

## FCC Test Report (2.4GHz WLAN)

**Report No.:** RFBDKG-WTW-P21060168

**FCC ID:** JNZVR0029

**Test Model:** VR0029

**Received Date:** June 21, 2021

**Test Date:** June 24 to July 03, 2021

**Issued Date:** Aug. 11, 2021

**Applicant:** Logitech Far East Ltd

**Address:** 7700 Gateway Boulevard Newark California United States

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

**Lab Address:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan

**Test Location:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan

**FCC Registration /  
Designation Number:** 723255 / TW2022



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### Release Control Record

Issue No.	Description	Date Issued
RFBDKG-WTW-P21060168	Original release.	Aug. 11, 2021

## 1 Certificate of Conformity

**Product:** TAP IP

**Brand:** Logitech

**Test Model:** VR0029

**Sample Status:** Engineering sample

**Applicant:** Logitech Far East Ltd

**Test Date:** June 24 to July 03, 2021

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

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

**Prepared by :** Cherry Chuo, **Date:** Aug. 11, 2021  
Cherry Chuo / Specialist

**Approved by :** Clark Lin, **Date:** Aug. 11, 2021  
Clark Lin / Technical Manager

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -8.46 dB at 14.83594 MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -4.1 dB at 2390.00 MHz, 2483.50 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:

- For 2.4 GHz band compliance with rule 15.247(d) of the band-edge items, the test plots were recorded in Annex A.
- 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) ( $\pm$ )
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	TAP IP
Brand	Logitech
Test Model	VR0029
Status of EUT	Engineering sample
Power Supply Rating	56 Vdc from PoE
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	298.538 mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Cable Supplied	NA

Note:

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

Condition	Technology	
1	WLAN (2.4GHz)	WLAN (5GHz)
2	WLAN (2.4GHz)	Bluetooth
3	WLAN (5GHz)	Bluetooth

Note: The emission of the simultaneous operation has been evaluated and no non-compliance was found.

3. 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
FIH	S0A602600A0	2.73	2.4~2.4835	Monopole	none
		2.97	5.15~5.25		
		2.35	5.25~5.35		
		3	5.47~5.725		
		2.64	5.725~5.85		

4. The EUT incorporates a SISO function:

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

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

### 3.2 Description of Test Modes

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

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



### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable To				Description
	RE $\geq$ 1G	RE $<$ 1G	PLC	APCM	
-	√	√	√	√	-

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

#### **Radiated Emission Test (Above 1GHz):**

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

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

#### **Radiated Emission Test (Below 1GHz):**

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

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11b	1 to 11	6	DSSS	DBPSK	1

#### **Power Line Conducted Emission Test:**

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

Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Data Rate (Mbps)
802.11b	1 to 11	6	DSSS	DBPSK	1

**Antenna Port Conducted Measurement:**

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

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

**Test Condition:**

Applicable To	Environmental Conditions	Input Power (System)	Tested By
RE $\geq$ 1G	25deg. C, 65%RH	120Vac, 60Hz	Ryan Du
RE $<$ 1G	25deg. C, 70%RH	120Vac, 60Hz	Ryan Du
PLC	25deg. C, 75%RH	120Vac, 60Hz	Ryan Du
APCM	25deg. C, 60%RH	120Vac, 60Hz	Kevin Ko

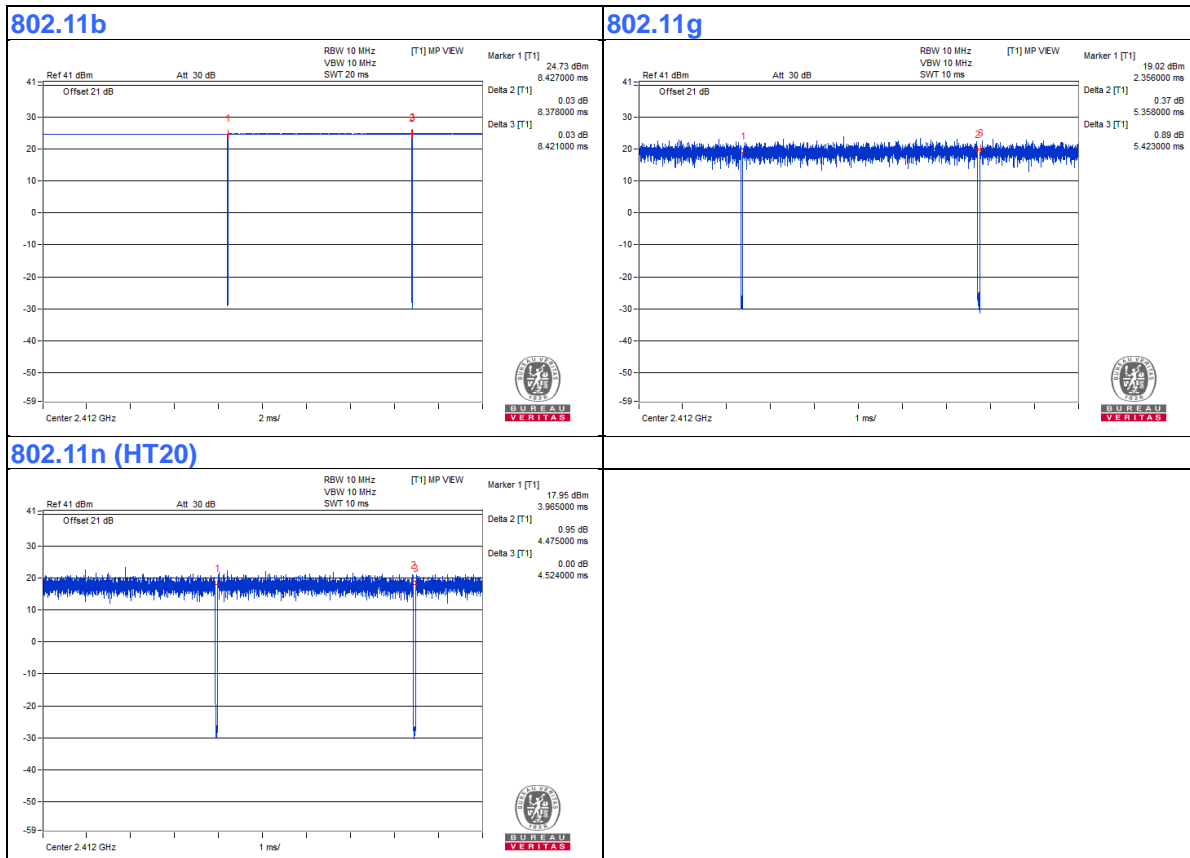
### 3.3 Duty Cycle of Test Signal

Duty cycle of test signal is  $\geq 98\%$ , duty factor is not required.

802.11b: Duty cycle =  $8.378 \text{ ms} / 8.421 \text{ ms} = 0.995$

802.11g: Duty cycle =  $5.358 \text{ ms} / 5.423 \text{ ms} = 0.988$

802.11n (HT20): Duty cycle =  $4.475 \text{ ms} / 4.524 \text{ ms} = 0.989$



### 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.	PoE	Bullet	BPI100-H	NA	NA	Supplied by client
B.	Laptop	Lenovo	20U5S01X00 L14	PF-1ANPYA	NA	Provided by Lab

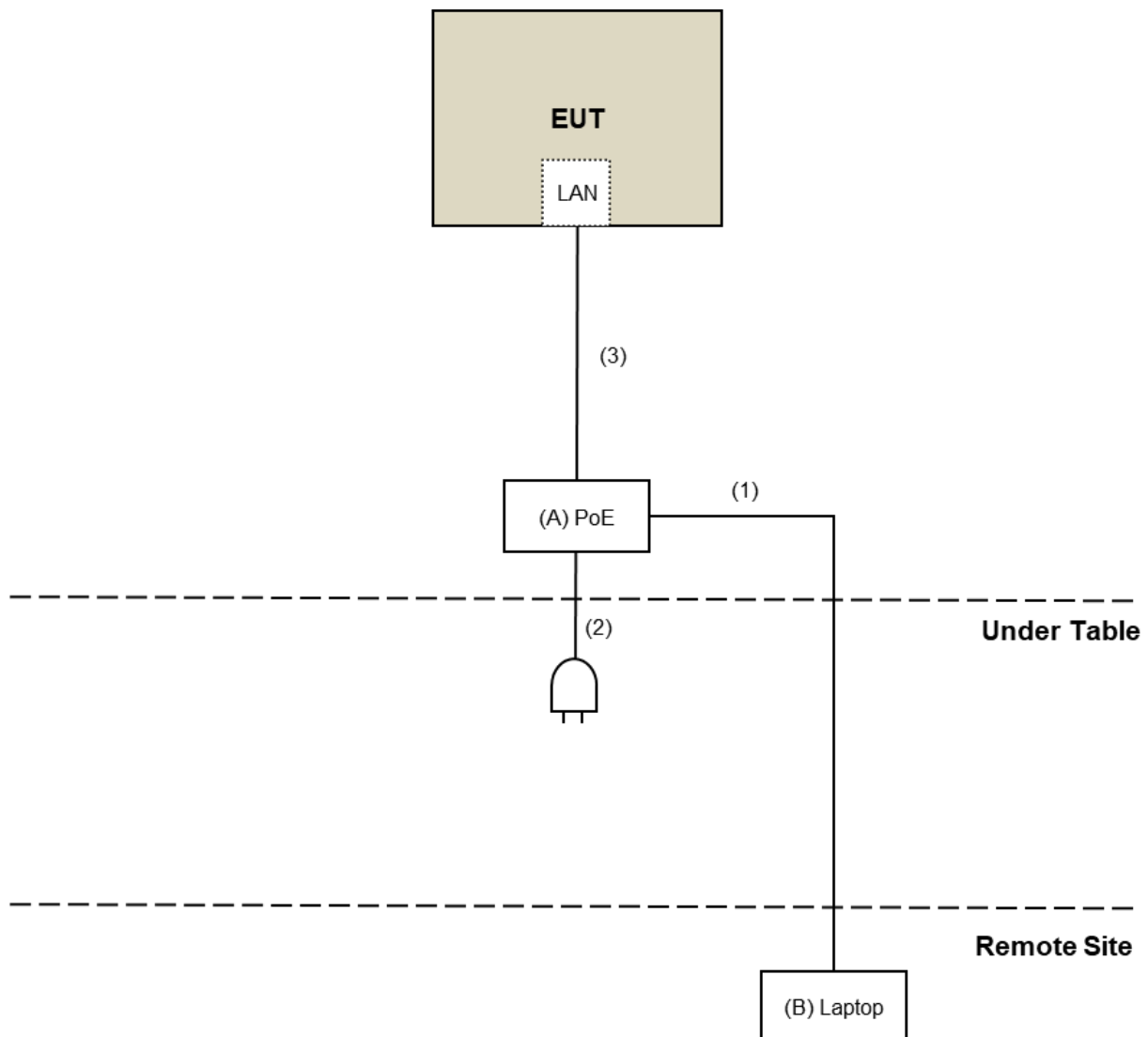
Note:

