

## FCC Test Report

**Report No.:** RF141015C26E

**FCC ID:** H8N-WLU5260

**Test Model:** WLU5260-D81

**Received Date:** Oct. 25, 2016

**Test Date:** Nov. 11 ~ Dec. 15, 2016

**Issued Date:** Dec. 16, 2016

**Applicant:** ASKEY COMPUTER CORP.

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23585, TAIWAN, R.O.C.

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

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### Release Control Record

Issue No.	Description	Date Issued
RF141015C26E	Original release.	Dec. 16, 2016

## 1 Certificate of Conformity

**Product:** Wireless Module

**Brand:** Panasonic

**Test Model:** WLU5260-D81


**Sample Status:** Engineering sample


**Applicant:** ASKEY COMPUTER CORP.

**Test Date:** Nov. 11 ~ Dec. 15, 2016

**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:** Dec. 16, 2016  
Pettie Chen / Senior Specialist

**Approved by :**  , **Date:** Dec. 16, 2016  
Ken Liu / Senior 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 -11.51dB at 1.68359MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -1.0dB at 2390.00, 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	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	2.44 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.86 dB
	200MHz ~ 1000MHz	3.87 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

Product	Wireless Module
Brand	Panasonic
Test Model	WLU5260-D81
Status of EUT	Engineering sample
Power Supply Rating	5Vdc from host equipment
Modulation Type	CCK, DQPSK, DBPSK for DSSS; 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11.0/ 5.5/ 2.0/ 1.0Mbps 802.11g: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11n: up to 300.0Mbps
Operating Frequency	2412 ~ 2462MHz
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40)
Output Power	294.466mW
Antenna Type	Printed antenna with 2.28dBi gain
Antenna Connector	NA
Accessory Device	NA
Cable Supplied	NA

**Note:**

1. The EUT incorporates a MIMO function. Physically, the EUT provides 2 completed transmitters and 2 receivers.

Modulation Mode	TX Function
802.11b	2TX
802.11g	2TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX

2. 2.4GHz and 5GHz cannot transmit simultaneously
3. 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		

7 channels are provided for 802.11n (HT40):

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



### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

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

Note: The EUT had been pre-tested on the positioned of each 3 axis. The worst case was found when positioned on **Y-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.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	7.2
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	15.0

#### **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.

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11b	1 to 11	6	DSSS	DBPSK	1.0

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

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11b	1 to 11	6	DSSS	DBPSK	1.0

**Antenna Port Conducted Measurement:**

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

EUT CONFIGURE MODE	MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
-	802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1.0
-	802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6.0
-	802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	7.2
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	15.0

**Test Condition:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE $\geq$ 1G	20deg. C, 69%RH	120Vac, 60Hz	Bayu Chen Bond Tseng Tank Wu
RE<1G	20deg. C, 69%RH	120Vac, 60Hz	Bayu Chen
PLC	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui
APCM	24deg. C, 64%RH	120Vac, 60Hz	Match Tsui

### 3.3 Duty Cycle of Test Signal

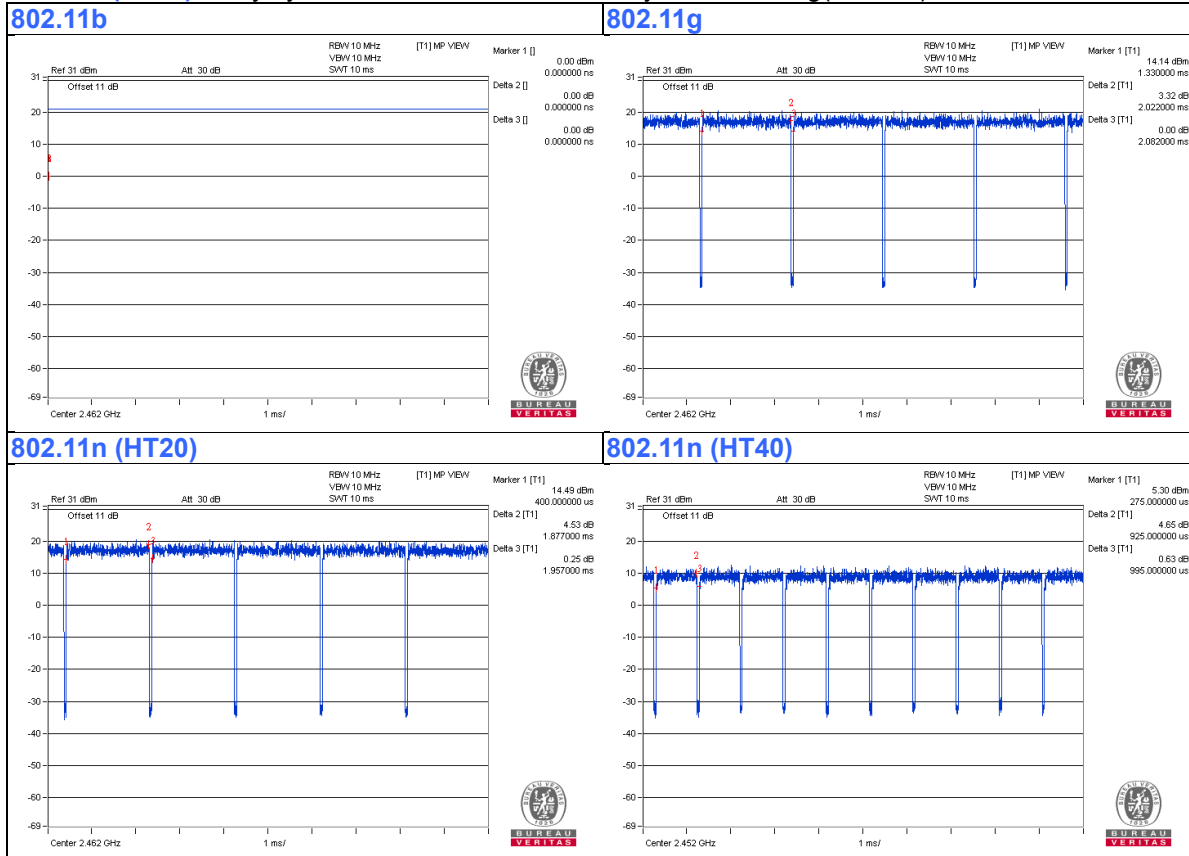
**802.11b:** Duty cycle of test signal is 100 %, duty factor is not required.

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

**802.11g:** Duty cycle =  $2.022/2.082=0.971$ , Duty factor= $10*\log(1/0.971)=0.13$

**802.11n (HT20):** Duty cycle =  $1.877/1.957=0.959$ , Duty factor= $10*\log(1/0.959)=0.18$

**802.11n (HT40):** Duty cycle =  $0.925/0.995=0.930$ , Duty factor= $10*\log(1/0.930)=0.32$



### 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.

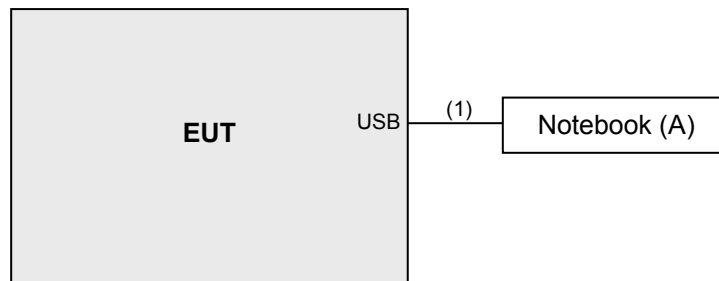
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Notebook	DELL	Latitude E6420	HPFC5Q1	FCC DoC Approved	-

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	1.8	N	0	-

#### 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 DTS Meas Guidance v03r05**

**KDB 662911 D01 Multiple Transmitter Output v02r01**

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 30dB 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 30dB under any condition of modulation.

#### 4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Dec. 23, 2015	Dec. 22, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Apr. 19, 2016	Apr. 18, 2017
BILOG Antenna SCHWARZBECK	VULB9168	9168-148	Jan. 18, 2016	Jan. 17, 2017
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Jan. 08, 2016	Jan. 07, 2017
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Dec. 14, 2016	Dec. 13, 2017
Loop Antenna	EM-6879	269	Aug. 11, 2016	Aug. 10, 2017
Preamplifier Agilent	8449B	3008A01911	Aug. 09, 2016	Aug. 08, 2017
Preamplifier Agilent	8447D	2944A10638	Aug. 09, 2016	Aug. 08, 2017
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-02 (309222 +248780)	Aug. 09, 2016	Aug. 08, 2017
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-03 (274092)	Aug. 09, 2016	Aug. 08, 2017
RF signal cable Woken	8D-FB	Cable-CH9-01	Aug. 09, 2016	Aug. 08, 2017
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower EMCO	2070/2080	512.835.4684	NA	NA
Turn Table EMCO	2087-2.03	NA	NA	NA
Antenna Tower & Turn BV ADT	AT100	AT93021705	NA	NA
Turn Table BV ADT	TT100	TT93021705	NA	NA
Turn Table Controller BV ADT	SC100	SC93021705	NA	NA
High Speed Peak Power Meter	ML2495A	0824011	Jul. 09, 2016	Jul. 08, 2017
Power Sensor	MA2411B	0738171	Aug. 11, 2016	Aug. 10, 2017

- Note:
1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
  2. The test was performed in HwaYa Chamber 3.
  3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  4. The FCC Site Registration No. is 988962.
  5. The IC Site Registration No. is IC 7450F-3.

#### 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 detect 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:**

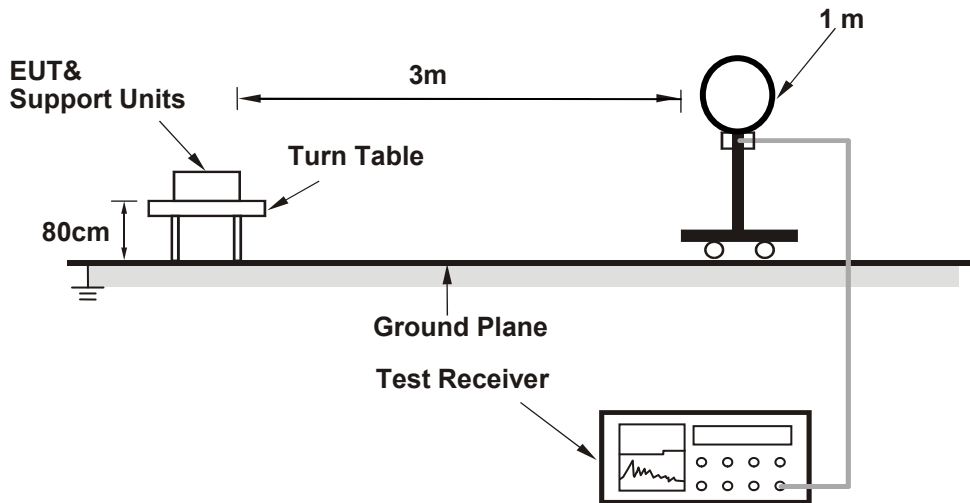
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

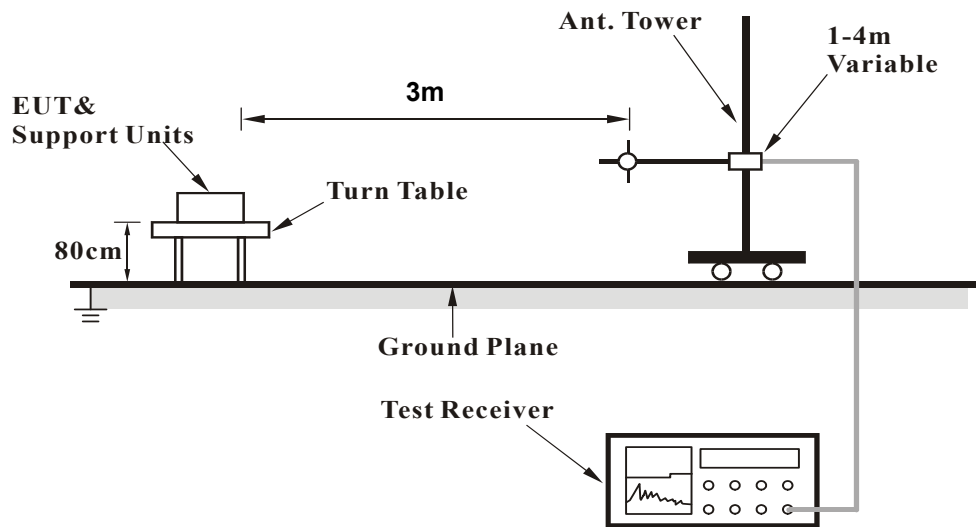
No deviation.

