

## FCC Test Report

**Report No.:** RF151017C01B

**FCC ID:** H8N-WLU5330

**Test Model:** WLU5330-D81

**Received Date:** Oct. 30, 2015

**Test Date:** Nov. 06 ~ Dec. 15, 2015

**Issued Date:** Dec. 22, 2015

**Applicant:** ASKEY COMPUTER CORP.

**Address:** 6-10F, No.119, Jiankang Rd., Zhonghe Dist., New Taipei City, Taiwan

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

**Lab Address:** No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan

**Test Location:** No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City  
33383, TAIWAN (R.O.C.)



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### Release Control Record

Issue No.	Description	Date Issued
RF151017C01B	Original release.	Dec. 22, 2015

## 1 Certificate of Conformity

**Product:** Wireless Module  
**Brand:** Panasonic  
**Test Model:** WLU5330-D81  
**Sample Status:** Engineering sample  
**Applicant:** ASKEY COMPUTER CORP.  
**Test Date:** Nov. 06 ~ Dec. 15, 2015  
**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. 22, 2015  
Pettie Chen / Senior Specialist

**Approved by :**  , **Date:** Dec. 22, 2015  
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 -9.47dB at 0.52927MHz.
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS	Meet the requirement of limit. Minimum passing margin is -0.3dB at 2390.00MHz.
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	2.44 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.63 dB
	200MHz ~ 1000MHz	3.64 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	WLU5330-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	578.473mW
Antenna Type	2.4GHz: Printed antenna with 1.40dBi gain
Antenna Connector	N/A
Accessory Device	N/A
Data Cable Supplied	N/A

**Note:**

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

Modulation Mode	TX Function
802.11b	1TX (Chain 0)
802.11g	2TX
802.11n (HT20)	2TX
802.11n (HT40)	2TX

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

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

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

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	6.5
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

#### **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.

EUT CONFIGURE MODE	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.

EUT CONFIGURE MODE	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.

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	6.5
-	802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5

**Test Condition:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
RE≥1G	25deg. C, 65%RH	120Vac, 60Hz	Tank Wu
RE<1G	25deg. C, 65%RH	120Vac, 60Hz	Tank Wu
PLC	25deg. C, 60%RH	120Vac, 60Hz	Tank Wu
APCM	25deg. C, 60%RH	120Vac, 60Hz	Antony Lee

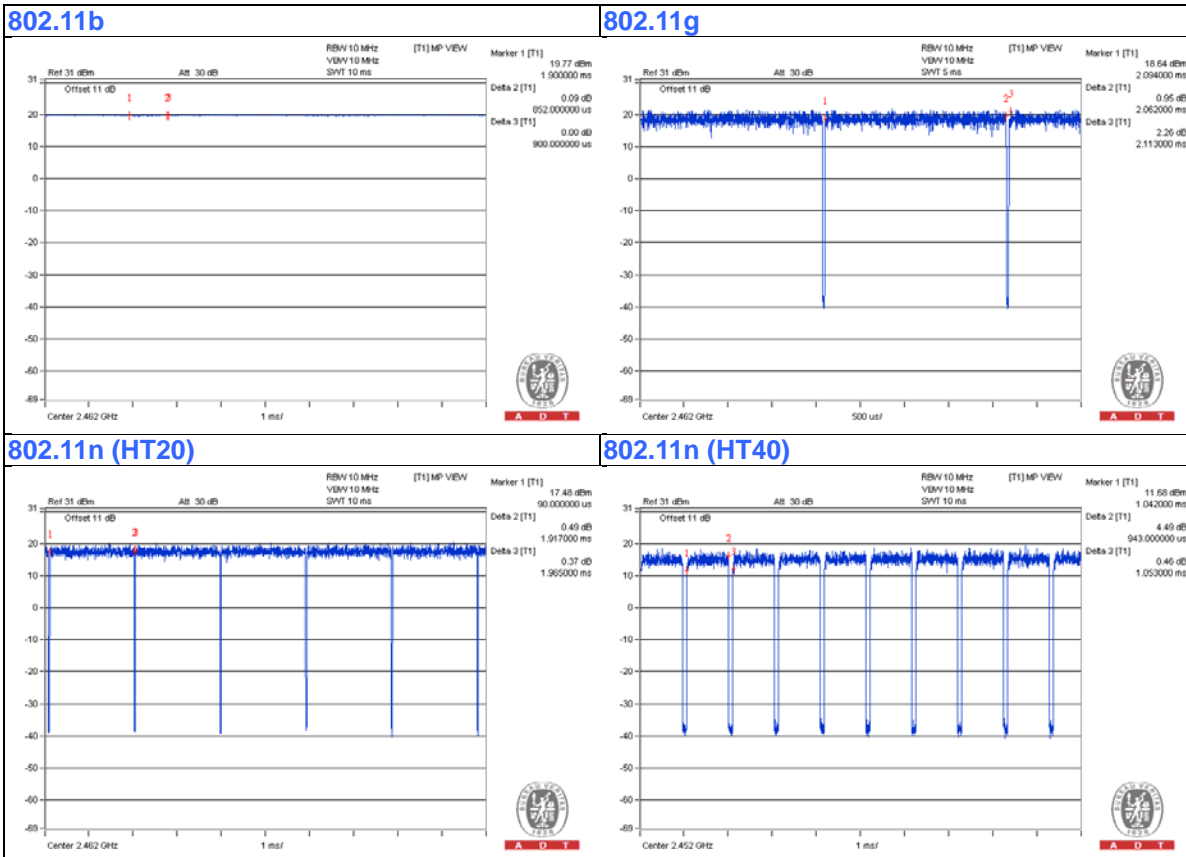
### 3.3 Duty Cycle of Test Signal

**802.11b:** Duty cycle = 100%

**802.11g:** Duty cycle =  $2.062/2.113 = 0.976$

**802.11n (HT20):** Duty cycle =  $1.917/1.965 = 0.976$

**802.11n (HT40):** Duty cycle =  $0.943/1.053 = 0.896$



### 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	E5420	33MKMQ1	FCC DoC Approved	-

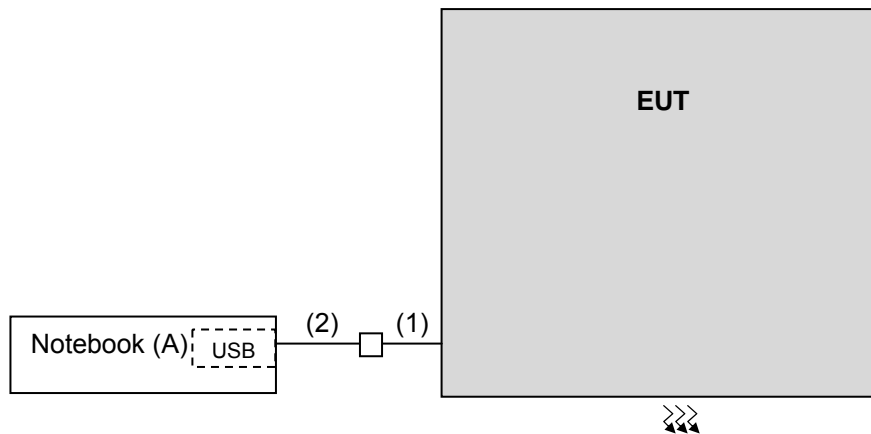
Note:

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	0.1	N	0	Provided by manufacturer
2.	USB cable	1	1	Y	0	-

Note: The core(s) is(are) originally attached to the cable(s).

#### 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)**
- 558074 D01 DTS Meas Guidance v03r03**
- 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 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.



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## 4.1.2 Test Instruments

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 12, 2015	Oct. 11, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Mar. 30, 2015	Mar. 29, 2016
BILOG Antenna SCHWARZBECK	VULB9168	9168-148	Feb. 02, 2015	Feb. 01, 2016
HORN Antenna SCHWARZBECK	BBHA 9120 D	9120D-1169	Feb. 09, 2015	Feb. 08, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 09, 2015	Feb. 08, 2016
Preamplifier Agilent	8449B	3008A01911	Aug. 09, 2015	Aug. 08, 2016
Preamplifier Agilent	8447D	2944A10638	Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-02(309222 +248780)	Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	CABLE-CH9-03(274092)	Aug. 09, 2015	Aug. 08, 2016
RF signal cable Woken	8D-FB	Cable-CH9-01	Aug. 11, 2015	Aug. 10, 2016
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
26GHz ~ 40GHz Amplifier	EM26400	815221	Oct. 18, 2015	Oct. 17, 2016
High Speed Peak Power Meter	ML2495A	0824011	Jul. 09, 2015	Jul. 08, 2016
Power Sensor	MA2411B	0738171	Jul. 09, 2015	Jul. 08, 2016

- 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 9.
  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 215374.
  5. The IC Site Registration No. is IC 7450F-9.

#### 4.1.3 Test Procedures

- a. The EUT was placed on the top of a rotating table 0.8 meters (for below 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:**

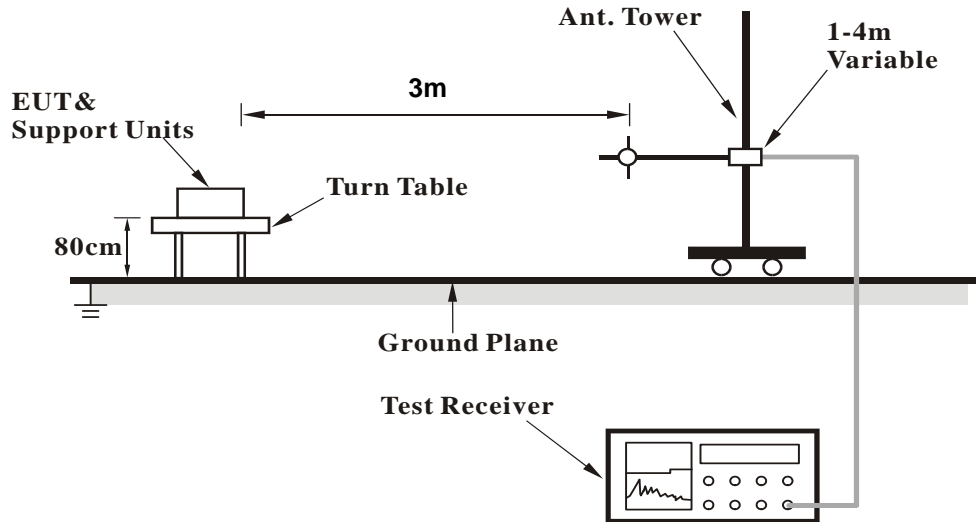
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ( $10 \log(1/\text{duty cycle})$ ).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 Deviation from Test Standard

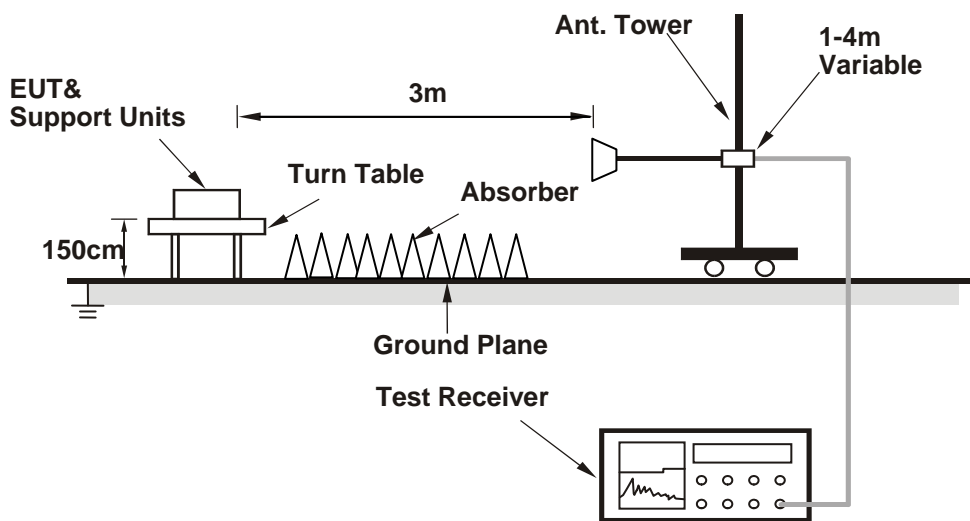
No deviation.

