

## FCC Test Report

**Report No.:** RF190516E08

**FCC ID:** MQT-AT170R18U

**Test Model:** xCL\_AT-170-R-18U

**Received Date:** May 16, 2019

**Test Date:** June 20 to 25, 2019

**Issued Date:** July 11, 2019

**Applicant:** XAC AUTOMATION CORP.

**Address:** 4F, No. 30, INDUSTRY E. RD. IX, SCIENCE-BASED INDUSTRIAL  
PARK,HSINCHU,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 R.O.C.

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

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



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### Release Control Record

Issue No.	Description	Date Issued
RF190516E08	Original release.	July 11, 2019

## 1 Certificate of Conformity

**Product:** Terminal

**Brand:** XAC

**Test Model:** xCL\_AT-170-R-18U

**Sample Status:** ENGINEERING SAMPLE

**Applicant:** XAC AUTOMATION CORP.

**Test Date:** June 20 to 25, 2019

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

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

**Prepared by :**



**Date:**

July 11, 2019

Wendy Wu / Specialist

**Approved by :**



**Date:**

July 11, 2019

May Chen / 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 -14.25dB at 17.84375MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.5dB at 2483.50MHz.
15.247(d)	Antenna Port Emission	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	Antenna connector is i-pex(MHF) not a standard connector.

### Note:

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	1.8 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.9 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.1 dB
	6GHz ~ 18GHz	4.9 dB
	18GHz ~ 40GHz	5.2 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT (WLAN)

Product	Terminal
Brand	XAC
Test Model	xCL_AT-170-R-18U
Status of EUT	ENGINEERING SAMPLE
Test Software Version	QDART 4.8.29
Power Supply Rating	5Vdc from power adapter or 3.8Vdc from battery
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11a/g: up to 54Mbps 802.11n: up to 150Mbps
Operating Frequency	<b>2.4GHz:</b> 2.412 ~ 2.462GHz <b>5GHz:</b> 5.18~ 5.24GHz, 5.26GHz ~ 5.32GHz, 5.50GHz ~ 5.70GHz, 5.745 ~ 5.825GHz
Number of Channel	<b>2.4GHz:</b> 802.11b, 802.11g, 802.11n (HT20): 11 <b>5GHz:</b> 802.11a, 802.11n (HT20): 24 802.11n (HT40): 11
Output Power	<b>2.4GHz:</b> 261.818 mW <b>5GHz:</b> <b>5.18 ~ 5.24GHz:</b> 59.704 mW <b>5.26 ~ 5.32GHz:</b> 58.749 mW <b>5.5 ~ 5.7GHz:</b> 59.979 mW <b>5.745 ~ 5.825GHz:</b> 60.954mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	Battery x1 (option), Adapter x 1 (option)
Data Cable Supplied	NA

Note:

1. The EUT has below radios as following table:

Radio 1	Radio 2	Radio 3
WLAN+Bluetooth	WWAN	NFC

2. Simultaneously transmission condition.

Condition	Technology	
1	WWAN	NFC
2	WWAN	Bluetooth
3	WLAN 2.4GHz	NFC
4	WLAN 5GHz	NFC
5	Bluetooth	NFC

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

3. The EUT must be supplied with a power adapter or a battery as following table:

Adapter		
Brand	Model No.	Spec.
MASS POWER	NBS10B050200VUU	Input: 100-240Vac, 0.3A, 50~60Hz Output: 5Vdc, 2A DC output cable: Shielded, 1.2 m
Battery		
Brand	Model No.	Spec.
Shenzhen Rishengzhi Electronics Technology Co., Ltd.	J601	3.8Vdc, 5200mAh, 19.76Wh

Note: From the above adapter and battery, the worst radiated emission test was found in **Adapter**. Therefore only the test data of the modes were recorded in this report.

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

Ant. No.	RF Chain No.	Brand	Model	Ant. Net Gain (dBi)	Frequency Range	Antenna Type	Connector Type
Wi-Fi + BT	Main	awan-ant	AYF6P-100000	2.34	2.4~2.4835 GHz	FPCB	i-pex(MHF)
				4.48	5.15~5.85 GHz	FPCB	i-pex(MHF)
3G/LTE	Main	awan-ant	AXF6P-100002	3.44	699~2690 MHz	FPCB	i-pex(MHF)
3G/LTE	Aux	awan-ant	AXF6P-100003	3.75	699~2690 MHz	FPCB	i-pex(MHF)
NFC	Main	XAC	RTOS	13	13.56 MHz	Wire	None

5. The EUT incorporates a SISO function.

2.4GHz Band		
MODULATION MODE	RADIATED EMISSION	
802.11b	1TX	1RX
802.11g	1TX	1RX
802.11n (HT20)	1TX	1RX

6. The power setting are list as below:

Modulation Mode	Frequency (MHz)	Power Setting
802.11b	2412	17
	2437	19.5
	2462	19.5
802.11g	2412	16.5
	2437	20
	2462	15
802.11n(HT20)	2412	15.5
	2437	19.5
	2462	14.5

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



### 3.2 Description of Test Modes

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

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

### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE $\geq$ 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

**NOTE:**

1 The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on Z-plane.

#### **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	TESTED BY
RE $\geq$ 1G	21deg. C, 64%RH	120Vac, 60Hz	Robert Cheng
RE $<$ 1G	22deg. C, 66%RH	120Vac, 60Hz	Robert Cheng
PLC	24deg. C, 76%RH	120Vac, 60Hz	Andy Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	Jyunchun Lin

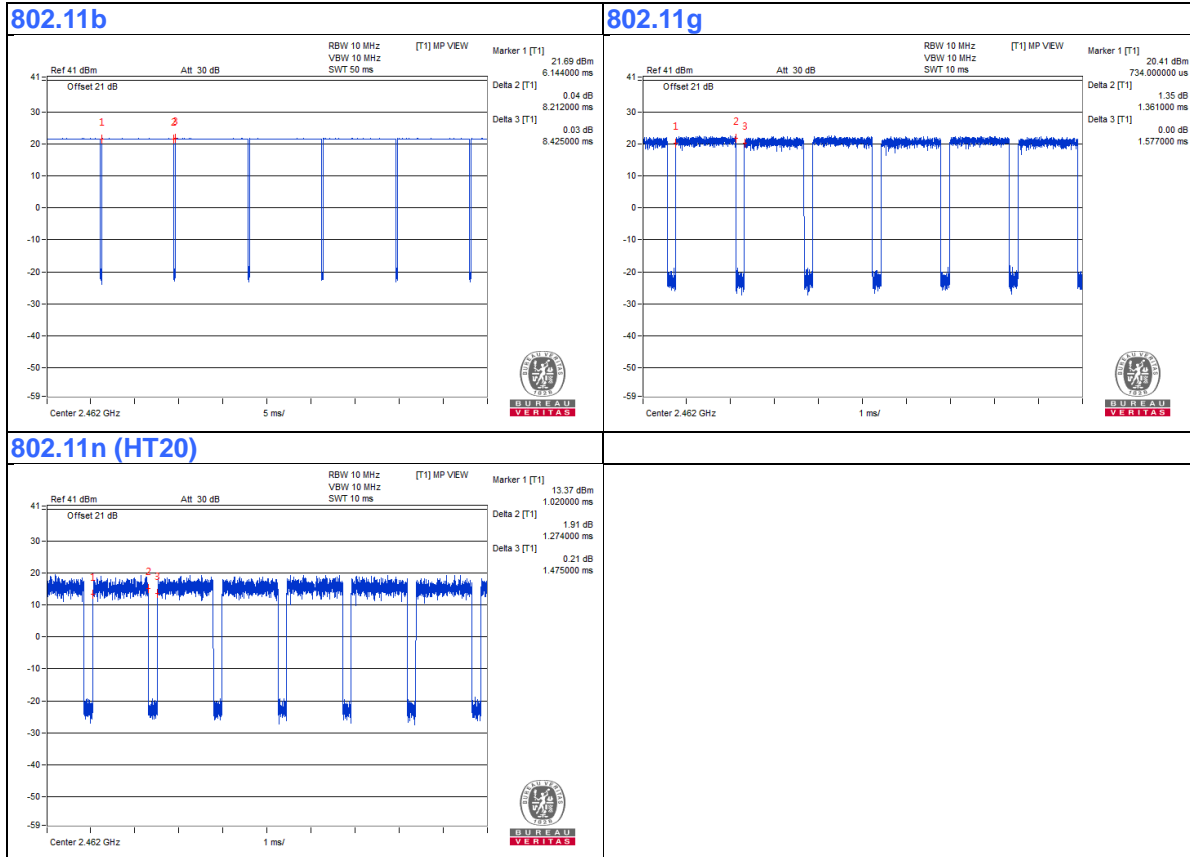
### 3.3 Duty Cycle of Test Signal

If duty cycle of test signal is < 98%, duty factor shall be considered.

