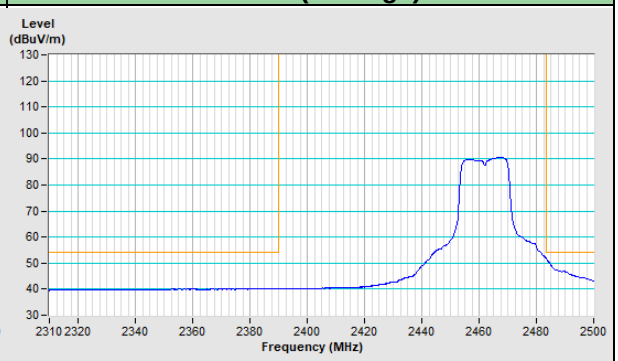
Horizontal (Average)



Vertical (Peak)

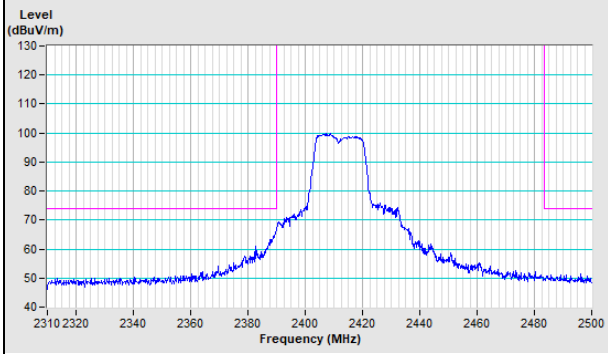


Vertical (Average)

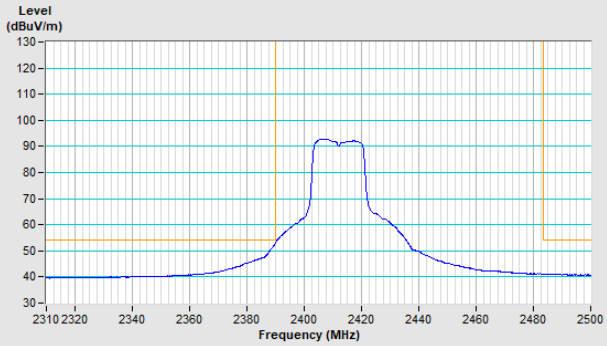


802.11n (HT20) Channel 1

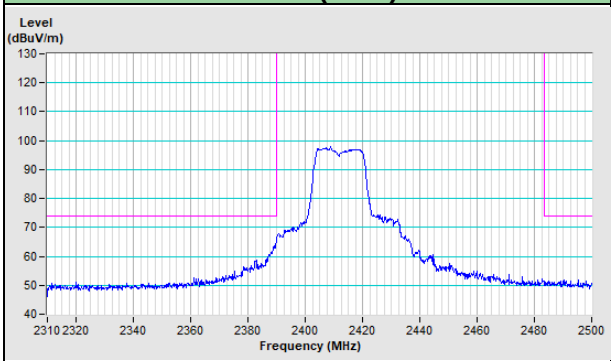
Horizontal (Peak)



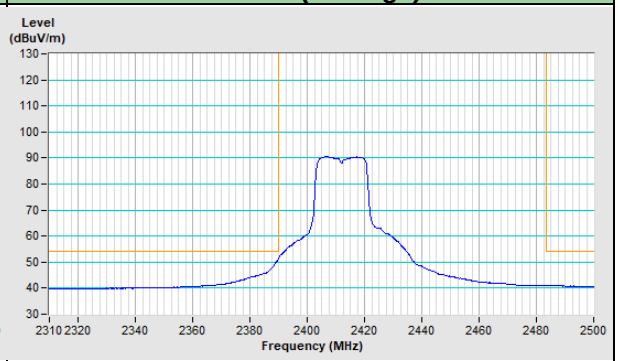
Horizontal (Average)



Vertical (Peak)

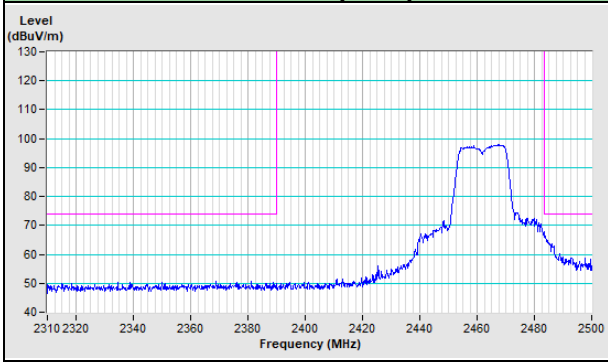


Vertical (Average)

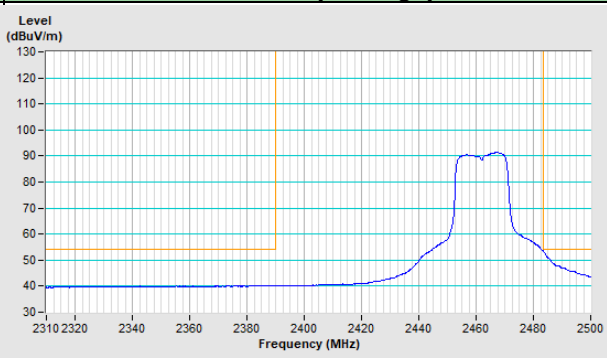


802.11n (HT20) Channel 11

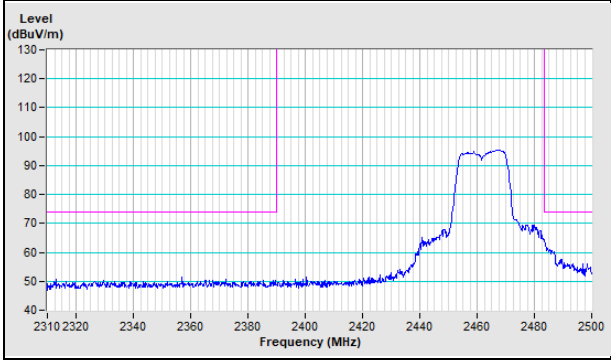
Horizontal (Peak)



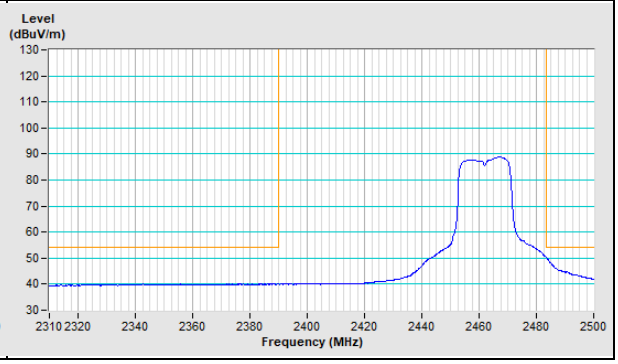
Horizontal (Average)



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:

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.

--- END ---