4.1.5 Test Set Up

**<Frequency Range 30MHz ~ 1GHz>**



**<Frequency Range above 1GHz>**



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

4.1.6 EUT Operating Conditions

- a. Connected the EUT with notebook via a USB cable and placed them on the testing table.
- b. The notebook system ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- c. The necessary accessories enable the system in full functions.



#### 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	59.4 PK	74.0	-14.6	1.96 H	20	24.70	34.70
2	2390.00	49.1 AV	54.0	-4.9	1.96 H	20	14.40	34.70
3	*2412.00	103.0 PK			3.19 H	159	68.10	34.90
4	*2412.00	99.2 AV			3.19 H	159	64.30	34.90
5	4824.00	52.4 PK	74.0	-21.6	2.77 H	319	48.40	4.00
6	4824.00	44.0 AV	54.0	-10.0	2.77 H	319	40.00	4.00

#### 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	62.8 PK	74.0	-11.2	1.43 V	164	28.10	34.70
2	2390.00	52.9 AV	54.0	-1.1	1.43 V	164	18.20	34.70
3	*2412.00	110.5 PK			1.64 V	165	75.60	34.90
4	*2412.00	106.6 AV			1.64 V	165	71.70	34.90
5	4824.00	53.6 PK	74.0	-20.4	1.33 V	7	49.60	4.00
6	4824.00	47.8 AV	54.0	-6.2	1.33 V	7	43.80	4.00

#### 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	104.5 PK			1.48 H	154	69.50	35.00
2	*2437.00	100.8 AV			1.48 H	154	65.80	35.00
3	4874.00	52.3 PK	74.0	-21.7	1.25 H	173	48.30	4.00
4	4874.00	44.0 AV	54.0	-10.0	1.25 H	173	40.00	4.00

**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	112.6 PK			1.54 V	164	77.60	35.00
2	*2437.00	108.8 AV			1.54 V	164	73.80	35.00
3	4874.00	54.2 PK	74.0	-19.8	2.75 V	18	50.20	4.00
4	4874.00	48.7 AV	54.0	-5.3	2.75 V	18	44.70	4.00

**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	100.8 PK			1.11 H	152	65.60	35.20
2	*2462.00	97.0 AV			1.11 H	152	61.80	35.20
3	2483.50	60.5 PK	74.0	-13.5	1.88 H	26	25.30	35.20
4	2483.50	49.0 AV	54.0	-5.0	1.88 H	26	13.80	35.20
5	4924.00	53.2 PK	74.0	-20.8	2.82 H	314	49.00	4.20
6	4924.00	46.6 AV	54.0	-7.4	2.82 H	314	42.40	4.20

**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	109.5 PK			1.52 V	161	74.30	35.20
2	*2462.00	105.7 AV			1.52 V	161	70.50	35.20
3	2483.50	62.2 PK	74.0	-11.8	1.49 V	162	27.00	35.20
4	2483.50	52.6 AV	54.0	-1.4	1.49 V	162	17.40	35.20
5	4924.00	54.5 PK	74.0	-19.5	1.39 V	8	50.30	4.20
6	4924.00	49.4 AV	54.0	-4.6	1.39 V	8	45.20	4.20

**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	66.2 PK	74.0	-7.8	2.22 H	32	31.50	34.70
2	2390.00	52.5 AV	54.0	-1.5	2.22 H	32	17.80	34.70
3	*2412.00	104.8 PK			1.58 H	8	69.90	34.90
4	*2412.00	95.0 AV			1.58 H	8	60.10	34.90
5	4824.00	49.8 PK	74.0	-24.2	1.48 H	174	45.80	4.00
6	4824.00	36.1 AV	54.0	-17.9	1.48 H	174	32.10	4.00

**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	68.9 PK	74.0	-5.1	1.21 V	303	34.20	34.70
2	2390.00	53.0 AV	54.0	-1.0	1.21 V	303	18.30	34.70
3	*2412.00	108.4 PK			1.35 V	105	73.50	34.90
4	*2412.00	98.4 AV			1.35 V	105	63.50	34.90
5	4824.00	51.1 PK	74.0	-22.9	1.56 V	9	47.10	4.00
6	4824.00	38.0 AV	54.0	-16.0	1.56 V	9	34.00	4.00

**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	65.5 PK	74.0	-8.5	3.50 H	16	30.80	34.70
2	2390.00	51.0 AV	54.0	-3.0	3.50 H	16	16.30	34.70
3	*2437.00	109.1 PK			1.40 H	197	74.10	35.00
4	*2437.00	98.8 AV			1.40 H	197	63.80	35.00
5	4874.00	49.9 PK	74.0	-24.1	1.96 H	323	45.90	4.00
6	4874.00	36.8 AV	54.0	-17.2	1.96 H	323	32.80	4.00

**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	66.8 PK	74.0	-7.2	1.16 V	303	32.10	34.70
2	2390.00	53.0 AV	54.0	-1.0	1.16 V	303	18.30	34.70
3	*2437.00	111.1 PK			1.39 V	102	76.10	35.00
4	*2437.00	100.9 AV			1.39 V	102	65.90	35.00
5	4874.00	51.5 PK	74.0	-22.5	1.42 V	28	47.50	4.00
6	4874.00	38.1 AV	54.0	-15.9	1.42 V	28	34.10	4.00

**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	106.9 PK			1.74 H	8	71.70	35.20
2	*2462.00	96.8 AV			1.74 H	8	61.60	35.20
3	2483.50	67.4 PK	74.0	-6.6	1.68 H	9	32.20	35.20
4	2483.50	52.3 AV	54.0	-1.7	1.68 H	9	17.10	35.20
5	4924.00	50.1 PK	74.0	-23.9	1.32 H	233	45.90	4.20
6	4924.00	36.5 AV	54.0	-17.5	1.32 H	233	32.30	4.20

**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	109.0 PK			1.28 V	161	73.80	35.20
2	*2462.00	98.9 AV			1.28 V	161	63.70	35.20
3	2483.50	69.8 PK	74.0	-4.2	1.23 V	95	34.60	35.20
4	2483.50	52.8 AV	54.0	-1.2	1.23 V	95	17.60	35.20
5	4924.00	51.8 PK	74.0	-22.2	1.47 V	19	47.60	4.20
6	4924.00	38.7 AV	54.0	-15.3	1.47 V	19	34.50	4.20

**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)

<b>ANTENNA POLARITY &amp; TEST DISTANCE: HORIZONTAL AT 3 M</b>								
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	64.1 PK	74.0	-9.9	2.00 H	22	29.40	34.70
2	2390.00	50.5 AV	54.0	-3.5	2.00 H	22	15.80	34.70
3	*2412.00	102.0 PK			1.80 H	13	67.10	34.90
4	*2412.00	91.4 AV			1.80 H	13	56.50	34.90
5	4824.00	49.5 PK	74.0	-24.5	1.66 H	180	45.50	4.00
6	4824.00	36.2 AV	54.0	-17.8	1.66 H	180	32.20	4.00
<b>ANTENNA POLARITY &amp; TEST DISTANCE: VERTICAL AT 3 M</b>								
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	69.8 PK	74.0	-4.2	1.16 V	161	35.10	34.70
2	2390.00	53.0 AV	54.0	-1.0	1.16 V	161	18.30	34.70
3	*2412.00	105.5 PK			1.17 V	160	70.60	34.90
4	*2412.00	95.4 AV			1.17 V	160	60.50	34.90
5	4824.00	50.7 PK	74.0	-23.3	1.53 V	12	46.70	4.00
6	4824.00	36.5 AV	54.0	-17.5	1.53 V	12	32.50	4.00

**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	64.1 PK	74.0	-9.9	2.09 H	16	29.40	34.70
2	2390.00	51.4 AV	54.0	-2.6	2.09 H	16	16.70	34.70
3	*2437.00	109.4 PK			2.42 H	195	74.40	35.00
4	*2437.00	98.7 AV			2.42 H	195	63.70	35.00
5	4874.00	49.2 PK	74.0	-24.8	1.39 H	193	45.20	4.00
6	4874.00	36.3 AV	54.0	-17.7	1.39 H	193	32.30	4.00

**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	67.6 PK	74.0	-6.4	1.90 V	147	32.90	34.70
2	2390.00	53.0 AV	54.0	-1.0	1.90 V	147	18.30	34.70
3	*2437.00	111.7 PK			1.36 V	96	76.70	35.00
4	*2437.00	101.5 AV			1.36 V	96	66.50	35.00
5	4874.00	50.7 PK	74.0	-23.3	1.64 V	18	46.70	4.00
6	4874.00	38.0 AV	54.0	-16.0	1.64 V	18	34.00	4.00

**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			2.18 H	7	71.00	35.20
2	*2462.00	96.1 AV			2.18 H	7	60.90	35.20
3	2483.50	69.9 PK	74.0	-4.1	1.68 H	8	34.70	35.20
4	2483.50	52.8 AV	54.0	-1.2	1.68 H	8	17.60	35.20
5	4924.00	50.3 PK	74.0	-23.7	1.51 H	188	46.10	4.20
6	4924.00	36.8 AV	54.0	-17.2	1.51 H	188	32.60	4.20

**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	109.1 PK			1.07 V	93	73.90	35.20
2	*2462.00	99.2 AV			1.07 V	93	64.00	35.20
3	2483.50	71.4 PK	74.0	-2.6	1.25 V	103	36.20	35.20
4	2483.50	53.0 AV	54.0	-1.0	1.25 V	103	17.80	35.20
5	4924.00	53.1 PK	74.0	-20.9	1.61 V	26	48.90	4.20
6	4924.00	39.0 AV	54.0	-15.0	1.61 V	26	34.80	4.20

**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 (HT40)**

<b>CHANNEL</b>	TX Channel 3	<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	64.5 PK	74.0	-9.5	3.89 H	9	29.80	34.70
2	2390.00	52.7 AV	54.0	-1.3	3.89 H	9	18.00	34.70
3	*2422.00	96.6 PK			2.56 H	38	61.70	34.90
4	*2422.00	85.9 AV			2.56 H	38	51.00	34.90
5	4844.00	49.0 PK	74.0	-25.0	1.00 H	247	45.00	4.00
6	4844.00	35.9 AV	54.0	-18.1	1.00 H	247	31.90	4.00

**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	66.4 PK	74.0	-7.6	1.32 V	250	31.70	34.70
<b>2</b>	<b>2390.00</b>	<b>53.7 AV</b>	<b>54.0</b>	<b>-0.3</b>	<b>1.32 V</b>	<b>250</b>	<b>19.00</b>	<b>34.70</b>
3	*2422.00	99.7 PK			1.00 V	259	64.80	34.90
4	*2422.00	89.3 AV			1.00 V	259	54.40	34.90
5	4844.00	49.3 PK	74.0	-24.7	1.08 V	256	45.30	4.00
6	4844.00	36.1 AV	54.0	-17.9	1.08 V	256	32.10	4.00

**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	63.5 PK	74.0	-10.5	2.12 H	345	28.80	34.70
2	2390.00	50.4 AV	54.0	-3.6	2.12 H	345	15.70	34.70
3	*2437.00	100.2 PK			2.22 H	358	65.20	35.00
4	*2437.00	89.4 AV			2.22 H	358	54.40	35.00
5	4837.00	49.0 PK	74.0	-25.0	1.00 H	124	45.00	4.00
6	4837.00	36.2 AV	54.0	-17.8	1.00 H	124	32.20	4.00