**802.11b:** Duty cycle = 8.212 ms/8.425 ms = 0.975, Duty factor =  $10 * \log(1/\text{Duty cycle}) = 0.11$

**802.11g:** Duty cycle = 1.361 ms/1.577 ms = 0.863, Duty factor =  $10 * \log(1/\text{Duty cycle}) = 0.64$

**802.11n (HT20):** Duty cycle = 1.274 ms/1.475 ms = 0.939, Duty factor =  $10 * \log(1/\text{Duty cycle}) = 0.64$



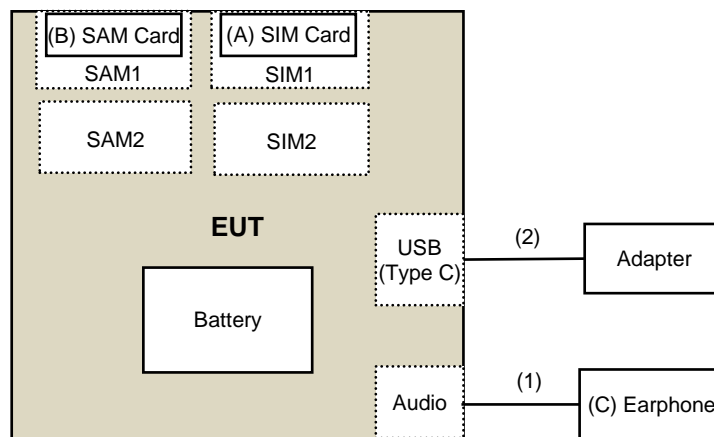
### 3.4 Description of Support Units

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.	SIM Card	NA	NA	NA	NA	Provided by Lab
B.	SAM Card	NA	NA	NA	NA	Supplied by client
C.	Earphone	Sony	NA	NA	NA	Provided by Lab

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	Audio Cable	1	0.6	No	0	Provided by Lab
2.	USB Type C Cable	1	1.2	Yes	0	Supplied by client

#### 3.4.1 Configuration of System under Test



### 3.5 General Description of Applied Standards

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

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

**KDB 558074 D01 15.247 Meas Guidance v05r02**

**ANSI C63.10-2013**

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

## 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

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 05, 2018	July 04, 2019
Pre-Amplifier EMCI	EMC001340	980142	Jan. 25, 2019	Jan. 24, 2020
Loop Antenna Electro-Metrics	EM-6879	269	Sep. 07, 2018	Sep. 06, 2019
RF Cable	NA	LOOPCAB-001	Jan. 14, 2019	Jan. 13, 2020
RF Cable	NA	LOOPCAB-002	Jan. 14, 2019	Jan. 13, 2020
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Oct. 30, 2018	Oct. 29, 2019
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 22, 2018	Nov. 21, 2019
RF Cable	8D	966-4-1	Mar. 19, 2019	Mar. 18, 2020
RF Cable	8D	966-4-2	Mar. 19, 2019	Mar. 18, 2020
RF Cable	8D	966-4-3	Mar. 19, 2019	Mar. 18, 2020
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Sep. 27, 2018	Sep. 26, 2019
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Nov. 25, 2018	Nov. 24, 2019
Pre-Amplifier EMCI	EMC12630SE	980385	Aug. 16, 2018	Aug. 15, 2019
RF Cable	EMC104-SM-SM-1200	160923	Jan. 28, 2019	Jan. 27, 2020
RF Cable	104 RF cable	131215	Jan. 10, 2019	Jan. 09, 2020
RF Cable	EMC104-SM-SM-6000	180418	May 03, 2019	May 02, 2020
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 28, 2019	Jan. 27, 2020
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170519	Nov. 25, 2018	Nov. 24, 2019
RF Cable	EMC102-KM-KM-1200	160924	Jan. 28, 2019	Jan. 27, 2020
RF Cable	EMC102-KM-KM-1200	160925	Jan. 28, 2019	Jan. 27, 2020
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Boresight Antenna Tower & Turn Table Max-Full	MF-7802BS	MF780208530	NA	NA
Spectrum Analyzer R&S	FSV40	100964	June 04, 2019	June 03, 2020
Power meter Anritsu	ML2495A	1014008	May 13, 2019	May 12, 2020
Power sensor Anritsu	MA2411B	0917122	May 13, 2019	May 12, 2020

**NOTE:**

1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. The test was performed in 966 Chamber No. 4.
3. Loop antenna was used for all emissions below 30 MHz.
4. Tested Date: June 24, 2019



#### 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:**

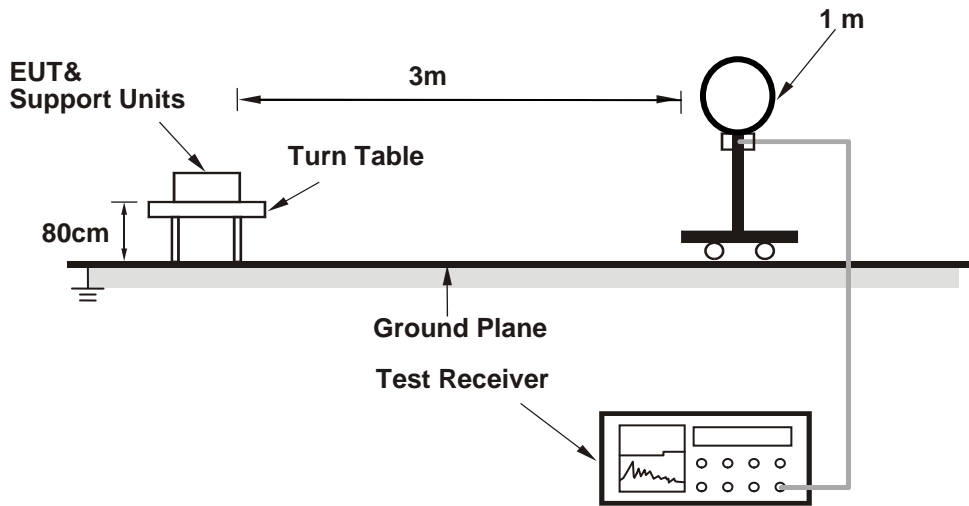
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

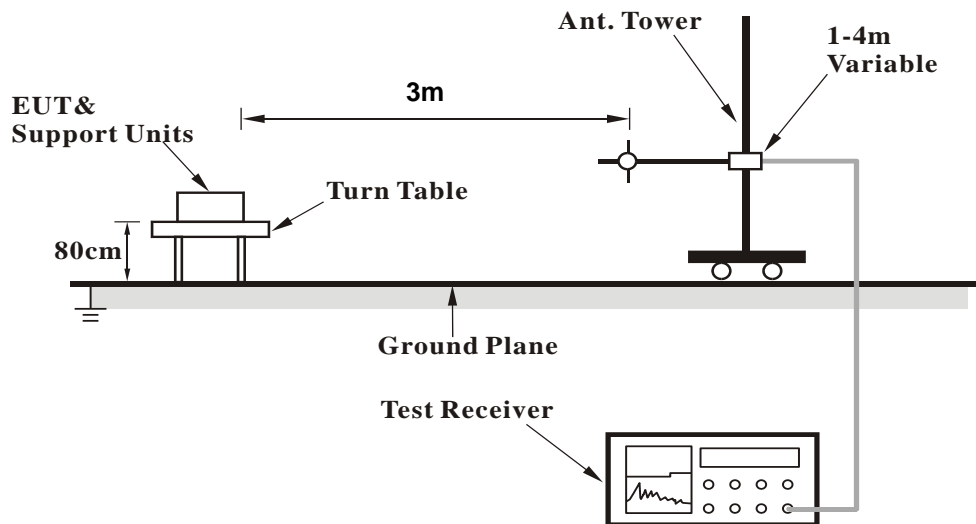
No deviation.

4.1.5 Test Setup

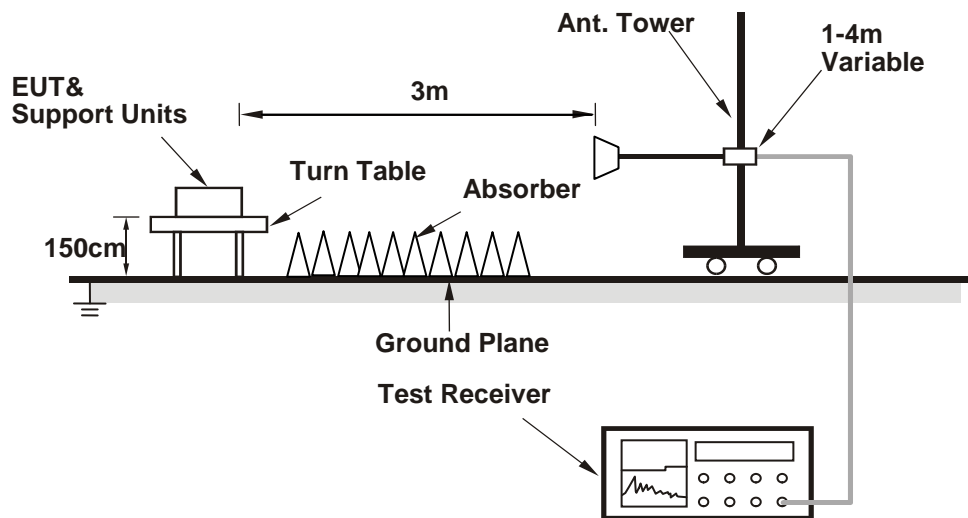
**For Radiated emission below 30MHz**



**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 (QDART 4.8.29) has been activated to set the EUT under transmission condition continuously at specific channel frequency.