#### 4.1.5 Test Set Up

##### For Radiated emission below 30MHz

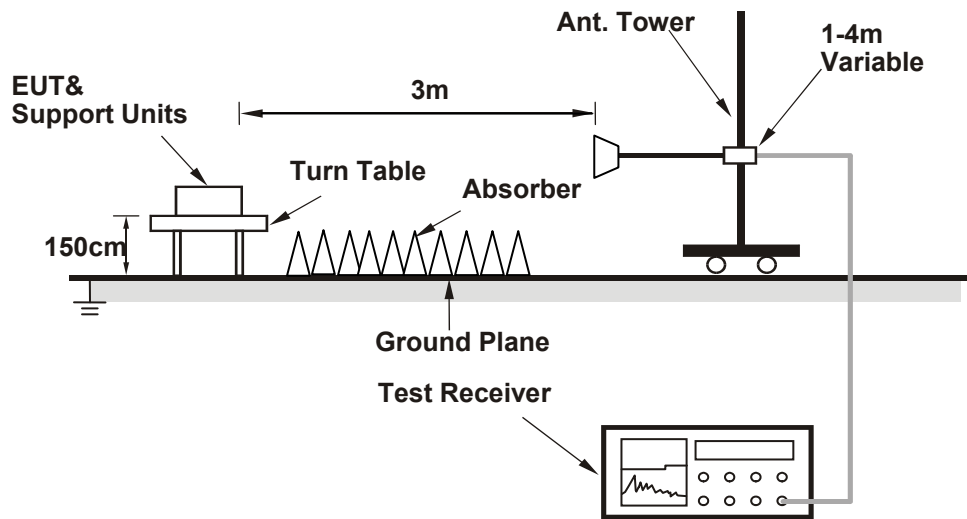


##### For Radiated emission 30MHz to 1GHz





### 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

- Connected the EUT with the notebook and placed them on the testing table.
- Set the EUT under transmission condition continuously at specific channel frequency.
- The necessary accessories enable the system in full functions.

4.1.7 Test Results

Above 1GHz Data :

802.11b

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	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	59.5 PK	74.0	-14.5	1.73 H	128	24.5	35.0
2	2390.00	48.2 AV	54.0	-5.8	1.73 H	128	13.2	35.0
3	*2412.00	97.3 PK			1.66 H	143	62.3	35.0
4	*2412.00	92.7 AV			1.66 H	143	57.7	35.0
5	4824.00	55.7 PK	74.0	-18.3	3.92 H	24	51.5	4.2
6	4824.00	52.4 AV	54.0	-1.6	3.92 H	24	48.2	4.2

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	60.2 PK	74.0	-13.8	1.87 V	334	25.2	35.0
2	2390.00	49.1 AV	54.0	-4.9	1.87 V	334	14.1	35.0
3	*2412.00	102.0 PK			2.01 V	347	67.0	35.0
4	*2412.00	98.0 AV			2.01 V	347	63.0	35.0
5	4824.00	51.0 PK	74.0	-23.0	1.63 V	42	46.8	4.2
6	4824.00	42.9 AV	54.0	-11.1	1.63 V	42	38.7	4.2

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

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	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	95.3 PK			1.52 H	133	60.1	35.2
2	*2437.00	91.4 AV			1.52 H	133	56.2	35.2
3	4874.00	55.9 PK	74.0	-18.1	3.83 H	24	51.5	4.4
4	4874.00	52.6 AV	54.0	-1.4	3.83 H	24	48.2	4.4
5	7311.00	58.3 PK	74.0	-15.7	1.64 H	127	47.8	10.5
6	7311.00	43.7 AV	54.0	-10.3	1.64 H	127	33.2	10.5

**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	100.6 PK			1.55 V	0	65.4	35.2
2	*2437.00	96.9 AV			1.55 V	0	61.7	35.2
3	4874.00	50.4 PK	74.0	-23.6	3.68 V	100	46.0	4.4
4	4874.00	41.7 AV	54.0	-12.3	3.68 V	100	37.3	4.4
5	7311.00	57.7 PK	74.0	-16.3	1.59 V	38	47.2	10.5
6	7311.00	45.5 AV	54.0	-8.5	1.59 V	38	35.0	10.5

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

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	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	107.1 PK			2.44 H	217	71.8	35.3
2	*2462.00	103.2 AV			2.44 H	217	67.9	35.3
3	2483.50	61.5 PK	74.0	-12.5	1.47 H	263	26.1	35.4
4	2483.50	52.3 AV	54.0	-1.7	1.47 H	263	16.9	35.4
5	4924.00	51.1 PK	74.0	-22.9	2.18 H	14	46.5	4.6
6	4924.00	40.1 AV	54.0	-13.9	2.18 H	14	35.5	4.6

**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	107.5 PK			2.00 V	287	72.2	35.3
2	*2462.00	103.6 AV			2.00 V	287	68.3	35.3
3	2483.50	61.9 PK	74.0	-12.1	1.46 V	238	26.5	35.4
<b>4</b>	<b>2483.50</b>	<b>53.0 AV</b>	<b>54.0</b>	<b>-1.0</b>	<b>1.46 V</b>	<b>238</b>	<b>17.6</b>	<b>35.4</b>
5	4924.00	51.8 PK	74.0	-22.2	1.52 V	193	47.2	4.6
6	4924.00	41.5 AV	54.0	-12.5	1.52 V	193	36.9	4.6

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

802.11g

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	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	67.3 PK	74.0	-6.7	3.71 H	193	32.3	35.0
2	2390.00	52.1 AV	54.0	-1.9	3.71 H	193	17.1	35.0
3	*2412.00	104.2 PK			3.82 H	189	69.2	35.0
4	*2412.00	94.6 AV			3.82 H	189	59.6	35.0
5	4824.00	54.1 PK	74.0	-19.9	3.69 H	29	49.9	4.2
6	4824.00	40.2 AV	54.0	-13.8	3.69 H	29	36.0	4.2

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	70.5 PK	74.0	-3.5	1.28 V	222	35.5	35.0
2	2390.00	52.6 AV	54.0	-1.4	1.28 V	222	17.6	35.0
3	*2412.00	105.0 PK			1.32 V	264	70.0	35.0
4	*2412.00	95.6 AV			1.32 V	264	60.6	35.0
5	4824.00	50.0 PK	74.0	-24.0	3.77 V	32	45.8	4.2
6	4824.00	36.8 AV	54.0	-17.2	3.77 V	32	32.6	4.2

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

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	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	67.7 PK	74.0	-6.3	3.71 H	204	32.7	35.0
2	2390.00	50.8 AV	54.0	-3.2	3.71 H	204	15.8	35.0
3	*2437.00	112.1 PK			3.84 H	185	76.9	35.2
4	*2437.00	102.3 AV			3.84 H	185	67.1	35.2
5	2483.50	66.2 PK	74.0	-7.8	3.92 H	178	30.8	35.4
6	2483.50	49.9 AV	54.0	-4.1	3.92 H	178	14.5	35.4
7	4874.00	60.9 PK	74.0	-13.1	3.84 H	23	56.5	4.4
8	4874.00	48.1 AV	54.0	-5.9	3.84 H	23	43.7	4.4
9	7311.00	61.5 PK	74.0	-12.5	3.79 H	19	51.0	10.5
10	7311.00	48.0 AV	54.0	-6.0	3.79 H	19	37.5	10.5

**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	69.1 PK	74.0	-4.9	2.19 V	243	34.1	35.0
2	2390.00	52.0 AV	54.0	-2.0	2.19 V	243	17.0	35.0
3	*2437.00	114.6 PK			1.90 V	249	79.4	35.2
4	*2437.00	104.7 AV			1.90 V	249	69.5	35.2
5	2483.50	72.1 PK	74.0	-1.9	2.00 V	251	36.7	35.4
6	2483.50	52.0 AV	54.0	-2.0	2.00 V	251	16.6	35.4
7	4874.00	56.2 PK	74.0	-17.8	3.87 V	262	51.8	4.4
8	4874.00	43.4 AV	54.0	-10.6	3.87 V	262	39.0	4.4
9	7311.00	58.0 PK	74.0	-16.0	3.50 V	39	47.5	10.5
10	7311.00	44.8 AV	54.0	-9.2	3.50 V	39	34.3	10.5

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

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	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	104.6 PK			3.68 H	200	69.3	35.3
2	*2462.00	94.1 AV			3.68 H	200	58.8	35.3
3	2483.50	71.1 PK	74.0	-2.9	3.70 H	184	35.7	35.4
4	2483.50	52.2 AV	54.0	-1.8	3.70 H	184	16.8	35.4
5	4924.00	53.7 PK	74.0	-20.3	4.00 H	28	49.1	4.6
6	4924.00	40.6 AV	54.0	-13.4	4.00 H	28	36.0	4.6

**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	106.3 PK			1.31 V	344	71.0	35.3
2	*2462.00	96.3 AV			1.31 V	344	61.0	35.3
3	2483.50	72.3 PK	74.0	-1.7	1.27 V	344	36.9	35.4
4	2483.50	52.7 AV	54.0	-1.3	1.27 V	344	17.3	35.4
5	4924.00	51.0 PK	74.0	-23.0	3.61 V	13	46.4	4.6
6	4924.00	38.0 AV	54.0	-16.0	3.61 V	13	33.4	4.6

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

802.11n (HT20)

CHANNEL	TX Channel 1	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	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	59.7 PK	74.0	-14.3	1.83 H	129	24.7	35.0
2	2390.00	48.7 AV	54.0	-5.3	1.83 H	129	13.7	35.0
3	*2412.00	94.2 PK			1.62 H	138	59.2	35.0
4	*2412.00	84.5 AV			1.62 H	138	49.5	35.0
5	4824.00	52.2 PK	74.0	-21.8	3.91 H	18	48.0	4.2
6	4824.00	37.5 AV	54.0	-16.5	3.91 H	18	33.3	4.2

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	69.1 PK	74.0	-4.9	1.47 V	189	34.1	35.0
2	2390.00	52.8 AV	54.0	-1.2	1.47 V	189	17.8	35.0
3	*2412.00	103.8 PK			1.74 V	241	68.8	35.0
4	*2412.00	94.0 AV			1.74 V	241	59.0	35.0
5	4824.00	49.4 PK	74.0	-24.6	2.05 V	55	45.2	4.2
6	4824.00	35.6 AV	54.0	-18.4	2.05 V	55	31.4	4.2

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



CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	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	65.9 PK	74.0	-8.1	4.00 H	191	30.9	35.0
2	2390.00	49.9 AV	54.0	-4.1	4.00 H	191	14.9	35.0
3	*2437.00	107.9 PK			3.74 H	149	72.7	35.2
4	*2437.00	97.3 AV			3.74 H	149	62.1	35.2
5	2483.50	70.7 PK	74.0	-3.3	3.96 H	186	35.3	35.4
6	2483.50	49.9 AV	54.0	-4.1	3.96 H	186	14.5	35.4
7	4874.00	60.9 PK	74.0	-13.1	3.85 H	21	56.5	4.4
8	4874.00	48.3 AV	54.0	-5.7	3.85 H	21	43.9	4.4
9	7311.00	59.5 PK	74.0	-14.5	3.93 H	4	49.0	10.5
10	7311.00	46.2 AV	54.0	-7.8	3.93 H	4	35.7	10.5

**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	69.9 PK	74.0	-4.1	1.67 V	249	34.9	35.0
2	2390.00	52.9 AV	54.0	-1.1	1.67 V	249	17.9	35.0
3	*2437.00	113.8 PK			2.35 V	246	78.6	35.2
4	*2437.00	103.9 AV			2.35 V	246	68.7	35.2
5	2483.50	72.7 PK	74.0	-1.3	1.53 V	236	37.3	35.4
6	2483.50	52.1 AV	54.0	-1.9	1.53 V	236	16.7	35.4
7	4874.00	52.5 PK	74.0	-21.5	2.01 V	253	48.1	4.4
8	4874.00	41.0 AV	54.0	-13.0	2.01 V	253	36.6	4.4
9	7311.00	59.0 PK	74.0	-15.0	3.67 V	138	48.5	10.5
10	7311.00	46.1 AV	54.0	-7.9	3.67 V	138	35.6	10.5

