

## FCC Test Report

**Report No.:** RF180112E03

**FCC ID:** NOIKBN249

**Test Model:** N249

**Received Date:** Jan. 12, 2018

**Test Date:** Jan. 30 to Mar. 07, 2018

**Issued Date:** Mar. 12, 2018

**Applicant:** NETRONIX, INC.

**Address:** No. 945, Boai St., Jubei City, Hsin-Chu,302,Taiwan, R.O.C.

**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
RF180112E03	Original release.	Mar. 12, 2018

## 1 Certificate of Conformity

**Product:** Electronic Display Device

**Brand:** Rakuten Kobo

**Test Model:** N249

**Sample Status:** ENGINEERING SAMPLE

**Applicant:** NETRONIX, INC.

**Test Date:** Jan. 30 to Mar. 07, 2018

**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 :** Mary Ko , **Date:** Mar. 12, 2018  
Mary Ko / Specialist

**Approved by :** May Chen , **Date:** Mar. 12, 2018  
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 -14.33dB at 0.16562MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.1dB at 7311.00MHz.
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.

### 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	1.84 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	5.33 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.10 dB
	6GHz ~ 18GHz	4.85 dB
	18GHz ~ 40GHz	5.24 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

Product	Electronic Display Device
Brand	Rakuten Kobo
Test Model	N249
Status of EUT	ENGINEERING SAMPLE
Power Supply Rating	DC 3.7V from battery DC 5V from USB interface
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: up to 11Mbps 802.11g: up to 54Mbps 802.11n: up to 72.2Mbps
Operating Frequency	2.412 ~ 2.462GHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20): 11
Output Power	173.38mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	USB cable x 1 (1m, shielded)

Note:

1. The EUT could be supplied with a rechargeable battery as the following table:

Brand Name	Model No.	Spec.
TCL	PR-284983N	3.7Vdc, 1500mAh, 5.55 Wh

2. When USB port is charging the rechargeable battery, the EUT has WiFi function under charging mode. And the USB port is connected to Host unit, the EUT WiFi function will be disabled.

3. The EUT must be supplied with a USB Cable and following different brands could be chosen as following table:

No	Brand	Spec.
1	Yih Fone	Shielded, 1.0m
2	LUXSHARE	Shielded, 1.0m

From the above cables, the worst case was found in **No. 1**. Therefore only the test data of the mode was recorded in this report.

4. The EUT incorporates a SISO function.

MODULATION MODE	DATA RATE (MCS)	TX & RX CONFIGURATION	
<b>802.11b</b>	1 ~ 11Mbps	1TX	1RX
<b>802.11g</b>	6 ~ 54Mbps	1TX	1RX
<b>802.11n (HT20)</b>	MCS 0~7	1TX	1RX

5. 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
Walsin Technology Corporation	RFECA3216060AAT	2	2.4~2.4835	Ceramic	soldering terminal

6. For the radiated emissions, the EUT was pre-tested under the following modes:

Test Mode	Description
<b>Mode A</b>	<b>Power from adapter</b>
Mode B	Power from battery

From the above modes, the worst case was found in **Mode A**. Therefore only the test data of the mode was recorded in this report.

7. 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.



### 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	
1	√	√	√	√	Powered from adapter
2	-	-	√	-	Powered from laptop

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 **X-plane**.  
 2. "-" means no effect.

#### **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)
802.11n (HT20)	1 to 11	6	OFDM	BPSK	6.5

#### **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)
802.11n (HT20)	1 to 11	6	OFDM	BPSK	6.5

**Antenna Port Conducted Measurement:**

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

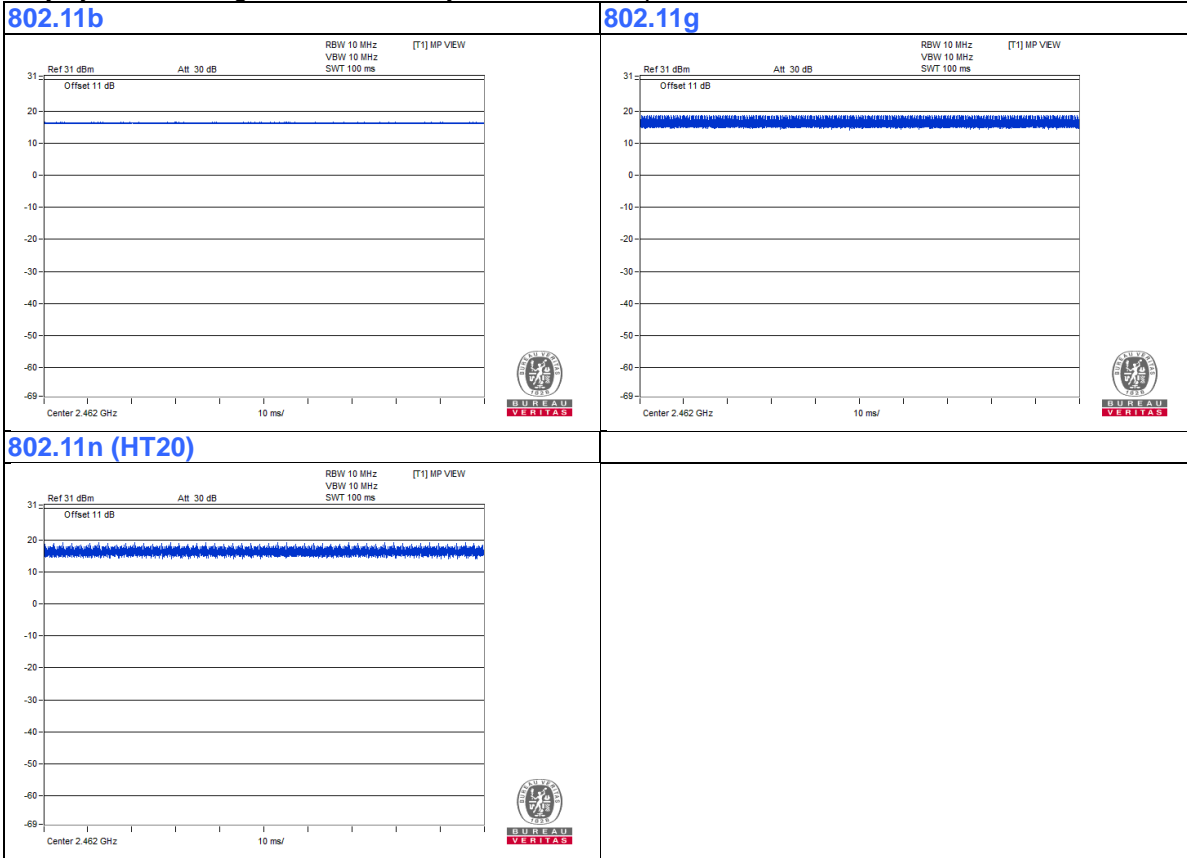
MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5

**Test Condition:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (system)	TESTED BY
RE $\geq$ 1G	24deg. C, 68%RH	120Vac, 60Hz	Andy Ho
RE<1G	2deg. C, 68%RH	120Vac, 60Hz	Steven Chiang
PLC	25deg. C, 75%RH	120Vac, 60Hz	Andy Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	Robert Cheng

### 3.3 Duty Cycle of Test Signal

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



### 3.4 Description of Support Units

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

ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	USB Adapter	ASUS	EXA1205UA	NA	NA	Provided by Lab
B.	Laptop	NA	NA	NA	NA	Provided by Lab

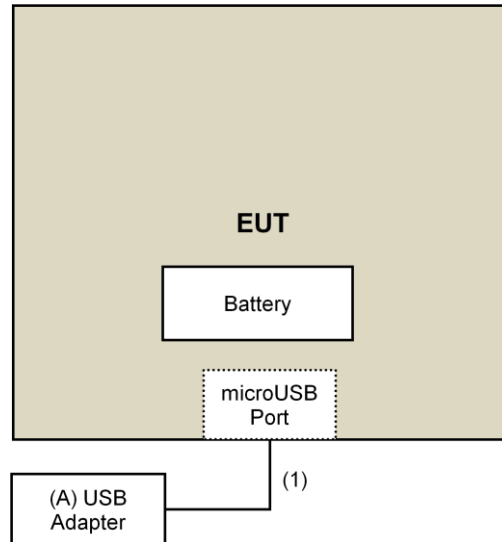
Note:

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

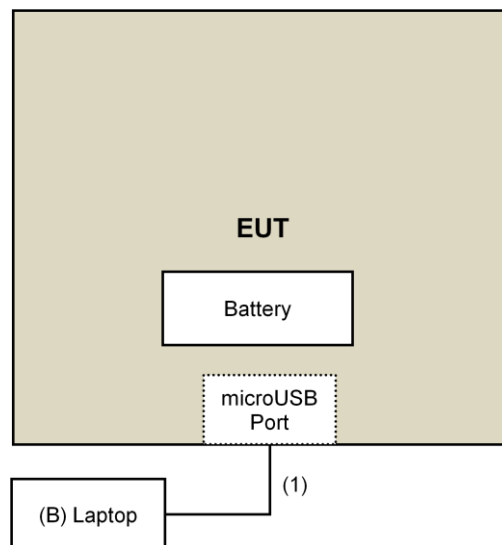
ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	USB Cable	1	1	Yes	0	Supplied by client