1. All power cords of the above support units are non-shielded (1.8m).

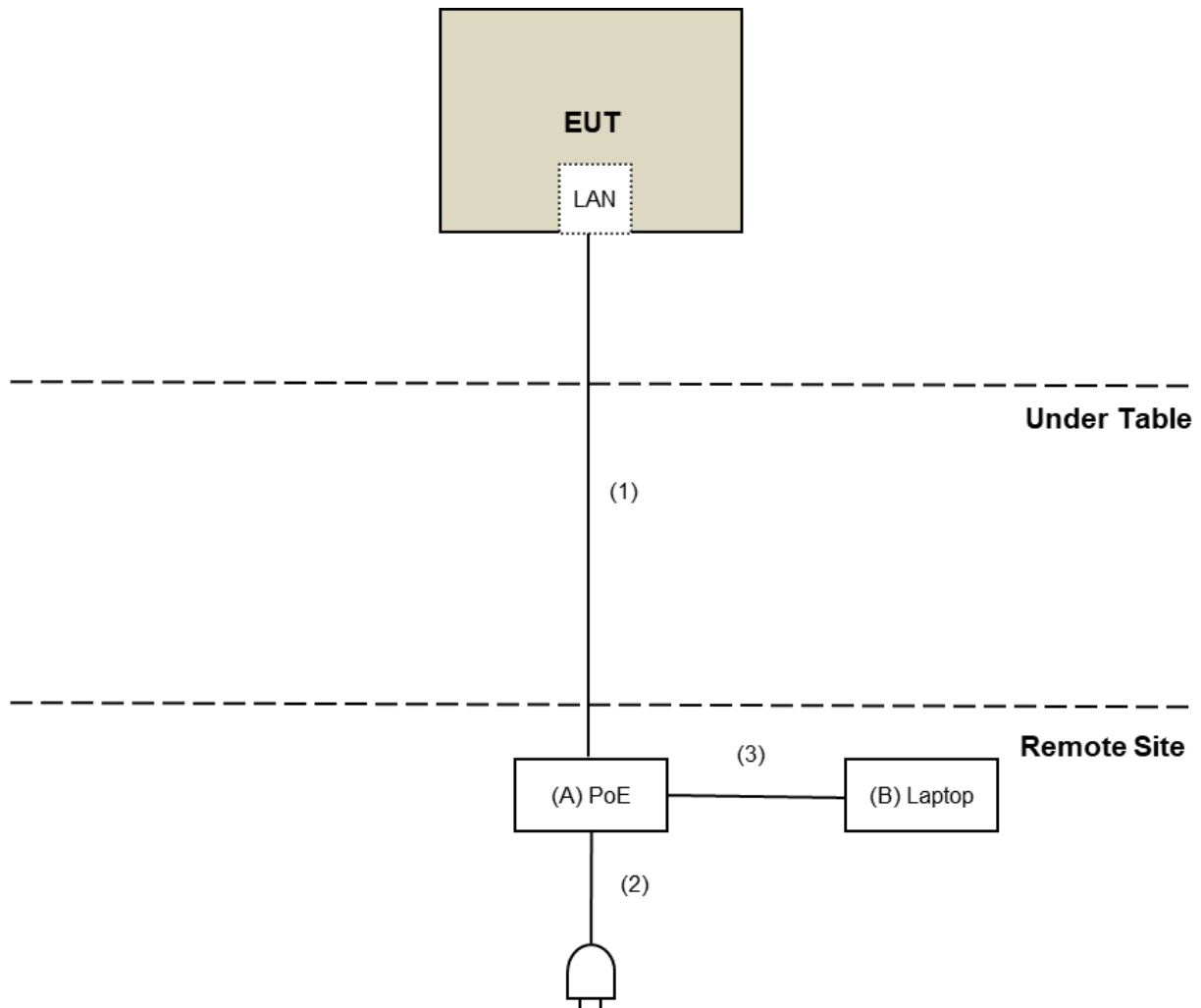
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ-45 Cable	1	10	No	0	Provided by Lab
2.	AC Cable	1	1.8	No	0	Provided by Lab
3.	RJ-45 Cable	1	1.5	No	0	Supplied by client

### 3.4.1 Configuration of System under Test

#### For AC Power Conducted Emissions test:



**For Radiated Emissions test:**



### 3.5 General Description of Applied Standards and References

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

**Test Standard:**

**FCC Part 15, Subpart C (15.247)**

**ANSI C63.10-2013**

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

**References Test Guidance:**

**KDB 558074 D01 15.247 Meas Guidance v05r02**

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

## 4 Test Types and Results

### 4.1 Radiated Emission and Bandedge Measurement

#### 4.1.1 Limits of Radiated Emission and Bandedge Measurement

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

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

**Note:**

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



## 4.1.2 Test Instruments

**For Radiated Emission and Bandedge test:**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 06, 2020	July 05, 2021
Pre-Amplifier EMCI	EMC001340	980142	May 24, 2021	May 23, 2022
Loop Antenna Electro-Metrics	EM-6879	264	Mar. 05, 2021	Mar. 04, 2022
RF Cable	5D-FB	LOOPCAB-001	Jan. 07, 2021	Jan. 06, 2022
RF Cable	5D-FB	LOOPCAB-002	Jan. 07, 2021	Jan. 06, 2022
Pre-Amplifier Mini-Circuits	ZFL-1000VH2	QA0838008	Oct. 20, 2020	Oct. 19, 2021
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Nov. 05, 2020	Nov. 04, 2021
RF Cable	8D	966-3-1	Mar. 16, 2021	Mar. 15, 2022
RF Cable	8D	966-3-2	Mar. 16, 2021	Mar. 15, 2022
RF Cable	8D	966-3-3	Mar. 16, 2021	Mar. 15, 2022
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-3-01	Sep. 24, 2020	Sep. 23, 2021
Horn_Antenna SCHWARZBECK	BBHA9120-D	9120D-406	Nov. 22, 2020	Nov. 21, 2021
Pre-Amplifier EMCI	EMC12630SE	980384	Jan. 11, 2021	Jan. 10, 2022
RF Cable	EMC104-SM-SM-1500	180504	Apr. 26, 2021	Apr. 25, 2022
RF Cable	EMC104-SM-SM-2000	180601	June 08, 2021	June 07, 2022
RF Cable	EMC104-SM-SM-6000	210201	May 13, 2021	May 12, 2022
Spectrum Analyzer Keysight	N9030A	MY54490679	July 13, 2020	July 12, 2021
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 11, 2021	Jan. 10, 2022
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 22, 2020	Nov. 21, 2021
RF Cable	EMC102-KM-KM-1200	160924	Jan. 11, 2021	Jan. 10, 2022
RF Cable	EMC-KM-KM-4000	200214	Mar. 10, 2021	Mar. 09, 2022
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208406	NA	NA
Boresight Antenna Fixture	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: July 01 to 03, 2021

**For other test items:**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	101516	Mar. 08, 2021	Mar. 07, 2022
Power meter Anritsu	ML2495A	1529002	June 21, 2021	June 20, 2022
Power sensor Anritsu	MA2411B	1339443	May 31, 2021	May 30, 2022
10dB Attenuator Woken	MDCS18N-10	MDCS18N-10-01	Apr. 13, 2021	Apr. 12, 2022
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: June 24, 2021

#### 4.1.3 Test Procedures

##### **For Radiated emission below 30MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

##### **Note:**

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

##### **For Radiated emission above 30MHz**

- a. The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

##### **Note:**

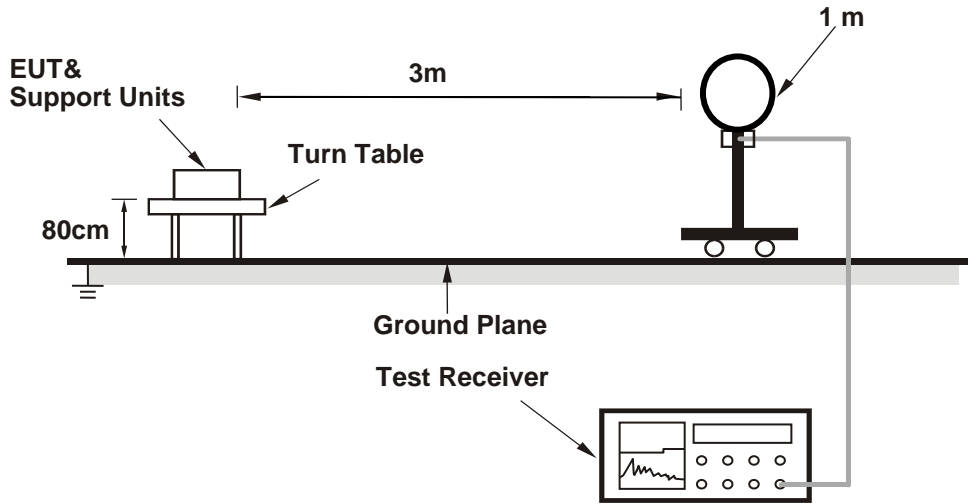
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle  $< 98\%$ ) or 10Hz (Duty cycle  $\geq 98\%$ ) 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

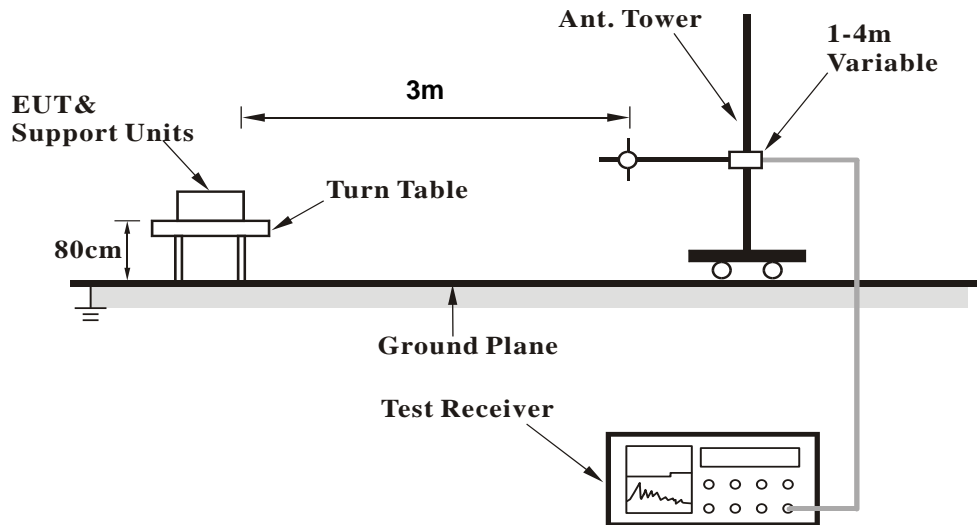
No deviation.