**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	70.8 PK	74.0	-3.2	1.57 V	79	36.10	34.70
2	2390.00	53.0 AV	54.0	-1.0	1.57 V	79	18.30	34.70
3	*2437.00	101.3 PK			1.37 V	119	66.30	35.00
4	*2437.00	91.8 AV			1.37 V	119	56.80	35.00
5	4837.00	50.5 PK	74.0	-23.5	1.68 V	270	46.50	4.00
6	4837.00	36.6 AV	54.0	-17.4	1.68 V	270	32.60	4.00

**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 9	<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	*2452.00	103.5 PK			1.52 H	358	68.50	35.00
2	*2452.00	93.3 AV			1.52 H	358	58.30	35.00
3	2483.50	67.3 PK	74.0	-6.7	1.00 H	352	32.10	35.20
4	2483.50	52.9 AV	54.0	-1.1	1.00 H	352	17.70	35.20
5	4904.00	49.5 PK	74.0	-24.5	1.34 H	106	45.30	4.20
6	4904.00	36.0 AV	54.0	-18.0	1.34 H	106	31.80	4.20

**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	103.7 PK			1.42 V	117	68.70	35.00
2	*2452.00	93.1 AV			1.42 V	117	58.10	35.00
3	2483.50	66.8 PK	74.0	-7.2	1.61 V	119	31.60	35.20
4	2483.50	52.6 AV	54.0	-1.4	1.61 V	119	17.40	35.20
5	4904.00	49.8 PK	74.0	-24.2	1.00 V	224	45.60	4.20
6	4904.00	36.4 AV	54.0	-17.6	1.00 V	224	32.20	4.20

**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	55.13	19.0 QP	40.0	-21.0	1.01 H	180	33.00	-14.00
2	136.62	19.0 QP	43.5	-24.5	2.00 H	9	33.60	-14.60
3	190.95	20.9 QP	43.5	-22.6	1.51 H	241	37.20	-16.30
4	251.11	33.7 QP	46.0	-12.3	1.26 H	192	48.20	-14.50
5	379.17	27.6 QP	46.0	-18.4	1.01 H	308	39.00	-11.40
6	936.07	33.6 QP	46.0	-12.4	1.26 H	95	34.60	-1.00

**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	49.30	32.4 QP	40.0	-7.6	1.00 V	11	46.20	-13.80
2	99.75	25.8 QP	43.5	-17.7	1.50 V	12	44.30	-18.50
3	165.73	33.9 QP	43.5	-9.6	1.00 V	138	47.90	-14.00
4	272.45	33.0 QP	46.0	-13.0	2.00 V	236	46.30	-13.30
5	355.89	32.3 QP	46.0	-13.7	1.50 V	163	44.20	-11.90
6	918.60	38.9 QP	46.0	-7.1	1.25 V	7	39.90	-1.00

**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.	Date Of Calibration	Due Date Of Calibration
Test Receiver ROHDE & SCHWARZ	ESCS 30	100288	Apr. 27, 2015	Apr. 26, 2016
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 26, 2014	Dec. 25, 2015
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 26, 2015	Feb. 25, 2016
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 24, 2015	Jul. 23, 2016
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 1.

3. The VCCI Site Registration No. is C-2040.

### 4.2.3 Test Procedures

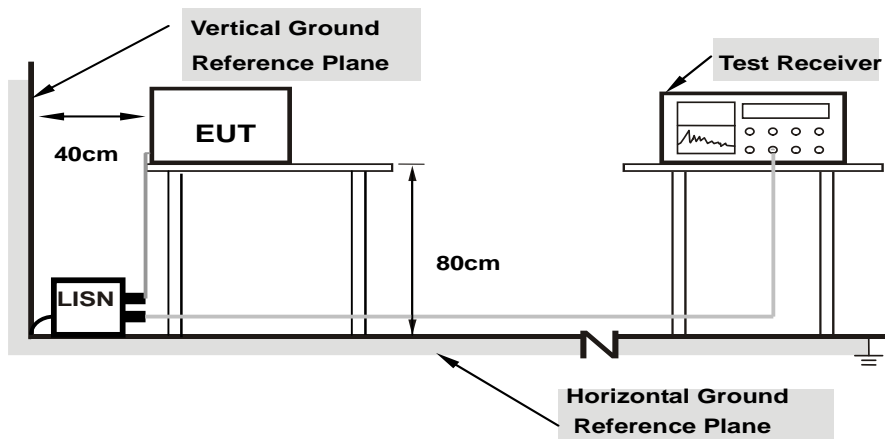
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance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

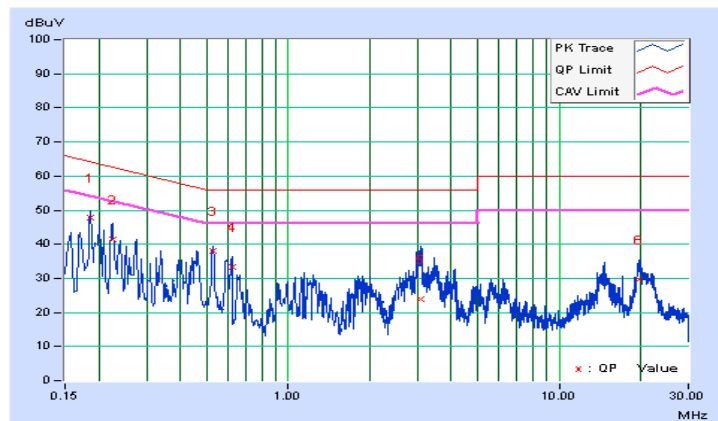
#### 4.2.7 Test Results

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

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18519	9.83	37.92	23.23	47.75	33.06	64.25	54.25	-16.50	-21.19
2	0.22434	9.84	31.42	14.81	41.26	24.65	62.66	52.66	-21.39	-28.00
<b>3</b>	<b>0.52927</b>	<b>9.89</b>	<b>28.25</b>	<b>26.64</b>	<b>38.14</b>	<b>36.53</b>	<b>56.00</b>	<b>46.00</b>	<b>-17.86</b>	<b>-9.47</b>
4	0.61920	9.90	23.45	3.94	33.35	13.84	56.00	46.00	-22.65	-32.16
5	3.10205	10.07	13.97	7.28	24.04	17.35	56.00	46.00	-31.96	-28.65
6	19.60225	11.07	18.49	11.17	29.56	22.24	60.00	50.00	-30.44	-27.76

#### 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.



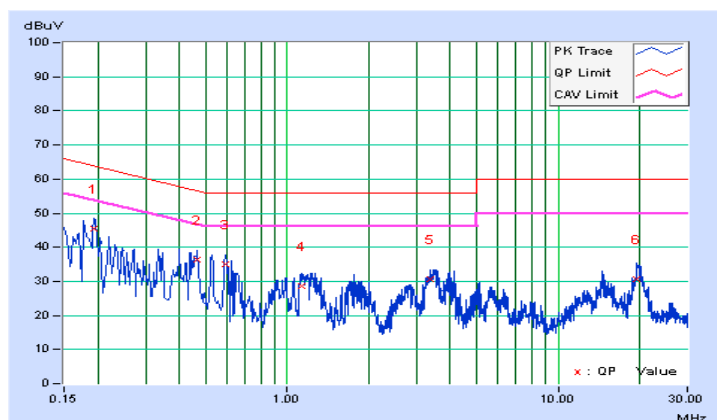


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.19305	9.83	35.77	21.68	45.60	31.51	63.90
2	0.46669	9.89	26.64	22.59	36.53	32.48	56.57	46.57	-20.05	-14.10
3	0.59158	9.90	25.27	23.11	35.17	33.01	56.00	46.00	-20.83	-12.99
4	1.13532	9.94	18.74	4.80	28.68	14.74	56.00	46.00	-27.32	-31.26
5	3.37605	10.09	20.60	12.41	30.69	22.50	56.00	46.00	-25.31	-23.50
6	19.53187	10.90	19.64	13.68	30.54	24.58	60.00	50.00	-29.46	-25.42

**REMARKS:**

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

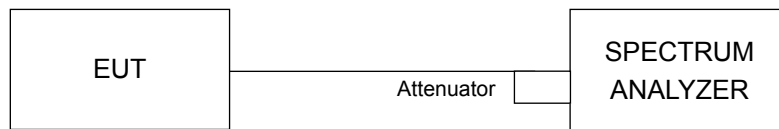


### 4.3 6dB Bandwidth Measurement

#### 4.3.1 Limits of 6dB Bandwidth Measurement

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

#### 4.3.2 Test Setup



#### 4.3.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

#### 4.3.4 Test Procedure

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

#### 4.3.5 Deviation from Test Standard

No deviation.

#### 4.3.6 EUT Operating Conditions

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

#### 4.3.7 Test Result

##### 802.11b

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	8.09	0.5	PASS
6	2437	8.11	0.5	PASS
11	2462	8.08	0.5	PASS

##### 802.11g

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	16.40	16.41	0.5	PASS
6	2437	16.39	16.40	0.5	PASS
11	2462	16.40	16.41	0.5	PASS

##### 802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	17.64	17.66	0.5	PASS
6	2437	17.63	17.63	0.5	PASS
11	2462	17.65	17.65	0.5	PASS

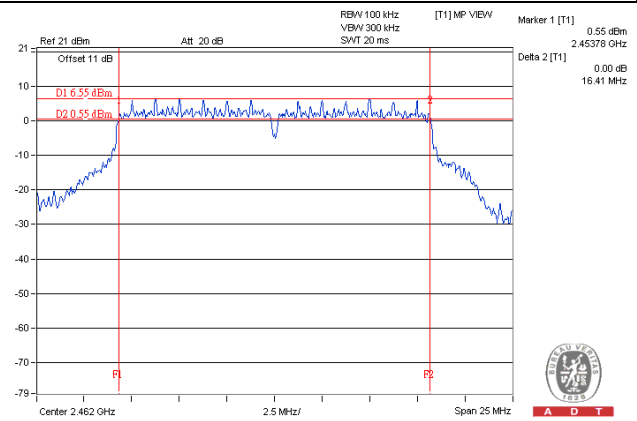
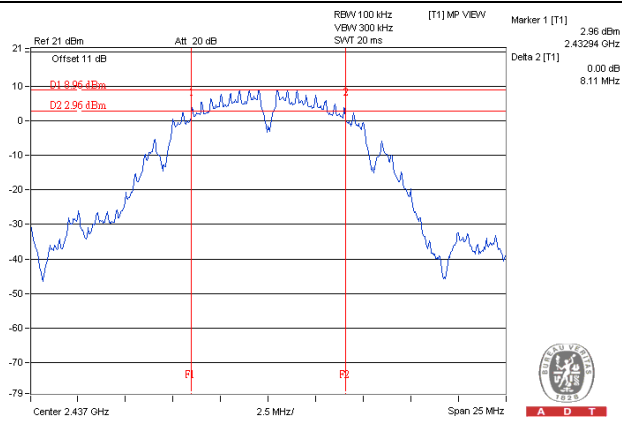
##### 802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	36.43	36.44	0.5	PASS
6	2437	36.38	36.39	0.5	PASS
9	2452	36.38	36.41	0.5	PASS