#### 4.1.7 Test Results

#### Above 1GHz Data :

#### 802.11b

<b>CHANNEL</b>	TX Channel 1	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

#### ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M

NO.	FREQ. (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	51.2 PK	74.0	-22.8	1.32 H	60	52.8	-1.6
2	2390.00	39.5 AV	54.0	-14.5	1.32 H	60	41.1	-1.6
3	*2412.00	102.1 PK			1.32 H	60	103.8	-1.7
4	*2412.00	99.7 AV			1.32 H	60	101.4	-1.7
5	4824.00	48.1 PK	74.0	-25.9	1.21 H	312	45.8	2.3
6	4824.00	46.1 AV	54.0	-7.9	1.21 H	312	43.8	2.3

#### ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M

NO.	FREQ. (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	55.7 PK	74.0	-18.3	2.45 V	247	57.3	-1.6
2	2390.00	43.9 AV	54.0	-10.1	2.45 V	247	45.5	-1.6
3	*2412.00	107.4 PK			1.00 V	350	109.1	-1.7
4	*2412.00	104.6 AV			1.00 V	350	106.3	-1.7
5	4824.00	47.2 PK	74.0	-26.8	1.37 V	20	44.9	2.3
6	4824.00	44.9 AV	54.0	-9.1	1.37 V	20	42.6	2.3

#### REMARKS:

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

<b>CHANNEL</b>	TX Channel 6	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	103.5 PK			1.28 H	36	105.3	-1.8
2	*2437.00	100.7 AV			1.28 H	36	102.5	-1.8
3	4874.00	48.4 PK	74.0	-25.6	1.11 H	308	46.0	2.4
4	4874.00	46.1 AV	54.0	-7.9	1.11 H	308	43.7	2.4
5	7311.00	44.7 PK	74.0	-29.3	1.67 H	258	35.5	9.2
6	7311.00	33.5 AV	54.0	-20.5	1.67 H	258	24.3	9.2

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	107.8 PK			1.49 V	230	109.6	-1.8
2	*2437.00	105.0 AV			1.49 V	230	106.8	-1.8
3	4874.00	47.2 PK	74.0	-26.8	1.36 V	27	44.8	2.4
4	4874.00	45.0 AV	54.0	-9.0	1.36 V	27	42.6	2.4
5	7311.00	44.6 PK	74.0	-29.4	1.86 V	219	35.4	9.2
6	7311.00	34.1 AV	54.0	-19.9	1.86 V	219	24.9	9.2

**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.
5. " \* ": Fundamental frequency.

<b>CHANNEL</b>	TX Channel 11	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

NO.	FREQ. (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	103.8 PK			1.29 H	45	105.6	-1.8
2	*2462.00	100.9 AV			1.29 H	45	102.7	-1.8
3	2483.50	59.0 PK	74.0	-15.0	1.29 H	45	60.7	-1.7
4	2483.50	48.0 AV	54.0	-6.0	1.29 H	45	49.7	-1.7
5	4924.00	48.1 PK	74.0	-25.9	1.16 H	312	45.6	2.5
6	4924.00	46.0 AV	54.0	-8.0	1.16 H	312	43.5	2.5
7	7386.00	44.2 PK	74.0	-29.8	1.65 H	266	34.8	9.4
8	7386.00	33.2 AV	54.0	-20.8	1.65 H	266	23.8	9.4

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	108.7 PK			1.64 V	241	110.5	-1.8
2	*2462.00	105.7 AV			1.64 V	241	107.5	-1.8
3	2483.50	60.3 PK	74.0	-13.7	1.64 V	241	62.0	-1.7
4	2483.50	52.1 AV	54.0	-1.9	1.64 V	241	53.8	-1.7
5	2487.20	61.3 PK	74.0	-12.7	1.64 V	241	63.0	-1.7
6	2487.20	52.7 AV	54.0	-1.3	1.64 V	241	54.4	-1.7
7	4924.00	47.3 PK	74.0	-26.7	1.31 V	18	44.8	2.5
8	4924.00	45.2 AV	54.0	-8.8	1.31 V	18	42.7	2.5
9	7386.00	44.5 PK	74.0	-29.5	1.86 V	216	35.1	9.4
10	7386.00	33.7 AV	54.0	-20.3	1.86 V	216	24.3	9.4

**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.
5. " \* ": Fundamental frequency.

**802.11g**

<b>CHANNEL</b>	TX Channel 1	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.0 PK	74.0	-15.0	1.30 H	34	60.6	-1.6
2	2390.00	47.7 AV	54.0	-6.3	1.30 H	34	49.3	-1.6
3	*2412.00	102.9 PK			1.30 H	34	104.6	-1.7
4	*2412.00	93.2 AV			1.30 H	34	94.9	-1.7
5	4824.00	40.9 PK	74.0	-33.1	1.12 H	336	38.6	2.3
6	4824.00	29.5 AV	54.0	-24.5	1.12 H	336	27.2	2.3

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (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	72.8 PK	74.0	-1.2	1.22 V	227	74.4	-1.6
2	2390.00	53.4 AV	54.0	-0.6	1.22 V	227	55.0	-1.6
3	*2412.00	107.7 PK			1.22 V	227	109.4	-1.7
4	*2412.00	98.0 AV			1.22 V	227	99.7	-1.7
5	4824.00	39.8 PK	74.0	-34.2	1.35 V	39	37.5	2.3
6	4824.00	29.1 AV	54.0	-24.9	1.35 V	39	26.8	2.3

**REMARKS:**

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

<b>CHANNEL</b>	TX Channel 6	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	105.2 PK			1.31 H	59	107.0	-1.8
2	*2437.00	95.1 AV			1.31 H	59	96.9	-1.8
3	4874.00	45.3 PK	74.0	-28.7	1.19 H	321	42.9	2.4
4	4874.00	34.2 AV	54.0	-19.8	1.19 H	321	31.8	2.4
5	7311.00	44.2 PK	74.0	-29.8	1.70 H	251	35.0	9.2
6	7311.00	33.5 AV	54.0	-20.5	1.70 H	251	24.3	9.2

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	110.1 PK			1.33 V	238	111.9	-1.8
2	*2437.00	100.3 AV			1.33 V	238	102.1	-1.8
3	4874.00	44.8 PK	74.0	-29.2	1.33 V	30	42.4	2.4
4	4874.00	33.9 AV	54.0	-20.1	1.33 V	30	31.5	2.4
5	7311.00	44.0 PK	74.0	-30.0	1.90 V	229	34.8	9.2
6	7311.00	33.4 AV	54.0	-20.6	1.90 V	229	24.2	9.2

**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.
5. " \* ": Fundamental frequency.



<b>CHANNEL</b>	TX Channel 11	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

NO.	FREQ. (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	99.8 PK			1.29 H	35	101.6	-1.8
2	*2462.00	91.1 AV			1.29 H	35	92.9	-1.8
3	2483.50	59.0 PK	74.0	-15.0	1.29 H	35	60.7	-1.7
4	2483.50	48.0 AV	54.0	-6.0	1.29 H	35	49.7	-1.7
5	4924.00	41.1 PK	74.0	-32.9	1.18 H	328	38.6	2.5
6	4924.00	29.7 AV	54.0	-24.3	1.18 H	328	27.2	2.5
7	7386.00	44.1 PK	74.0	-29.9	1.65 H	259	34.7	9.4
8	7386.00	33.2 AV	54.0	-20.8	1.65 H	259	23.8	9.4

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	104.7 PK			1.20 V	224	106.5	-1.8
2	*2462.00	95.8 AV			1.20 V	224	97.6	-1.8
3	2483.50	68.1 PK	74.0	-5.9	1.20 V	224	69.8	-1.7
4	<b>2483.50</b>	<b>53.5 AV</b>	<b>54.0</b>	<b>-0.5</b>	<b>1.20 V</b>	<b>224</b>	<b>55.2</b>	<b>-1.7</b>
5	4924.00	40.2 PK	74.0	-33.8	1.37 V	24	37.7	2.5
6	4924.00	29.4 AV	54.0	-24.6	1.37 V	24	26.9	2.5
7	7386.00	44.5 PK	74.0	-29.5	1.87 V	214	35.1	9.4
8	7386.00	33.9 AV	54.0	-20.1	1.87 V	214	24.5	9.4

**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.
5. " \* ": Fundamental frequency.

**802.11n (HT20)**

<b>CHANNEL</b>	TX Channel 1	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

NO.	FREQ. (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	58.5 PK	74.0	-15.5	1.27 H	41	60.1	-1.6
2	2390.00	47.7 AV	54.0	-6.3	1.27 H	41	49.3	-1.6
3	*2412.00	100.9 PK			1.27 H	41	102.6	-1.7
4	*2412.00	91.6 AV			1.27 H	41	93.3	-1.7
5	4824.00	41.3 PK	74.0	-32.7	1.16 H	326	39.0	2.3
6	4824.00	29.8 AV	54.0	-24.2	1.16 H	326	27.5	2.3