#### 4.1.5 Test Setup

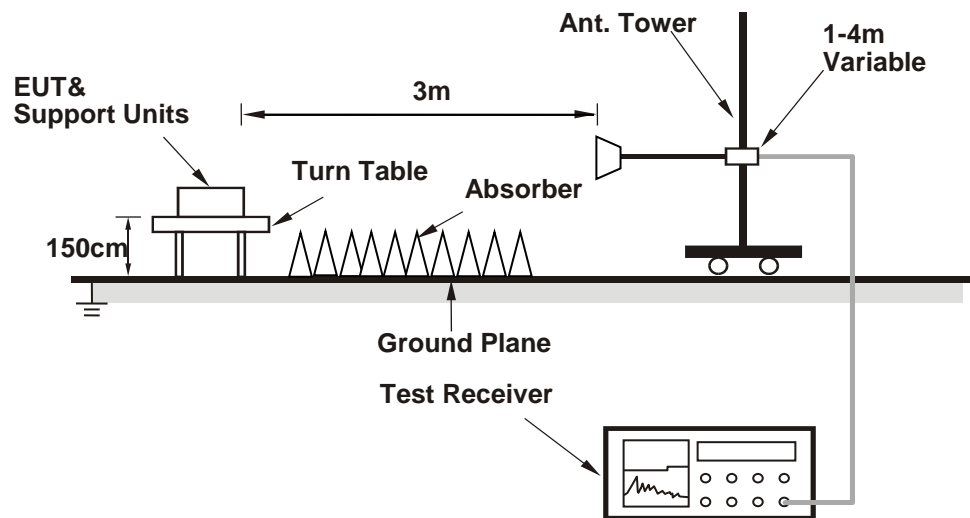
##### For Radiated emission below 30MHz



##### 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 (SP META) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

#### 4.1.7 Test Results

##### Above 1GHz Data:

<b>RF Mode</b>	TX 802.11b	<b>Channel</b>	CH 1 : 2412 MHz
<b>Frequency Range</b>	1GHz ~ 25GHz	<b>Detector Function</b>	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	2388.12	57.3 PK	74.0	-16.7	2.38 H	194	58.5	-1.2
2	2388.12	46.7 AV	54.0	-7.3	2.38 H	194	47.9	-1.2
3	*2412.00	112.6 PK			2.38 H	194	113.8	-1.2
4	*2412.00	110.4 AV			2.38 H	194	111.6	-1.2
5	4824.00	45.8 PK	74.0	-28.2	1.51 H	220	42.1	3.7
6	4824.00	41.5 AV	54.0	-12.5	1.51 H	220	37.8	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	2385.28	57.0 PK	74.0	-17.0	2.23 V	289	58.2	-1.2
2	2385.28	45.9 AV	54.0	-8.1	2.23 V	289	47.1	-1.2
3	*2412.00	110.9 PK			2.23 V	289	112.1	-1.2
4	*2412.00	108.6 AV			2.23 V	289	109.8	-1.2
5	4824.00	45.2 PK	74.0	-28.8	1.33 V	212	41.5	3.7
6	4824.00	41.0 AV	54.0	-13.0	1.33 V	212	37.3	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.

<b>RF Mode</b>	TX 802.11b	<b>Channel</b>	CH 6 : 2437 MHz
<b>Frequency Range</b>	1GHz ~ 25GHz	<b>Detector Function</b>	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	57.3 PK	74.0	-16.7	2.41 H	190	58.5	-1.2
2	2390.00	46.9 AV	54.0	-7.1	2.41 H	190	48.1	-1.2
3	*2437.00	113.7 PK			2.41 H	190	114.9	-1.2
4	*2437.00	111.7 AV			2.41 H	190	112.9	-1.2
5	2483.50	56.8 PK	74.0	-17.2	2.41 H	190	58.0	-1.2
6	2483.50	46.5 AV	54.0	-7.5	2.41 H	190	47.7	-1.2
7	4874.00	46.0 PK	74.0	-28.0	1.52 H	218	42.2	3.8
8	4874.00	41.7 AV	54.0	-12.3	1.52 H	218	37.9	3.8
9	7311.00	45.8 PK	74.0	-28.2	1.63 H	86	36.1	9.7
10	7311.00	35.3 AV	54.0	-18.7	1.63 H	86	25.6	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	56.8 PK	74.0	-17.2	2.29 V	282	58.0	-1.2
2	2390.00	45.7 AV	54.0	-8.3	2.29 V	282	46.9	-1.2
3	*2437.00	112.0 PK			2.29 V	282	113.2	-1.2
4	*2437.00	109.8 AV			2.29 V	282	111.0	-1.2
5	2483.50	57.0 PK	74.0	-17.0	2.29 V	282	58.2	-1.2
6	2483.50	46.2 AV	54.0	-7.8	2.29 V	282	47.4	-1.2
7	4874.00	44.8 PK	74.0	-29.2	1.22 V	183	41.0	3.8
8	4874.00	40.6 AV	54.0	-13.4	1.22 V	183	36.8	3.8
9	7311.00	47.2 PK	74.0	-26.8	1.12 V	212	37.5	9.7
10	7311.00	38.7 AV	54.0	-15.3	1.12 V	212	29.0	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.

<b>RF Mode</b>	TX 802.11b	<b>Channel</b>	CH 11 : 2462 MHz
<b>Frequency Range</b>	1GHz ~ 25GHz	<b>Detector Function</b>	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	111.8 PK			2.05 H	191	113.0	-1.2
2	*2462.00	109.4 AV			2.05 H	191	110.6	-1.2
3	2488.68	58.5 PK	74.0	-15.5	2.05 H	191	59.7	-1.2
4	2488.68	49.2 AV	54.0	-4.8	2.05 H	191	50.4	-1.2
5	4924.00	45.8 PK	74.0	-28.2	1.49 H	221	41.9	3.9
6	4924.00	41.6 AV	54.0	-12.4	1.49 H	221	37.7	3.9
7	7386.00	46.1 PK	74.0	-27.9	1.66 H	76	36.4	9.7
8	7386.00	35.6 AV	54.0	-18.4	1.66 H	76	25.9	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	*2462.00	110.3 PK			2.27 V	256	111.5	-1.2
2	*2462.00	108.0 AV			2.27 V	256	109.2	-1.2
3	2486.75	57.6 PK	74.0	-16.4	2.27 V	256	58.8	-1.2
4	2486.75	46.8 AV	54.0	-7.2	2.27 V	256	48.0	-1.2
5	4924.00	45.5 PK	74.0	-28.5	1.27 V	186	41.6	3.9
6	4924.00	41.1 AV	54.0	-12.9	1.27 V	186	37.2	3.9
7	7386.00	47.7 PK	74.0	-26.3	1.11 V	219	38.0	9.7
8	7386.00	39.2 AV	54.0	-14.8	1.11 V	219	29.5	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.



<b>RF Mode</b>	TX 802.11g	<b>Channel</b>	CH 1 : 2412 MHz
<b>Frequency Range</b>	1GHz ~ 25GHz	<b>Detector Function</b>	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	65.0 PK	74.0	-9.0	2.23 H	199	66.2	-1.2
2	2390.00	49.8 AV	54.0	-4.2	2.23 H	199	51.0	-1.2
3	*2412.00	110.9 PK			2.23 H	199	112.1	-1.2
4	*2412.00	100.9 AV			2.23 H	199	102.1	-1.2
5	4824.00	45.8 PK	74.0	-28.2	1.51 H	204	42.1	3.7
6	4824.00	41.6 AV	54.0	-12.4	1.51 H	204	37.9	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	64.4 PK	74.0	-9.6	2.22 V	287	65.6	-1.2
2	2390.00	49.4 AV	54.0	-4.6	2.22 V	287	50.6	-1.2
3	*2412.00	110.5 PK			2.22 V	287	111.7	-1.2
4	*2412.00	100.4 AV			2.22 V	287	101.6	-1.2
5	4824.00	45.4 PK	74.0	-28.6	1.30 V	190	41.7	3.7
6	4824.00	41.1 AV	54.0	-12.9	1.30 V	190	37.4	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.

<b>RF Mode</b>	TX 802.11g	<b>Channel</b>	CH 6 : 2437 MHz
<b>Frequency Range</b>	1GHz ~ 25GHz	<b>Detector Function</b>	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	57.7 PK	74.0	-16.3	2.27 H	206	58.9	-1.2
2	2390.00	46.9 AV	54.0	-7.1	2.27 H	206	48.1	-1.2
3	*2437.00	114.5 PK			2.27 H	206	115.7	-1.2
4	*2437.00	104.6 AV			2.27 H	206	105.8	-1.2
5	2483.50	58.1 PK	74.0	-15.9	2.27 H	206	59.3	-1.2
6	2483.50	47.2 AV	54.0	-6.8	2.27 H	206	48.4	-1.2
7	4874.00	46.0 PK	74.0	-28.0	1.48 H	208	42.2	3.8
8	4874.00	42.0 AV	54.0	-12.0	1.48 H	208	38.2	3.8
9	7311.00	45.7 PK	74.0	-28.3	1.69 H	81	36.0	9.7
10	7311.00	35.2 AV	54.0	-18.8	1.69 H	81	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	2390.00	57.4 PK	74.0	-16.6	2.23 V	289	58.6	-1.2
2	2390.00	46.7 AV	54.0	-7.3	2.23 V	289	47.9	-1.2
3	*2437.00	113.7 PK			2.23 V	289	114.9	-1.2
4	*2437.00	103.9 AV			2.23 V	289	105.1	-1.2
5	2483.50	57.7 PK	74.0	-16.3	2.23 V	289	58.9	-1.2
6	2483.50	47.1 AV	54.0	-6.9	2.23 V	289	48.3	-1.2
7	4874.00	45.1 PK	74.0	-28.9	1.23 V	188	41.3	3.8
8	4874.00	40.7 AV	54.0	-13.3	1.23 V	188	36.9	3.8
9	7311.00	47.4 PK	74.0	-26.6	1.07 V	230	37.7	9.7
10	7311.00	38.9 AV	54.0	-15.1	1.07 V	230	29.2	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.

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

**Antenna Polarity & Test Distance : Horizontal at 3 m**

No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	109.5 PK			2.16 H	200	110.7	-1.2
2	*2462.00	100.0 AV			2.16 H	200	101.2	-1.2
3	2483.50	66.7 PK	74.0	-7.3	2.16 H	200	67.9	-1.2
4	2483.50	49.6 AV	54.0	-4.4	2.16 H	200	50.8	-1.2
5	4924.00	45.9 PK	74.0	-28.1	1.54 H	205	42.0	3.9
6	4924.00	41.6 AV	54.0	-12.4	1.54 H	205	37.7	3.9
7	7386.00	46.2 PK	74.0	-27.8	1.66 H	86	36.5	9.7
8	7386.00	35.5 AV	54.0	-18.5	1.66 H	86	25.8	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	109.3 PK			2.21 V	269	110.5	-1.2
2	*2462.00	99.7 AV			2.21 V	269	100.9	-1.2
3	2483.50	63.1 PK	74.0	-10.9	2.21 V	269	64.3	-1.2
4	2483.50	49.5 AV	54.0	-4.5	2.21 V	269	50.7	-1.2
5	4924.00	45.1 PK	74.0	-28.9	1.22 V	195	41.2	3.9
6	4924.00	40.8 AV	54.0	-13.2	1.22 V	195	36.9	3.9
7	7386.00	47.7 PK	74.0	-26.3	1.08 V	216	38.0	9.7
8	7386.00	39.1 AV	54.0	-14.9	1.08 V	216	29.4	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.

<b>RF Mode</b>	TX 802.11n (HT20)	<b>Channel</b>	CH 1 : 2412 MHz
<b>Frequency Range</b>	1GHz ~ 25GHz	<b>Detector Function</b>	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	63.8 PK	74.0	-10.2	2.42 H	200	65.0	-1.2
2	2390.00	49.9 AV	54.0	-4.1	2.42 H	200	51.1	-1.2
3	*2412.00	111.4 PK			2.42 H	200	112.6	-1.2
4	*2412.00	100.6 AV			2.42 H	200	101.8	-1.2
5	4824.00	45.7 PK	74.0	-28.3	1.54 H	209	42.0	3.7
6	4824.00	41.3 AV	54.0	-12.7	1.54 H	209	37.6	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	64.2 PK	74.0	-9.8	2.17 V	272	65.4	-1.2
2	2390.00	49.6 AV	54.0	-4.4	2.17 V	272	50.8	-1.2
3	*2412.00	111.2 PK			2.17 V	272	112.4	-1.2
4	*2412.00	100.2 AV			2.17 V	272	101.4	-1.2
5	4824.00	45.2 PK	74.0	-28.8	1.32 V	197	41.5	3.7
6	4824.00	41.2 AV	54.0	-12.8	1.32 V	197	37.5	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.