### 3.4.1 Configuration of System under Test

#### Adapter mode:



#### Laptop mode:



### 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 DTS Meas Guidance v04**  
**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

**For other test:**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver Keysight	N9038A	MY54450088	July 08, 2017	July 07, 2018
Loop Antenna <sup>(*)</sup> TESEQ	HLA 6121	45745	May 19, 2017	May 18, 2018
Pre-Amplifier Mini-Circuits	ZFL-1000VH2B	AMP-ZFL-01	Nov. 09, 2017	Nov. 08, 2018
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-406	Nov. 29, 2017	Nov. 28, 2018
RF Cable	8D	966-4-1 966-4-2 966-4-3	Apr. 01, 2017	Mar. 31, 2018
Fixed attenuator Mini-Circuits	UNAT-5+	PAD-3m-4-01	Oct. 03, 2017	Oct. 02, 2018
Horn_Antenna SCHWARZBECK	BBHA 9120D	9120D-783	Dec. 12, 2017	Dec. 11, 2018
Pre-Amplifier EMCI	EMC12630SE	980385	Jan. 29, 2018	Jan. 28, 2019
RF Cable	EMC104-SM-SM-1200 EMC104-SM-SM-2000 EMC104-SM-SM-5000	160923 150318 150321	Feb. 02, 2017 Mar. 29, 2017 Mar. 29, 2017	Feb. 01, 2018 Mar. 28, 2018 Mar. 28, 2018
Pre-Amplifier EMCI	EMC184045SE	980387	Jan. 29, 2018	Jan. 28, 2019
Horn_Antenna SCHWARZBECK	BBHA 9170	BBHA9170608	Dec. 14, 2017	Dec. 13, 2018
RF Cable	SUCOFLEX 102	36432/2 36433/2	Jan. 11, 2018	Jan. 10, 2019
Software	ADT_Radiated_V8.7.08	NA	NA	NA
Antenna Tower & Turn Table Max-Full	MF-7802	MF780208410	NA	NA
Boresight Antenna Fixture	FBA-01	FBA-SIP02	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 calibration interval of the above test instruments is 24 months and the calibrations are traceable to NML/ROC and NIST/USA.
3. The test was performed in 966 Chamber No. 4.
4. Loop antenna was used for all emissions below 30 MHz.
5. The CANADA Site Registration No. is 20331-2
6. Tested Date: Jan. 30, 2018

**For power output test:**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSV40	100964	July 1, 2017	June 30, 2018
Power meter Anritsu	ML2495A	1014008	May 11, 2017	May 10, 2018
Power sensor Anritsu	MA2411B	0917122	May 11, 2017	May 10, 2018

**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. The CANADA Site Registration No. is 20331-2
4. Tested Date: Mar. 07, 2018

#### 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. Both X and Y axes 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:**

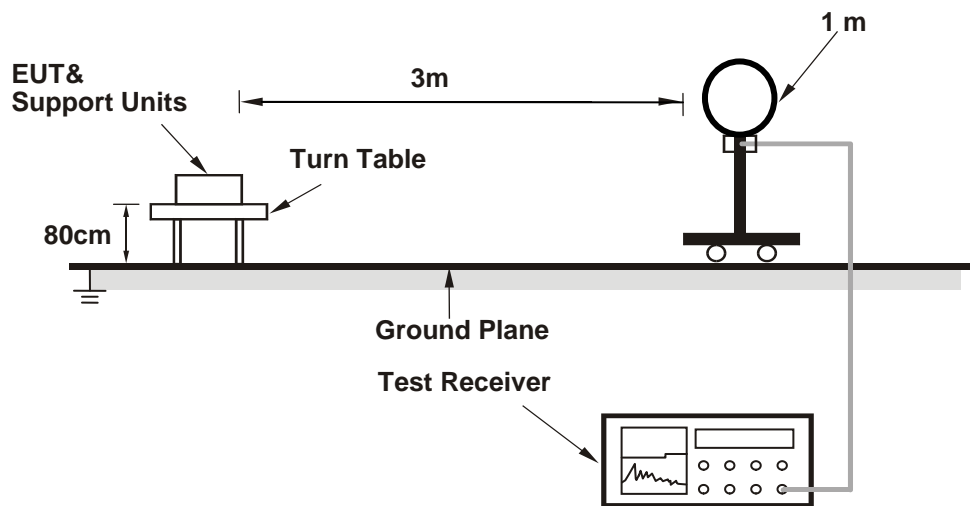
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

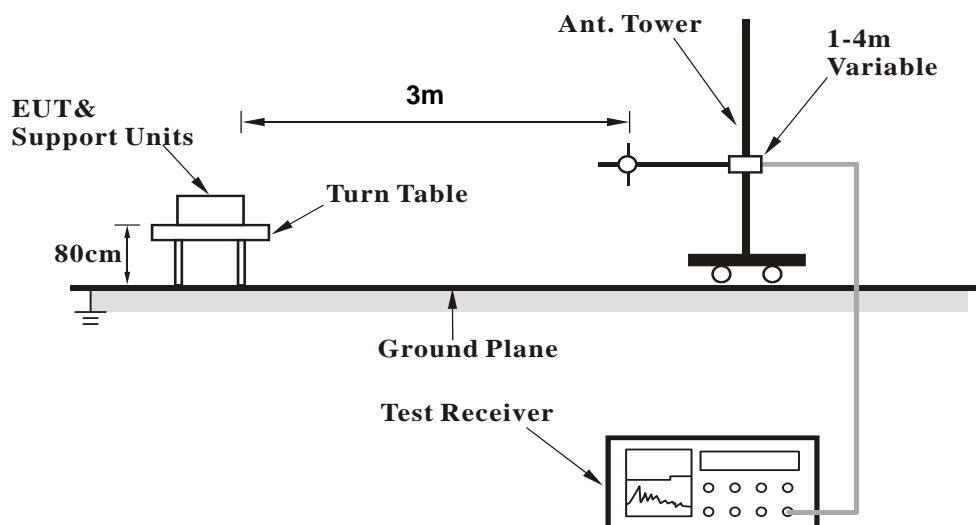
No deviation.

#### 4.1.5 Test Setup

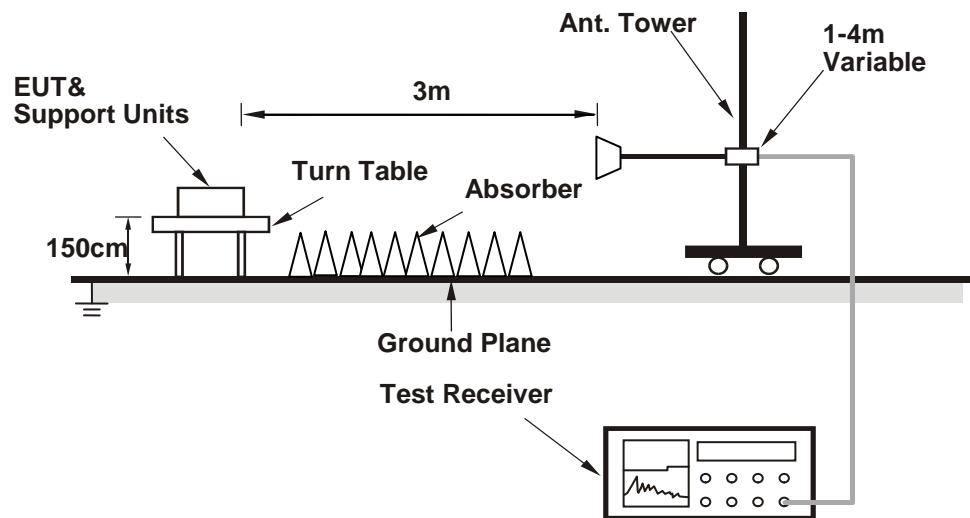
##### For Radiated emission below 30MHz



##### 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

- Placed the EUT on the testing table.
- Controlling software (HyperTerminal paste 1Tx\_WiFi\_Mp command .txt) has been activated to set the EUT on specific status.