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (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	70.0 PK	74.0	-4.0	1.20 V	239	71.6	-1.6
2	2390.00	53.3 AV	54.0	-0.7	1.20 V	239	54.9	-1.6
3	*2412.00	105.8 PK			1.20 V	239	107.5	-1.7
4	*2412.00	96.4 AV			1.20 V	239	98.1	-1.7
5	4824.00	40.4 PK	74.0	-33.6	1.35 V	34	38.1	2.3
6	4824.00	29.6 AV	54.0	-24.4	1.35 V	34	27.3	2.3

**REMARKS:**

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

<b>CHANNEL</b>	TX Channel 6	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

NO.	FREQ. (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	50.2 PK	74.0	-23.8	1.25 H	58	51.8	-1.6
2	2390.00	38.1 AV	54.0	-15.9	1.25 H	58	39.7	-1.6
3	*2437.00	104.1 PK			1.25 H	58	105.9	-1.8
4	*2437.00	94.2 AV			1.25 H	58	96.0	-1.8
5	2483.50	50.9 PK	74.0	-23.1	1.25 H	58	52.6	-1.7
6	2483.50	38.7 AV	54.0	-15.3	1.25 H	58	40.4	-1.7
7	4874.00	41.1 PK	74.0	-32.9	1.15 H	331	38.7	2.4
8	4874.00	30.0 AV	54.0	-24.0	1.15 H	331	27.6	2.4
9	7311.00	43.7 PK	74.0	-30.3	1.63 H	265	34.5	9.2
10	7311.00	32.9 AV	54.0	-21.1	1.63 H	265	23.7	9.2

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.6 PK	74.0	-18.4	1.38 V	229	57.2	-1.6
2	2390.00	43.8 AV	54.0	-10.2	1.38 V	229	45.4	-1.6
3	*2437.00	109.1 PK			1.38 V	229	110.9	-1.8
4	*2437.00	99.2 AV			1.38 V	229	101.0	-1.8
5	2483.50	55.2 PK	74.0	-18.8	1.38 V	229	56.9	-1.7
6	2483.50	44.5 AV	54.0	-9.5	1.38 V	229	46.2	-1.7
7	4874.00	40.3 PK	74.0	-33.7	1.40 V	28	37.9	2.4
8	4874.00	29.8 AV	54.0	-24.2	1.40 V	28	27.4	2.4
9	7311.00	44.2 PK	74.0	-29.8	1.81 V	211	35.0	9.2
10	7311.00	33.7 AV	54.0	-20.3	1.81 V	211	24.5	9.2

**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.
5. " \* ": Fundamental frequency.

<b>CHANNEL</b>	TX Channel 11	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 25GHz		Average (AV)

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

NO.	FREQ. (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	99.8 PK			1.24 H	44	101.6	-1.8
2	*2462.00	89.5 AV			1.24 H	44	91.3	-1.8
3	2483.50	59.3 PK	74.0	-14.7	1.24 H	44	61.0	-1.7
4	2483.50	48.1 AV	54.0	-5.9	1.24 H	44	49.8	-1.7
5	4924.00	41.6 PK	74.0	-32.4	1.15 H	323	39.1	2.5
6	4924.00	30.1 AV	54.0	-23.9	1.15 H	323	27.6	2.5
7	7386.00	43.4 PK	74.0	-30.6	1.61 H	271	34.0	9.4
8	7386.00	32.7 AV	54.0	-21.3	1.61 H	271	23.3	9.4

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	104.1 PK			1.20 V	241	105.9	-1.8
2	*2462.00	94.4 AV			1.20 V	241	96.2	-1.8
3	2483.50	70.2 PK	74.0	-3.8	1.20 V	241	71.9	-1.7
4	<b>2483.50</b>	<b>53.5 AV</b>	<b>54.0</b>	<b>-0.5</b>	<b>1.20 V</b>	<b>241</b>	<b>55.2</b>	<b>-1.7</b>
5	4924.00	40.3 PK	74.0	-33.7	1.43 V	22	37.8	2.5
6	4924.00	29.4 AV	54.0	-24.6	1.43 V	22	26.9	2.5
7	7386.00	44.7 PK	74.0	-29.3	1.84 V	217	35.3	9.4
8	7386.00	34.4 AV	54.0	-19.6	1.84 V	217	25.0	9.4

**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.
5. " \* ": Fundamental frequency.

Below 1GHz Data:

802.11g

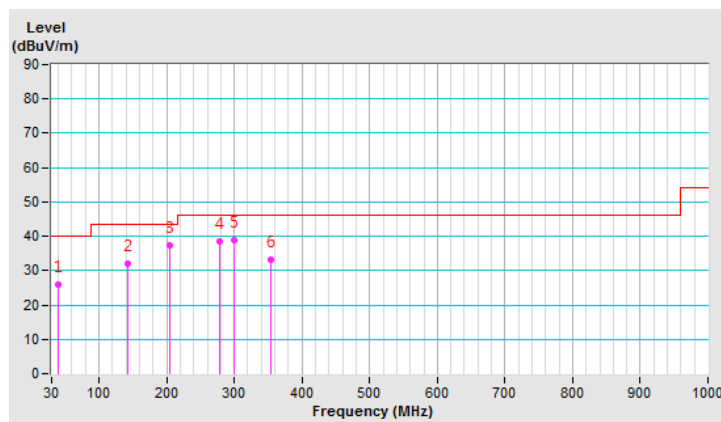
<b>CHANNEL</b>	TX Channel 6	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	9kHz ~ 1GHz		

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	39.80	26.0 QP	40.0	-14.0	1.23 H	111	34.7	-8.7
2	142.40	32.1 QP	43.5	-11.4	1.56 H	211	40.2	-8.1
3	203.78	37.4 QP	43.5	-6.1	1.72 H	136	47.7	-10.3
4	278.76	38.6 QP	46.0	-7.4	1.36 H	77	46.1	-7.5
5	299.47	38.9 QP	46.0	-7.1	1.96 H	244	45.9	-7.0
6	353.13	33.1 QP	46.0	-12.9	1.88 H	265	38.8	-5.7

**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 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.



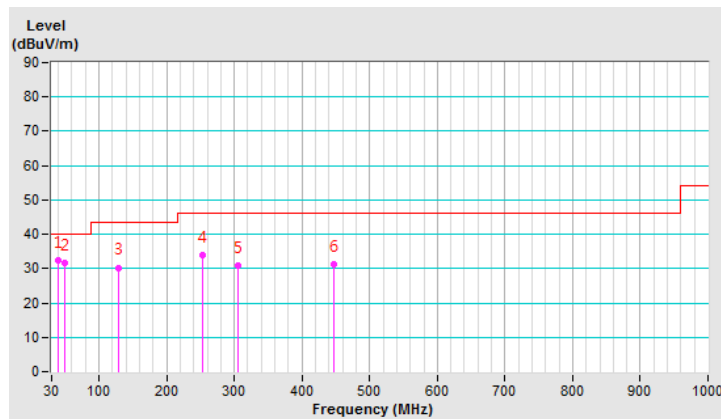
<b>CHANNEL</b>	TX Channel 6	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	9kHz ~ 1GHz		

**ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M**

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	40.28	32.4 QP	40.0	-7.6	1.00 V	241	41.0	-8.6
2	49.40	31.7 QP	40.0	-8.3	1.21 V	165	39.8	-8.1
3	128.43	30.3 QP	43.5	-13.2	1.35 V	155	39.5	-9.2
4	253.49	33.8 QP	46.0	-12.2	1.45 V	188	42.4	-8.6
5	305.36	30.8 QP	46.0	-15.2	1.00 V	195	37.6	-6.8
6	446.69	31.1 QP	46.0	-14.9	2.01 V	244	33.7	-2.6

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. Margin value = Emission Level – Limit value
4. The other emission levels were very low against the limit 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. 24, 2018	Oct. 23, 2019
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Oct. 22, 2018	Oct. 21, 2019
Line-Impedance Stabilization Network (for Peripheral) R&S	ESH3-Z5	835239/001	Mar. 17, 2019	Mar. 16, 2020
50 ohms Terminator	N/A	3	Oct. 22, 2018	Oct. 21, 2019
RF Cable	5D-FB	COCCAB-001	Sep. 28, 2018	Sep. 27, 2019
Fixed attenuator EMCI	STI02-2200-10	003	Mar. 14, 2019	Mar. 13, 2020
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: June 25, 2019