<b>RF Mode</b>	TX 802.11n (HT20)	<b>Channel</b>	CH 6 : 2437 MHz
<b>Frequency Range</b>	1GHz ~ 25GHz	<b>Detector Function</b>	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	60.9 PK	74.0	-13.1	2.03 H	200	62.1	-1.2
2	2390.00	47.2 AV	54.0	-6.8	2.03 H	200	48.4	-1.2
3	*2437.00	114.9 PK			2.03 H	200	116.1	-1.2
4	*2437.00	103.9 AV			2.03 H	200	105.1	-1.2
5	2483.50	63.6 PK	74.0	-10.4	2.03 H	200	64.8	-1.2
6	2483.50	49.6 AV	54.0	-4.4	2.03 H	200	50.8	-1.2
7	4874.00	45.4 PK	74.0	-28.6	1.53 H	235	41.6	3.8
8	4874.00	41.3 AV	54.0	-12.7	1.53 H	235	37.5	3.8
9	7311.00	46.2 PK	74.0	-27.8	1.65 H	66	36.5	9.7
10	7311.00	35.8 AV	54.0	-18.2	1.65 H	66	26.1	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	57.8 PK	74.0	-16.2	2.21 V	279	59.0	-1.2
2	2390.00	46.9 AV	54.0	-7.1	2.21 V	279	48.1	-1.2
3	*2437.00	114.1 PK			2.21 V	279	115.3	-1.2
4	*2437.00	103.4 AV			2.21 V	279	104.6	-1.2
5	2483.50	57.6 PK	74.0	-16.4	2.21 V	279	58.8	-1.2
6	2483.50	47.1 AV	54.0	-6.9	2.21 V	279	48.3	-1.2
7	4874.00	45.0 PK	74.0	-29.0	1.27 V	191	41.2	3.8
8	4874.00	40.8 AV	54.0	-13.2	1.27 V	191	37.0	3.8
9	7311.00	47.4 PK	74.0	-26.6	1.07 V	224	37.7	9.7
10	7311.00	38.9 AV	54.0	-15.1	1.07 V	224	29.2	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.

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

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	*2462.00	110.3 PK			2.15 H	198	111.5	-1.2
2	*2462.00	99.4 AV			2.15 H	198	100.6	-1.2
3	2483.50	64.5 PK	74.0	-9.5	2.15 H	198	65.7	-1.2
<b>4</b>	<b>2483.50</b>	<b>49.9 AV</b>	<b>54.0</b>	<b>-4.1</b>	<b>2.15 H</b>	<b>198</b>	<b>51.1</b>	<b>-1.2</b>
5	4924.00	46.3 PK	74.0	-27.7	1.47 H	216	42.4	3.9
6	4924.00	42.0 AV	54.0	-12.0	1.47 H	216	38.1	3.9
7	7386.00	46.6 PK	74.0	-27.4	1.65 H	91	36.9	9.7
8	7386.00	36.1 AV	54.0	-17.9	1.65 H	91	26.4	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	109.7 PK			2.22 V	274	110.9	-1.2
2	*2462.00	98.9 AV			2.22 V	274	100.1	-1.2
3	2483.50	64.7 PK	74.0	-9.3	2.22 V	274	65.9	-1.2
4	2483.50	48.6 AV	54.0	-5.4	2.22 V	274	49.8	-1.2
5	4924.00	45.4 PK	74.0	-28.6	1.25 V	175	41.5	3.9
6	4924.00	41.2 AV	54.0	-12.8	1.25 V	175	37.3	3.9
7	7386.00	47.8 PK	74.0	-26.2	1.12 V	220	38.1	9.7
8	7386.00	39.1 AV	54.0	-14.9	1.12 V	220	29.4	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.

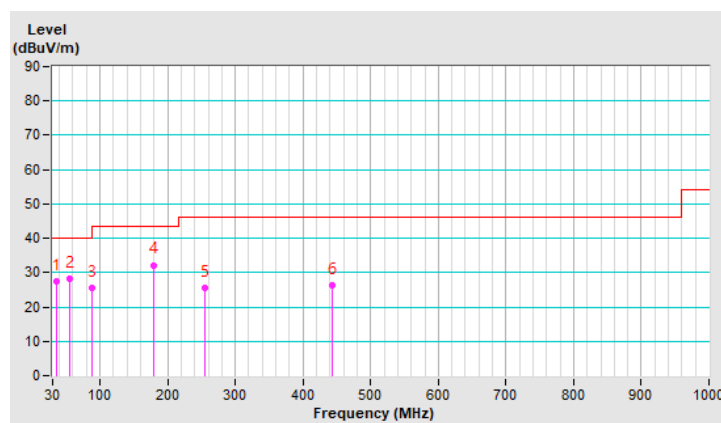
### Below 1GHz Data:

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

Antenna Polarity & Test Distance : Horizontal at 3 m								
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV)	Correction Factor (dB/m)
1	35.63	27.4 QP	40.0	-12.6	2.00 H	123	36.5	-9.1
2	55.78	28.2 QP	40.0	-11.8	2.00 H	232	36.5	-8.3
3	88.47	25.5 QP	43.5	-18.0	2.00 H	287	39.3	-13.8
4	179.77	32.2 QP	43.5	-11.3	1.50 H	71	41.3	-9.1
5	254.77	25.6 QP	46.0	-20.4	1.00 H	120	34.1	-8.5
6	443.73	26.3 QP	46.0	-19.7	1.50 H	11	28.5	-2.2

### Remarks:

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



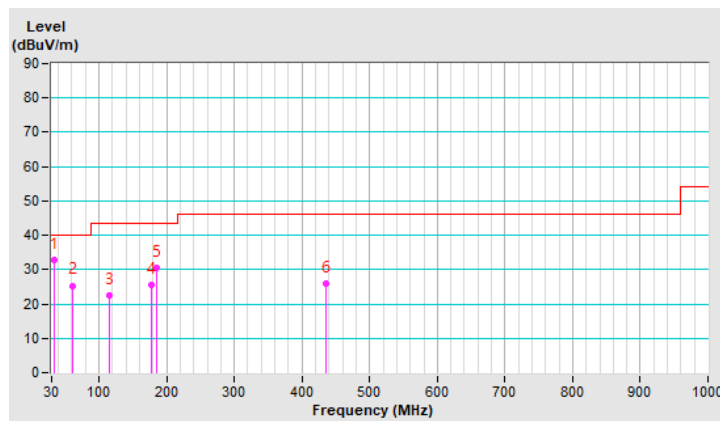
<b>RF Mode</b>	TX 802.11b	<b>Channel</b>	CH 6 : 2437 MHz
<b>Frequency Range</b>	9kHz ~ 1GHz	<b>Detector Function</b>	Quasi-Peak (QP)

**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	33.25	32.8 QP	40.0	-7.2	1.50 V	360	42.1	-9.3
2	60.53	25.4 QP	40.0	-14.6	1.00 V	155	34.2	-8.8
3	115.09	22.6 QP	43.5	-20.9	1.50 V	360	32.9	-10.3
4	176.74	25.6 QP	43.5	-17.9	1.00 V	358	34.5	-8.9
5	186.15	30.4 QP	43.5	-13.1	1.00 V	140	40.3	-9.9
6	435.39	25.8 QP	46.0	-20.2	2.00 V	360	28.2	-2.4

**Remarks:**

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





## 4.2 Conducted Emission Measurement

### 4.2.1 Limits of Conducted Emission Measurement

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

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

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

### 4.2.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver R&S	ESCS 30	847124/029	Oct. 20, 2020	Oct. 19, 2021
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 27, 2020	Oct. 26, 2021
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 26, 2021	Mar. 25, 2022
50 ohms Terminator	50	3	Oct. 26, 2020	Oct. 25, 2021
RF Cable	5D-FB	COCCAB-001	Sep. 26, 2020	Sep. 25, 2021
Fixed attenuator EMCI	STI02-2200-10	005	Aug. 29, 2020	Aug. 28, 2021
Software BVADT	BVADT_Cond_ V7.3.7.4	NA	NA	NA

**Note:**

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

#### 4.2.3 Test Procedures

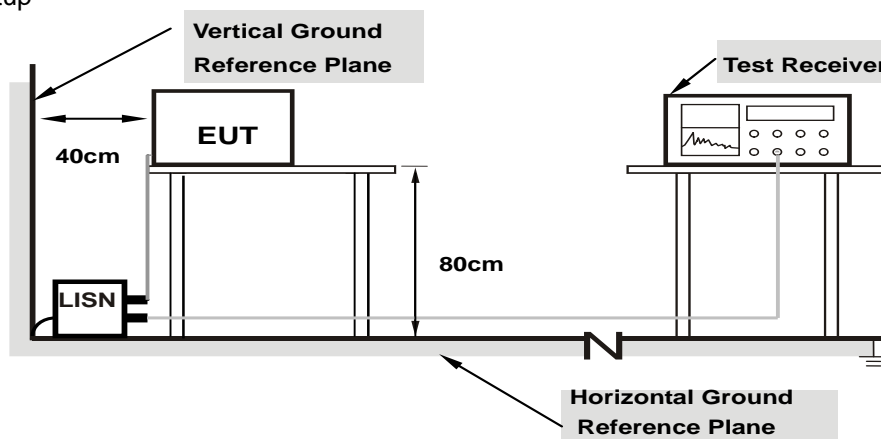
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- 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.

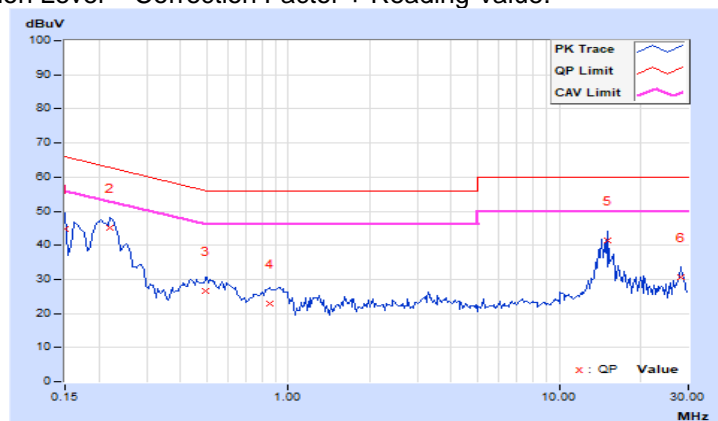
#### 4.2.7 Test Results

<b>RF Mode</b>	TX 802.11b	<b>Channel</b>	CH 6 : 2437 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	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	0.15000	9.95	34.99	18.73	44.94	28.68	66.00	56.00	-21.06	-27.32
2	0.22031	9.97	35.18	26.33	45.15	36.30	62.81	52.81	-17.66	-16.51
3	0.49766	10.00	16.67	10.60	26.67	20.60	56.04	46.04	-29.37	-25.44
4	0.85703	10.02	12.73	2.87	22.75	12.89	56.00	46.00	-33.25	-33.11
5	15.08594	10.83	30.71	28.68	41.54	39.51	60.00	50.00	-18.46	-10.49
6	28.16016	11.27	19.36	16.88	30.63	28.15	60.00	50.00	-29.37	-21.85