## 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	56.9 PK	74.0	-17.1	1.00 H	200	57.9	-1.0
2	2390.00	50.1 AV	54.0	-3.9	1.00 H	200	51.1	-1.0
3	*2412.00	108.7 PK			1.00 H	200	109.7	-1.0
4	*2412.00	106.5 AV			1.00 H	200	107.5	-1.0
5	4824.00	48.4 PK	74.0	-25.6	1.15 H	5	45.3	3.1
6	4824.00	42.6 AV	54.0	-11.4	1.15 H	5	39.5	3.1

**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	55.1 PK	74.0	-18.9	3.64 V	317	56.1	-1.0
2	2390.00	45.6 AV	54.0	-8.4	3.64 V	317	46.6	-1.0
3	*2412.00	105.9 PK			3.64 V	317	106.9	-1.0
4	*2412.00	103.8 AV			3.64 V	317	104.8	-1.0
5	4824.00	51.3 PK	74.0	-22.7	1.00 V	39	48.2	3.1
6	4824.00	49.7 AV	54.0	-4.3	1.00 V	39	46.6	3.1

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	53.1 PK	74.0	-20.9	1.01 H	208	54.1	-1.0
2	2390.00	41.2 AV	54.0	-12.8	1.01 H	208	42.2	-1.0
3	*2437.00	106.1 PK			1.01 H	208	107.5	-1.4
4	*2437.00	103.5 AV			1.01 H	208	104.9	-1.4
5	2483.50	52.8 PK	74.0	-21.2	1.01 H	208	54.0	-1.2
6	2483.50	40.9 AV	54.0	-13.1	1.01 H	208	42.1	-1.2
7	4874.00	48.5 PK	74.0	-25.5	1.19 H	8	45.2	3.3
8	4874.00	42.4 AV	54.0	-11.6	1.19 H	8	39.1	3.3
9	7311.00	54.2 PK	74.0	-19.8	1.23 H	343	44.2	10.0
10	7311.00	50.8 AV	54.0	-3.2	1.23 H	343	40.8	10.0

**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	51.3 PK	74.0	-22.7	3.56 V	295	52.3	-1.0
2	2390.00	36.7 AV	54.0	-17.3	3.56 V	295	37.7	-1.0
3	*2437.00	102.6 PK			3.56 V	295	104.0	-1.4
4	*2437.00	100.8 AV			3.56 V	295	102.2	-1.4
5	2483.50	51.0 PK	74.0	-23.0	3.56 V	295	52.2	-1.2
6	2483.50	36.4 AV	54.0	-17.6	3.56 V	295	37.6	-1.2
7	4874.00	51.7 PK	74.0	-22.3	1.06 V	34	48.4	3.3
8	4874.00	49.3 AV	54.0	-4.7	1.06 V	34	46.0	3.3
9	7311.00	56.5 PK	74.0	-17.5	1.11 V	347	46.5	10.0
<b>10</b>	<b>7311.00</b>	<b>53.9 AV</b>	<b>54.0</b>	<b>-0.1</b>	<b>1.11 V</b>	<b>347</b>	<b>43.9</b>	<b>10.0</b>

**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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	105.8 PK			1.02 H	204	107.2	-1.4
2	*2462.00	103.2 AV			1.02 H	204	104.6	-1.4
3	2483.50	53.5 PK	74.0	-20.5	1.02 H	204	54.7	-1.2
4	2483.50	41.7 AV	54.0	-12.3	1.02 H	204	42.9	-1.2
5	4924.00	42.6 PK	74.0	-31.4	1.10 H	4	39.1	3.5
6	4924.00	36.8 AV	54.0	-17.2	1.10 H	4	33.3	3.5
7	7386.00	53.7 PK	74.0	-20.3	1.26 H	332	43.5	10.2
8	7386.00	50.4 AV	54.0	-3.6	1.26 H	332	40.2	10.2

**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	*2462.00	101.9 PK			3.53 V	310	103.3	-1.4
2	*2462.00	100.5 AV			3.53 V	310	101.9	-1.4
3	2483.50	51.7 PK	74.0	-22.3	3.53 V	310	52.9	-1.2
4	2483.50	37.2 AV	54.0	-16.8	3.53 V	310	38.4	-1.2
5	4924.00	45.7 PK	74.0	-28.3	1.00 V	32	42.2	3.5
6	4924.00	43.1 AV	54.0	-10.9	1.00 V	32	39.6	3.5
7	7386.00	56.2 PK	74.0	-17.8	2.64 V	360	46.0	10.2
8	7386.00	53.7 AV	54.0	-0.3	2.64 V	360	43.5	10.2

**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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	68.4 PK	74.0	-5.6	1.46 H	200	69.4	-1.0
2	2390.00	52.3 AV	54.0	-1.7	1.46 H	200	53.3	-1.0
3	*2412.00	106.8 PK			1.46 H	200	107.8	-1.0
4	*2412.00	97.8 AV			1.46 H	200	98.8	-1.0
5	4824.00	36.2 PK	74.0	-37.8	1.18 H	10	33.1	3.1
6	4824.00	27.1 AV	54.0	-26.9	1.18 H	10	24.0	3.1

**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	66.6 PK	74.0	-7.4	3.54 V	308	67.6	-1.0
2	2390.00	47.8 AV	54.0	-6.2	3.54 V	308	48.8	-1.0
3	*2412.00	101.9 PK			3.54 V	308	102.9	-1.0
4	*2412.00	95.1 AV			3.54 V	308	96.1	-1.0
5	4824.00	39.2 PK	74.0	-34.8	1.54 V	61	36.1	3.1
6	4824.00	30.1 AV	54.0	-23.9	1.54 V	61	27.0	3.1

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	53.5 PK	74.0	-20.5	1.25 H	203	54.5	-1.0
2	2390.00	41.2 AV	54.0	-12.8	1.25 H	203	42.2	-1.0
3	*2437.00	107.6 PK			1.25 H	203	109.0	-1.4
4	*2437.00	99.2 AV			1.25 H	203	100.6	-1.4
5	2483.50	61.4 PK	74.0	-12.6	1.25 H	203	62.6	-1.2
6	2483.50	44.5 AV	54.0	-9.5	1.25 H	203	45.7	-1.2
7	4874.00	40.7 PK	74.0	-33.3	1.18 H	16	37.4	3.3
8	4874.00	29.1 AV	54.0	-24.9	1.18 H	16	25.8	3.3
9	7311.00	57.0 PK	74.0	-17.0	1.26 H	330	47.0	10.0
10	7311.00	44.6 AV	54.0	-9.4	1.26 H	330	34.6	10.0

**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	51.7 PK	74.0	-22.3	3.58 V	303	52.7	-1.0
2	2390.00	36.7 AV	54.0	-17.3	3.58 V	303	37.7	-1.0
3	*2437.00	102.7 PK			3.58 V	303	104.1	-1.4
4	*2437.00	96.5 AV			3.58 V	303	97.9	-1.4
5	2483.50	59.6 PK	74.0	-14.4	3.58 V	303	60.8	-1.2
6	2483.50	40.0 AV	54.0	-14.0	3.58 V	303	41.2	-1.2
7	4874.00	43.9 PK	74.0	-30.1	1.01 V	36	40.6	3.3
8	4874.00	32.1 AV	54.0	-21.9	1.01 V	36	28.8	3.3
9	7311.00	60.2 PK	74.0	-13.8	1.00 V	336	50.2	10.0
10	7311.00	47.6 AV	54.0	-6.4	1.00 V	336	37.6	10.0

**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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	106.2 PK			1.19 H	204	107.6	-1.4
2	*2462.00	97.3 AV			1.19 H	204	98.7	-1.4
3	2483.50	70.8 PK	74.0	-3.2	1.19 H	204	72.0	-1.2
4	2483.50	53.8 AV	54.0	-0.2	1.19 H	204	55.0	-1.2
5	4924.00	40.2 PK	74.0	-33.8	1.13 H	8	36.7	3.5
6	4924.00	28.9 AV	54.0	-25.1	1.13 H	8	25.4	3.5
7	7386.00	57.3 PK	74.0	-16.7	1.30 H	340	47.1	10.2
8	7386.00	44.7 AV	54.0	-9.3	1.30 H	340	34.5	10.2

**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	*2462.00	101.7 PK			3.56 V	314	103.1	-1.4
2	*2462.00	94.6 AV			3.56 V	314	96.0	-1.4
3	2483.50	69.0 PK	74.0	-5.0	3.56 V	314	70.2	-1.2
4	2483.50	49.3 AV	54.0	-4.7	3.56 V	314	50.5	-1.2
5	4924.00	36.9 PK	74.0	-37.1	1.61 V	30	33.4	3.5
6	4924.00	28.2 AV	54.0	-25.8	1.61 V	30	24.7	3.5
7	7386.00	62.8 PK	74.0	-11.2	1.00 V	346	52.6	10.2
8	7386.00	49.5 AV	54.0	-4.5	1.00 V	346	39.3	10.2

**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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	69.6 PK	74.0	-4.4	1.46 H	200	70.6	-1.0
2	2390.00	52.9 AV	54.0	-1.1	1.46 H	200	53.9	-1.0
3	*2412.00	106.2 PK			1.46 H	200	107.2	-1.0
4	*2412.00	97.5 AV			1.46 H	200	98.5	-1.0
5	4824.00	35.9 PK	74.0	-38.1	1.12 H	20	32.8	3.1
6	4824.00	26.9 AV	54.0	-27.1	1.12 H	20	23.8	3.1

**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	67.8 PK	74.0	-6.2	3.57 V	310	68.8	-1.0
2	2390.00	48.4 AV	54.0	-5.6	3.57 V	310	49.4	-1.0
3	*2412.00	101.3 PK			3.57 V	310	102.3	-1.0
4	*2412.00	94.8 AV			3.57 V	310	95.8	-1.0
5	4824.00	39.4 PK	74.0	-34.6	1.51 V	71	36.3	3.1
6	4824.00	30.0 AV	54.0	-24.0	1.51 V	71	26.9	3.1