### Spectrum Plot of Worst Value

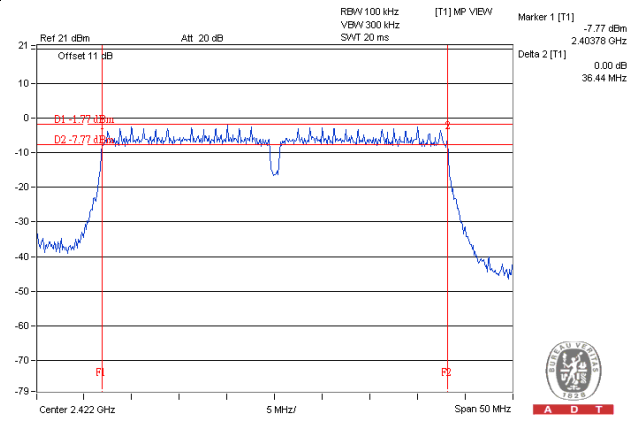
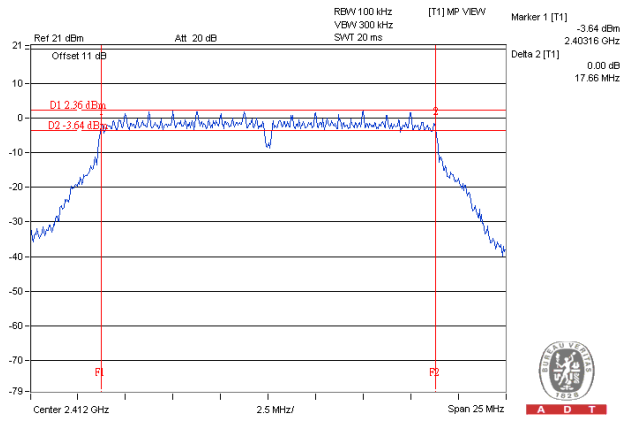
#### 802.11b

#### 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,

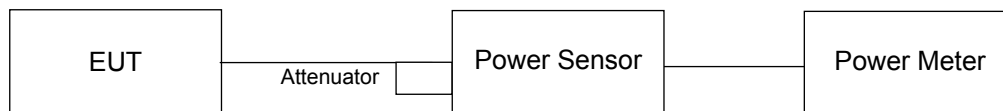
Array Gain = 0 dB (i.e., no array gain) for  $N_{ANT} \leq 4$ ;

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

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.

### 4.4.5 Deviation from Test Standard

No deviation.

### 4.4.6 EUT Operating Conditions

Same as Item 4.3.6.

#### 4.4.7 Test Results

#### FOR PEAK POWER

##### 802.11b

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass/Fail
1	2412	109.396	20.39	30	Pass
6	2437	295.801	24.71	30	Pass
11	2462	103.039	20.13	30	Pass

##### 802.11g

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	21.48	21.05	267.955	24.28	30	Pass
6	2437	24.78	24.30	569.761	27.56	30	Pass
11	2462	22.49	21.61	322.296	25.08	30	Pass

##### 802.11n (HT20)

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	18.71	18.22	140.676	21.48	30	Pass
6	2437	24.93	24.27	<b>578.473</b>	27.62	30	Pass
11	2462	21.24	22.66	317.547	25.02	30	Pass

##### 802.11n (HT40)

Chan.	Freq. (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	17.04	17.06	101.398	20.06	30	Pass
6	2437	19.84	19.50	185.508	22.68	30	Pass
9	2452	22.09	21.48	302.413	24.81	30	Pass

**FOR AVERAGE POWER**
**802.11b**

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)
1	2412	53.703	17.30
6	2437	176.198	22.46
11	2462	50.466	17.03

**802.11g**

Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	15.20	15.19	66.150	18.21
6	2437	21.64	21.22	278.315	24.45
11	2462	16.62	16.36	89.171	19.50

**802.11n (HT20)**

Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	12.52	12.31	34.887	15.43
6	2437	22.08	20.92	285.031	24.55
11	2462	16.01	16.20	81.589	19.12

**802.11n (HT40)**

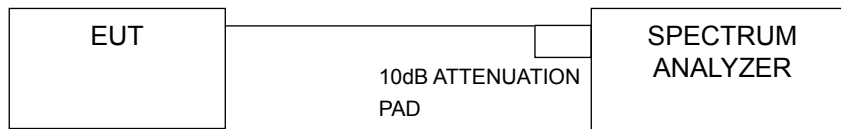
Chan.	Frequency (MHz)	Avg. Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
3	2422	10.75	10.76	23.797	13.77
6	2437	13.27	13.09	41.602	16.19
9	2452	15.41	15.62	71.229	18.53

## 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

- a. Set analyzer center frequency to DTS channel center frequency.
- b. Set the span to 1.5 times the DTS bandwidth.
- c. Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d. Set the VBW  $\geq 3 \times \text{RBW}$ .
- e. Detector = peak.
- f. Sweep time = auto couple.
- g. Trace mode = max hold.
- h. Allow trace to fully stabilize.
- i. Use the peak marker function to determine the maximum amplitude level within the RBW.

### 4.5.5 Deviation from Test Standard

No deviation.

### 4.5.6 EUT Operating Condition

Same as Item 4.3.6



#### 4.5.7 Test Results

##### 802.11b

Channel	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Pass /Fail
1	2412	-5.55	8	Pass
6	2437	-5.29	8	Pass
11	2462	-6.27	8	Pass

##### 802.11g

TX chain	Channel	Freq. (MHz)	PSD (dBm)	10 log (N=2) dB	Total PSD (dBm)	Limit (dBm)	Pass /Fail
0	1	2412	-10.66	3.01	-7.65	8	Pass
	6	2437	-8.37	3.01	-5.36	8	Pass
	11	2462	-9.27	3.01	-6.26	8	Pass
1	1	2412	-10.73	3.01	-7.72	8	Pass
	6	2437	-5.04	3.01	-2.03	8	Pass
	11	2462	-8.56	3.01	-5.55	8	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 =  $1.4\text{dBi} + 10\log(2) = 4.41\text{dBi} < 6\text{dBi}$ , so the power density limit no need to reduced.

##### 802.11n (HT20)

TX chain	Channel	Freq. (MHz)	PSD (dBm)	10 log (N=2) dB	Total PSD (dBm)	Limit (dBm)	Pass /Fail
0	1	2412	-14.20	3.01	-11.19	8	Pass
	6	2437	-8.41	3.01	-5.40	8	Pass
	11	2462	-10.58	3.01	-7.57	8	Pass
1	1	2412	-13.63	3.01	-10.62	8	Pass
	6	2437	-6.00	3.01	-2.99	8	Pass
	11	2462	-7.96	3.01	-4.95	8	Pass

**NOTE:**

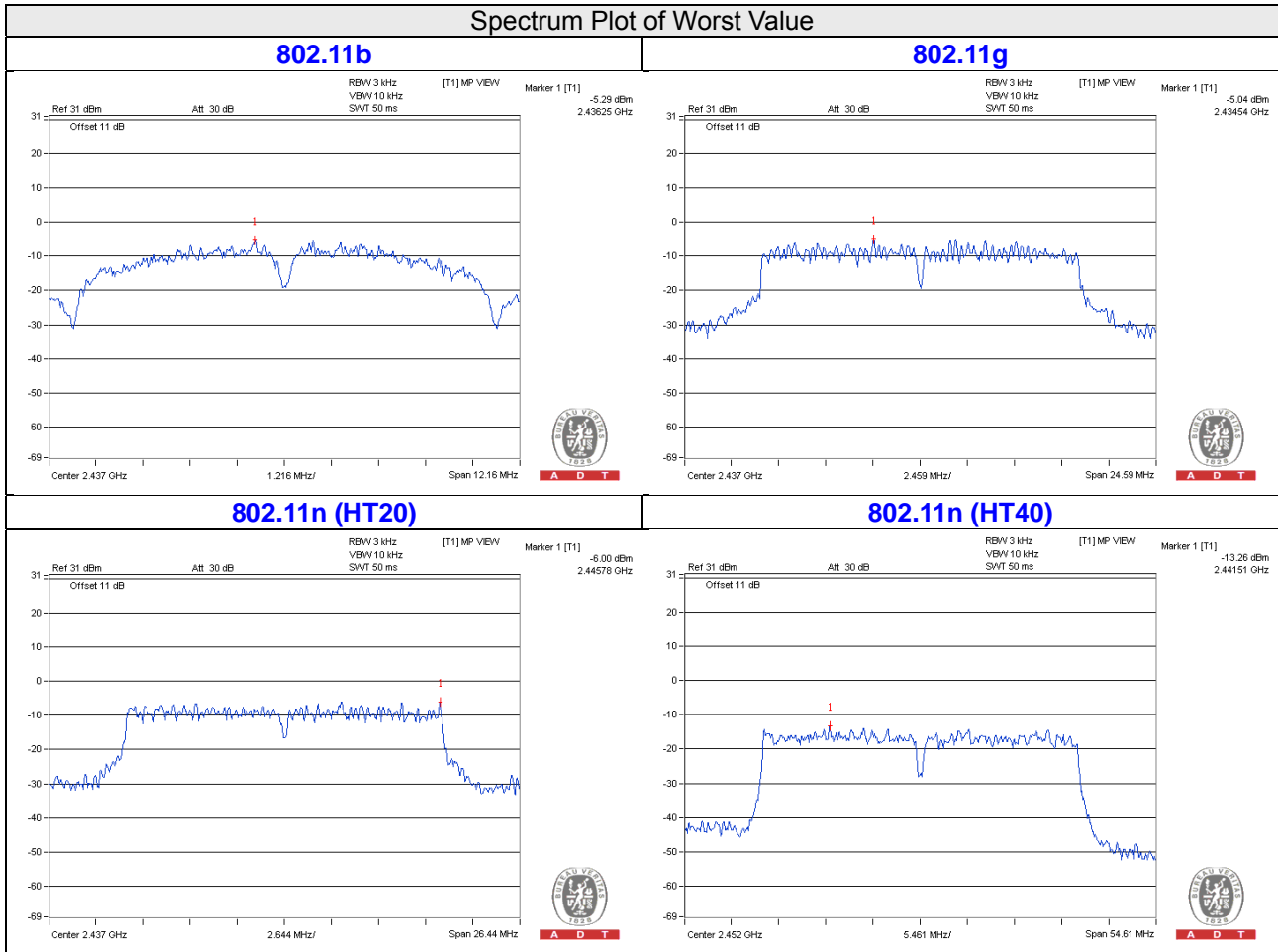
- Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
- Directional gain =  $1.4\text{dBi} + 10\log(2) = 4.41\text{dBi} < 6\text{dBi}$ , so the power density limit no need to reduced.

**802.11n (HT40)**

TX chain	Channel	Freq. (MHz)	PSD (dBm)	10 log (N=2) dB	Total PSD (dBm)	Limit (dBm)	Pass /Fail
0	3	2422	-18.84	3.01	-15.83	8	Pass
	6	2437	-16.44	3.01	-13.43	8	Pass
	9	2452	-14.79	3.01	-11.78	8	Pass
1	3	2422	-17.22	3.01	-14.21	8	Pass
	6	2437	-15.23	3.01	-12.22	8	Pass
	9	2452	-13.26	3.01	-10.25	8	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 =  $1.4\text{dBi} + 10\log(2) = 4.41\text{dBi} < 6\text{dBi}$ , so the power density limit no need to reduced.

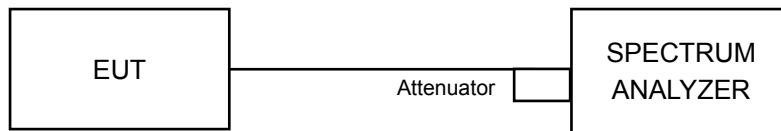


## 4.6 Conducted Out of Band Emission Measurement

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

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

### 4.6.2 Test Setup



### 4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.6.4 Test Procedure

#### MEASUREMENT PROCEDURE REF

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

#### MEASUREMENT PROCEDURE OOBE

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

### 4.6.5 Deviation from Test Standard

No deviation.