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

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	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	101.0 PK			1.77 H	192	65.7	35.3
2	*2462.00	91.8 AV			1.77 H	192	56.5	35.3
3	2483.50	71.1 PK	74.0	-2.9	1.93 H	259	35.7	35.4
4	2483.50	51.2 AV	54.0	-2.8	1.93 H	259	15.8	35.4
5	4924.00	48.6 PK	74.0	-25.4	1.66 H	168	44.0	4.6
6	4924.00	36.3 AV	54.0	-17.7	1.66 H	168	31.7	4.6

**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	101.4 PK			1.54 V	146	66.1	35.3
2	*2462.00	92.3 AV			1.54 V	146	57.0	35.3
3	2483.50	72.7 PK	74.0	-1.3	1.52 V	236	37.3	35.4
4	2483.50	52.9 AV	54.0	-1.1	1.52 V	236	17.5	35.4
5	4924.00	49.5 PK	74.0	-24.5	3.03 V	157	44.9	4.6
6	4924.00	36.8 AV	54.0	-17.2	3.03 V	157	32.2	4.6

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

802.11n (HT40)

CHANNEL	TX Channel 3	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	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	63.8 PK	74.0	-10.2	1.39 H	186	28.8	35.0
2	2390.00	50.3 AV	54.0	-3.7	1.39 H	186	15.3	35.0
3	*2422.00	98.8 PK			1.91 H	293	63.7	35.1
4	*2422.00	88.6 AV			1.91 H	293	53.5	35.1
5	4844.00	48.2 PK	74.0	-25.8	1.55 H	254	43.9	4.3
6	4844.00	36.5 AV	54.0	-17.5	1.55 H	254	32.2	4.3

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	65.8 PK	74.0	-8.2	1.42 V	220	30.8	35.0
2	2390.00	52.9 AV	54.0	-1.1	1.42 V	220	17.9	35.0
3	*2422.00	99.4 PK			3.74 V	285	64.3	35.1
4	*2422.00	89.4 AV			3.74 V	285	54.3	35.1
5	4844.00	49.4 PK	74.0	-24.6	1.22 V	353	45.1	4.3
6	4844.00	37.9 AV	54.0	-16.1	1.22 V	353	33.6	4.3

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

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	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	62.6 PK	74.0	-11.4	1.77 H	231	27.6	35.0
2	2390.00	51.9 AV	54.0	-2.1	1.77 H	231	16.9	35.0
3	*2437.00	99.6 PK			1.44 H	177	64.4	35.2
4	*2437.00	89.9 AV			1.44 H	177	54.7	35.2
5	4874.00	49.3 PK	74.0	-24.7	2.99 H	342	45.0	4.3
6	4874.00	36.5 AV	54.0	-17.5	2.99 H	342	32.2	4.3

**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	63.9 PK	74.0	-10.1	1.56 V	193	28.9	35.0
<b>2</b>	<b>2390.00</b>	<b>53.0 AV</b>	<b>54.0</b>	<b>-1.0</b>	<b>1.56 V</b>	<b>193</b>	<b>18.0</b>	<b>35.0</b>
3	*2437.00	99.0 PK			1.53 V	189	63.8	35.2
4	*2437.00	89.7 AV			1.53 V	189	54.5	35.2
5	4874.00	49.2 PK	74.0	-24.8	1.47 V	25	44.8	4.4
6	4874.00	36.1 AV	54.0	-17.9	1.47 V	25	31.7	4.4

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

CHANNEL	TX Channel 9	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	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	*2452.00	94.1 PK			3.71 H	151	58.9	35.2
2	*2452.00	84.7 AV			3.71 H	151	49.5	35.2
3	2483.50	62.2 PK	74.0	-11.8	3.56 H	157	26.8	35.4
4	2483.50	50.4 AV	54.0	-3.6	3.56 H	157	15.0	35.4
5	4904.00	50.2 PK	74.0	-23.8	1.48 H	146	45.7	4.5
6	4904.00	37.3 AV	54.0	-16.7	1.48 H	146	32.8	4.5

**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	*2452.00	100.0 PK			2.10 V	245	64.8	35.2
2	*2452.00	89.7 AV			2.10 V	245	54.5	35.2
3	2483.50	66.1 PK	74.0	-7.9	1.08 V	207	30.7	35.4
4	2483.50	52.9 AV	54.0	-1.1	1.08 V	207	17.5	35.4
5	4904.00	49.1 PK	74.0	-24.9	1.67 V	155	44.6	4.5
6	4904.00	36.2 AV	54.0	-17.8	1.67 V	155	31.7	4.5

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

Below 1GHz Data: 802.11b

CHANNEL	TX Channel 6	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	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	30.1 QP	40.0	-9.9	1.99 H	209	45.7	-15.6
2	125.06	31.2 QP	43.5	-12.3	1.50 H	303	46.8	-15.6
3	165.80	32.7 QP	43.5	-10.8	1.50 H	301	46.1	-13.4
4	245.34	38.2 QP	46.0	-7.8	1.24 H	178	51.7	-13.5
5	664.38	32.5 QP	46.0	-13.5	1.50 H	240	35.1	-2.6
6	835.10	36.4 QP	46.0	-9.6	1.99 H	15	35.0	1.4

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	31.94	32.8 QP	40.0	-7.2	1.26 V	322	48.7	-15.9
2	144.46	30.8 QP	43.5	-12.7	1.01 V	166	44.5	-13.7
3	165.80	29.8 QP	43.5	-13.7	1.01 V	220	43.2	-13.4
4	245.34	35.5 QP	46.0	-10.5	1.01 V	324	49.0	-13.5
5	664.38	34.9 QP	46.0	-11.1	1.26 V	146	37.5	-2.6
6	833.16	39.4 QP	46.0	-6.6	1.01 V	166	38.0	1.4

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)
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.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCS30	100289	Dec. 23, 2015	Dec. 22, 2016
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond2-01	Dec. 26, 2015	Dec. 25, 2016
LISN ROHDE & SCHWARZ (EUT)	ESH2-Z5	100100	Jan. 11, 2016	Jan. 10, 2017
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100312	Jul. 26, 2016	Jul. 25, 2017
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

Note: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2. The test was performed in HwaYa Shielded Room 2.

3. The VCCI Site Registration No. is C-2047.

#### 4.2.3 Test Procedures

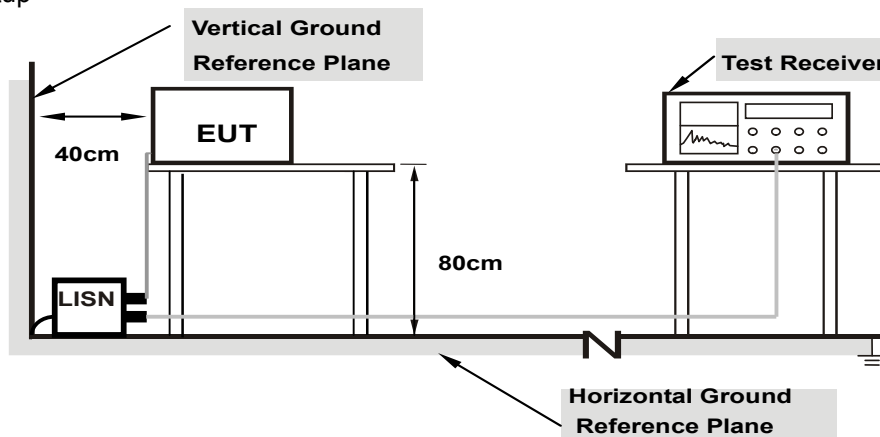
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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



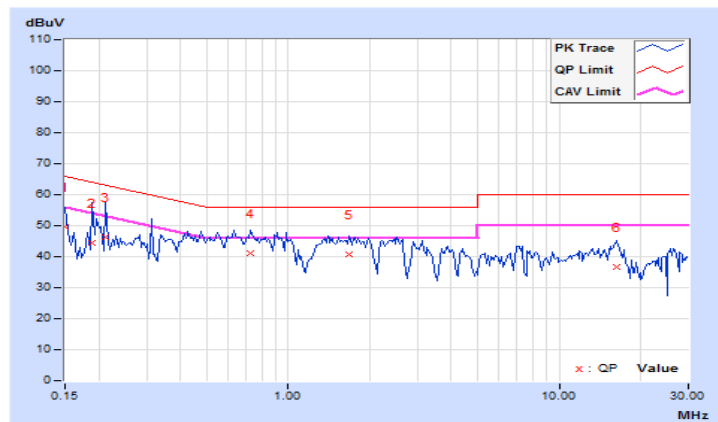
#### 4.2.7 Test Results

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

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
	1	0.15000	10.18	39.48	24.37	49.66	34.55	66.00	56.00	-16.34
2	0.18906	10.20	34.36	21.33	44.56	31.53	64.08	54.08	-19.52	-22.55
3	0.21250	10.21	36.27	28.50	46.48	38.71	63.11	53.11	-16.63	-14.40
4	0.72813	10.28	31.00	22.13	41.28	32.41	56.00	46.00	-14.72	-13.59
<b>5</b>	<b>1.68359</b>	<b>10.36</b>	<b>30.23</b>	<b>24.13</b>	<b>40.59</b>	<b>34.49</b>	<b>56.00</b>	<b>46.00</b>	<b>-15.41</b>	<b>-11.51</b>
6	16.30469	10.61	26.12	16.04	36.73	26.65	60.00	50.00	-23.27	-23.35

#### 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.

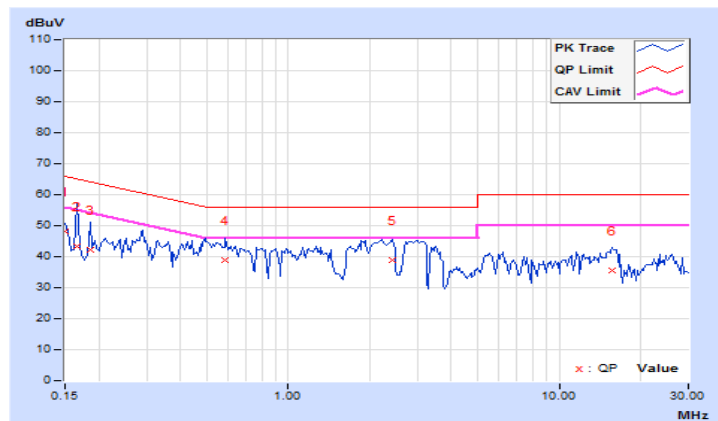


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	10.19	37.79	25.87	47.98	36.06	66.00	56.00	-18.02	-19.94
2	0.16562	10.19	33.22	18.47	43.41	28.66	65.18	55.18	-21.77	-26.52
3	0.18516	10.20	32.19	17.72	42.39	27.92	64.25	54.25	-21.86	-26.33
4	0.58750	10.30	28.67	17.68	38.97	27.98	56.00	46.00	-17.03	-18.02
5	2.41406	10.44	28.52	22.51	38.96	32.95	56.00	46.00	-17.04	-13.05
6	15.76563	10.75	24.79	16.21	35.54	26.96	60.00	50.00	-24.46	-23.04

**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.

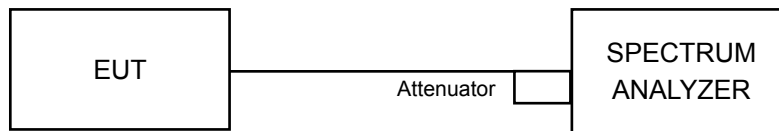


### 4.3 6dB Bandwidth Measurement

#### 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
		Chain 0	Chain 1		
1	2412	10.11	10.10	0.5	Pass
6	2437	10.12	10.11	0.5	Pass
11	2462	10.12	10.11	0.5	Pass

##### 802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.38	16.37	0.5	Pass
6	2437	16.34	16.37	0.5	Pass
11	2462	16.39	16.38	0.5	Pass