#### 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.

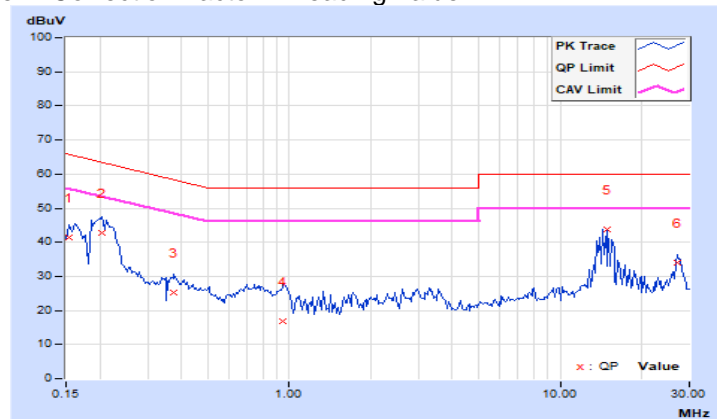


<b>RF Mode</b>	TX 802.11b	<b>Channel</b>	CH 6 : 2437 MHz
<b>Frequency Range</b>	150kHz ~ 30MHz	<b>Detector Function &amp; Resolution Bandwidth</b>	Quasi-Peak (QP) / Average (AV), 9kHz

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	0.15391	9.92	31.37	15.63	41.29	25.55	65.79	55.79	-24.50	-30.24
2	0.20469	9.95	32.88	16.94	42.83	26.89	63.42	53.42	-20.59	-26.53
3	0.37656	9.96	15.36	4.41	25.32	14.37	58.35	48.35	-33.03	-33.98
4	0.95078	10.00	6.76	-6.79	16.76	3.21	56.00	46.00	-39.24	-42.79
<b>5</b>	<b>14.83594</b>	<b>10.63</b>	<b>33.12</b>	<b>30.91</b>	<b>43.75</b>	<b>41.54</b>	<b>60.00</b>	<b>50.00</b>	<b>-16.25</b>	<b>-8.46</b>
6	27.15625	10.91	23.22	19.70	34.13	30.61	60.00	50.00	-25.87	-19.39

**REMARKS:**

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

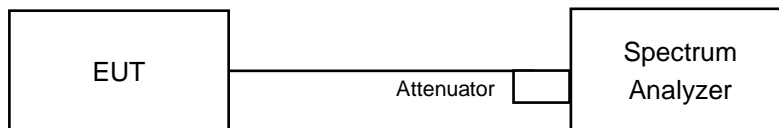


### 4.3 6dB Bandwidth Measurement

#### 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)  $\geq 3 \times$  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	8.6	0.5	Pass
6	2437	10.13	0.5	Pass
11	2462	8.1	0.5	Pass

##### 802.11g

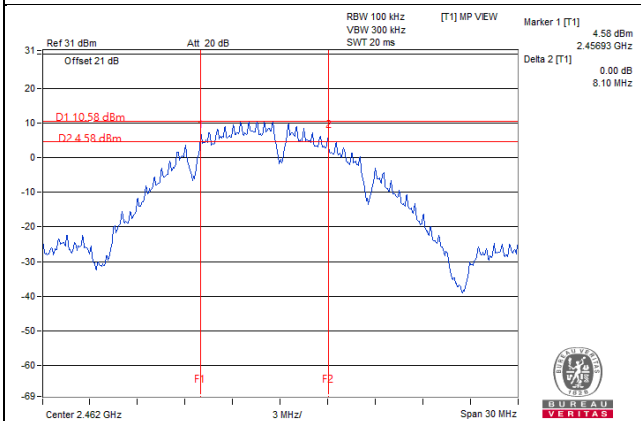
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	15.79	0.5	Pass
6	2437	15.79	0.5	Pass
11	2462	10.11	0.5	Pass

##### 802.11n (HT20)

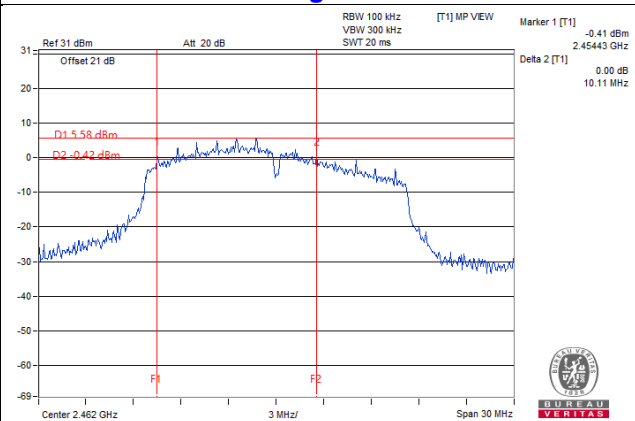
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.41	0.5	Pass
6	2437	16.39	0.5	Pass
11	2462	10.08	0.5	Pass

### Spectrum Plot of Worst Value

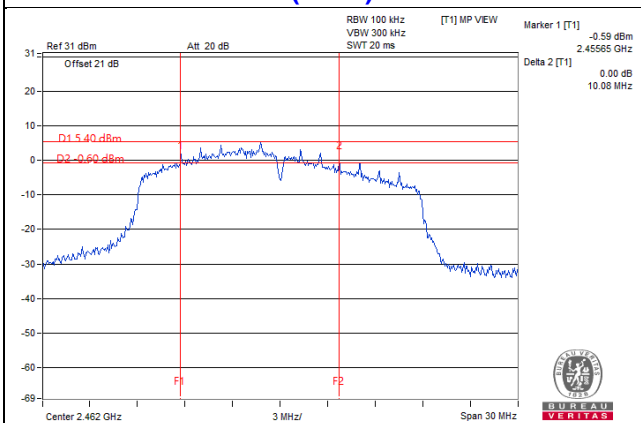
#### 802.11b / CH11



#### 802.11g / CH11



#### 802.11n (HT20) / CH11

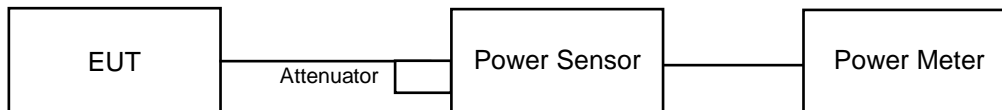


## 4.4 Conducted Output Power Measurement

### 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	238.781	23.78	30	Pass
6	2437	280.543	24.48	30	Pass
11	2462	112.46	20.51	30	Pass

##### 802.11g

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	274.789	24.39	30	Pass
6	2437	298.538	24.75	30	Pass
11	2462	163.682	22.14	30	Pass

##### 802.11n (HT20)

Chan.	Chan. Freq. (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	240.991	23.82	30	Pass
6	2437	269.153	24.30	30	Pass
11	2462	158.855	22.01	30	Pass

## FOR AVERAGE POWER

### 802.11b

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	159.588	22.03
6	2437	223.357	23.49
11	2462	74.645	18.73

### 802.11g

Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	48.641	16.87
6	2437	137.088	21.37
11	2462	29.648	14.72

### 802.11n (HT20)

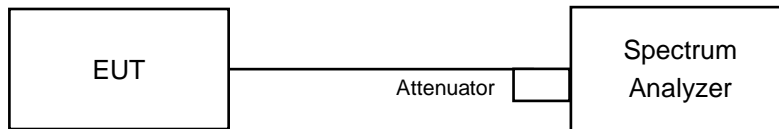
Chan.	Chan. Freq. (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	38.905	15.90
6	2437	105.439	20.23
11	2462	25.882	14.13

## 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:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d. Set the VBW  $\geq 3 \times \text{RBW}$ .
- e. Detector = peak.
- f. Sweep time = auto couple.
- g. Trace mode = max hold.
- h. Allow trace to fully stabilize.
- i. Use the peak marker function to determine the maximum amplitude level within the RBW.

### 4.5.5 Deviation from Test Standard

No deviation.

### 4.5.6 EUT Operating Condition

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	0.07	8.00	Pass
6	2437	0.26	8.00	Pass
11	2462	-3.54	8.00	Pass

##### 802.11g

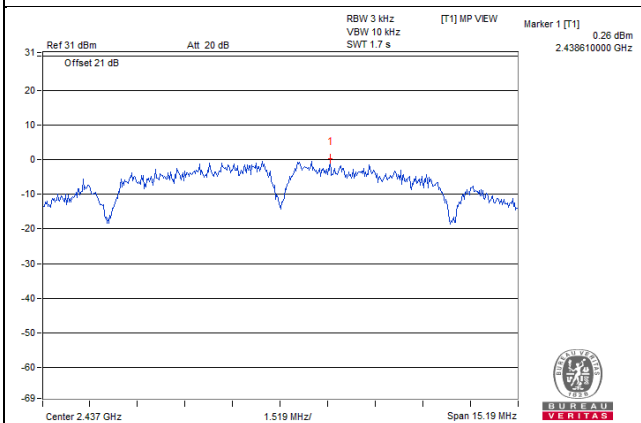
Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
1	2412	-8.32	8.00	Pass
6	2437	-3.45	8.00	Pass
11	2462	-7.92	8.00	Pass

##### 802.11n (HT20)

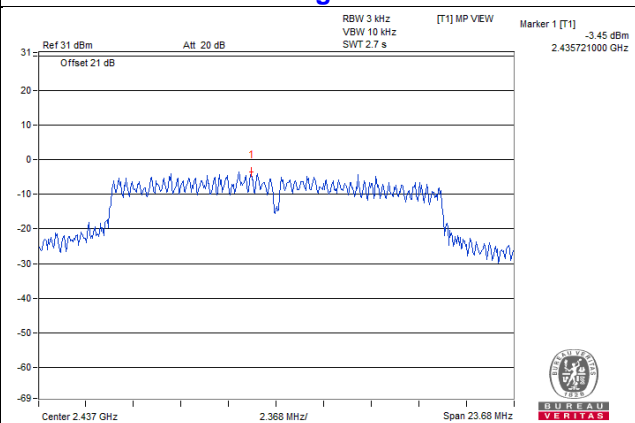
Chan.	Chan. Freq. (MHz)	PSD (dBm/3kHz)	PSD Limit (dBm/3kHz)	Pass / Fail
1	2412	-9.92	8.00	Pass
6	2437	-5.64	8.00	Pass
11	2462	-9.95	8.00	Pass

Spectrum Plot of Worst Value

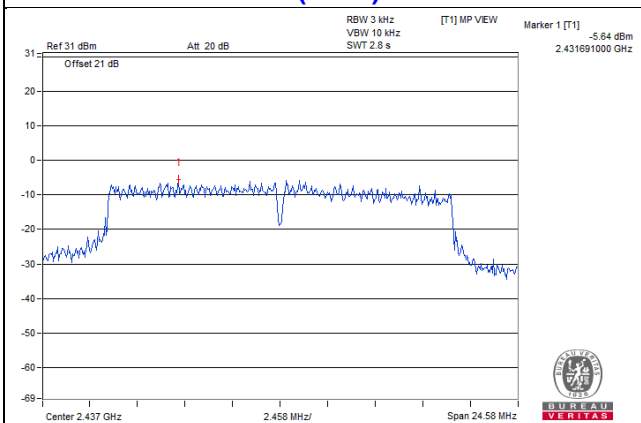
802.11b / CH6



802.11g / CH6



802.11n (HT20) / CH6

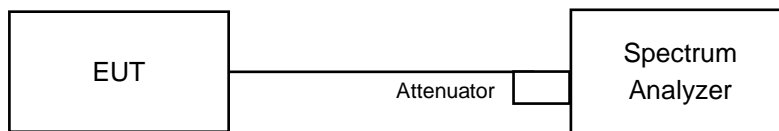


## 4.6 Conducted Out of Band Emission Measurement

### 4.6.1 Limits of Conducted Out of Band Emission Measurement

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

### 4.6.2 Test Setup



### 4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.6.4 Test Procedure

#### MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW  $\geq$  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 OOBE

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

### 4.6.5 Deviation from Test Standard

No deviation.