### 4.6.6 EUT Operating Condition

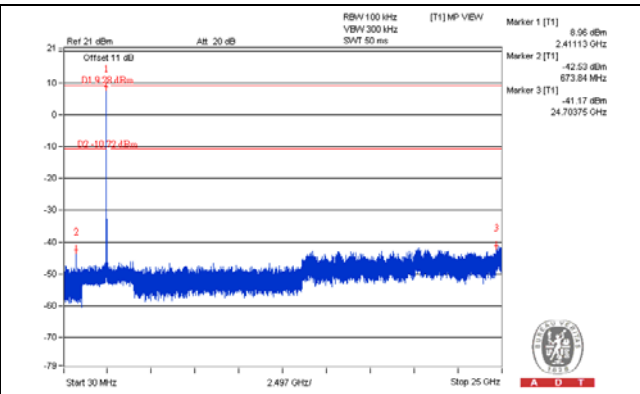
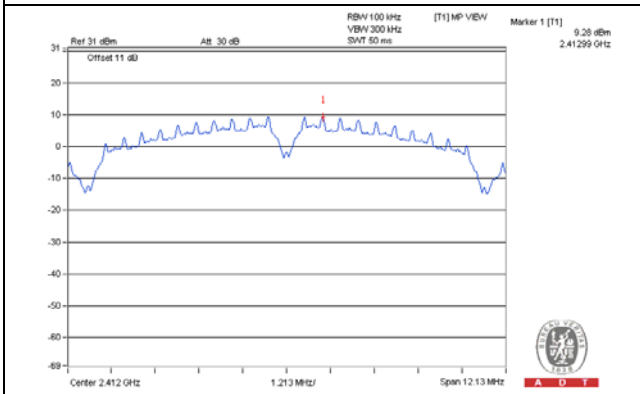
Same as Item 4.3.6

### 4.6.7 Test Results

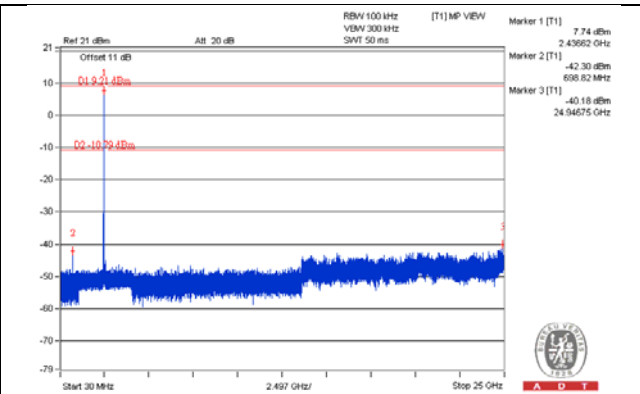
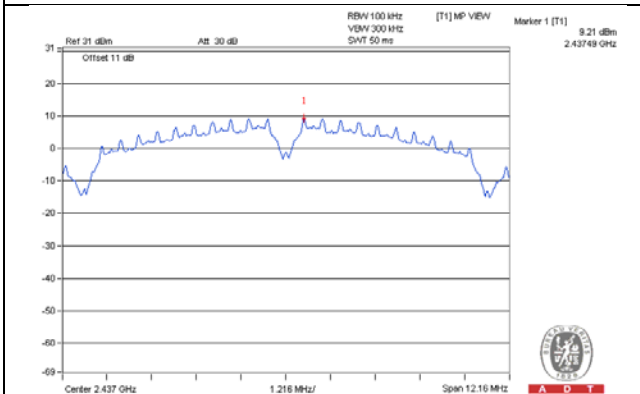
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

802.11b

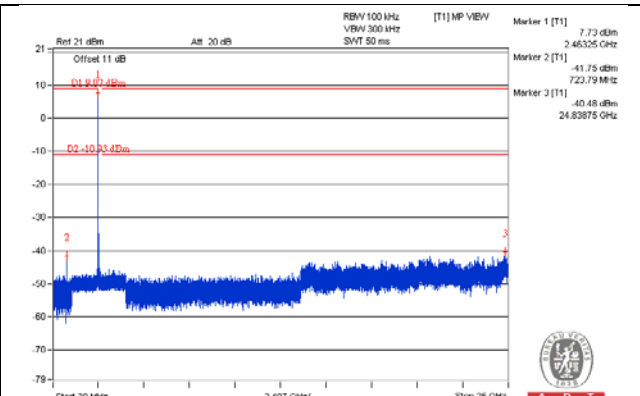
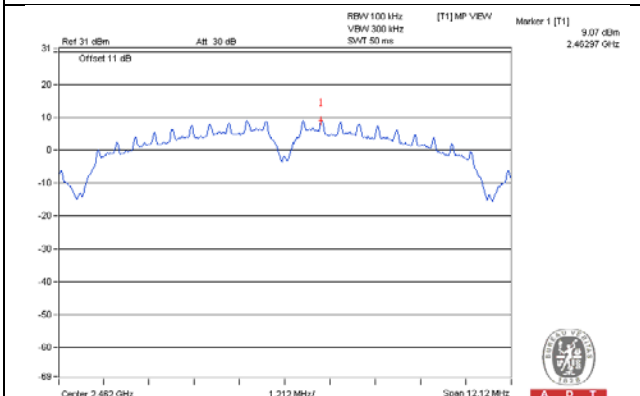
CH 1



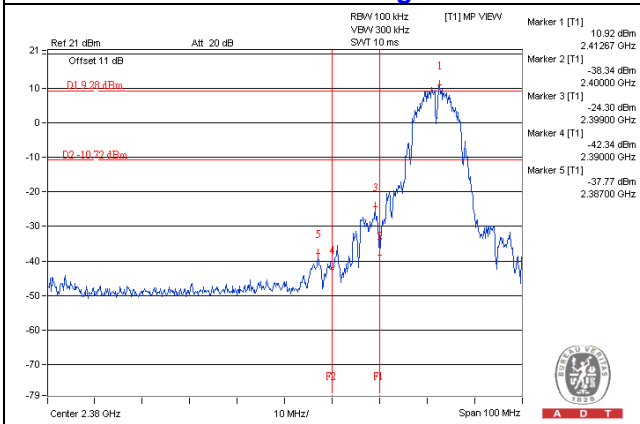
CH 6



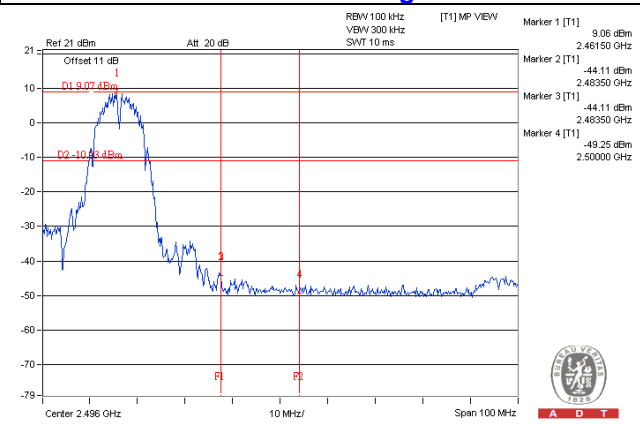
CH 11



CH 1 Band edge

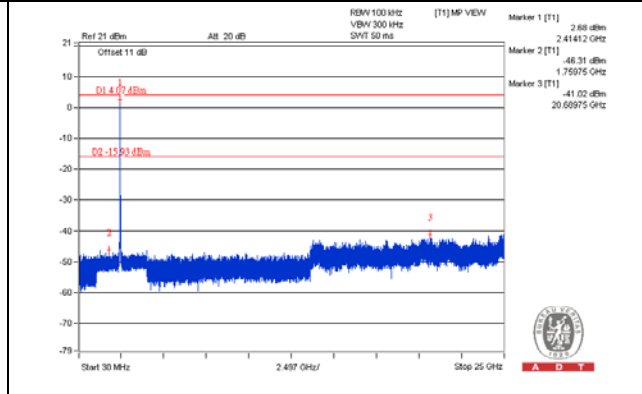
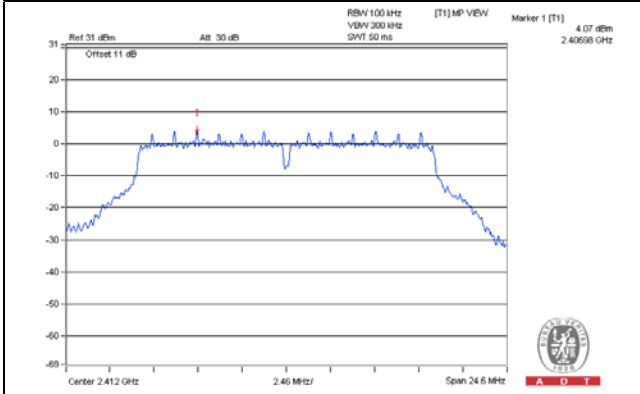


CH 11 Band edge

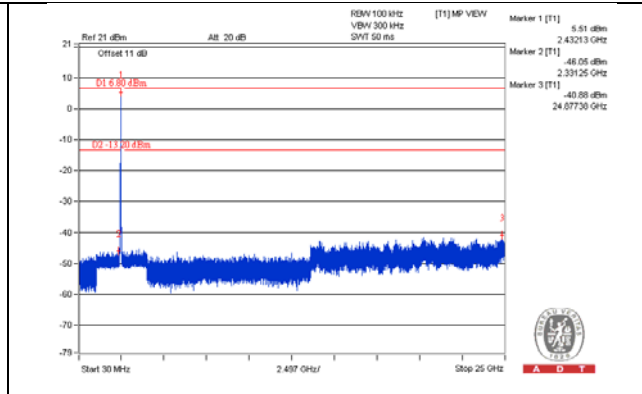
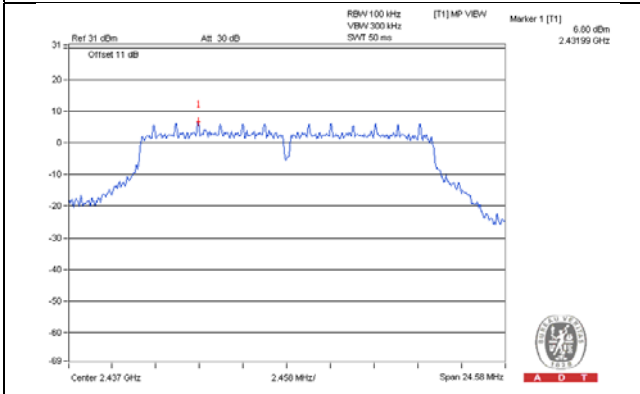


802.11g  
CHAIN 0

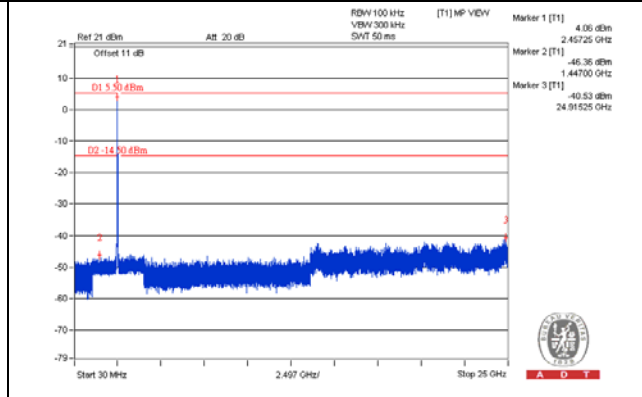
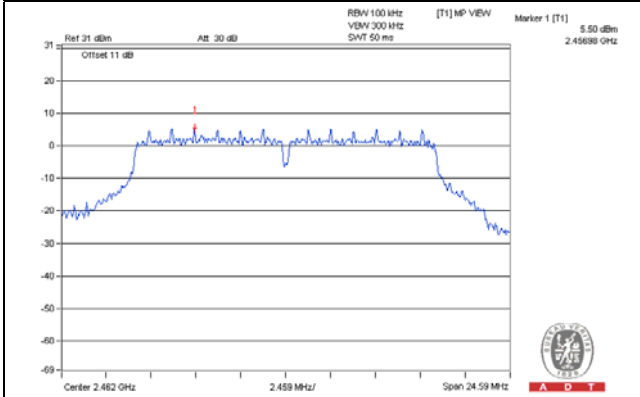
CH 1