##### 802.11n (HT20)

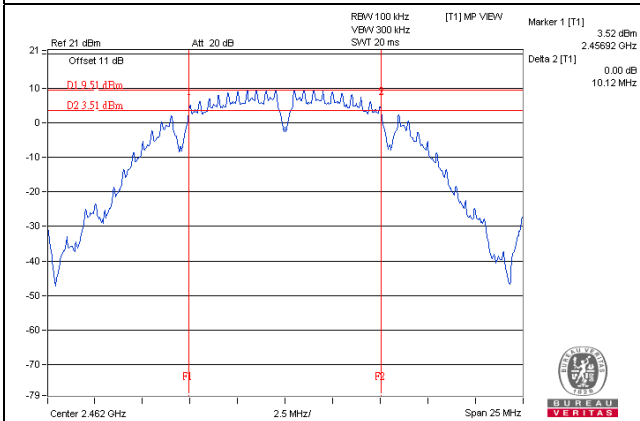
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.62	17.59	0.5	Pass
6	2437	17.28	17.32	0.5	Pass
11	2462	17.59	17.58	0.5	Pass

##### 802.11n (HT40)

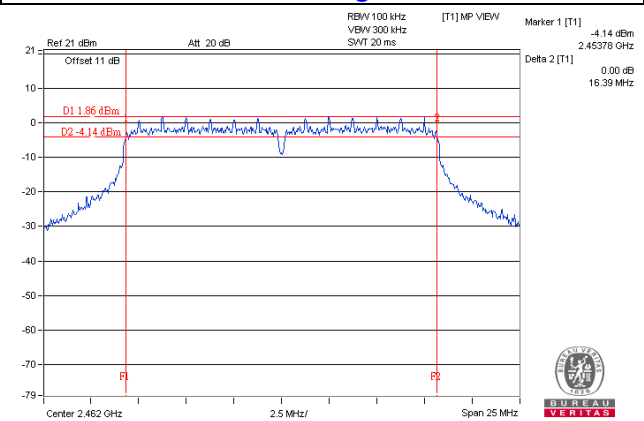
Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	36.19	36.41	0.5	Pass
6	2437	36.37	36.02	0.5	Pass
9	2452	36.16	36.36	0.5	Pass

### Spectrum Plot of Worst Value

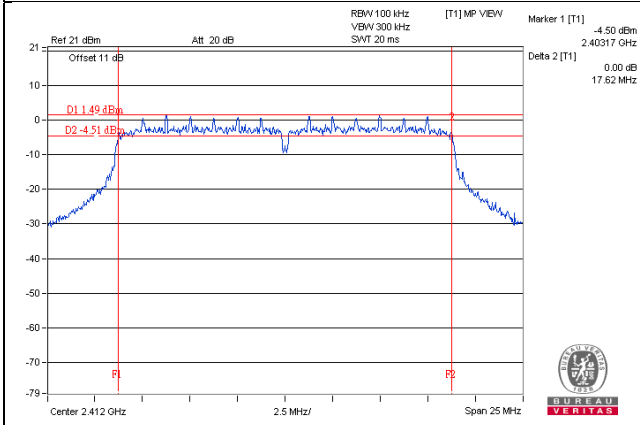
#### 802.11b



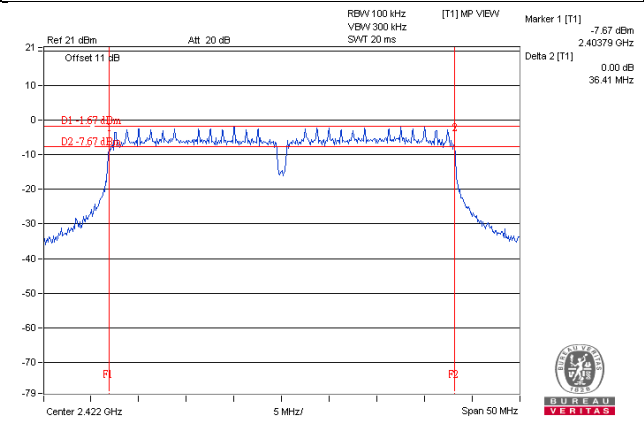
#### 802.11g



#### 802.11n (HT20)



#### 802.11n (HT40)



## 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)

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

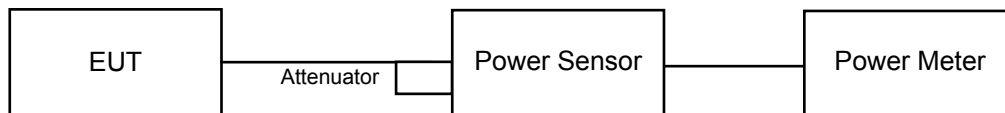
Array Gain = 0 dB (i.e., no array gain) for  $N_{ANT} \leq 4$ ;

Array Gain = 0 dB (i.e., no array gain) for channel widths  $\geq 40$  MHz for any  $N_{ANT}$ ;

Array Gain =  $5 \log(N_{ANT}/N_{SS})$  dB or 3 dB, whichever is less for 20-MHz channel widths with  $N_{ANT} \geq 5$ .

For power measurements on all other devices: Array Gain =  $10 \log(N_{ANT}/N_{SS})$  dB.

### 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

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

### 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

##### 802.11b

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass/Fail
		Chain 0	Chain 1				
1	2412	14.62	14.74	58.758	17.69	30.00	Pass
6	2437	21.70	21.66	294.466	24.69	30.00	Pass
11	2462	18.47	18.32	138.227	21.41	30.00	Pass

Note: Gain = 2.28dBi < 6dBi, so the limit no need to be reduced.

##### 802.11g

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass/Fail
		Chain 0	Chain 1				
1	2412	14.54	14.43	56.178	17.50	30.00	Pass
6	2437	21.03	21.23	259.504	24.14	30.00	Pass
11	2462	13.33	13.15	42.182	16.25	30.00	Pass

Note: Gain = 2.28dBi < 6dBi, so the limit no need to be reduced.

##### 802.11n (HT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass/Fail
		Chain 0	Chain 1				
1	2412	12.69	12.65	36.986	15.68	30.00	Pass
6	2437	20.70	20.81	237.994	23.77	30.00	Pass
11	2462	13.56	13.63	45.766	16.61	30.00	Pass

Note: Gain = 2.28dBi < 6dBi, so the limit no need to be reduced.

##### 802.11n (HT40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass/Fail
		Chain 0	Chain 1				
3	2422	12.31	12.35	34.201	15.34	30.00	Pass
6	2437	13.12	13.60	43.421	16.38	30.00	Pass
9	2452	8.48	8.98	14.954	11.75	30.00	Pass

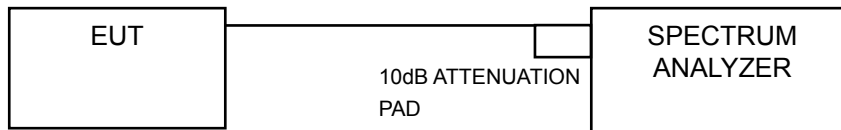
Note: Gain = 2.28dBi < 6dBi, so the limit no need to be reduced.

## 4.5 Power Spectral Density Measurement

### 4.5.1 Limits of Power Spectral Density Measurement

The Maximum of Power Spectral Density Measurement is 8dBm.

### 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

#### For AVG. power (duty cycle $\geq 98\%$ )

- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- Set VBW  $\geq 3 \times \text{RBW}$ .
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep  $\geq 2 \times \text{span}/\text{RBW}$ .
- Sweep time = auto couple.
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.

#### For AVG. power (duty cycle $< 98\%$ )

- Measure the duty cycle (x).
- Set instrument center frequency to DTS channel center frequency.
- Set span to at least 1.5 times the OBW.
- Set RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- Set VBW  $\geq 3 \times \text{RBW}$ .
- Detector = power averaging (RMS) or sample detector (when RMS not available).
- Ensure that the number of measurement points in the sweep  $\geq 2 \times \text{span}/\text{RBW}$ .
- Sweep time = auto couple.
- Do not use sweep triggering. Allow sweep to "free run".
- Employ trace averaging (RMS) mode over a minimum of 100 traces.
- Use the peak marker function to determine the maximum amplitude level.
- Add  $10 \log (1/x)$ , where x is the duty cycle measured in step (a), to the measured PSD to compute the average PSD during the actual transmission time.

### 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

TX chain	Channel	Freq. (MHz)	PSD (dBm/10kHz)	10 log (N=2) dB	Total PSD (dBm/10kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-13.74	3.01	-10.73	8.00	Pass
	6	2437	-6.72	3.01	-3.71	8.00	Pass
	11	2462	-9.77	3.01	-6.76	8.00	Pass
1	1	2412	-13.68	3.01	-10.67	8.00	Pass
	6	2437	-6.82	3.01	-3.81	8.00	Pass
	11	2462	-10.37	3.01	-7.36	8.00	Pass

Note:

- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain =  $2.28\text{dBi} + 10\log(2) = 5.29\text{dBi} < 6\text{dBi}$ , so the limit no need to be reduced.

##### 802.11g

TX chain	Channel	Freq. (MHz)	PSD W/O Duty Factor (dBm/10kHz)	10 log (N=2) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-15.67	3.01	0.13	-12.53	8.00	Pass
	6	2437	-1.05	3.01	0.13	2.09	8.00	Pass
	11	2462	-17.70	3.01	0.13	-14.56	8.00	Pass
1	1	2412	-15.80	3.01	0.13	-12.66	8.00	Pass
	6	2437	-9.07	3.01	0.13	-5.93	8.00	Pass
	11	2462	-17.48	3.01	0.13	-14.34	8.00	Pass

Note:

- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain =  $2.28\text{dBi} + 10\log(2) = 5.29\text{dBi} < 6\text{dBi}$ , so the limit no need to be reduced.
- Refer to section 3.3 for duty cycle spectrum plot.

### 802.11n (HT20)

TX chain	Channel	Freq. (MHz)	PSD W/O Duty Factor (dBm/10kHz)	10 log (N=2) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass /Fail
0	1	2412	-18.43	3.01	0.18	-15.24	8.00	Pass
	6	2437	-6.55	3.01	0.18	-3.36	8.00	Pass
	11	2462	-17.50	3.01	0.18	-14.31	8.00	Pass
1	1	2412	-18.35	3.01	0.18	-15.16	8.00	Pass
	6	2437	-4.80	3.01	0.18	-1.61	8.00	Pass
	11	2462	-17.23	3.01	0.18	-14.04	8.00	Pass

**Note:**

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 2.28dBi + 10log(2) = 5.29dBi < 6dBi, so the limit no need to be reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

### 802.11n (HT40)

TX chain	Channel	Freq. (MHz)	PSD W/O Duty Factor (dBm/10kHz)	10 log (N=2) dB	Duty Factor (dB)	TOTAL PSD With Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass /Fail
0	3	2422	-22.04	3.01	0.32	-18.71	8.00	Pass
	6	2437	-19.89	3.01	0.32	-16.56	8.00	Pass
	9	2452	-24.94	3.01	0.32	-21.61	8.00	Pass
1	3	2422	-21.33	3.01	0.32	-18.00	8.00	Pass
	6	2437	-19.65	3.01	0.32	-16.32	8.00	Pass
	9	2452	-24.11	3.01	0.32	-20.78	8.00	Pass

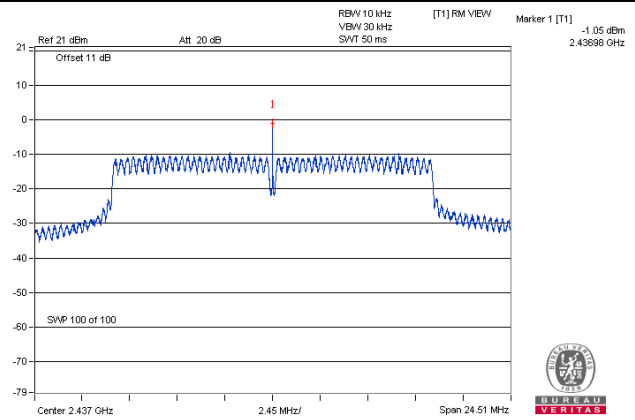
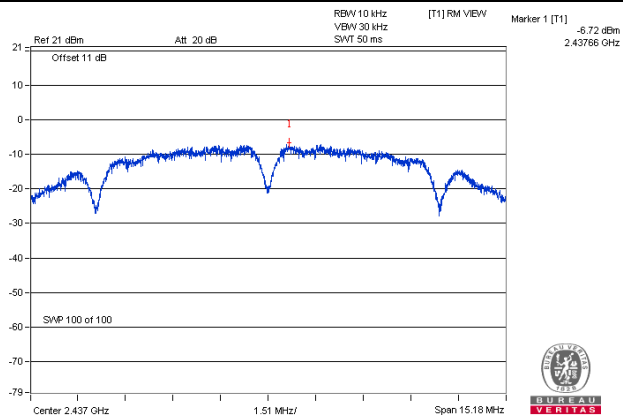
**Note:**

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Directional gain = 2.28dBi + 10log(2) = 5.29dBi < 6dBi, so the limit no need to be reduced.
3. Refer to section 3.3 for duty cycle spectrum plot.