**REMARKS:**

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB) – Pre-Amplifier Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	108.4 PK			1.20 H	202	109.8	-1.4
2	*2437.00	99.7 AV			1.20 H	202	101.1	-1.4
3	4874.00	40.8 PK	74.0	-33.2	1.19 H	21	37.5	3.3
4	4874.00	29.4 AV	54.0	-24.6	1.19 H	21	26.1	3.3
5	7311.00	56.7 PK	74.0	-17.3	1.28 H	337	46.7	10.0
6	7311.00	44.3 AV	54.0	-9.7	1.28 H	337	34.3	10.0

**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	103.5 PK			3.54 V	304	104.9	-1.4
2	*2437.00	97.0 AV			3.54 V	304	98.4	-1.4
3	4874.00	44.0 PK	74.0	-30.0	1.00 V	51	40.7	3.3
4	4874.00	32.1 AV	54.0	-21.9	1.00 V	51	28.8	3.3
5	7311.00	60.1 PK	74.0	-13.9	1.01 V	336	50.1	10.0
6	7311.00	47.6 AV	54.0	-6.4	1.01 V	336	37.6	10.0

**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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
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	106.5 PK			1.44 H	204	107.9	-1.4
2	*2462.00	97.1 AV			1.44 H	204	98.5	-1.4
3	2483.50	73.1 PK	74.0	-0.9	1.44 H	204	74.3	-1.2
4	2483.50	53.8 AV	54.0	-0.2	1.44 H	204	55.0	-1.2
5	4924.00	40.7 PK	74.0	-33.3	1.11 H	23	37.2	3.5
6	4924.00	29.3 AV	54.0	-24.7	1.11 H	23	25.8	3.5
7	7386.00	56.7 PK	74.0	-17.3	1.33 H	335	46.5	10.2
8	7386.00	44.3 AV	54.0	-9.7	1.33 H	335	34.1	10.2

**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	*2462.00	101.6 PK			3.61 V	299	103.0	-1.4
2	*2462.00	94.4 AV			3.61 V	299	95.8	-1.4
3	2483.50	71.3 PK	74.0	-2.7	3.61 V	299	72.5	-1.2
4	2483.50	49.3 AV	54.0	-4.7	3.61 V	299	50.5	-1.2
5	4924.00	36.3 PK	74.0	-37.7	1.01 V	39	32.8	3.5
6	4924.00	27.8 AV	54.0	-26.2	1.01 V	39	24.3	3.5
7	7386.00	62.6 PK	74.0	-11.4	1.00 V	336	52.4	10.2
8	7386.00	49.3 AV	54.0	-4.7	1.00 V	336	39.1	10.2

**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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value
5. " \* ": Fundamental frequency.

**Below 1GHz Data:**

**802.11n (HT20)**

<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	30.00	36.7 QP	40.0	-3.3	1.00 H	138	45.5	-8.8
2	83.96	25.7 QP	40.0	-14.3	2.00 H	240	39.0	-13.3
3	188.38	24.2 QP	43.5	-19.3	1.50 H	85	34.7	-10.5
4	527.29	26.8 QP	46.0	-19.2	1.50 H	254	28.6	-1.8
5	801.47	31.5 QP	46.0	-14.5	3.00 H	25	28.5	3.0
6	917.16	33.4 QP	46.0	-12.6	2.00 H	230	28.5	4.9

**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	41.98	35.5 QP	40.0	-4.5	1.00 V	360	43.5	-8.0
2	84.13	26.4 QP	40.0	-13.6	2.00 V	73	39.8	-13.4
3	388.27	23.6 QP	46.0	-22.4	2.50 V	156	28.4	-4.8
4	716.81	30.3 QP	46.0	-15.7	3.00 V	0	28.9	1.4
5	891.14	33.9 QP	46.0	-12.1	2.50 V	55	29.6	4.3
6	976.89	34.1 QP	54.0	-19.9	1.00 V	222	28.8	5.3

**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. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

## 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	Nov. 01, 2017	Oct. 31, 2018
Line-Impedance Stabilization Network (for EUT) R&S	ESH3-Z5	848773/004	Nov. 15, 2017	Nov. 14, 2018
Line-Impedance Stabilization Network (for Peripheral) R&S	ENV216	100072	June 03, 2017	June 02, 2018
50 ohms Terminator	N/A	EMC-02	Sep. 22, 2017	Sep. 21, 2018
RF Cable	5D-FB	COCCAB-001	Sep. 29, 2017	Sep. 28, 2018
10 dB PAD Mini-Circuits	HAT-10+	CONATT-004	June 18, 2017	June 17, 2018
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 Shielded Room No. 1.
3. Tested Date: Jan. 31, 2018



#### 4.2.3 Test Procedures

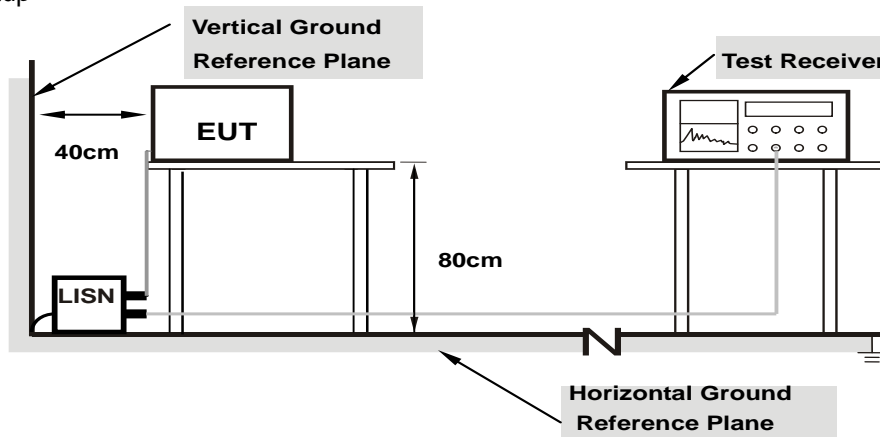
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded.

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

#### 4.2.4 Deviation from Test Standard

No deviation.

#### 4.2.5 Test Setup



**Note: 1.Support units were connected to second LISN.**

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

#### 4.2.6 EUT Operating Conditions

Same as 4.1.6.

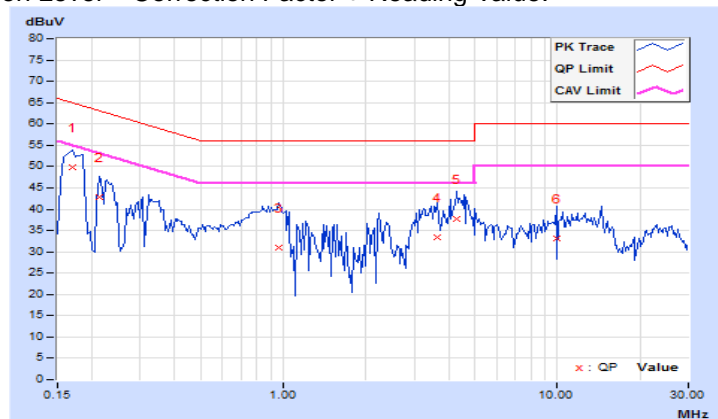
#### 4.2.7 Test Results (Mode 1)

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

No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	
1	0.16953	10.14	39.70	27.27	49.84	37.41	64.98	54.98	-15.14	-17.57
2	0.21250	10.15	32.59	21.68	42.74	31.83	63.11	53.11	-20.37	-21.28
3	0.95859	10.25	20.63	6.74	30.88	16.99	56.00	46.00	-25.12	-29.01
4	3.62891	10.41	22.86	9.83	33.27	20.24	56.00	46.00	-22.73	-25.76
5	4.30078	10.46	27.34	13.42	37.80	23.88	56.00	46.00	-18.20	-22.12
6	9.90625	10.80	22.32	13.02	33.12	23.82	60.00	50.00	-26.88	-26.18

#### 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.

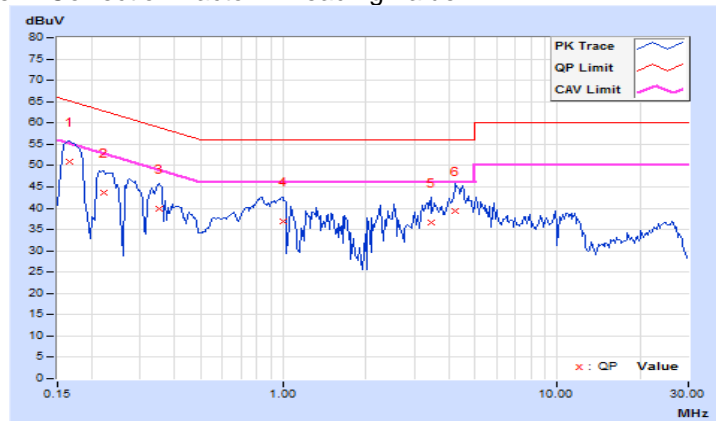


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
	<b>1</b>	<b>0.16562</b>	<b>10.05</b>	<b>40.80</b>	<b>25.49</b>	<b>50.85</b>	<b>35.54</b>	<b>65.18</b>	<b>55.18</b>	<b>-14.33</b>
2	0.22031	10.06	33.69	18.25	43.75	28.31	62.81	52.81	-19.06	-24.50
3	0.35313	10.09	29.78	16.41	39.87	26.50	58.89	48.89	-19.02	-22.39
4	0.99375	10.12	26.80	10.73	36.92	20.85	56.00	46.00	-19.08	-25.15
5	3.45313	10.26	26.42	12.90	36.68	23.16	56.00	46.00	-19.32	-22.84
6	4.24219	10.30	29.16	15.14	39.46	25.44	56.00	46.00	-16.54	-20.56