#### 4.2.3 Test Procedures

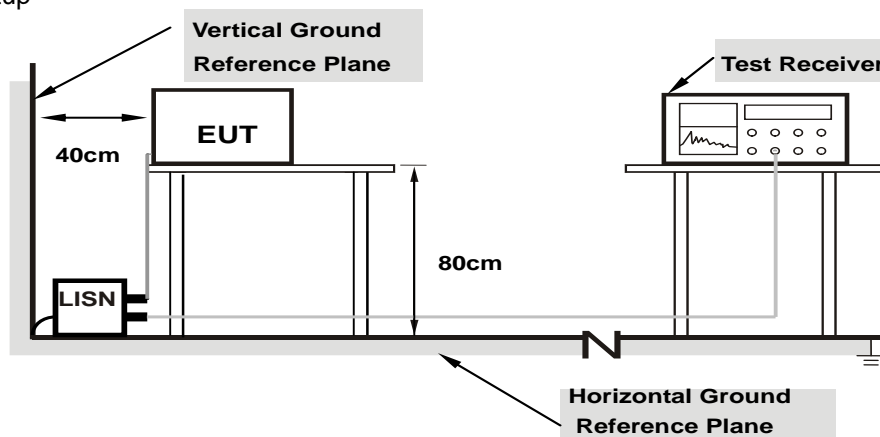
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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



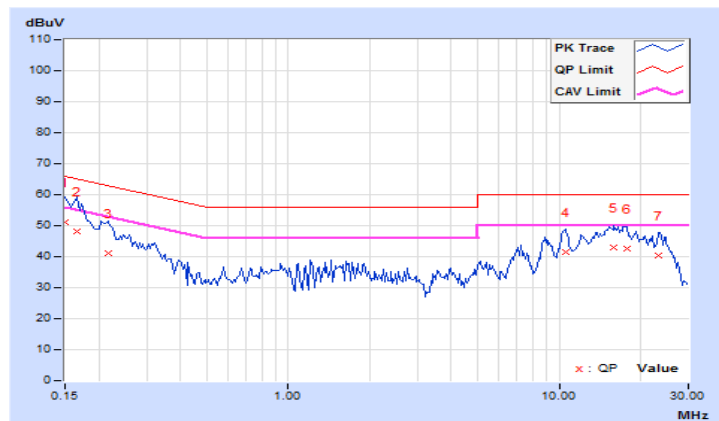
#### 4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	----------	-------------------	--------------------------------

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	10.03	40.93	22.09	50.96	32.12	66.00	56.00	-15.04	-23.88
2	0.16562	10.04	38.17	18.31	48.21	28.35	65.18	55.18	-16.97	-26.83
3	0.21641	10.05	30.94	12.34	40.99	22.39	62.96	52.96	-21.97	-30.57
4	10.52344	10.73	30.71	24.14	41.44	34.87	60.00	50.00	-18.56	-15.13
5	15.96484	11.09	31.77	24.29	42.86	35.38	60.00	50.00	-17.14	-14.62
<b>6</b>	<b>17.84375</b>	<b>11.22</b>	<b>31.27</b>	<b>24.53</b>	<b>42.49</b>	<b>35.75</b>	<b>60.00</b>	<b>50.00</b>	<b>-17.51</b>	<b>-14.25</b>
7	23.26172	11.44	29.08	15.63	40.52	27.07	60.00	50.00	-19.48	-22.93

#### 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

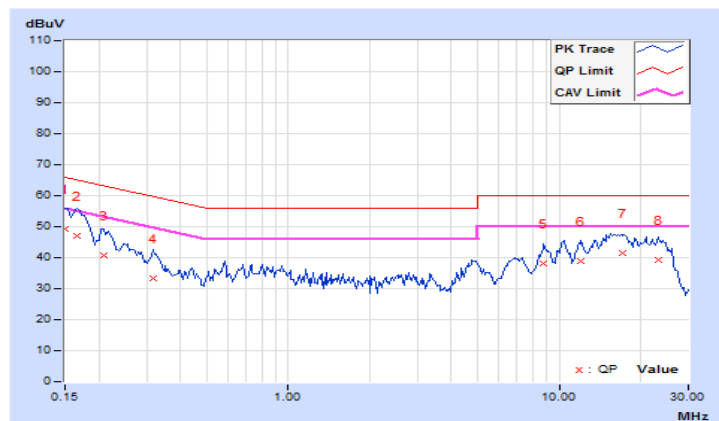


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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Phase Of Power : Neutral (N)										
No	Frequency (MHz)	Correction Factor (dB)	Reading Value (dBuV)		Emission Level (dBuV)		Limit (dBuV)		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	9.94	39.49	20.64	49.43	30.58	66.00	56.00	-16.57	-25.42
2	0.16562	9.94	37.08	17.27	47.02	27.21	65.18	55.18	-18.16	-27.97
3	0.20859	9.95	30.96	12.28	40.91	22.23	63.26	53.26	-22.35	-31.03
4	0.31797	9.97	23.27	5.88	33.24	15.85	59.76	49.76	-26.52	-33.91
5	8.75781	10.46	27.57	20.70	38.03	31.16	60.00	50.00	-21.97	-18.84
6	11.99219	10.65	28.19	21.60	38.84	32.25	60.00	50.00	-21.16	-17.75
7	17.20703	10.97	30.37	22.47	41.34	33.44	60.00	50.00	-18.66	-16.56
8	23.16797	11.19	28.19	14.08	39.38	25.27	60.00	50.00	-20.62	-24.73

**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

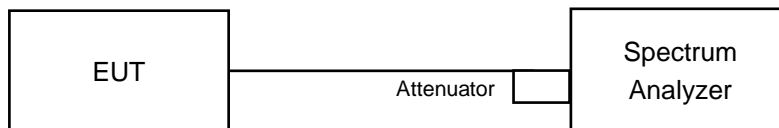


### 4.3 6dB Bandwidth Measurement

#### 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

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

#### 4.3.5 Deviation from Test Standard

No deviation.

#### 4.3.6 EUT Operating Conditions

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

#### 4.3.7 Test Result

##### 802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	7.59	0.5	PASS
6	2437	7.58	0.5	PASS
11	2462	7.14	0.5	PASS

##### 802.11g

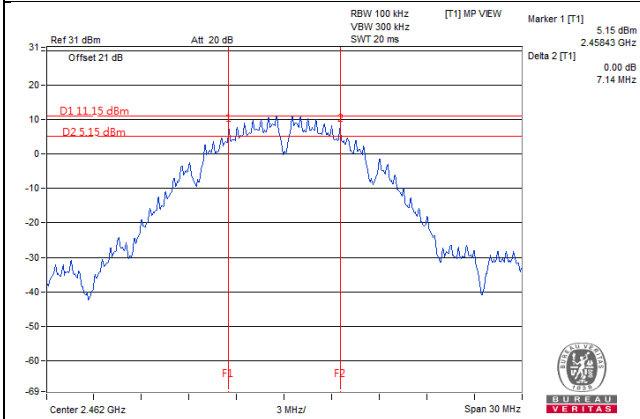
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.42	0.5	PASS
6	2437	16.03	0.5	PASS
11	2462	16.37	0.5	PASS

##### 802.11n (HT20)

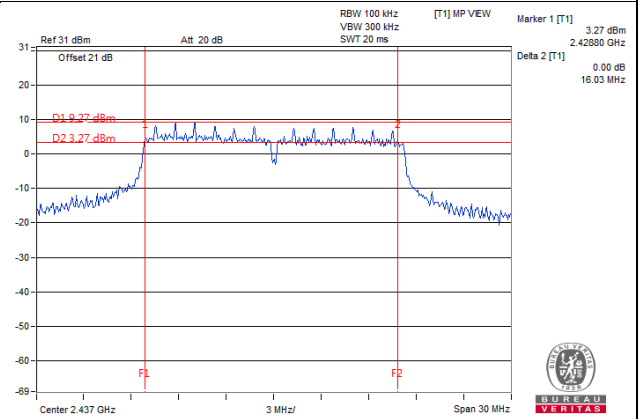
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	17.65	0.5	Pass
6	2437	17.39	0.5	Pass
11	2462	17.62	0.5	Pass

### Spectrum Plot of Worst Value

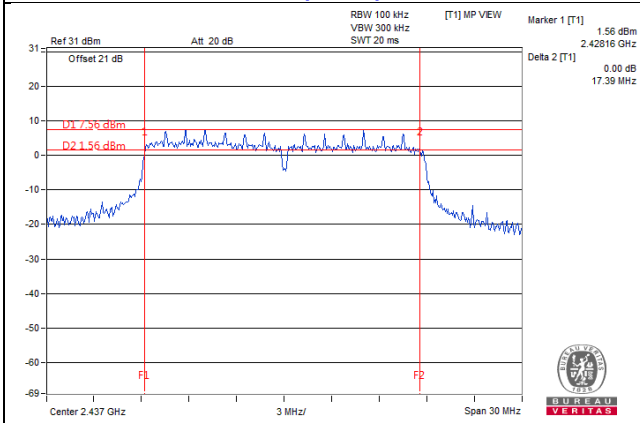
#### 802.11b : CH11



#### 802.11g : CH6



#### 802.11n (HT20): CH6

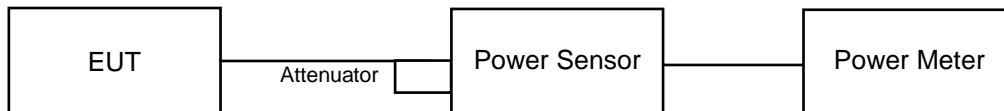


## 4.4 Conducted Output Power Measurement

### 4.4.1 Limits of Conducted Output Power Measurement

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

### 4.4.2 Test Setup



### 4.4.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.4.4 Test Procedures

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

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

### 4.4.5 Deviation from Test Standard

No deviation.