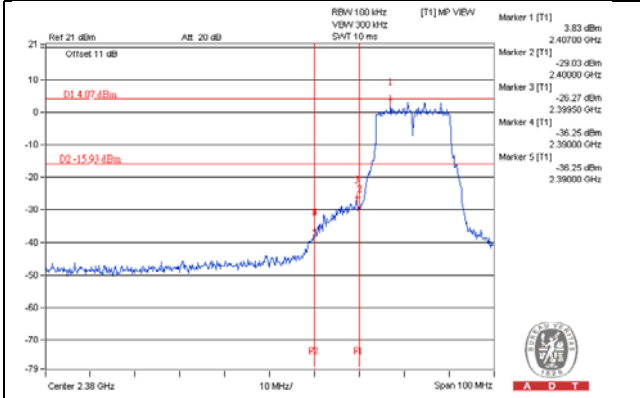
CH 6



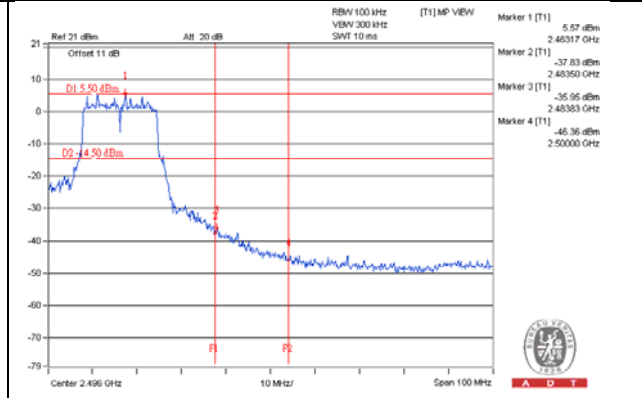
CH 11



CH 1 Band edge

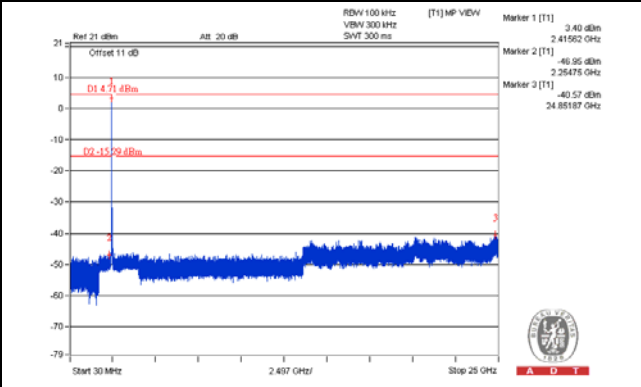
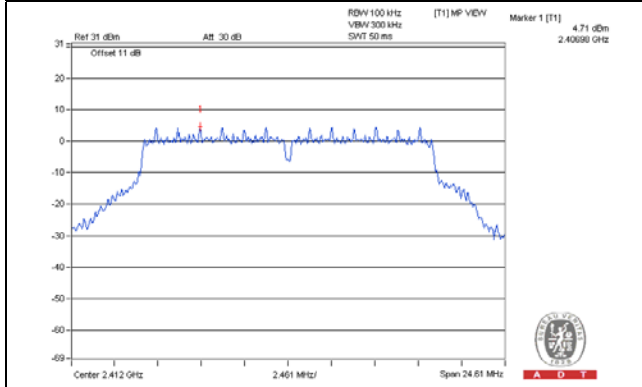


CH 11 Band edge

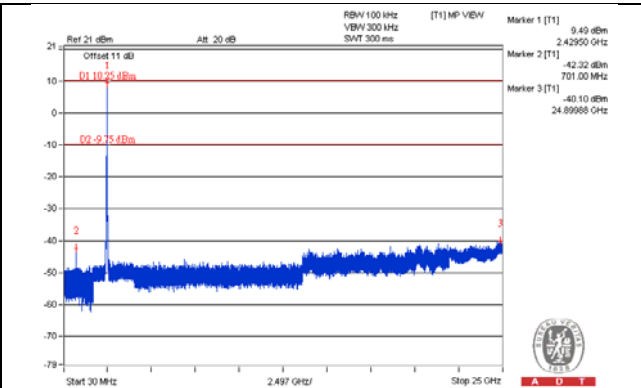
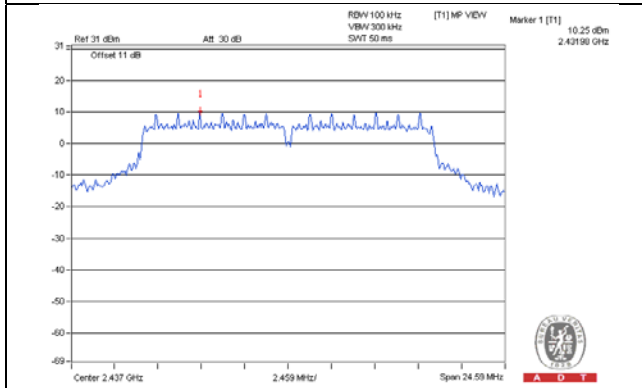


CHAIN 1

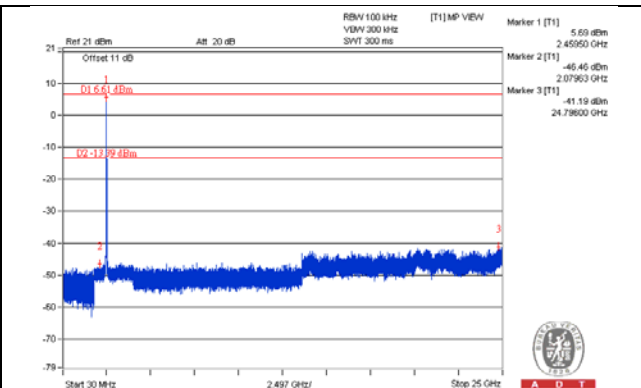
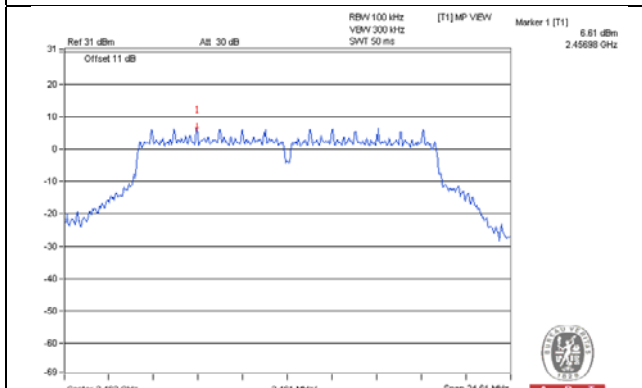
CH 1



CH 6

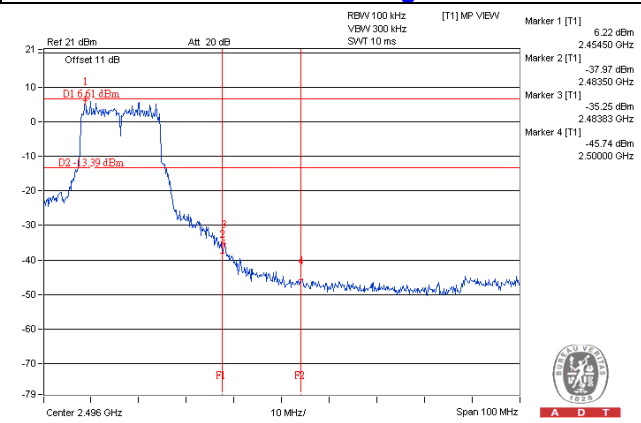
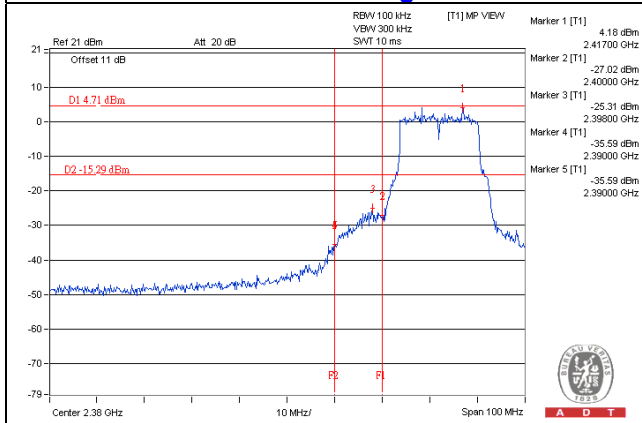


CH 11



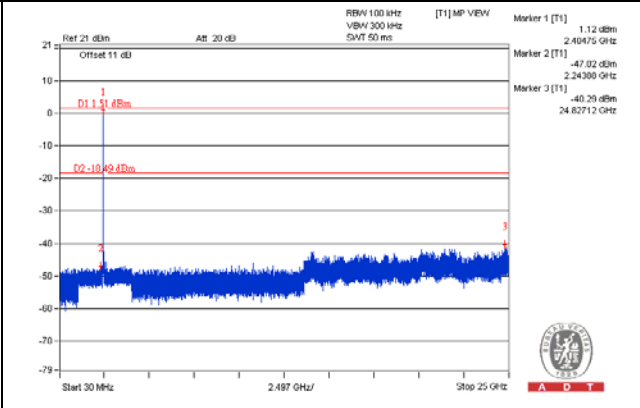
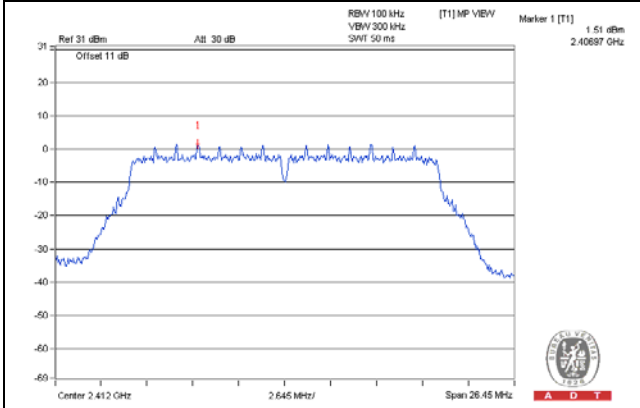
CH 1 Band edge

CH 11 Band edge

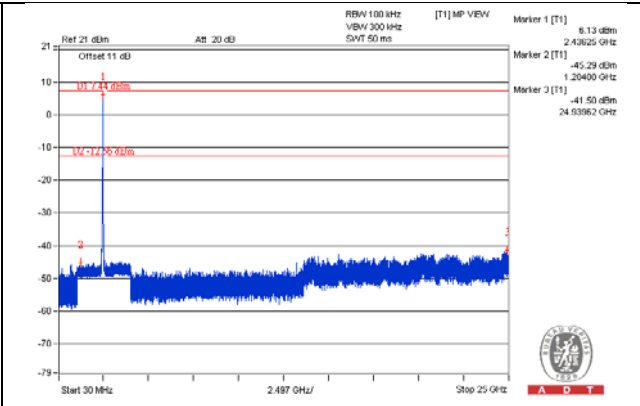
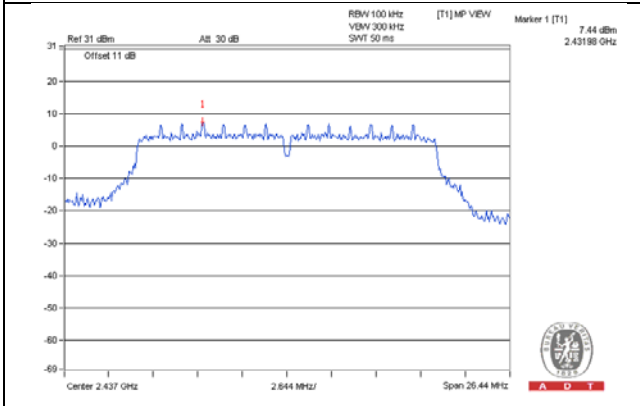