#### 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.



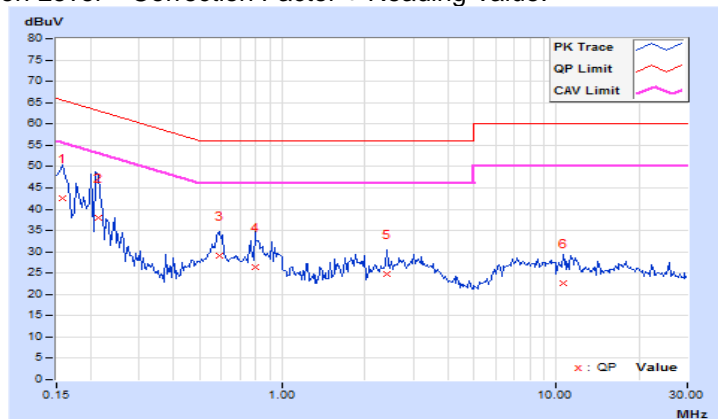
#### 4.2.8 Test Results (Mode 2)

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

No	Freq. [MHz]	Corr.	Reading Value		Emission Level		Limit		Margin	
		Factor	[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	
1	0.15781	10.13	32.33	16.55	42.46	26.68	65.58	55.58	-23.12	-28.90
2	0.21250	10.14	27.93	22.59	38.07	32.73	63.11	53.11	-25.04	-20.38
3	0.59141	10.20	18.90	11.24	29.10	21.44	56.00	46.00	-26.90	-24.56
4	0.79453	10.22	16.31	7.18	26.53	17.40	56.00	46.00	-29.47	-28.60
5	2.40625	10.29	14.44	8.86	24.73	19.15	56.00	46.00	-31.27	-26.85
6	10.62109	10.68	12.05	6.57	22.73	17.25	60.00	50.00	-37.27	-32.75

#### 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.

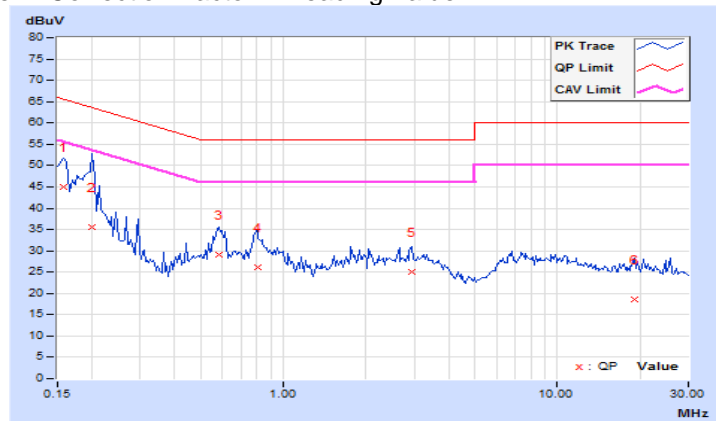


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
		(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
	1	0.15781	10.04	34.98	16.15	45.02	26.19	65.58	55.58	-20.56
2	0.20078	10.04	25.45	12.73	35.49	22.77	63.58	53.58	-28.09	-30.81
3	0.58359	10.09	18.88	12.23	28.97	22.32	56.00	46.00	-27.03	-23.68
4	0.80234	10.10	16.11	7.14	26.21	17.24	56.00	46.00	-29.79	-28.76
5	2.94141	10.19	14.79	10.07	24.98	20.26	56.00	46.00	-31.02	-25.74
6	19.00781	10.97	7.65	1.97	18.62	12.94	60.00	50.00	-41.38	-37.06

**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.

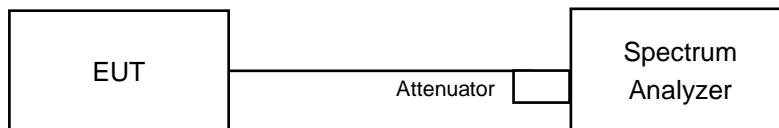


### 4.3 6dB Bandwidth Measurement

#### 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	9.08	0.5	PASS
6	2437	9.11	0.5	PASS
11	2462	9.10	0.5	PASS

##### 802.11g

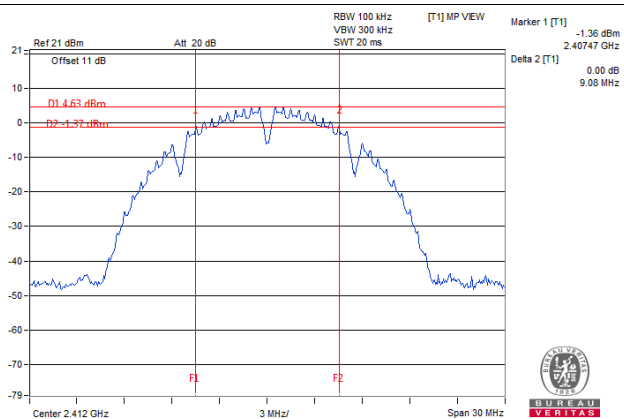
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.62	0.5	PASS
6	2437	16.62	0.5	PASS
11	2462	16.64	0.5	PASS

##### 802.11n (HT20)

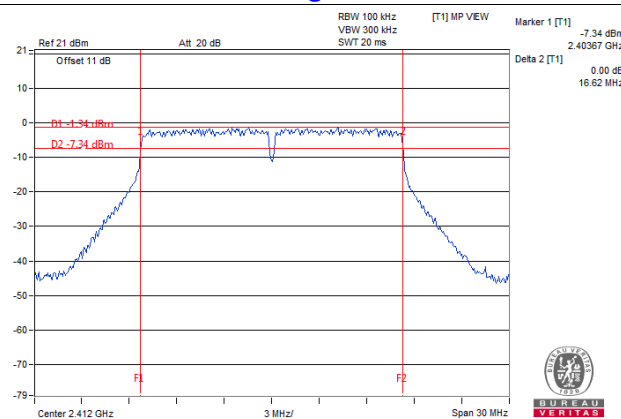
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	17.79	0.5	Pass
6	2437	17.78	0.5	Pass
11	2462	17.78	0.5	Pass

### Spectrum Plot of Worst Value

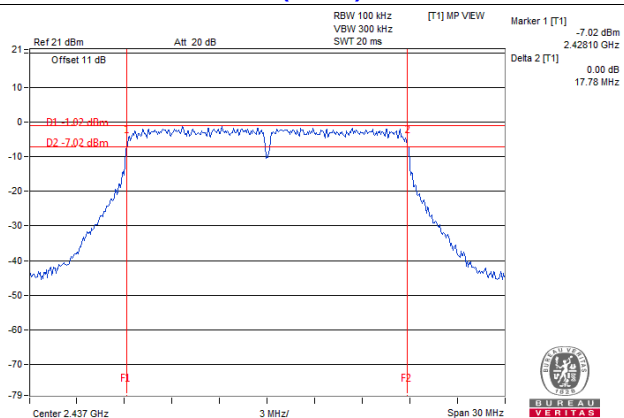
#### 802.11b / CH1



#### 802.11g / CH1



#### 802.11n (HT20) / CH6



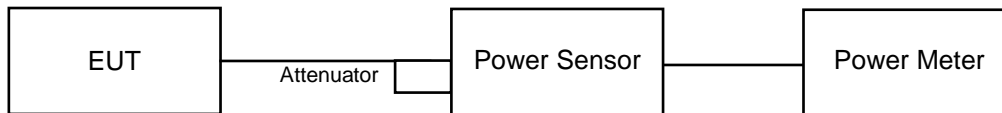


## 4.5 Conducted Output Power Measurement

### 4.5.1 Limits of Conducted Output Power Measurement

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

### 4.5.2 Test Setup



### 4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.5.4 Test Procedures

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

### 4.5.5 Deviation from Test Standard

No deviation.

### 4.5.6 EUT Operating Conditions

Same as Item 4.3.6.