### 4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

#### 4.4.7 Test Results

#### FOR PEAK POWER

##### 802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	138.357	21.41	30	Pass
6	2437	134.276	21.28	30	Pass
11	2462	141.579	21.51	30	Pass

##### 802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	196.336	22.93	30	Pass
6	2437	261.818	24.18	30	Pass
11	2462	131.522	21.19	30	Pass

##### 802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	189.234	22.77	30	Pass
6	2437	247.172	23.93	30	Pass
11	2462	135.519	21.32	30	Pass

## FOR AVERAGE POWER

### 802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	77.804	18.91
6	2437	72.611	18.61
11	2462	77.983	18.92

### 802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	46.026	16.63
6	2437	76.033	18.81
11	2462	21.086	13.24

### 802.11n (HT20)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	38.815	15.89
6	2437	59.841	17.77
11	2462	19.099	12.81

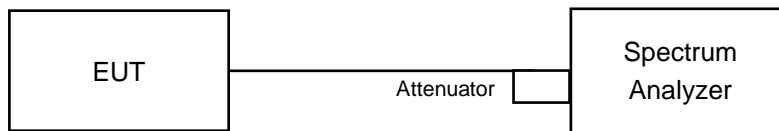


## 4.5 Power Spectral Density Measurement

### 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

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-2.48	8	Pass
6	2437	-2.98	8	Pass
11	2462	-2.09	8	Pass

##### 802.11g

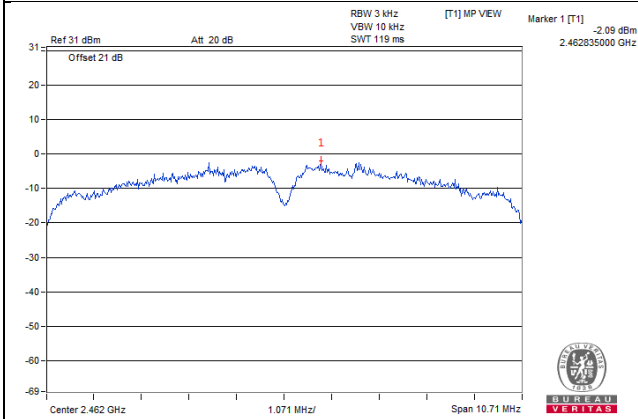
Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-6.82	8	Pass
6	2437	-6.06	8	Pass
11	2462	-6.03	8	Pass

##### 802.11n (HT20)

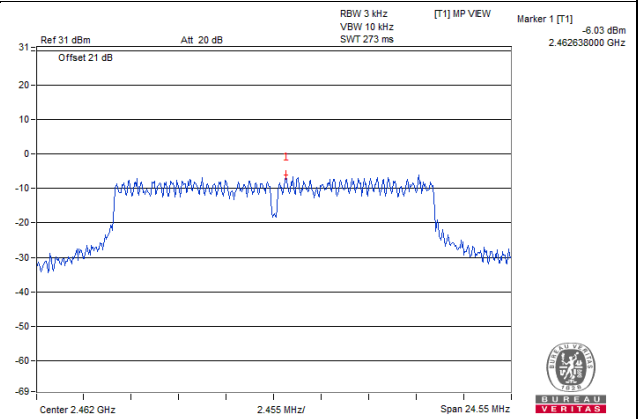
Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-9.47	8	Pass
6	2437	-7.37	8	Pass
11	2462	-11.62	8	Pass

### Spectrum Plot of Worst Value

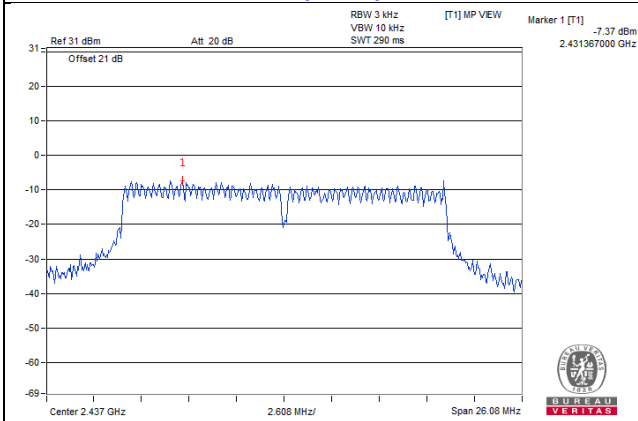
#### 802.11b : CH11



#### 802.11g : CH11



#### 802.11n (HT20): CH6

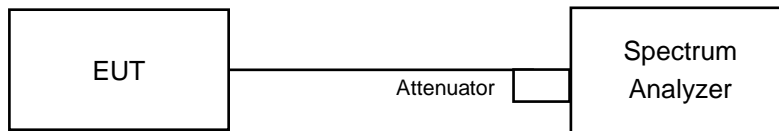


## 4.6 Conducted Out of Band Emission Measurement

### 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 OOB

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

### 4.6.5 Deviation from Test Standard

No deviation.

### 4.6.6 EUT Operating Condition

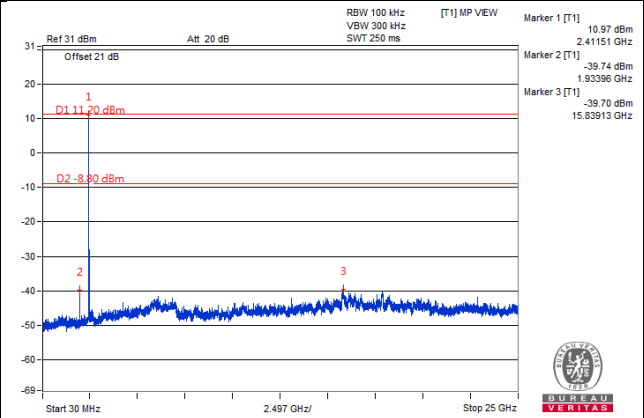
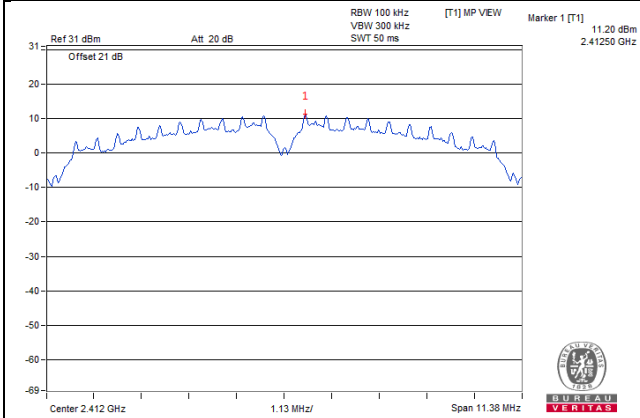
Same as Item 4.3.6

### 4.6.7 Test Results

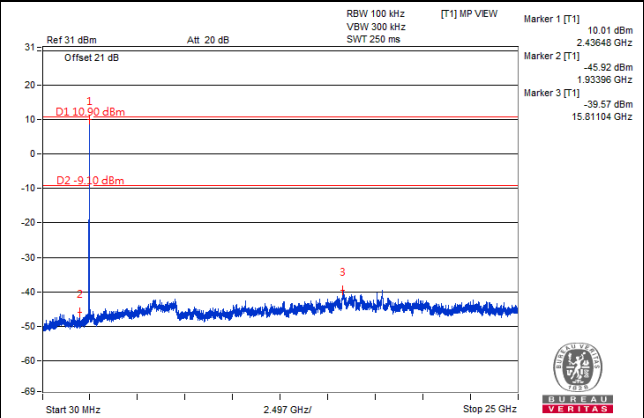
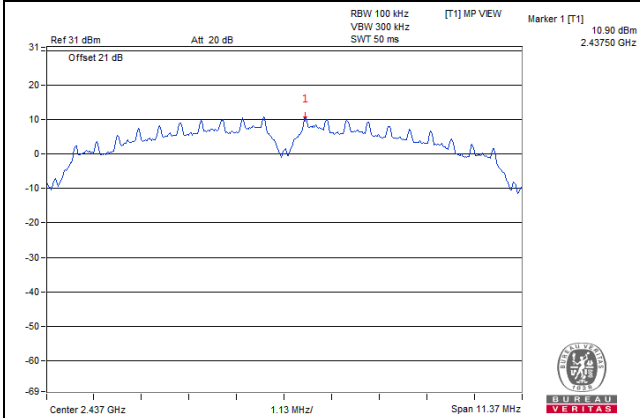
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dBoffset below D1. It shows compliance with the requirement.