802.11n (HT20)  
CHAIN 0

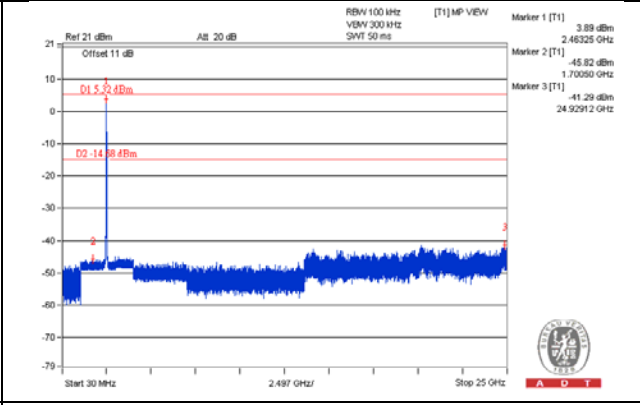
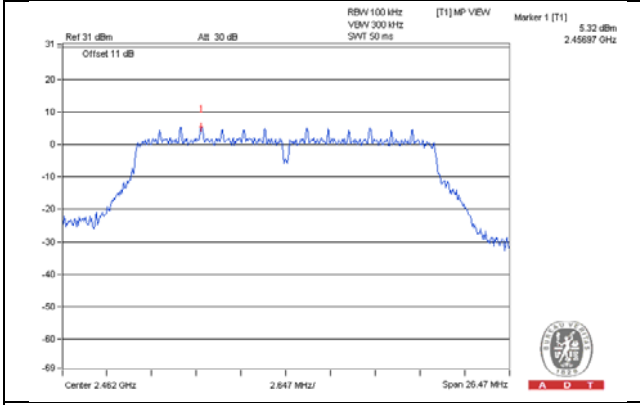
CH 1



CH 6

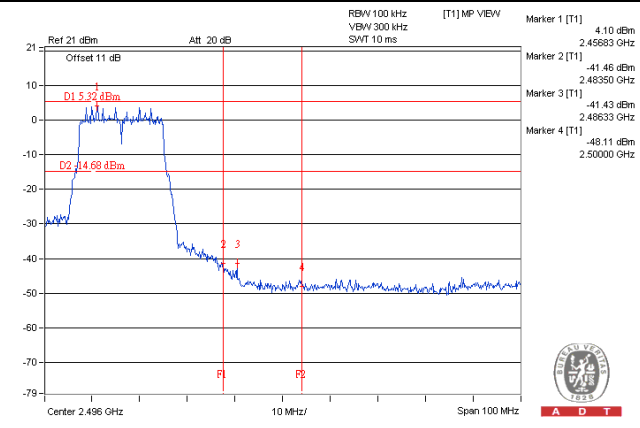
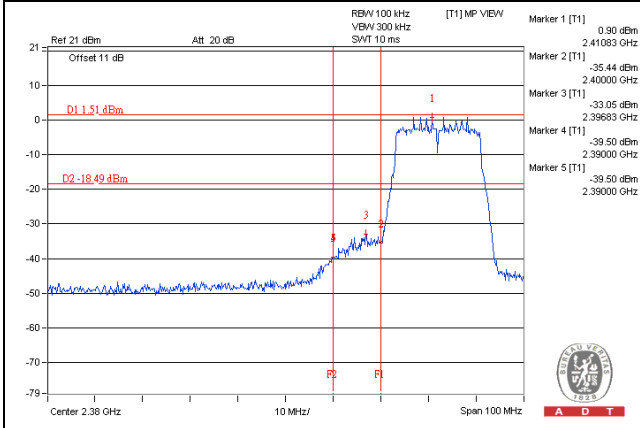


CH 11



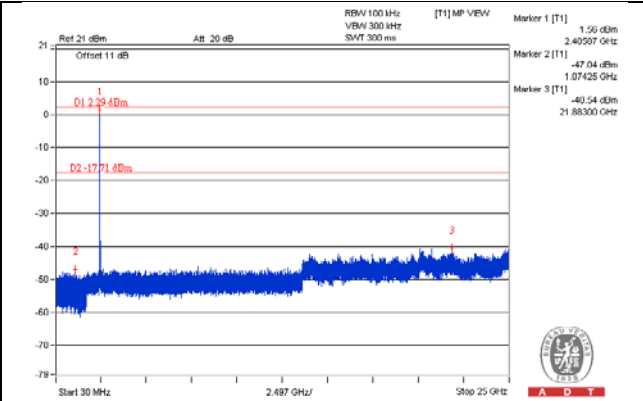
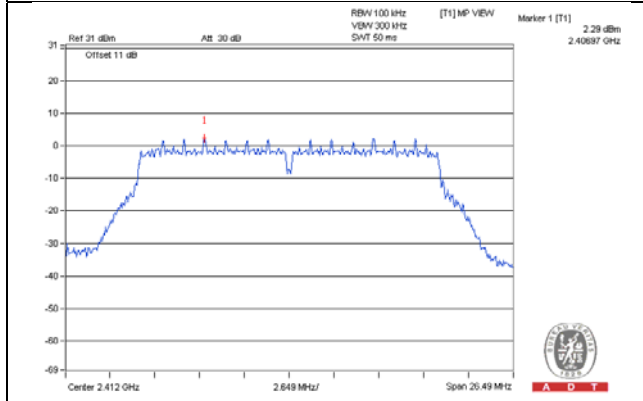
CH 1 Band edge

CH 11 Band edge

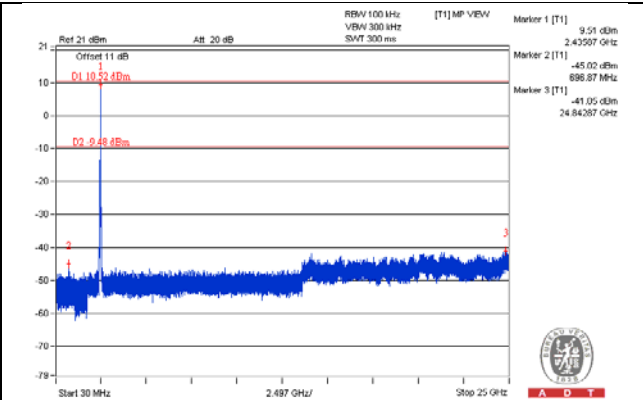
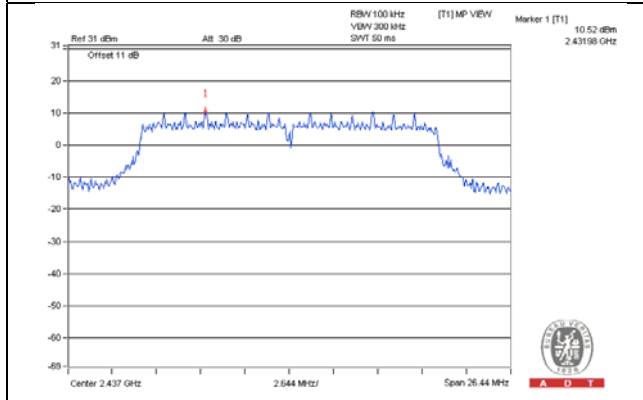


CHAIN 1

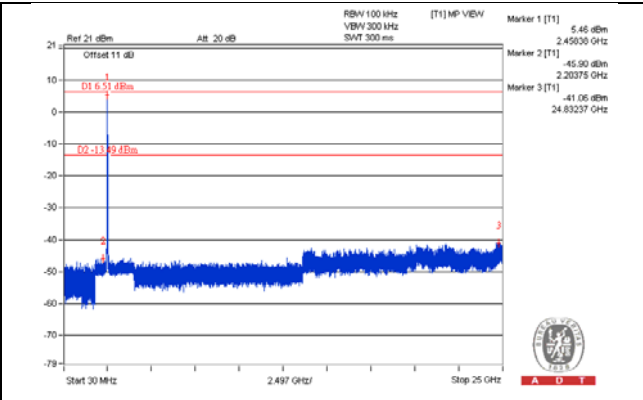
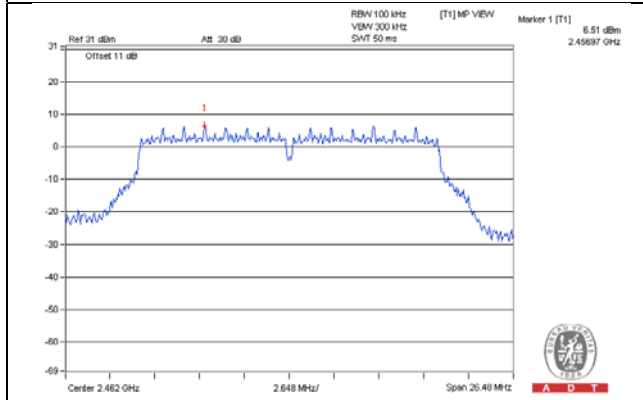
CH 1



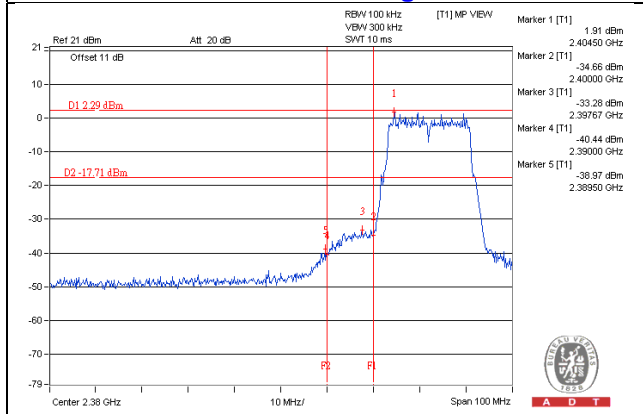
CH 6



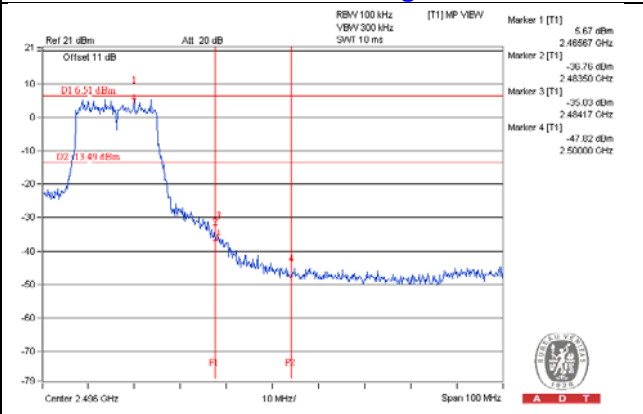
CH 11



CH 1 Band edge



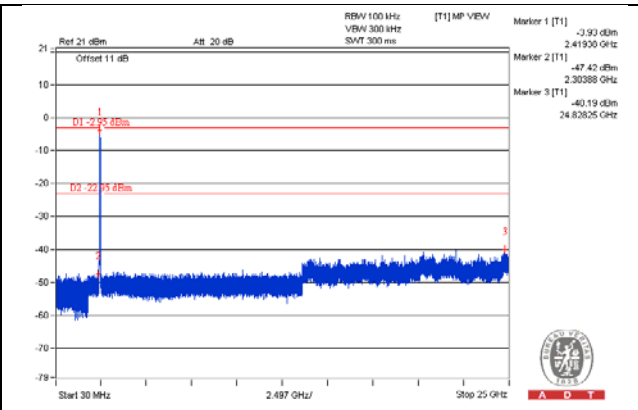
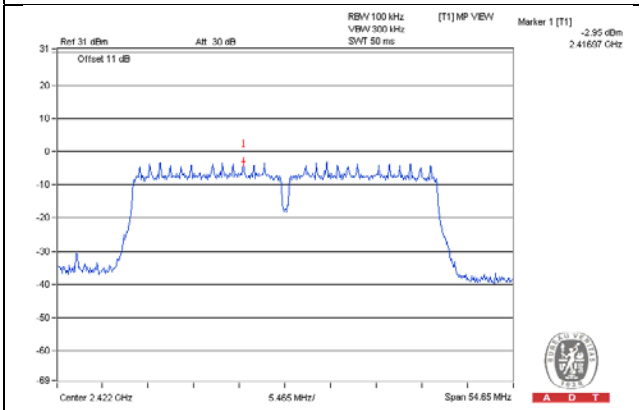
CH 11 Band edge