#### 4.5.7 Test Results

#### FOR PEAK POWER

##### 802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	53.333	17.27	30	Pass
6	2437	53.703	17.30	30	Pass
11	2462	50.119	17.00	30	Pass

##### 802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	159.221	22.02	30	Pass
6	2437	157.036	21.96	30	Pass
11	2462	157.036	21.96	30	Pass

##### 802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	173.38	22.39	30	Pass
6	2437	150.661	21.78	30	Pass
11	2462	171.396	22.34	30	Pass

## FOR AVERAGE POWER

### 802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	28.379	14.53
6	2437	29.107	14.64
11	2462	26.485	14.23

### 802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	22.491	13.52
6	2437	21.184	13.26
11	2462	21.232	13.27

### 802.11n (HT20)

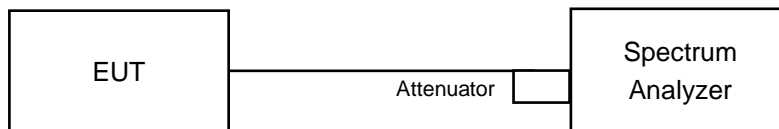
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	21.878	13.40
6	2437	22.336	13.49
11	2462	21.135	13.25

## 4.6 Power Spectral Density Measurement

### 4.6.1 Limits of Power Spectral Density Measurement

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

### 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

- 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.

### 4.6.5 Deviation from Test Standard

No deviation.

### 4.6.6 EUT Operating Condition

Same as Item 4.3.6

#### 4.6.7 Test Results

##### 802.11b

Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-15.50	8	Pass
6	2437	-15.44	8	Pass
11	2462	-16.00	8	Pass

##### 802.11g

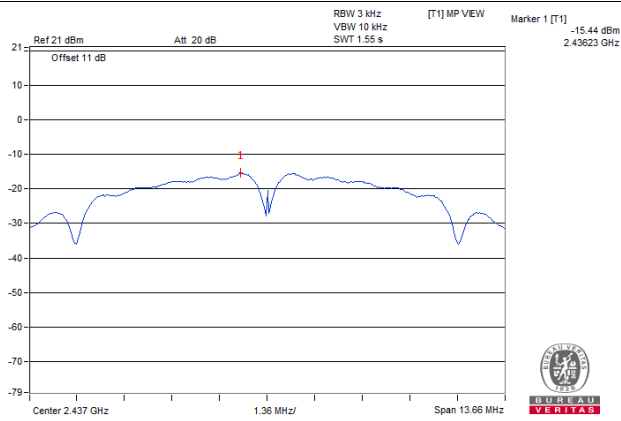
Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-15.41	8	Pass
6	2437	-16.08	8	Pass
11	2462	-15.77	8	Pass

##### 802.11n (HT20)

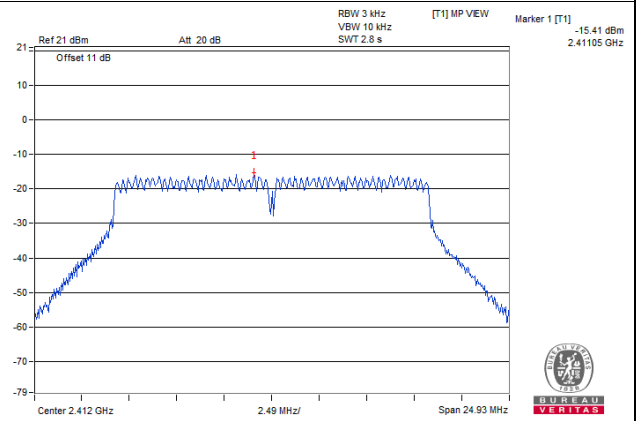
Channel	Freq. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	Pass /Fail
1	2412	-15.20	8	Pass
6	2437	-14.68	8	Pass
11	2462	-14.96	8	Pass

### Spectrum Plot of Worst Value

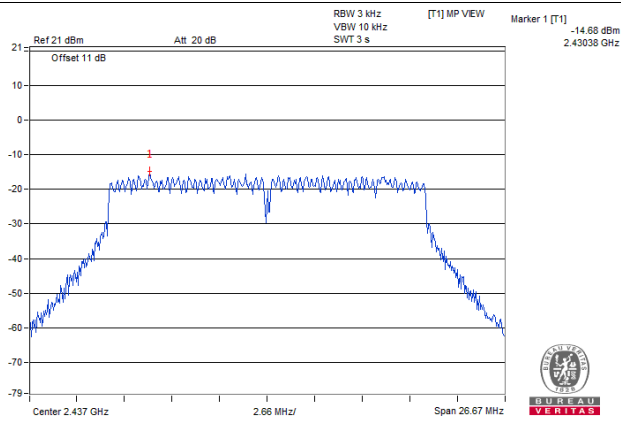
#### 802.11b / CH6



#### 802.11g / CH1



#### 802.11n (HT20) / CH6

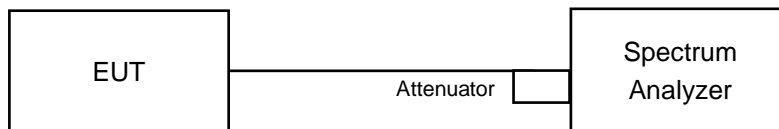


## 4.7 Conducted Out of Band Emission Measurement

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

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

### 4.7.2 Test Setup



### 4.7.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.7.4 Test Procedure

#### MEASUREMENT PROCEDURE REF

1. Set the RBW = 100 kHz.
2. Set the VBW  $\geq$  300 kHz.
3. Detector = peak.
4. Sweep time = auto couple.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

#### MEASUREMENT PROCEDURE OOB

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

### 4.7.5 Deviation from Test Standard

No deviation.

### 4.7.6 EUT Operating Condition

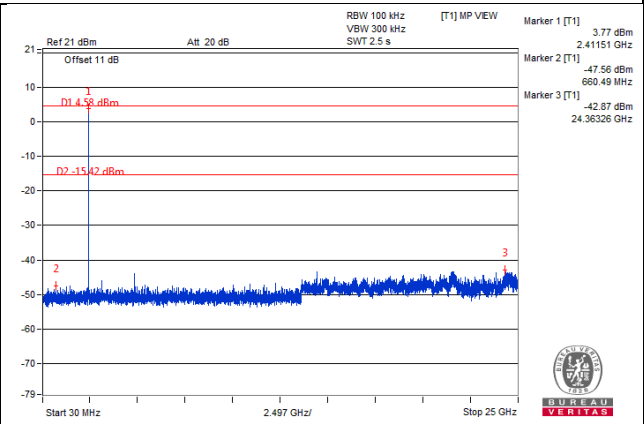
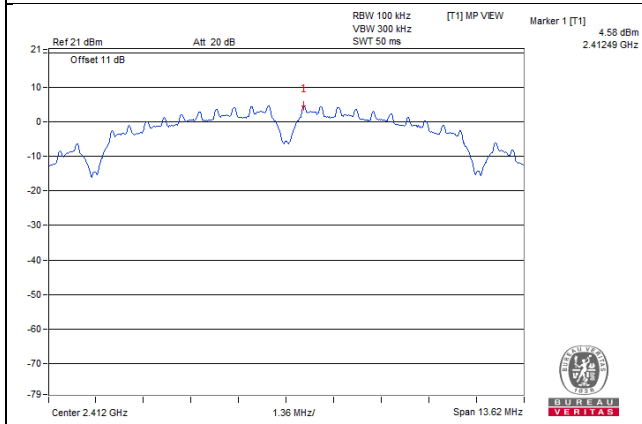
Same as Item 4.3.6

### 4.7.7 Test Results

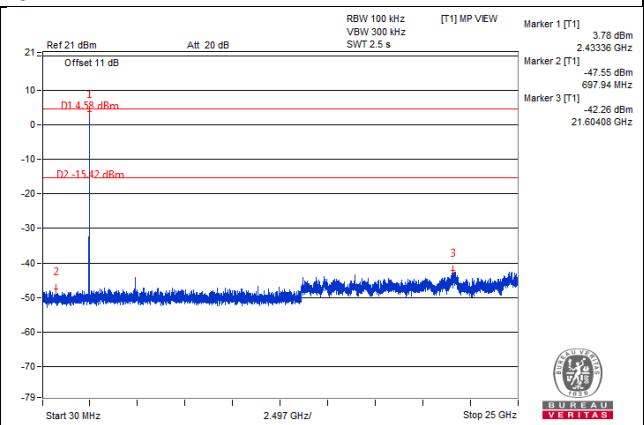
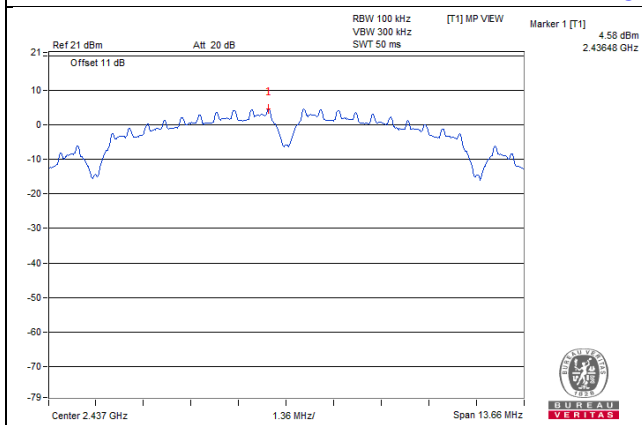
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