# 802.11b

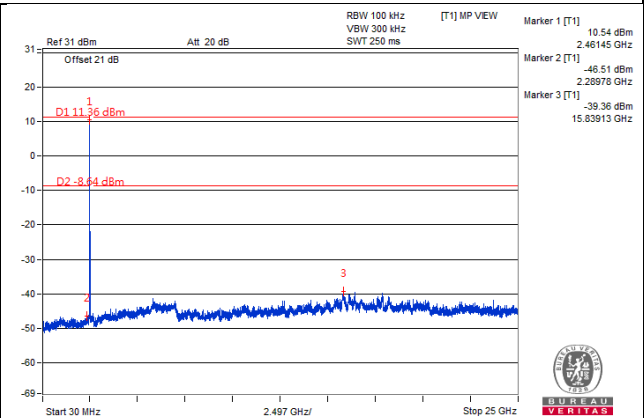
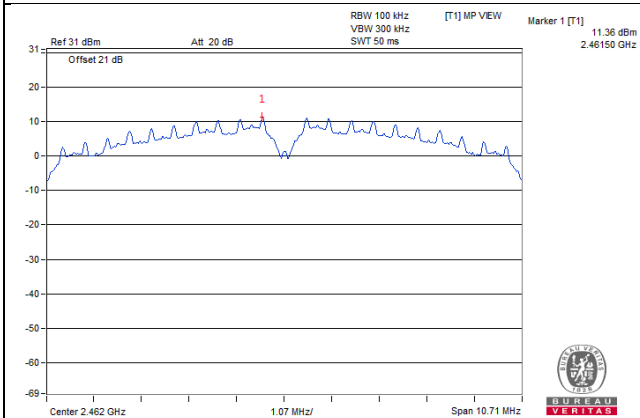
## CH 1



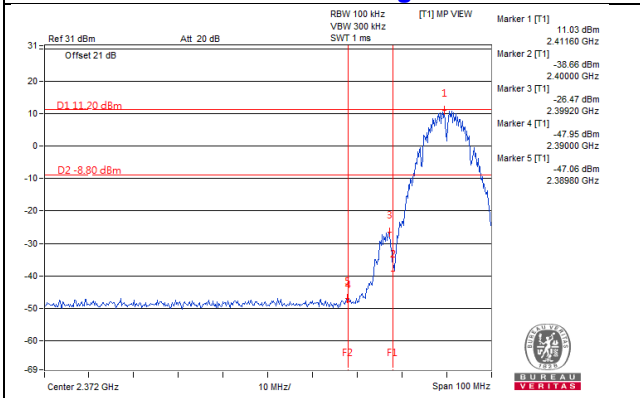
## CH 6



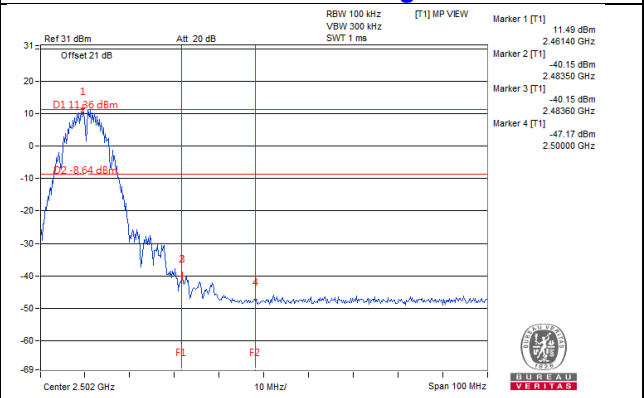
## CH 11



## CH 1 Band edge

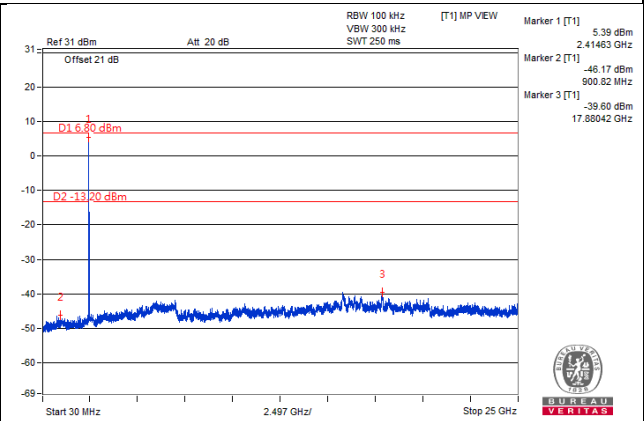
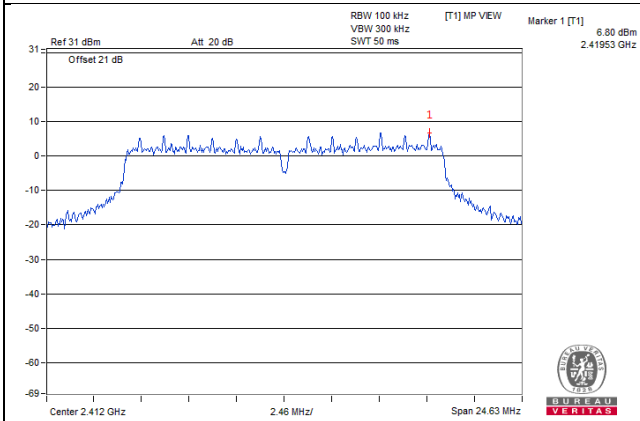


## CH 11 Band edge

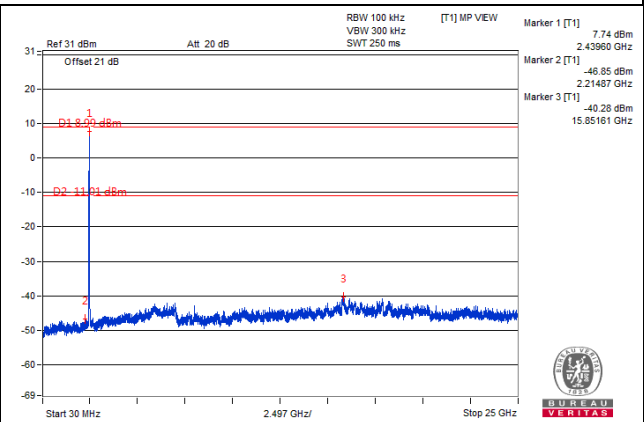
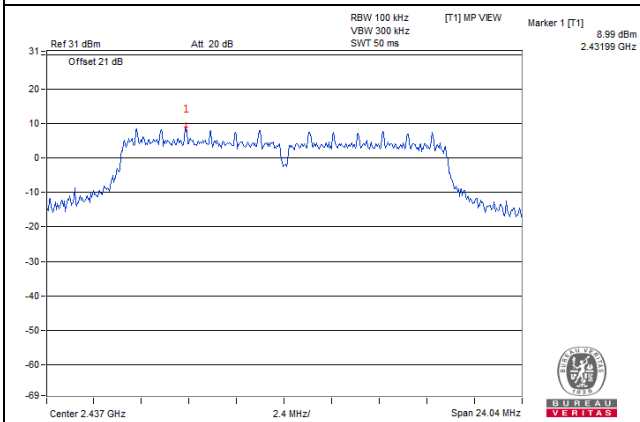


# 802.11g

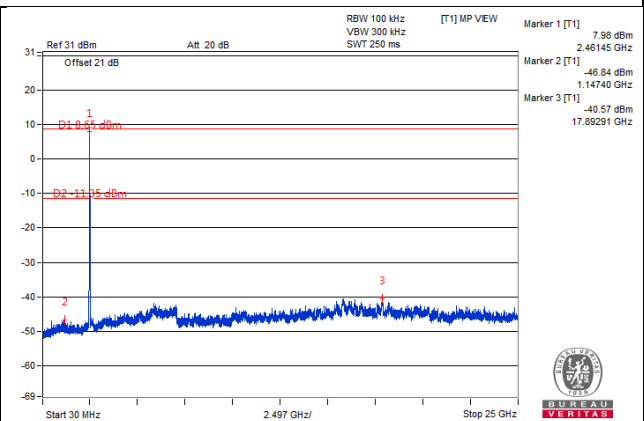
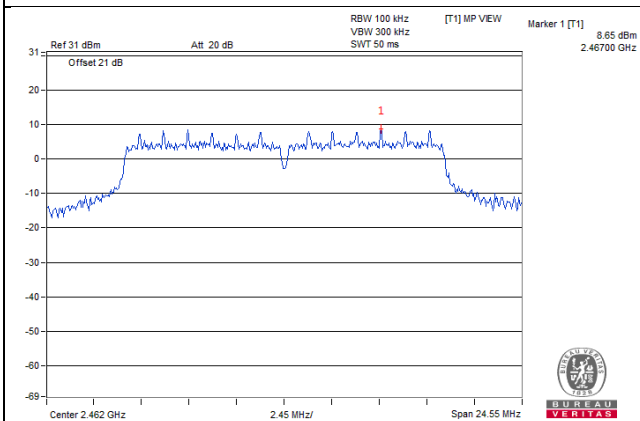
## CH 1