### 4.6.6 EUT Operating Condition

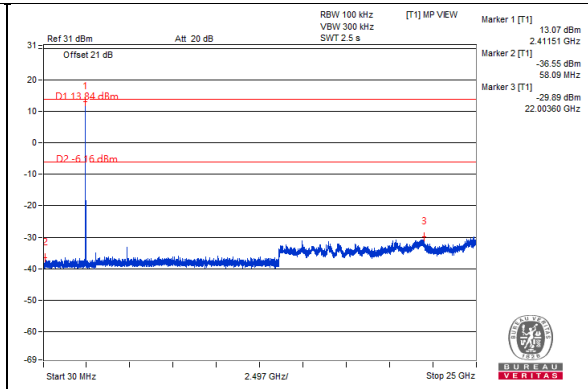
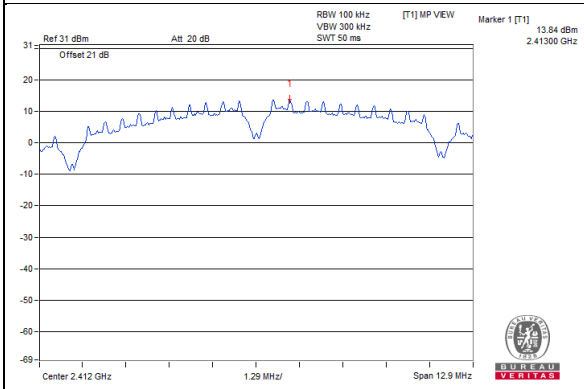
Same as Item 4.3.6

### 4.6.7 Test Results

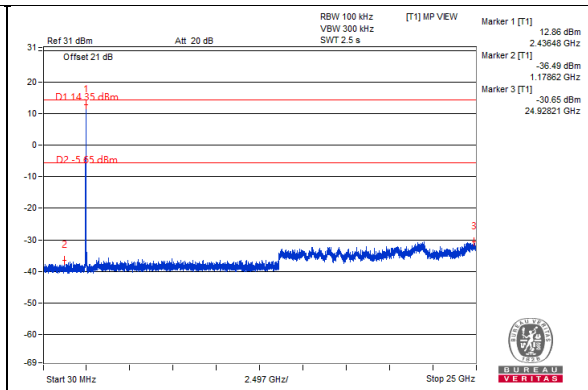
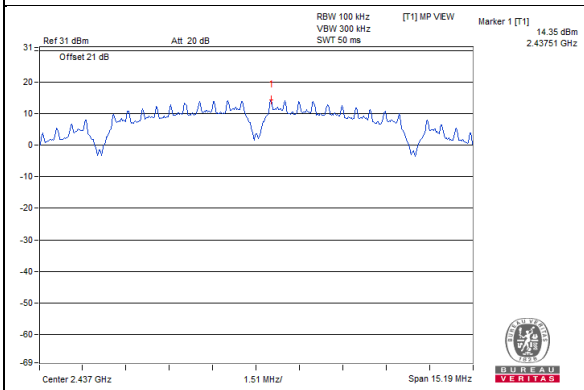
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

# 802.11b

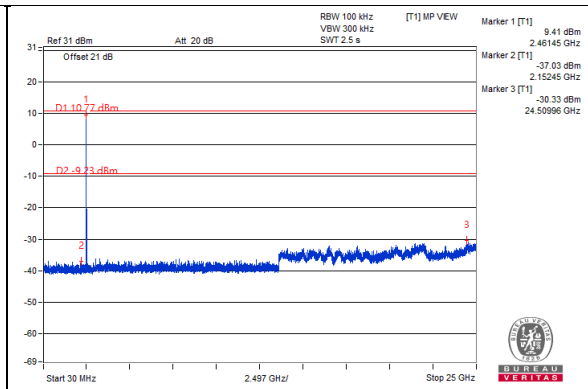
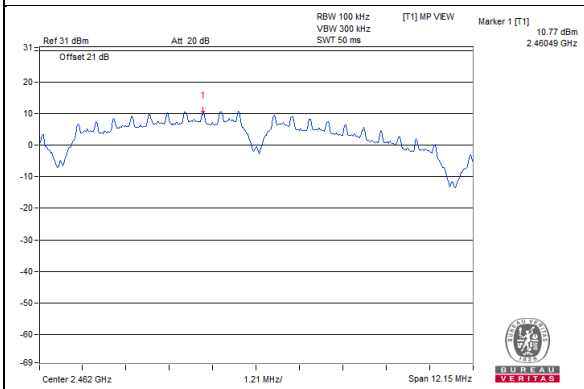
## CH 1



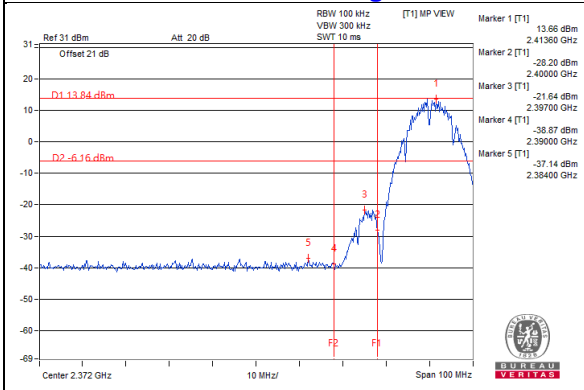
## CH 6



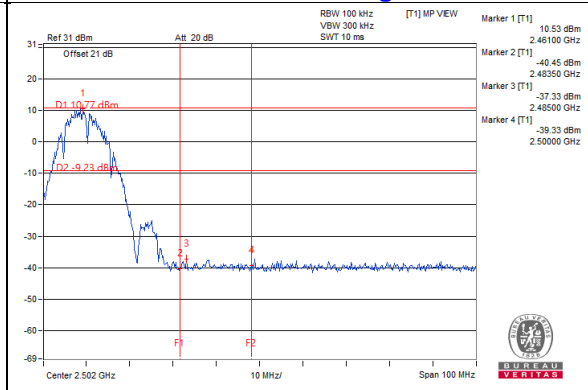
## CH 11



## CH 1 Band edge

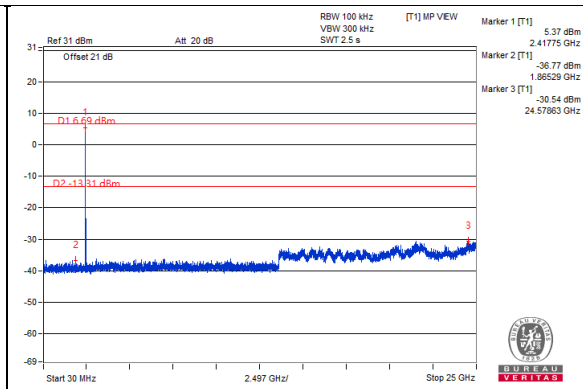
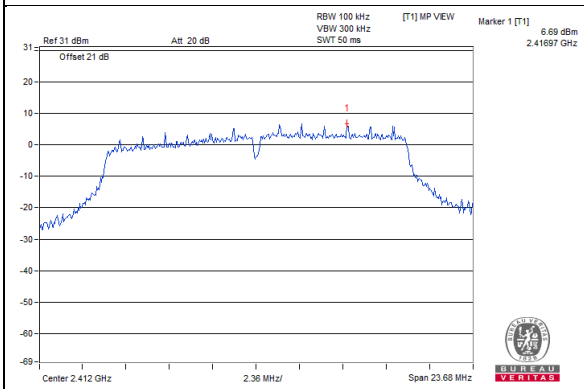


## CH 11 Band edge

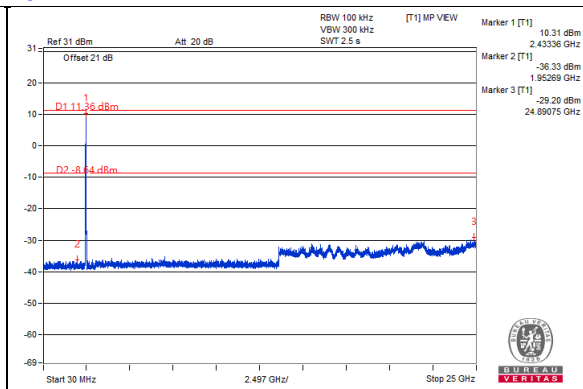
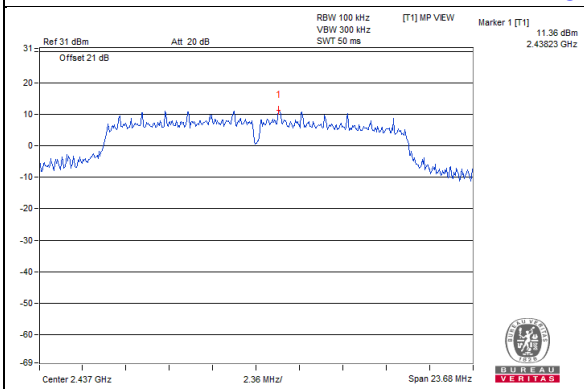


802.11g

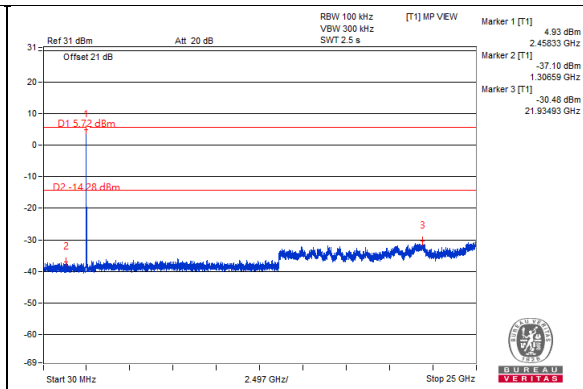
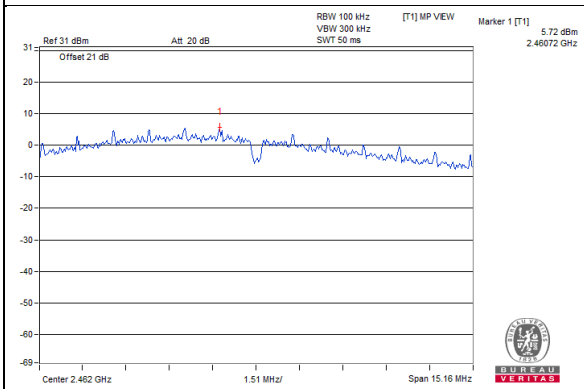
CH 1