# 802.11b

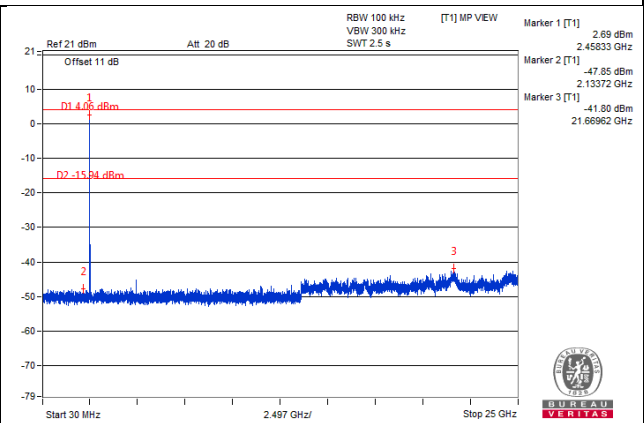
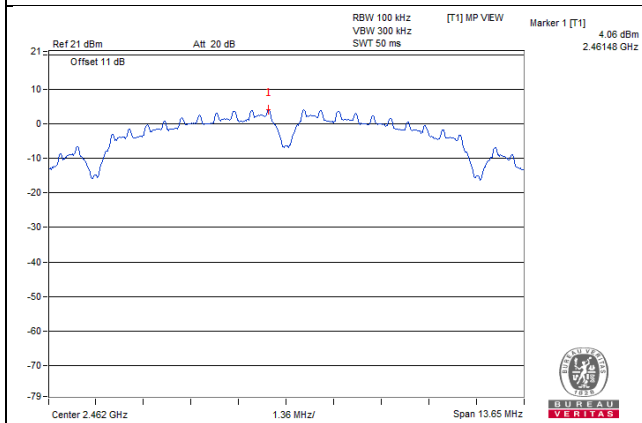
## CH 1



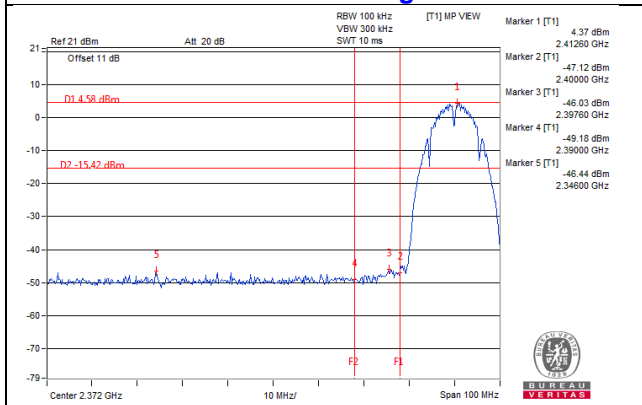
## CH 6



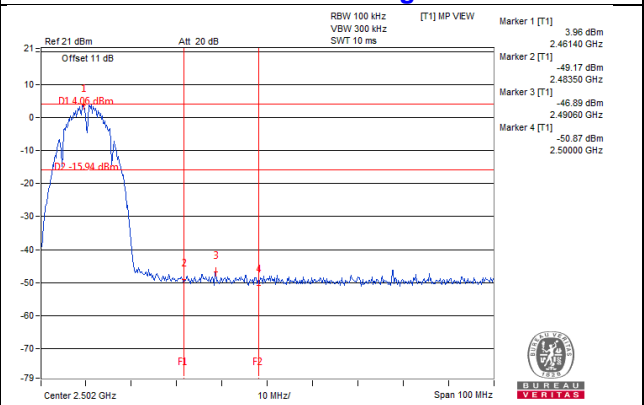
## CH 11



## CH 1 Band edge



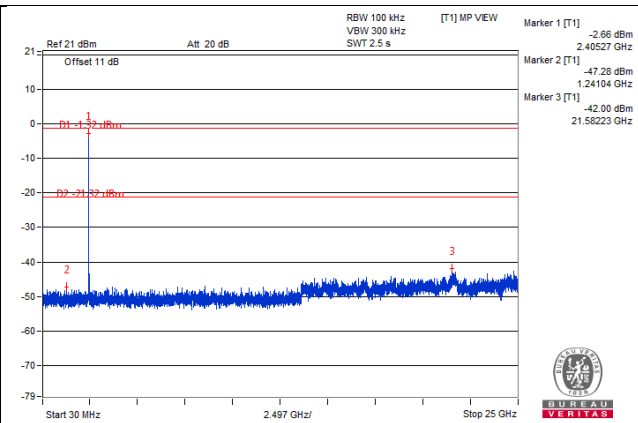
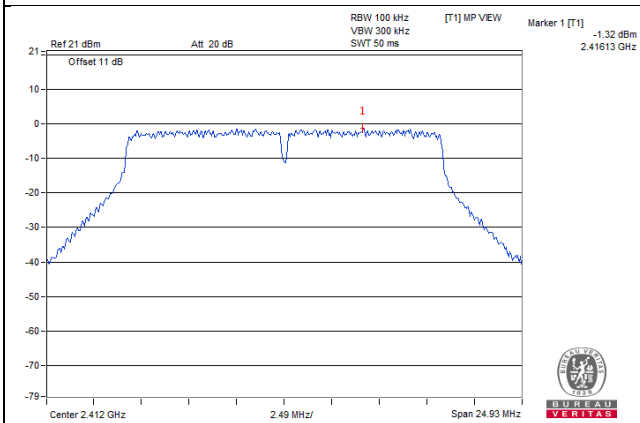
## CH 11 Band edge



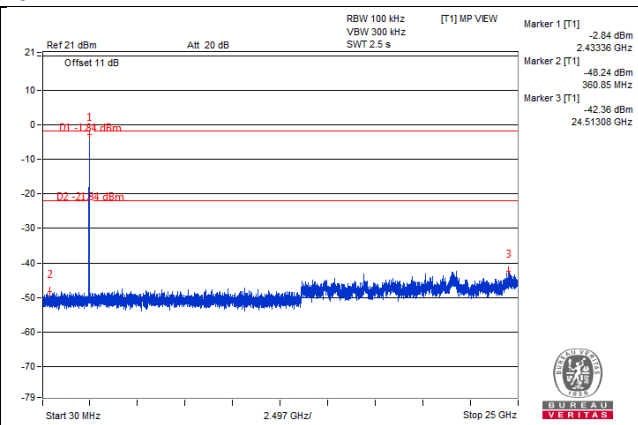
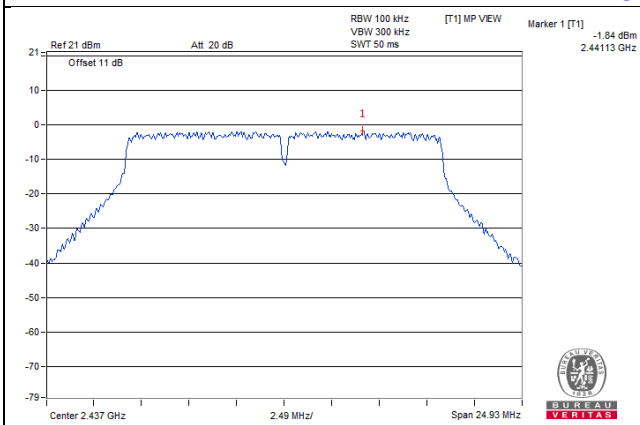


# 802.11g

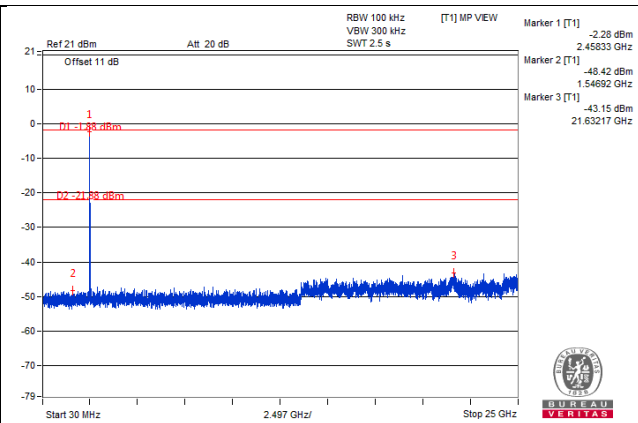
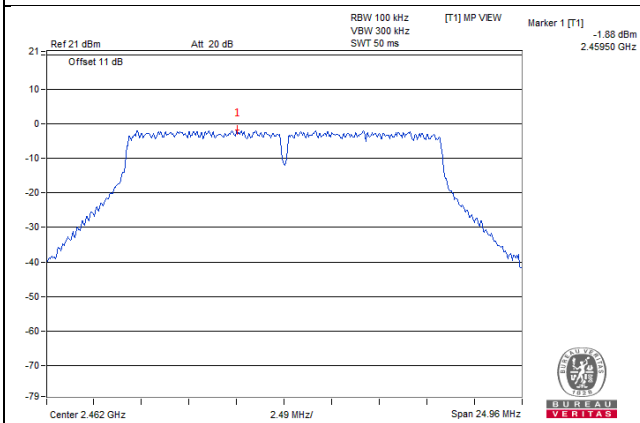
## CH 1