### Spectrum Plot of Worst Value

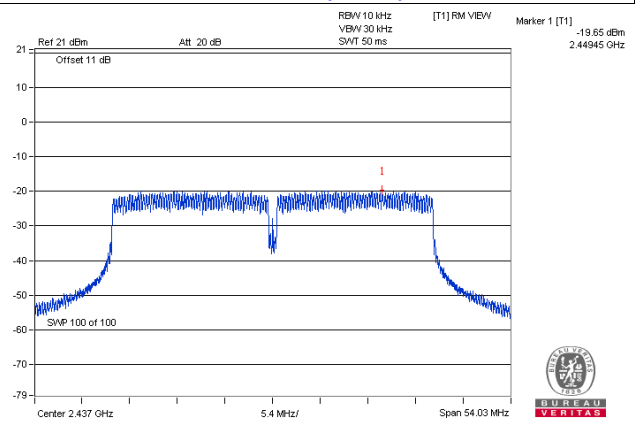
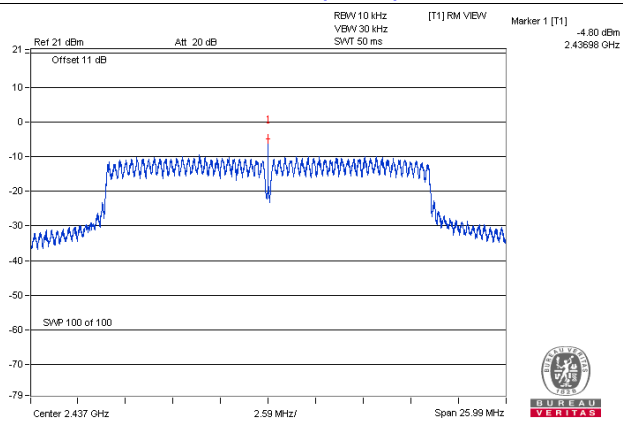
#### 802.11b

#### 802.11g



#### 802.11n (HT20)

#### 802.11n (HT40)

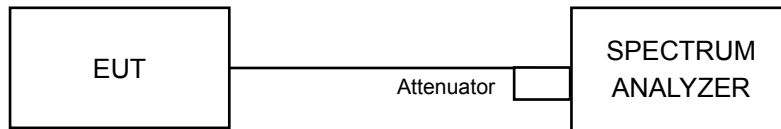


## 4.6 Conducted Out of Band Emission Measurement

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

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

### 4.6.2 Test Setup



### 4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.6.4 Test Procedure

#### MEASUREMENT PROCEDURE REF

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

#### MEASUREMENT PROCEDURE OOBE

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

### 4.6.5 Deviation from Test Standard

No deviation.

### 4.6.6 EUT Operating Condition

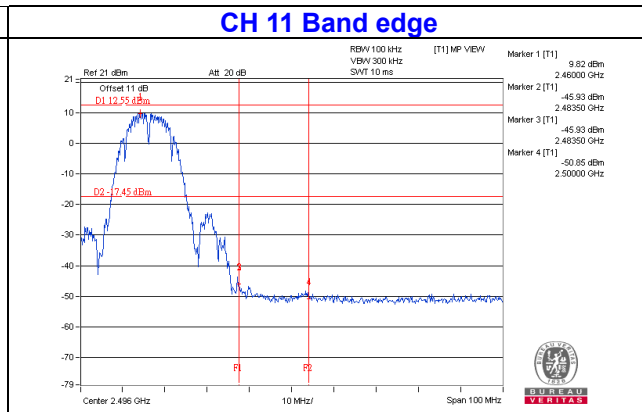
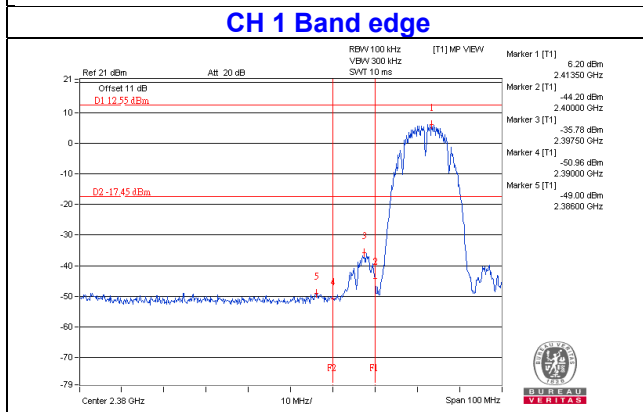
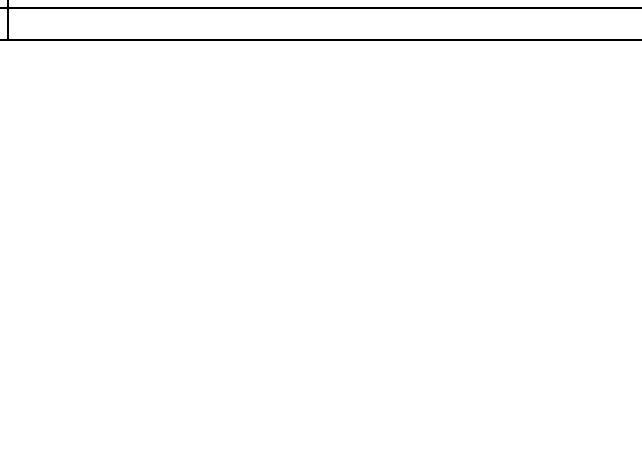
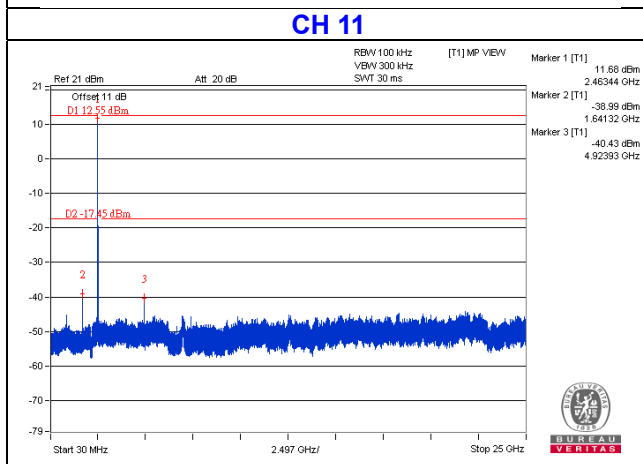
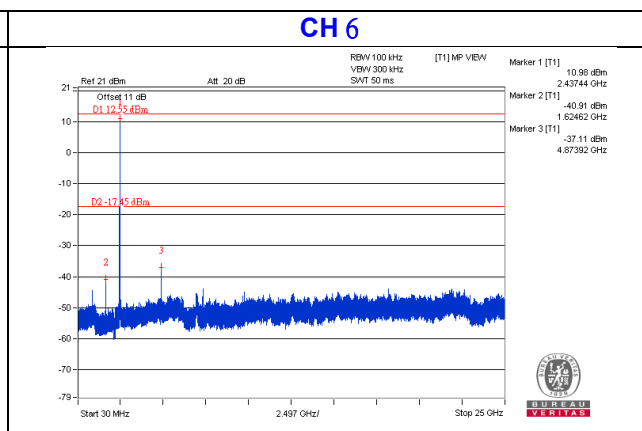
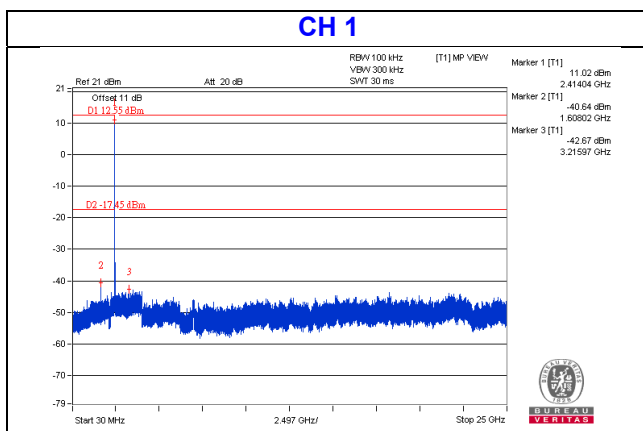
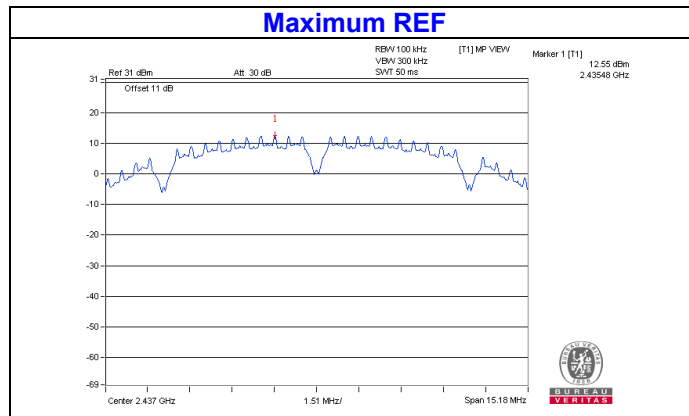
Same as Item 4.3.6

### 4.6.7 Test Results

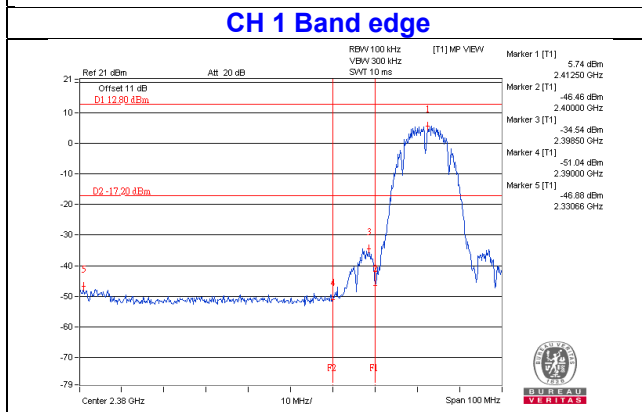
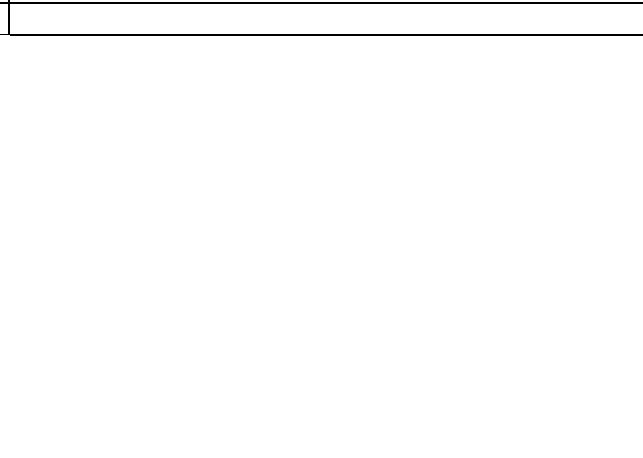
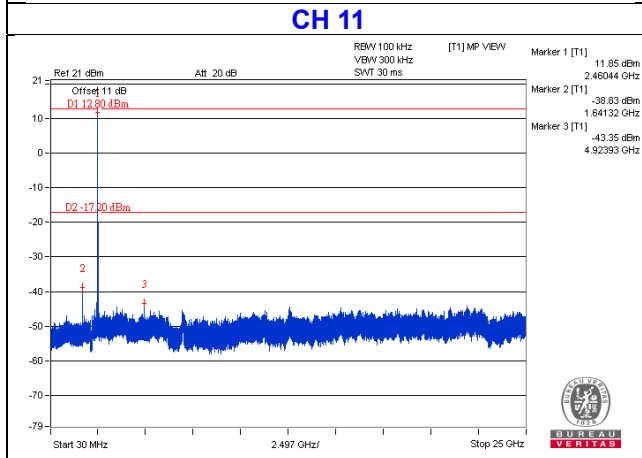
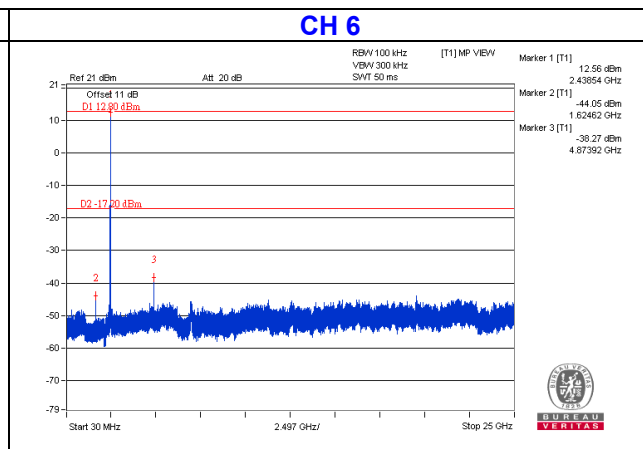
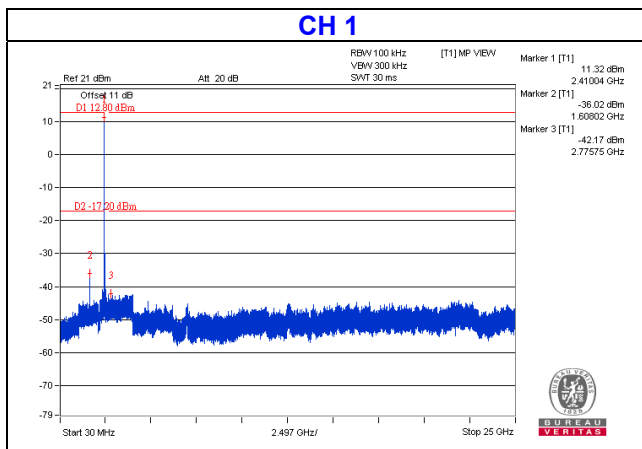
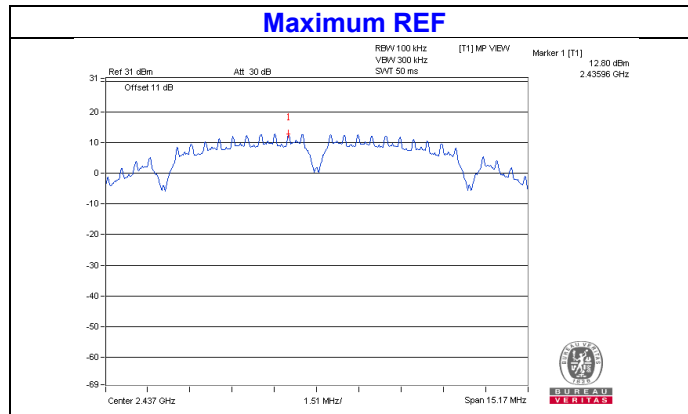
The conducted emission test is performed on each TX port of operating mode without summing or adding 10log (N) since the limit is relative emission limit.