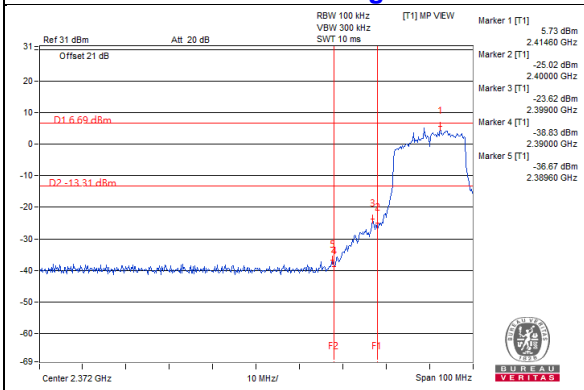
CH 6



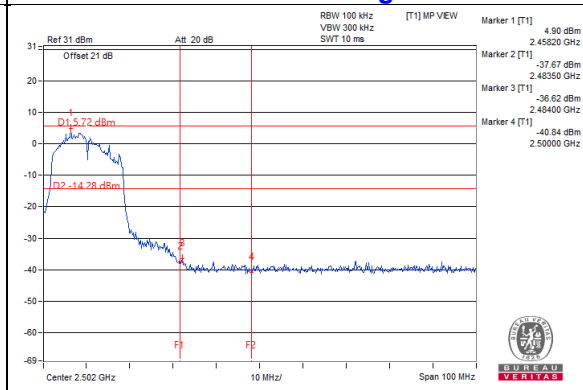
CH 11



CH 1 Band edge



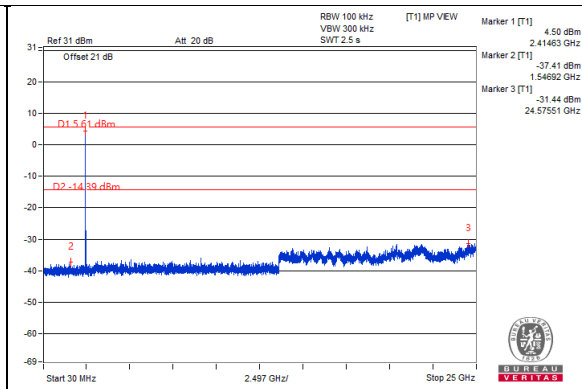
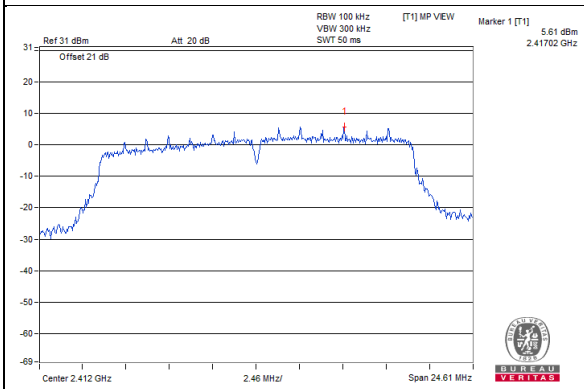
CH 11 Band edge



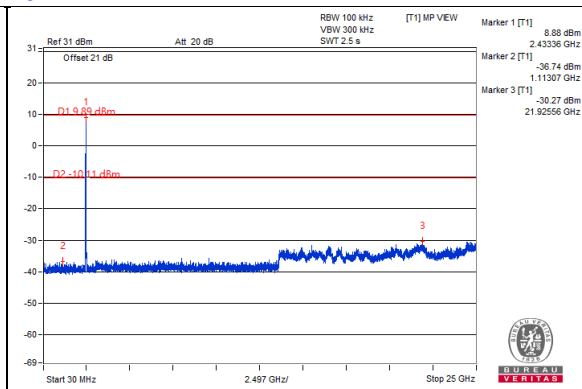
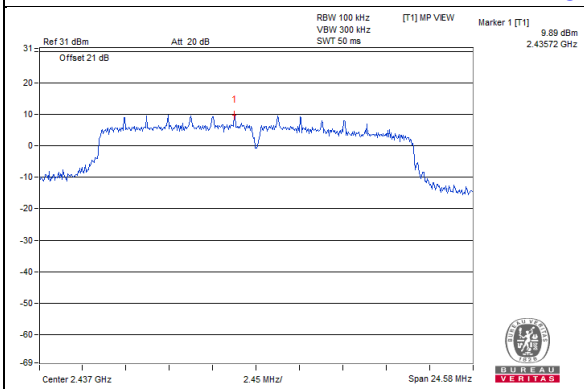


# 802.11n (HT20)

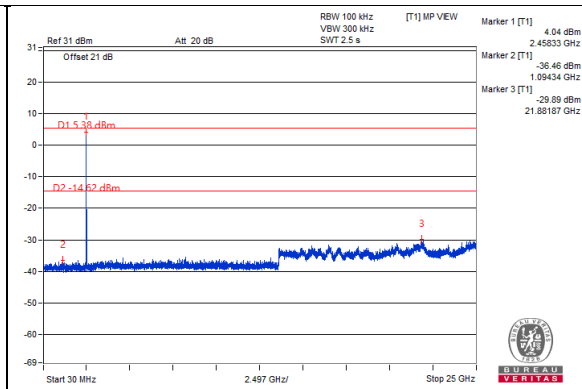
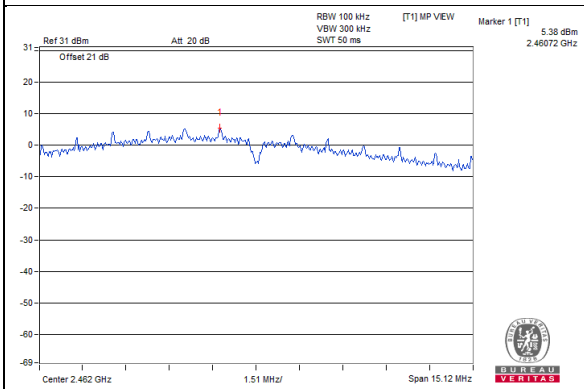
## CH 1



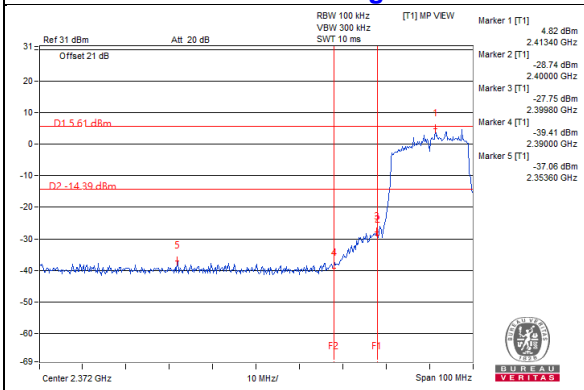
## CH 6



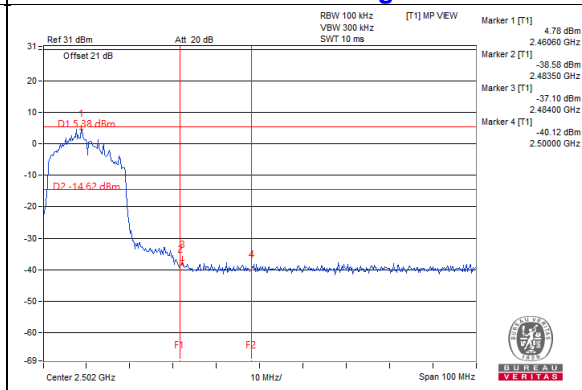
## CH 11



## CH 1 Band edge



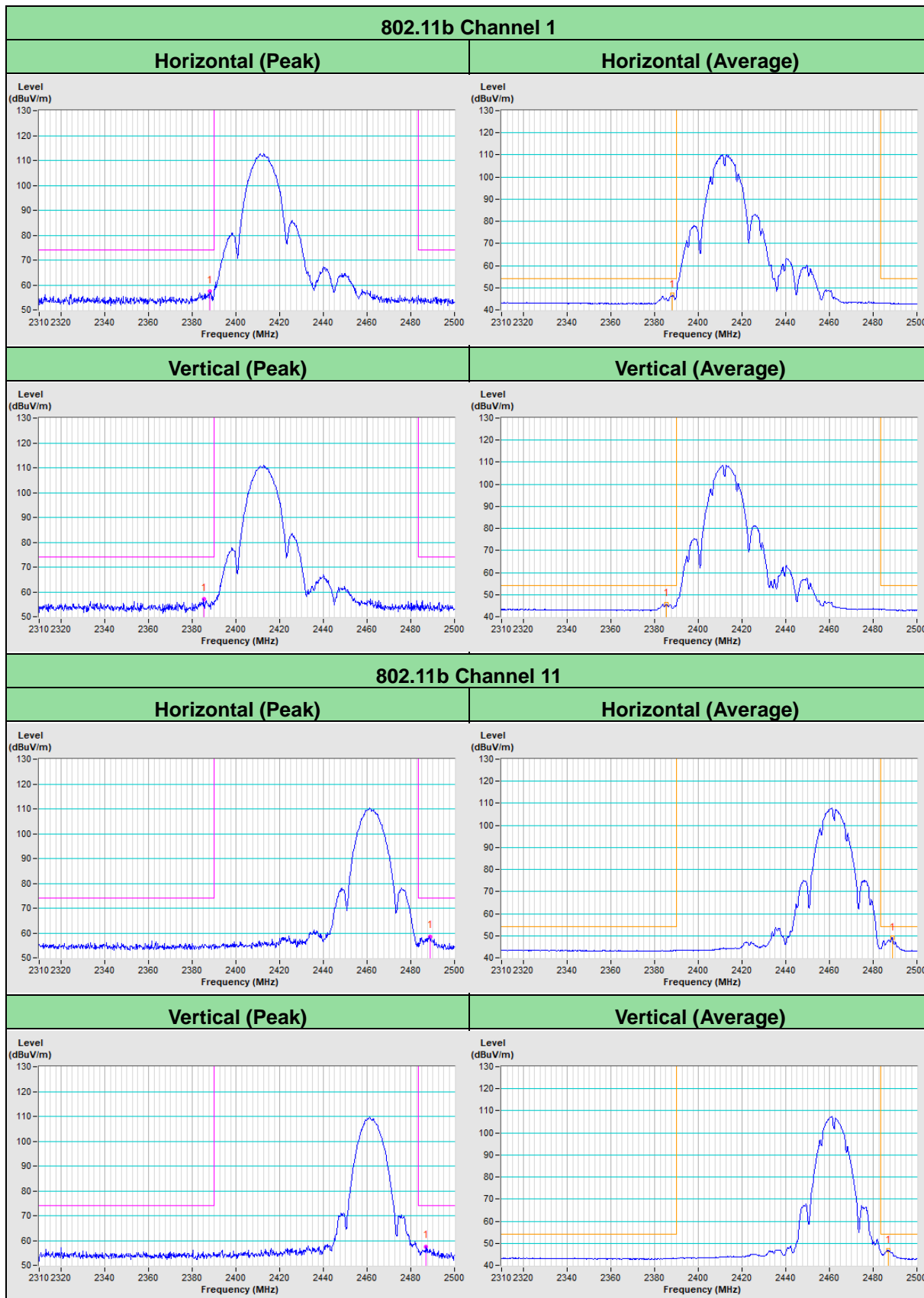
## CH 11 Band edge



## 5 Pictures of Test Arrangements

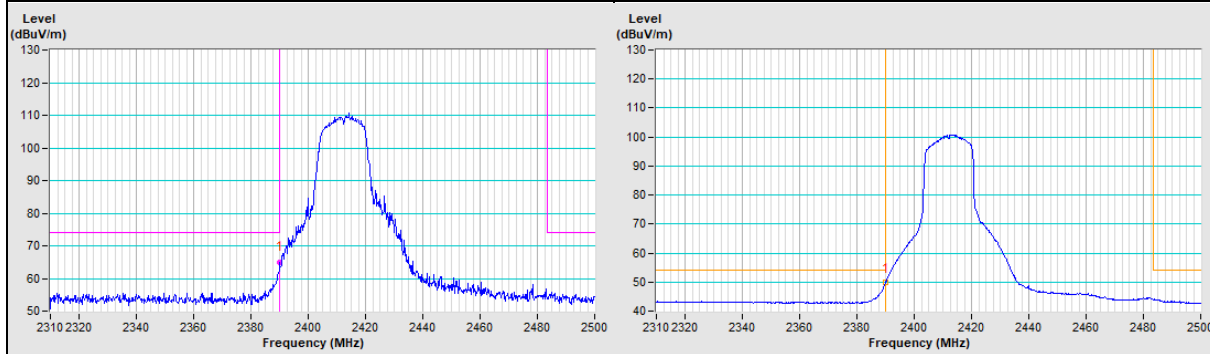
Please refer to the attached file (Test Setup Photo).