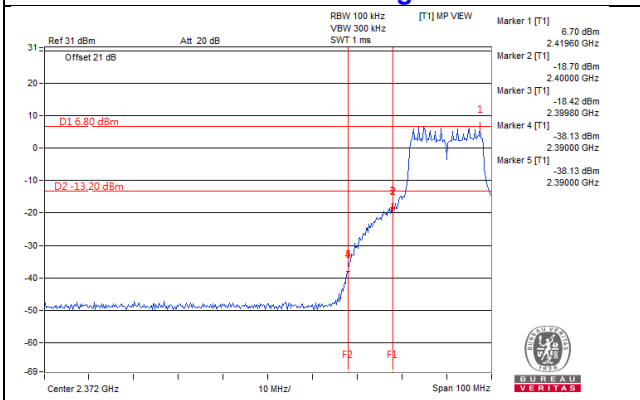
## CH 6



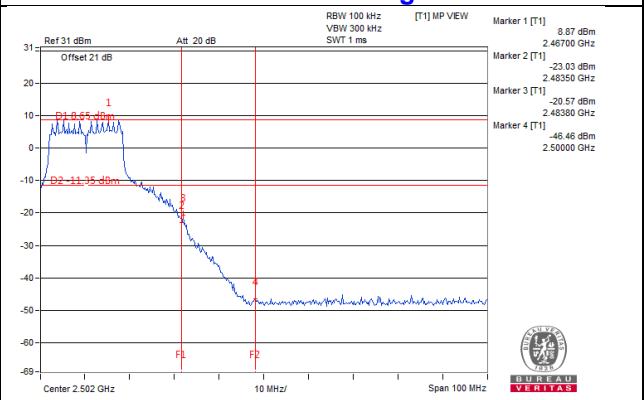
## CH 11



## CH 1 Band edge

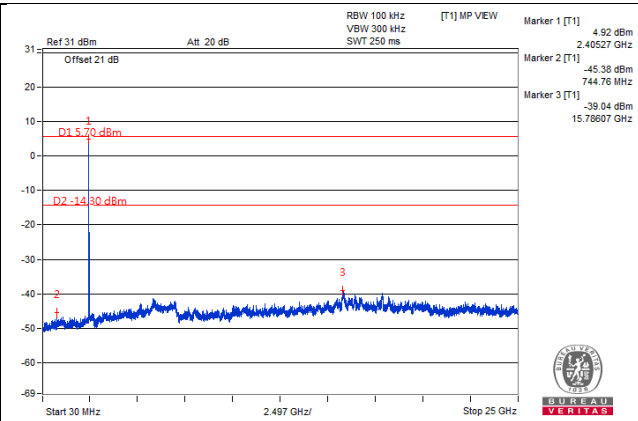
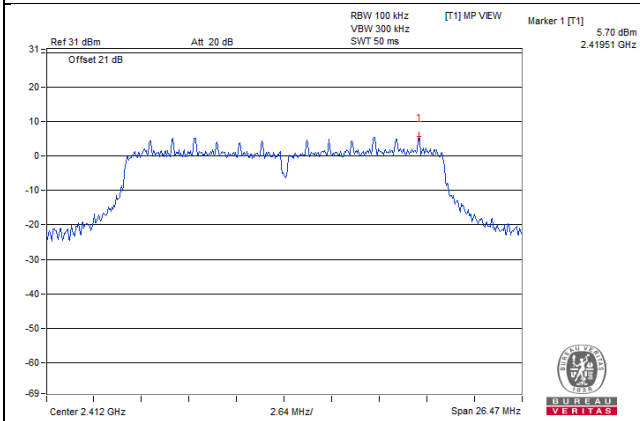


## CH 11 Band edge

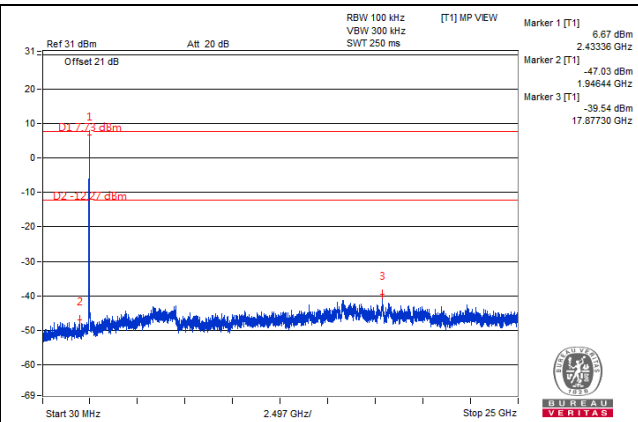
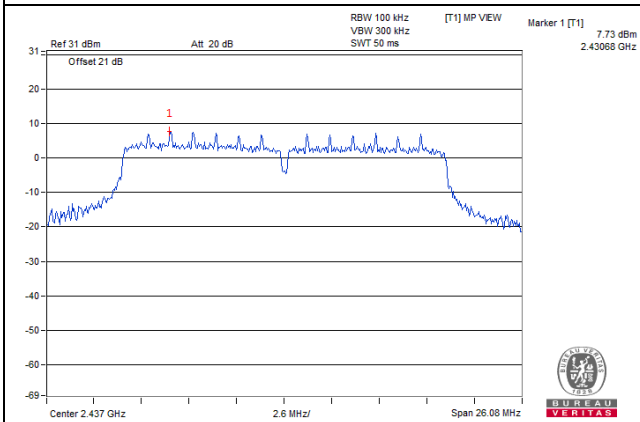


# 802.11n (HT20)

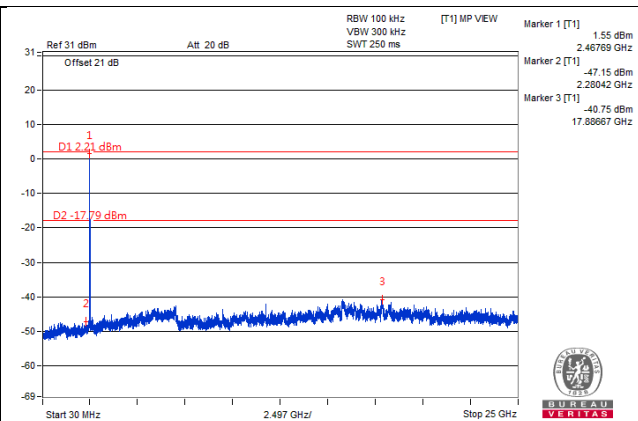
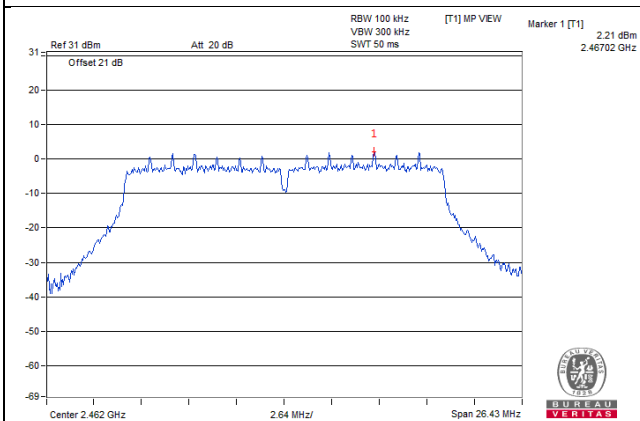
## CH 1



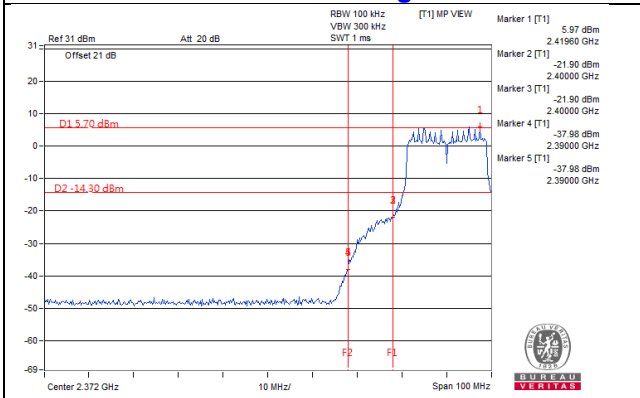
## CH 6



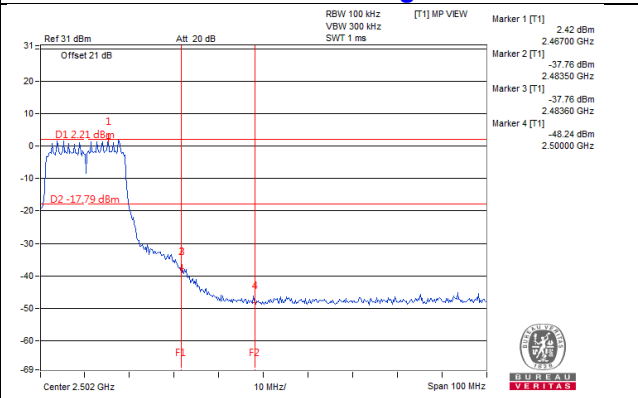
## CH 11



## CH 1 Band edge



## CH 11 Band edge



## 5 Pictures of Test Arrangements

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



## Appendix – Information of the Testing Laboratories

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

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

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

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