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

802.11b\_CHAIN 0



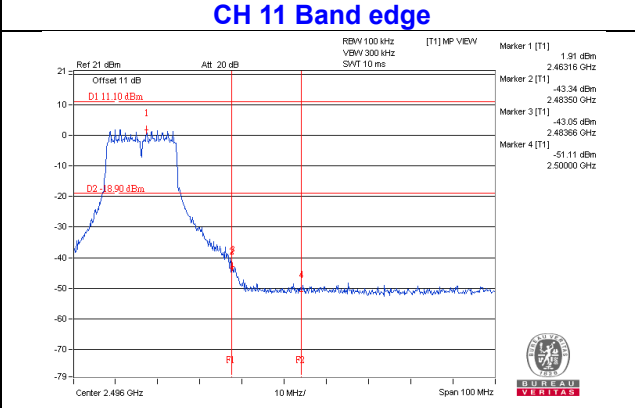
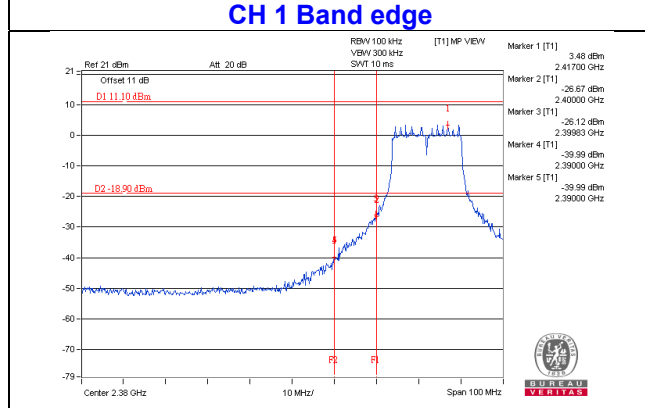
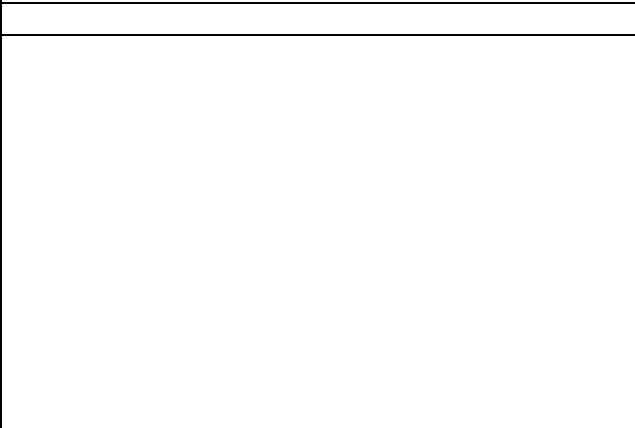
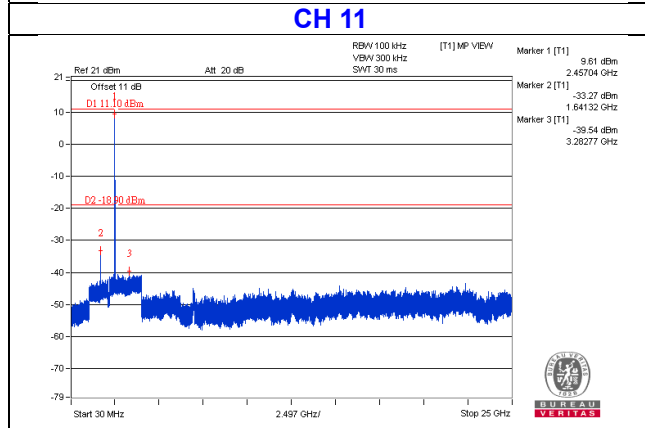
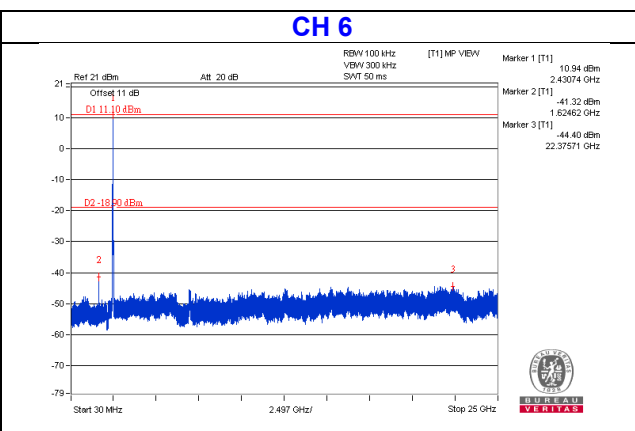
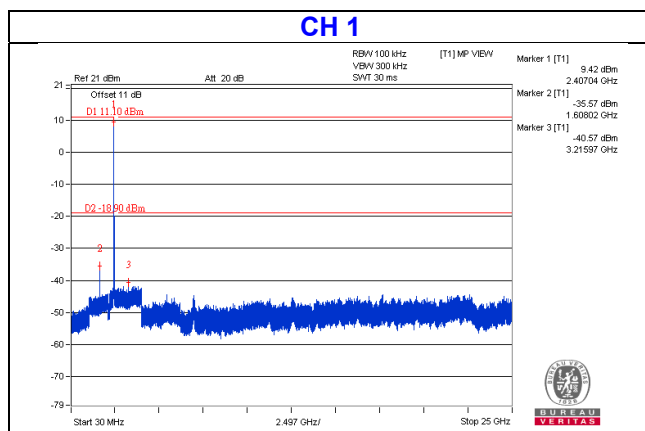
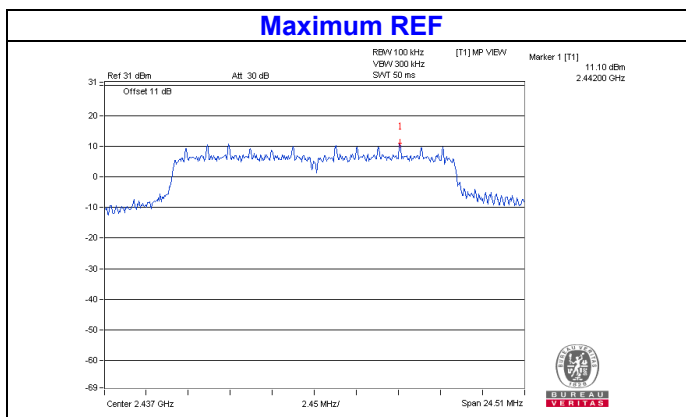
### 802.11b\_CHAIN 1