### Annex A - Band-Edge Measurement

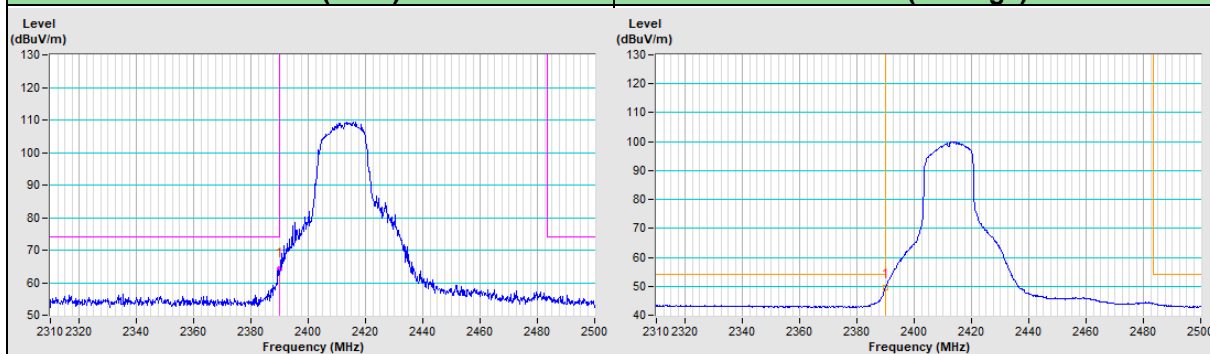


### 802.11g Channel 1

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

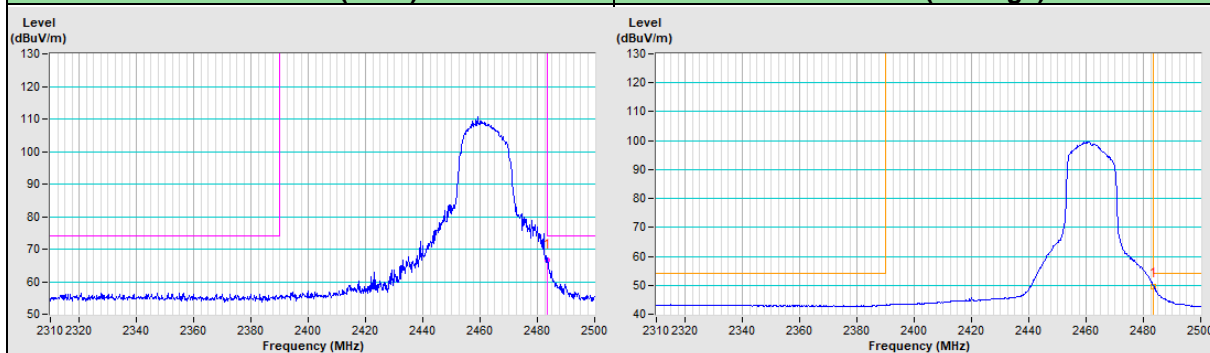


Vertical (Peak)	Vertical (Average)
-----------------	--------------------

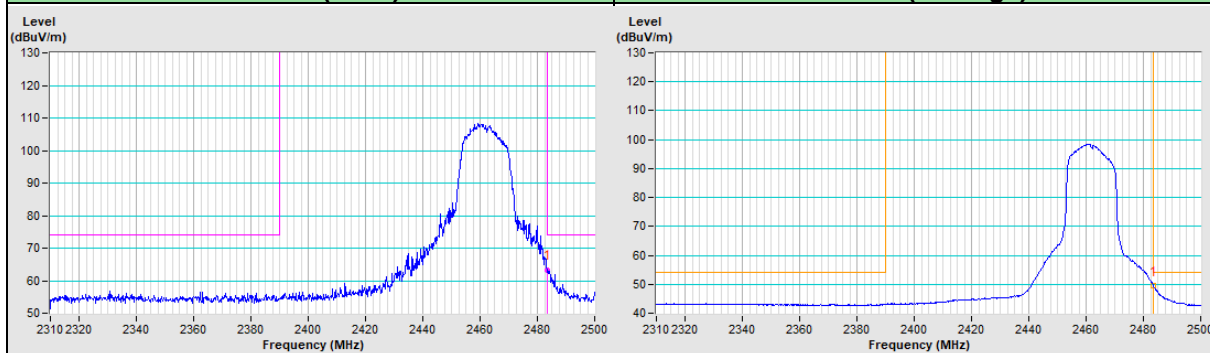


### 802.11g Channel 11

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

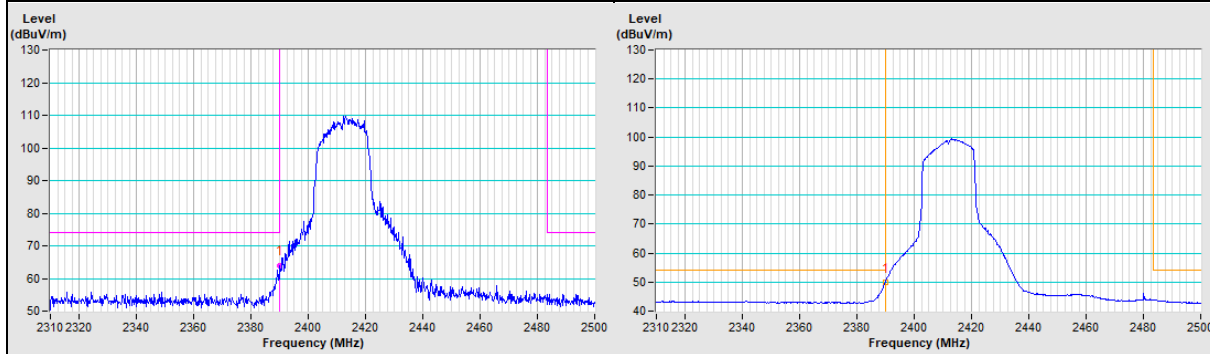


Vertical (Peak)	Vertical (Average)
-----------------	--------------------

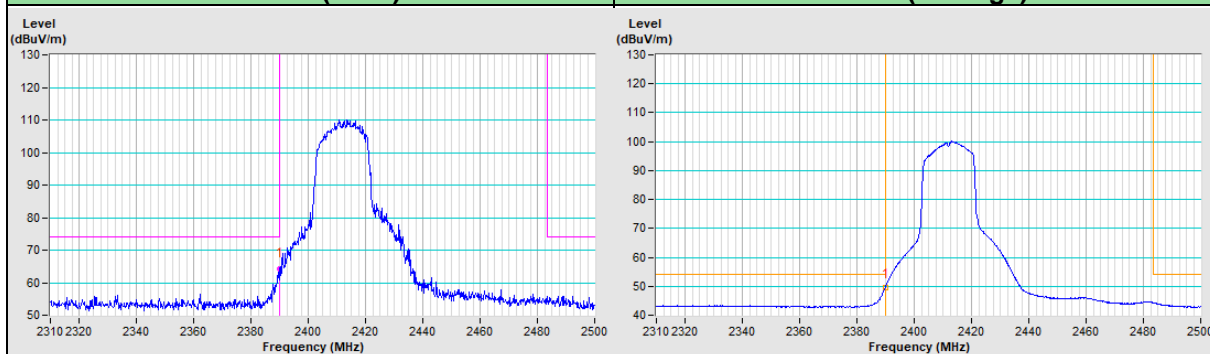


### 802.11n (HT20) Channel 1

Horizontal (Peak)	Horizontal (Average)
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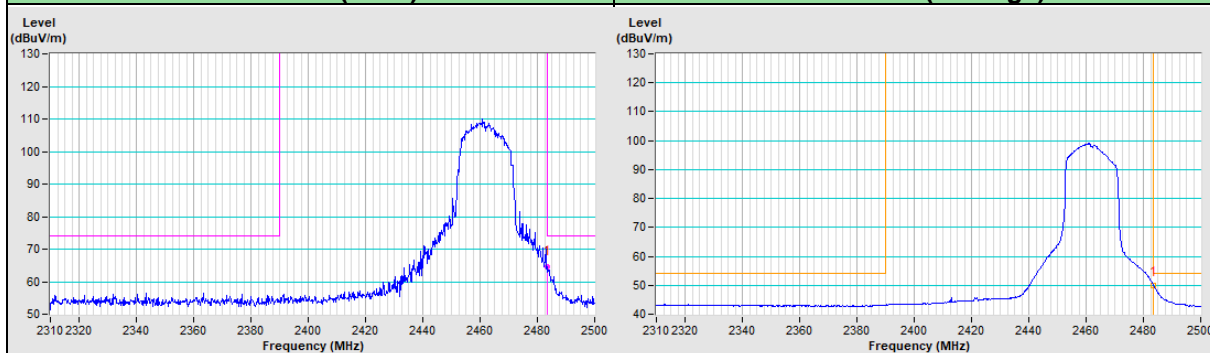


Vertical (Peak)	Vertical (Average)
-----------------	--------------------

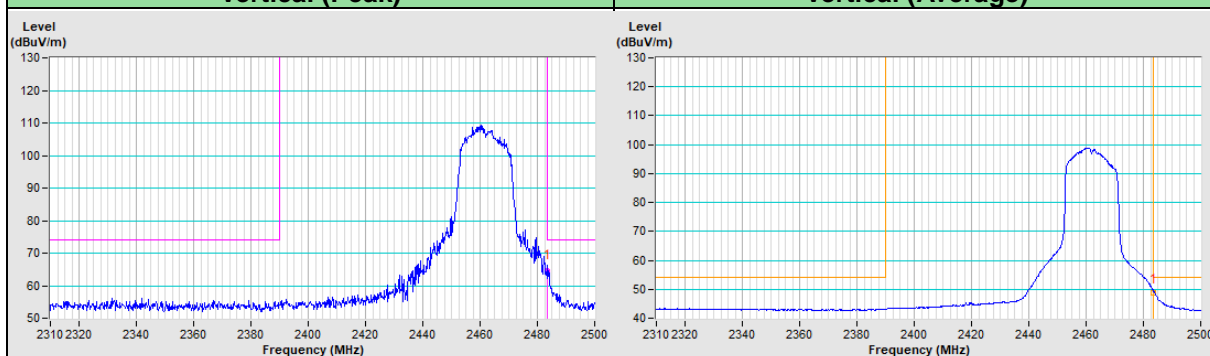


### 802.11n (HT20) Channel 11

Horizontal (Peak)	Horizontal (Average)
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Vertical (Peak)	Vertical (Average)
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## 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](mailto:service.adt@tw.bureauveritas.com)

**Web Site:** [www.bureauveritas-adt.com](http://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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