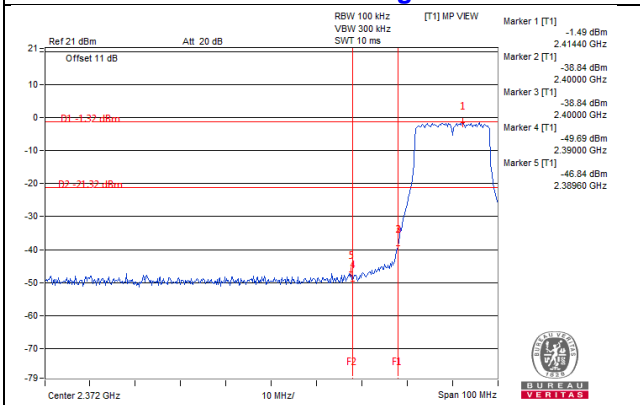
## CH 6



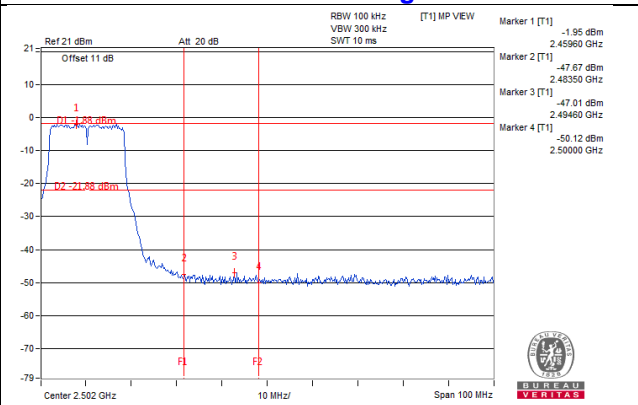
## CH 11



## CH 1 Band edge

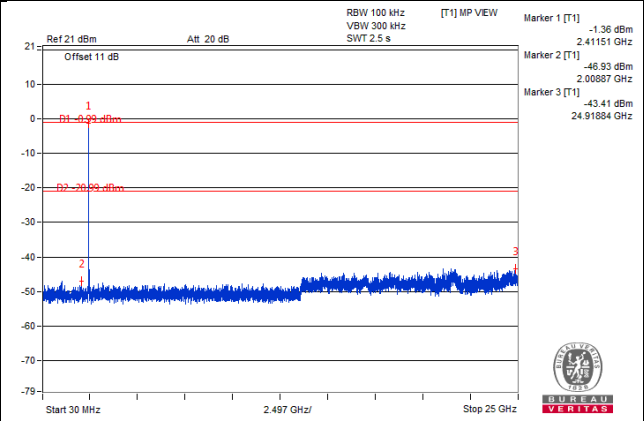
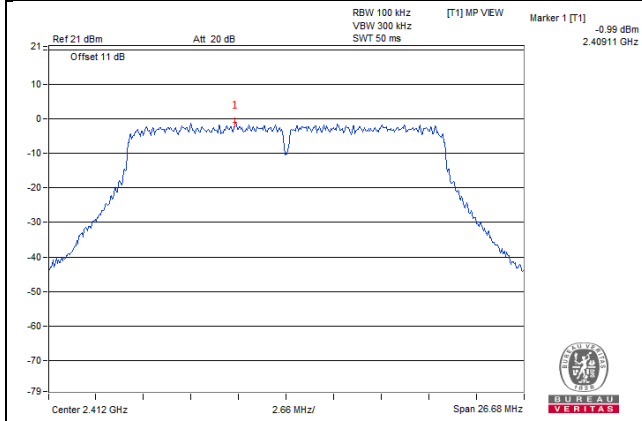


## CH 11 Band edge

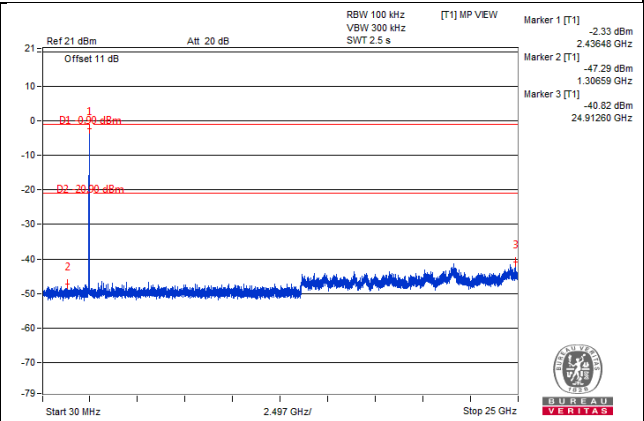
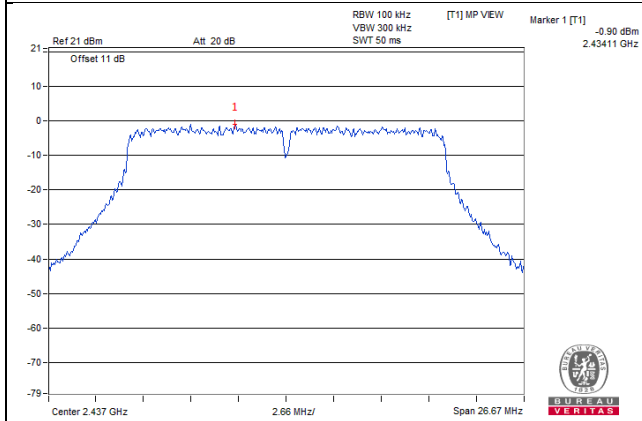


# 802.11n (HT20)

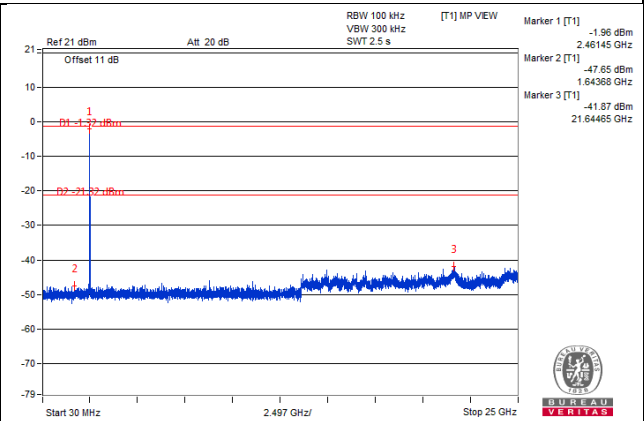
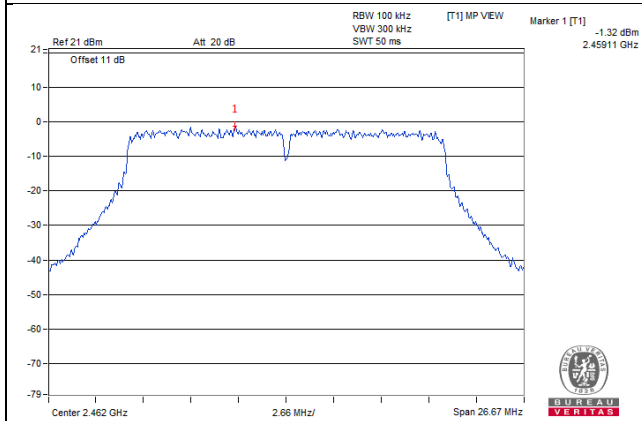
## CH 1



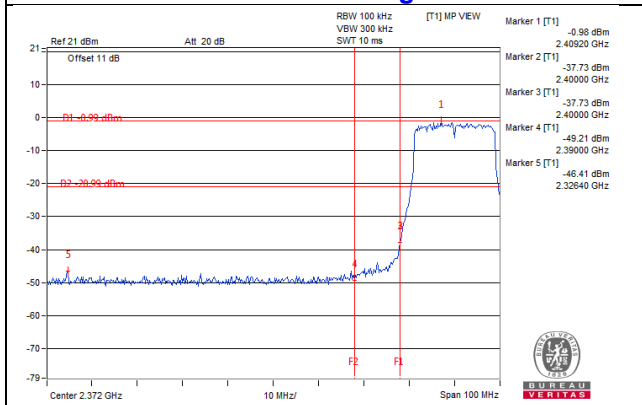
## CH 6



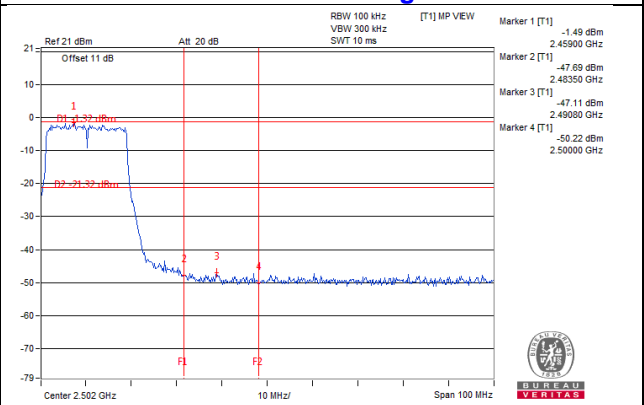
## CH 11



## CH 1 Band edge



## CH 11 Band edge



## 5 Pictures of Test Arrangements

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

## Appendix – Information on 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:

### Linkou 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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