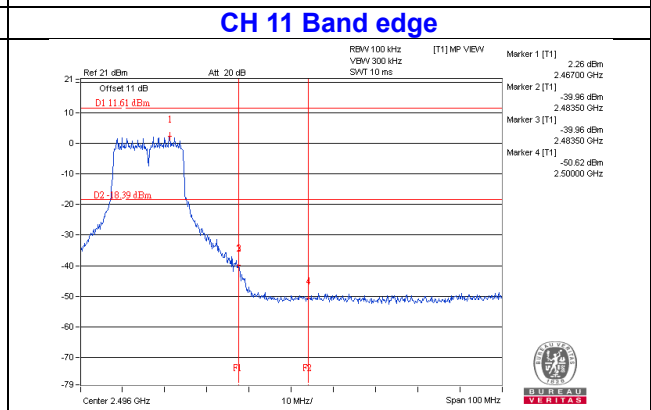
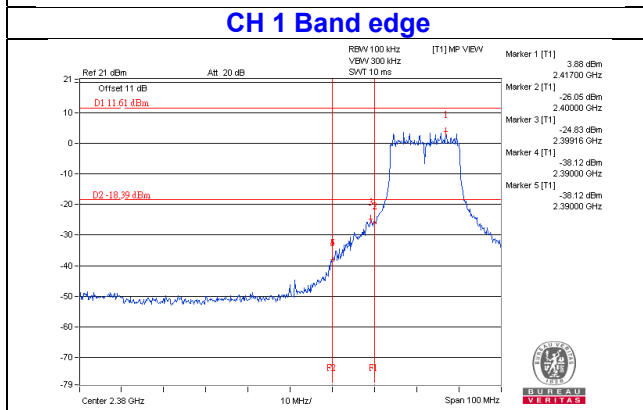
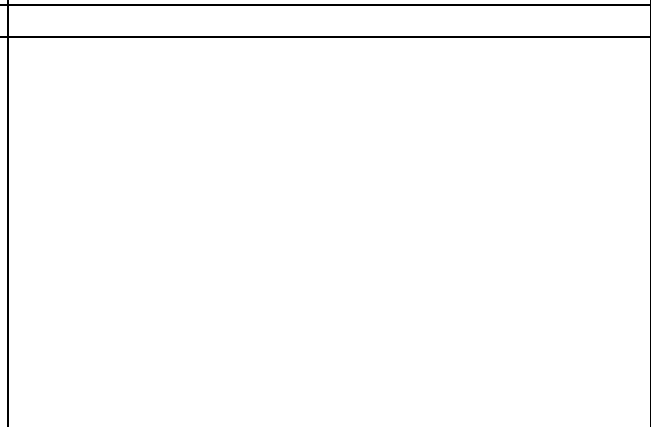
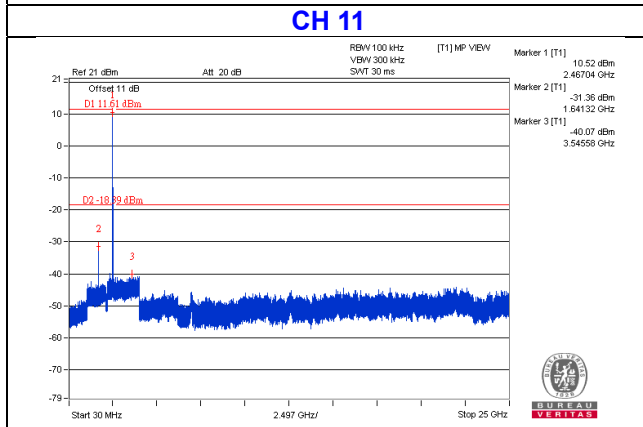
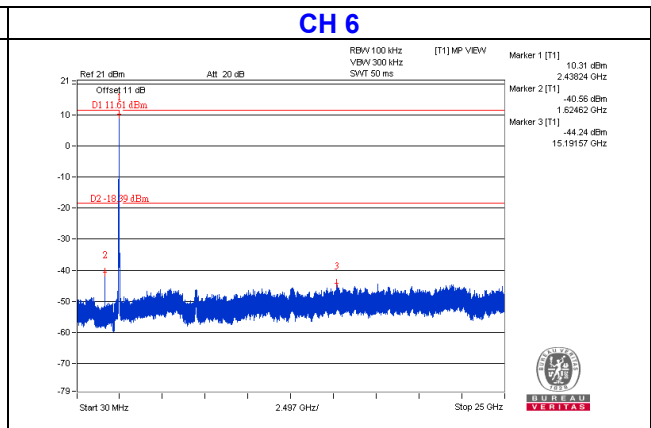
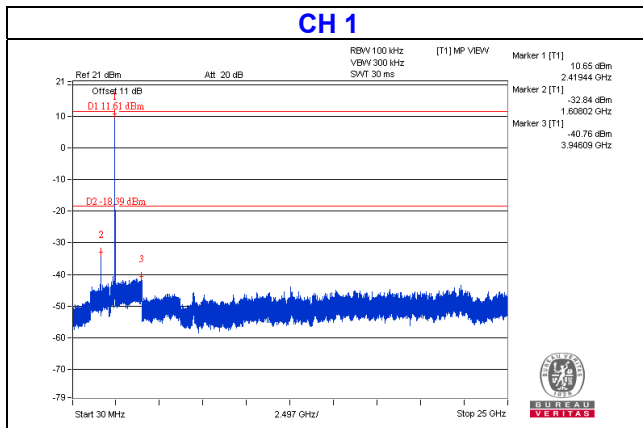
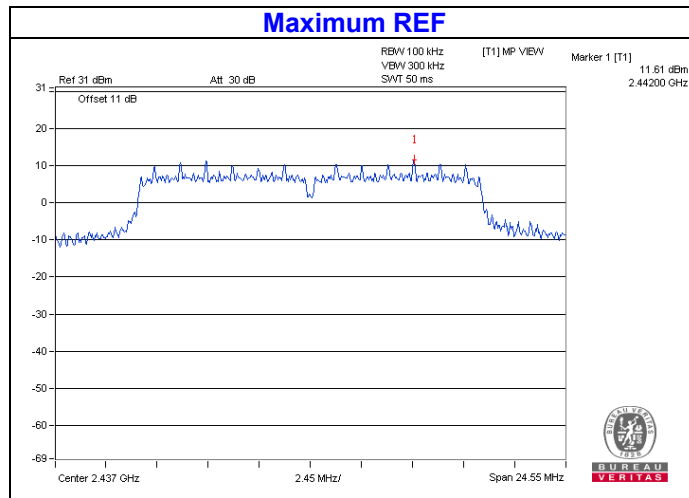


BUREAU VERITAS

# 802.11g\_CHAIN 0

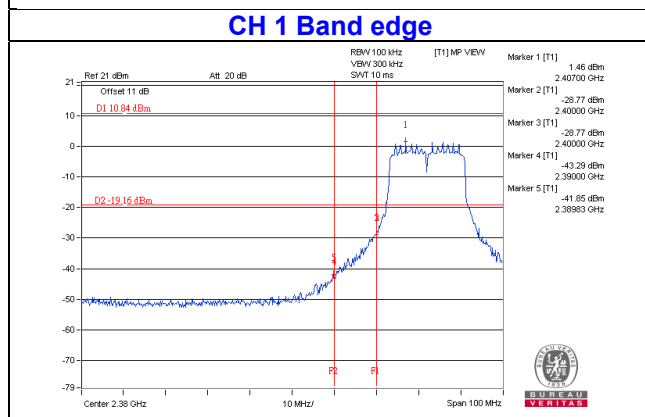
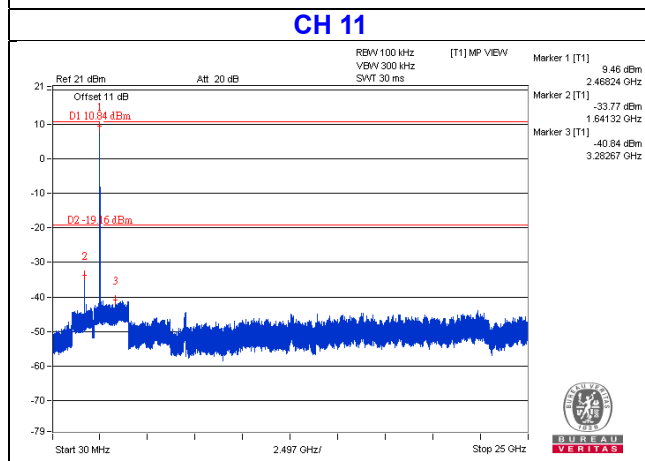
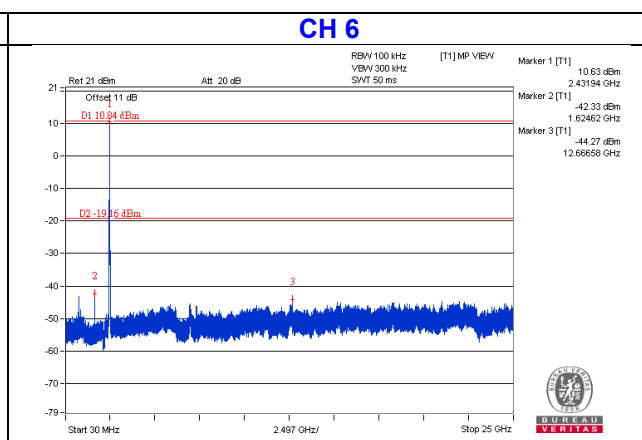
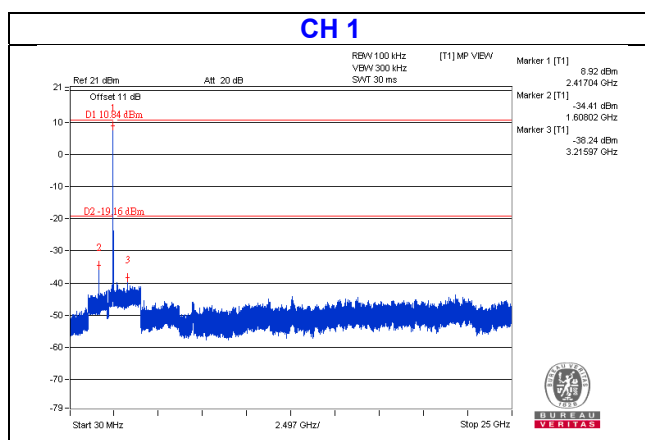
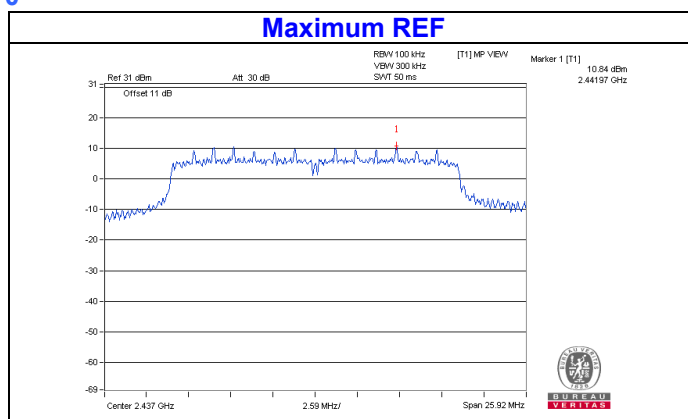


# 802.11g\_CHAIN 1

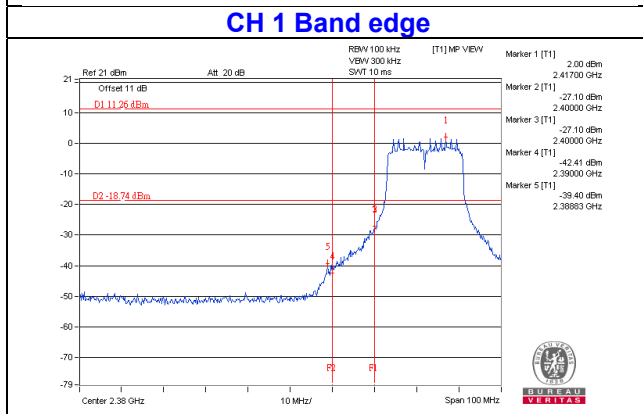
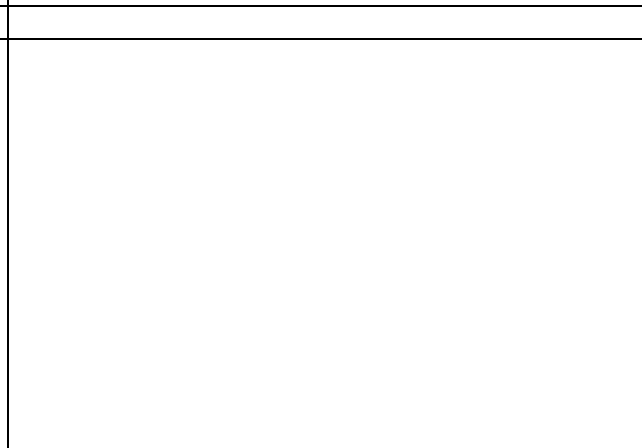
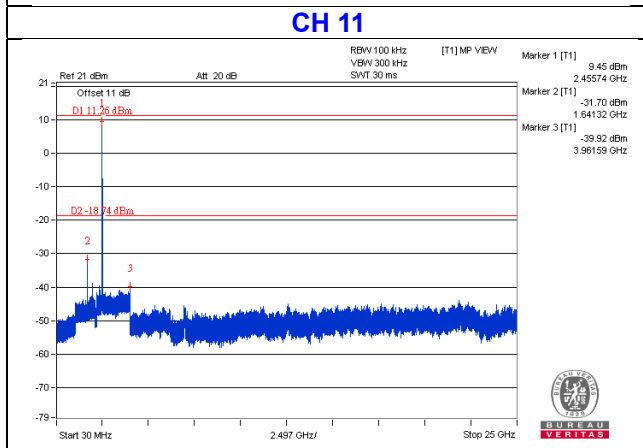
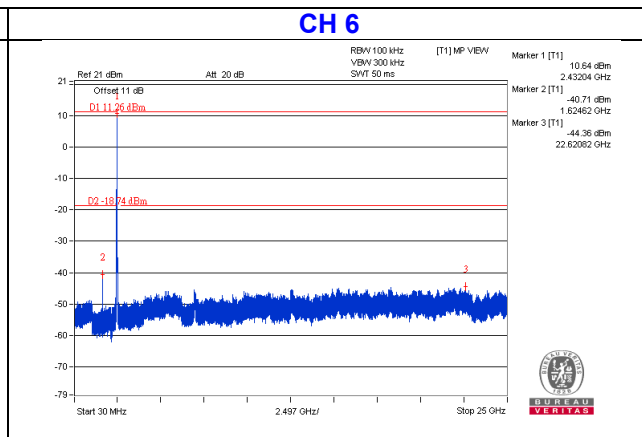
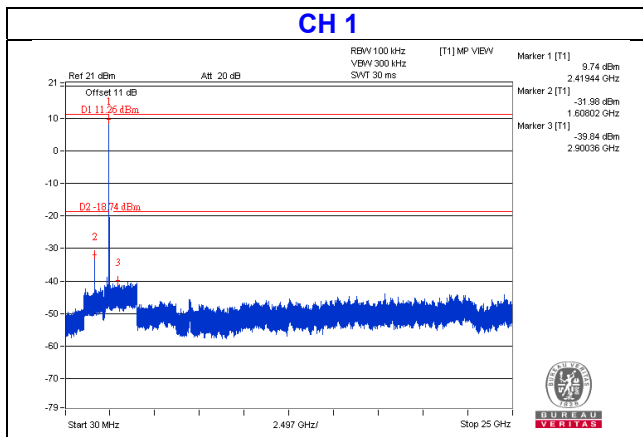
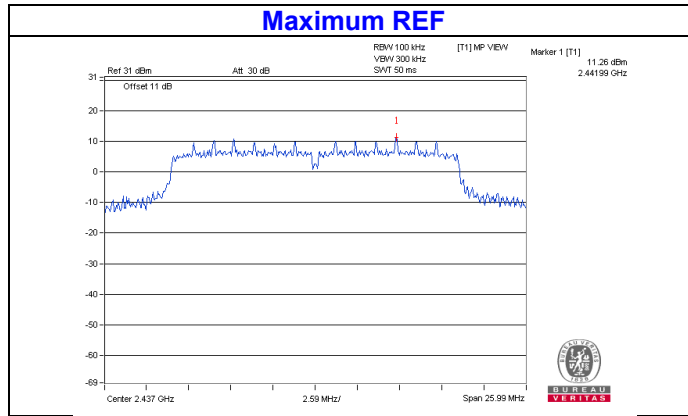




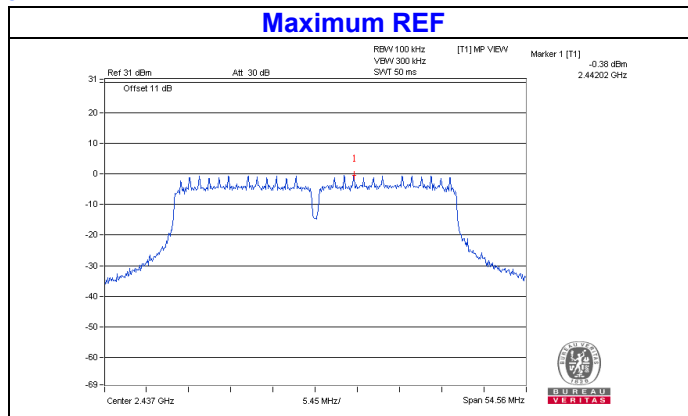
### 802.11n (HT20)\_CHAIN 0



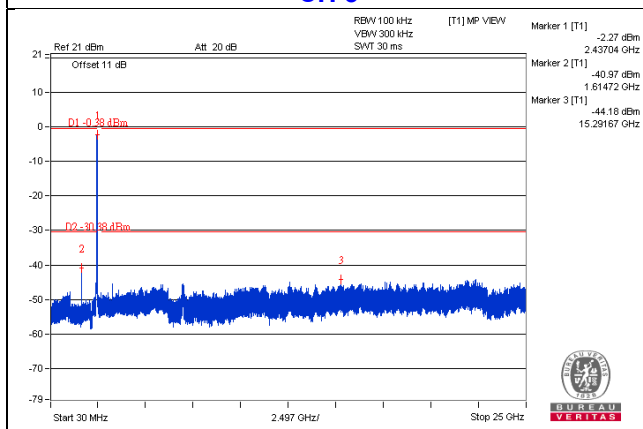
802.11n (HT20)\_CHAIN 1



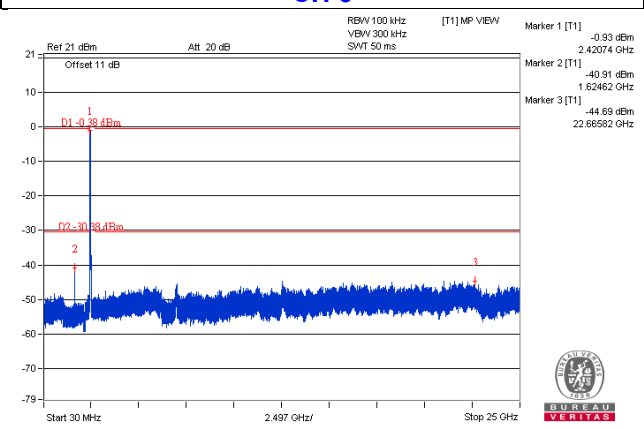
802.11n (HT40)\_CHAIN 0



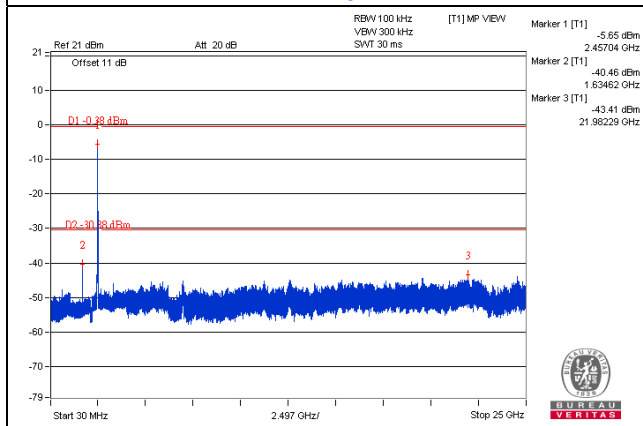
### CH 3



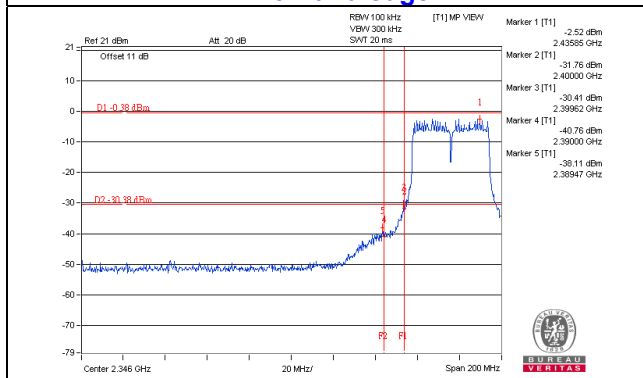
### CH 6



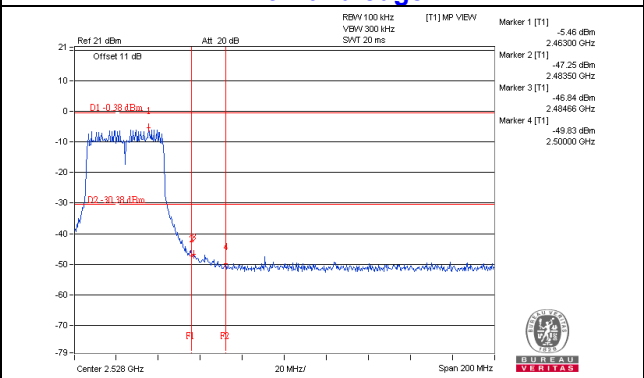
### CH 9



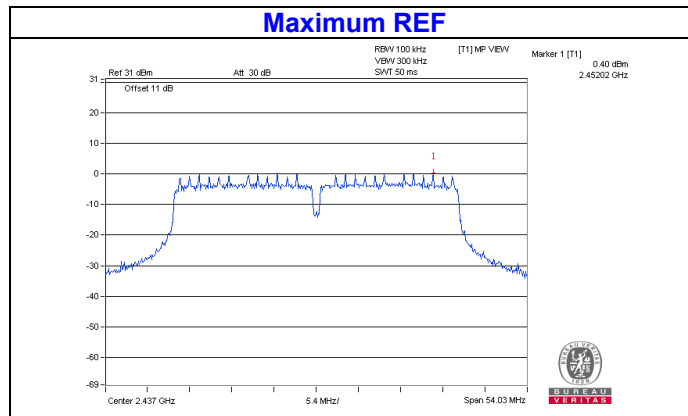
### CH 3 Band edge



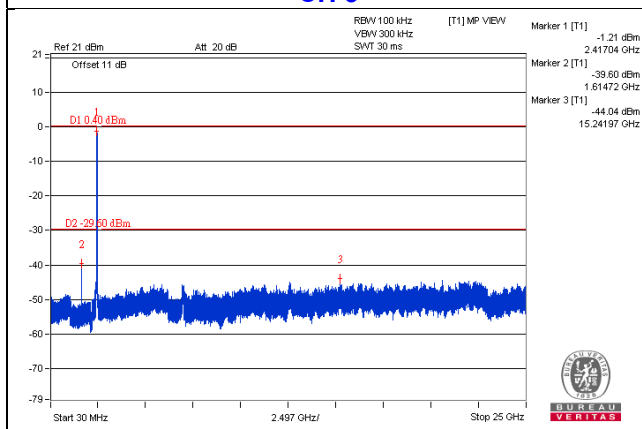
### CH 9 Band edge



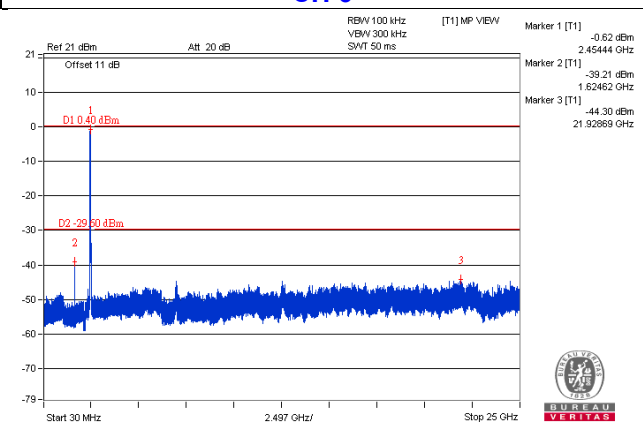
### 802.11n (HT40)\_CHAIN 1



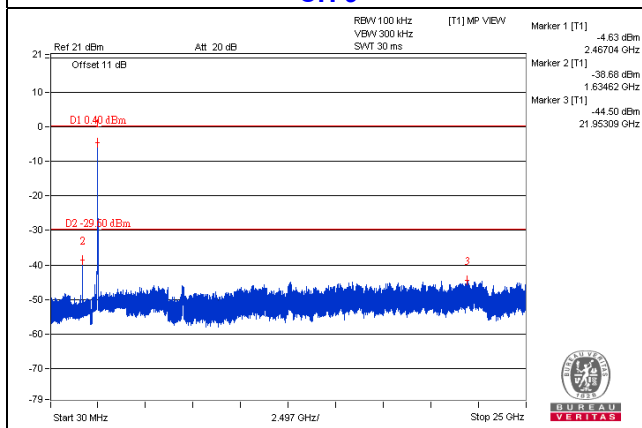
#### CH 3



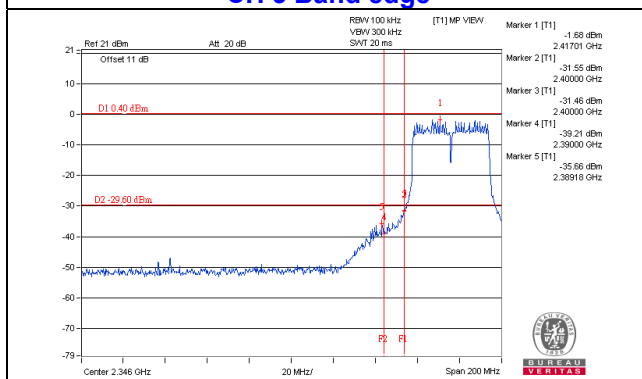
#### CH 6



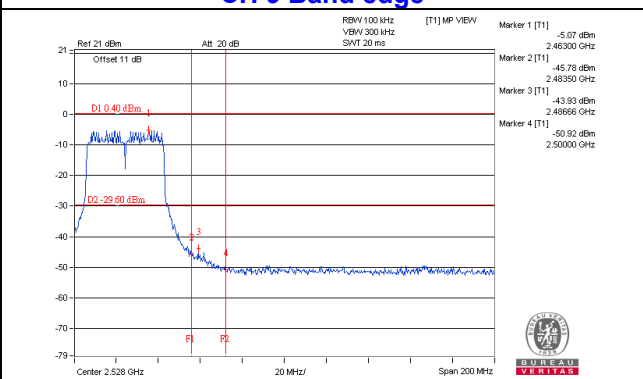
#### CH 9



#### CH 3 Band edge



#### CH 9 Band edge



## 5 Pictures of Test Arrangements

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

## 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 accredited and approved according to ISO/IEC 17025.

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**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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