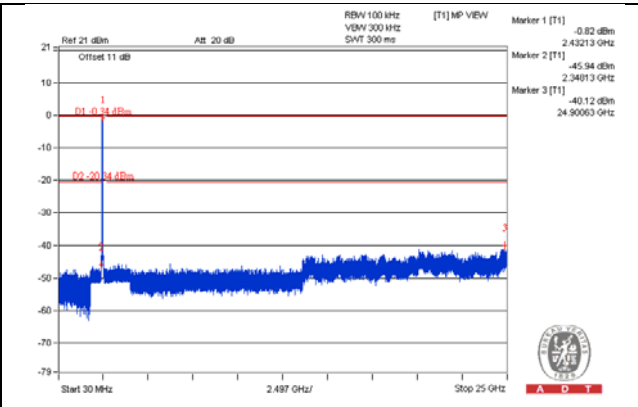
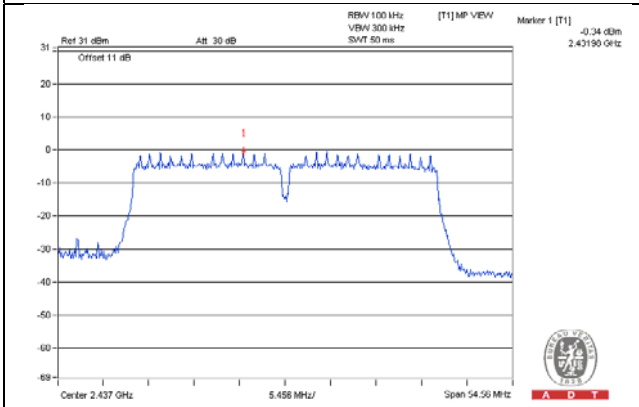


802.11n (HT40)  
CHAIN 0

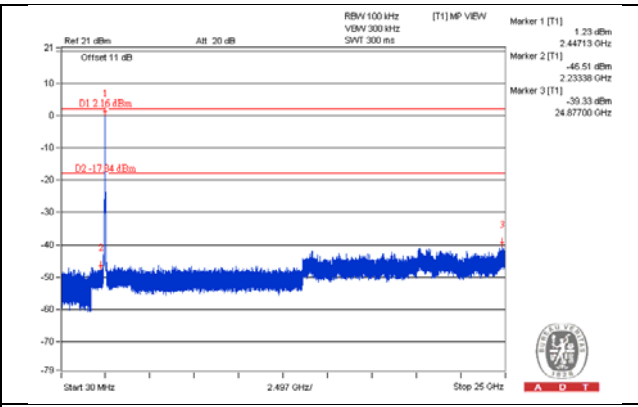
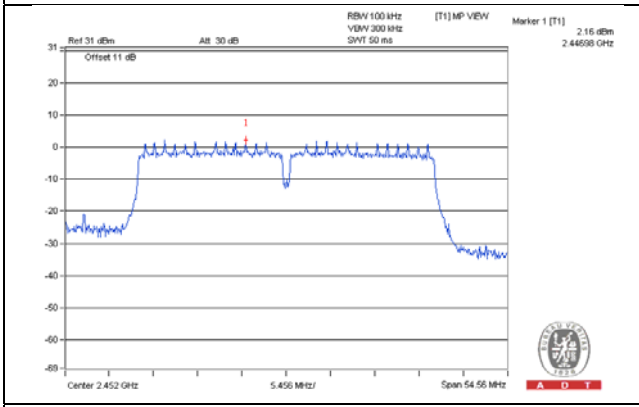
CH 3



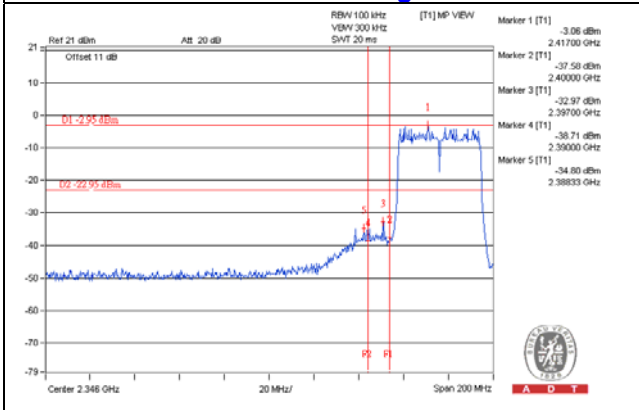
CH 6



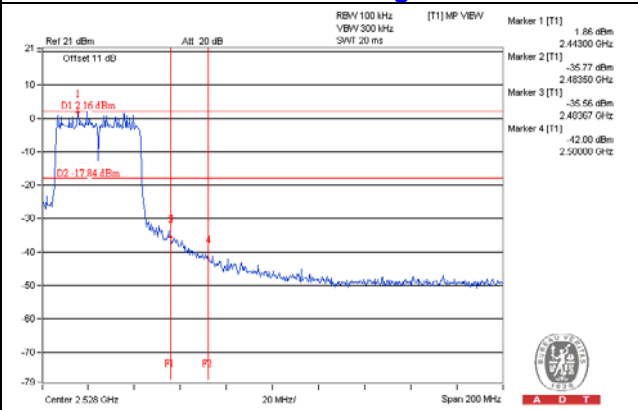
CH 9



CH 3 Band edge

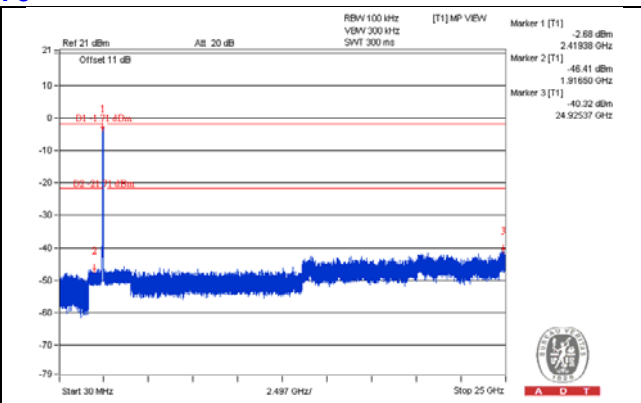
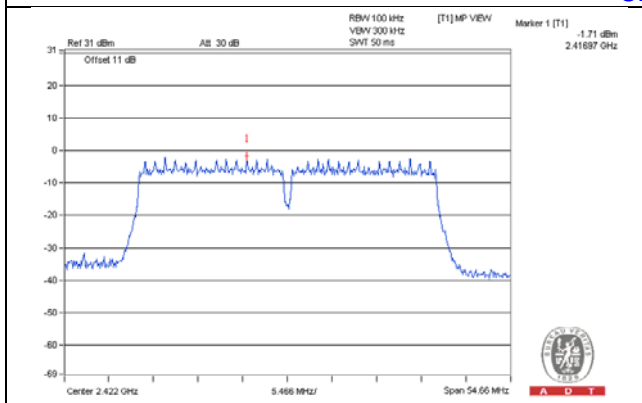


CH 9 Band edge

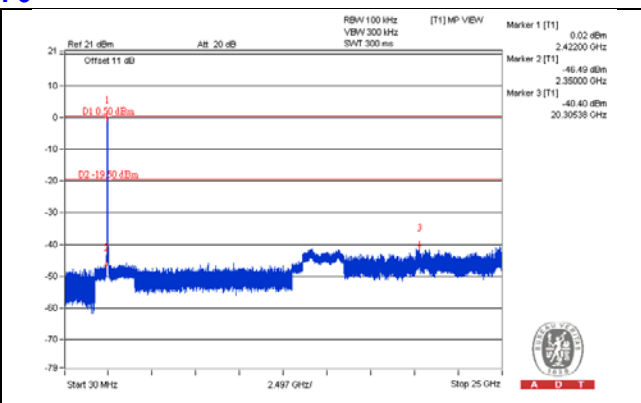
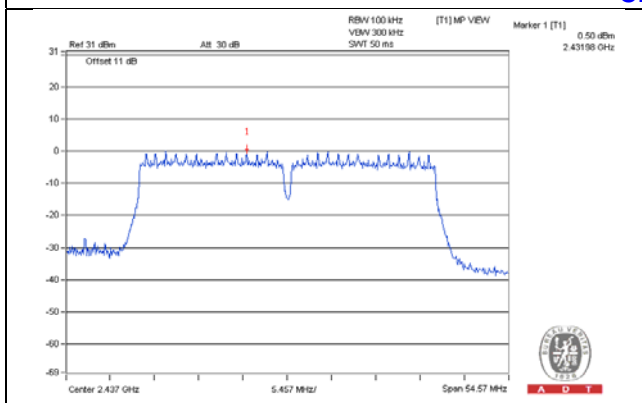


CHAIN 1

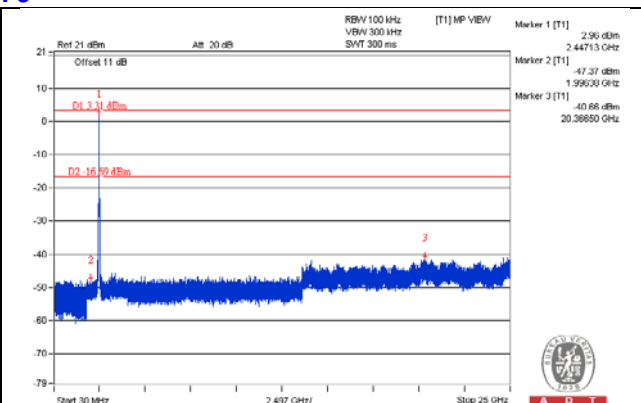
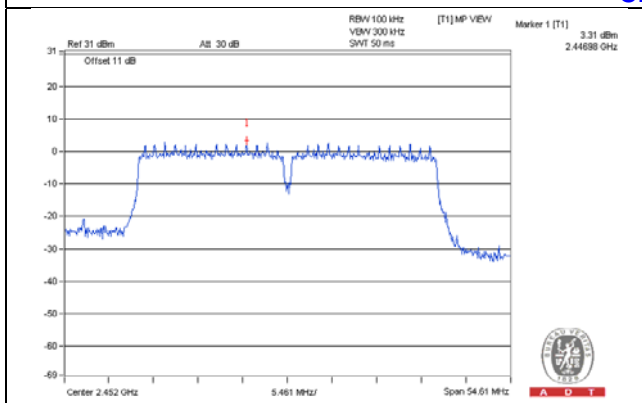
CH 3



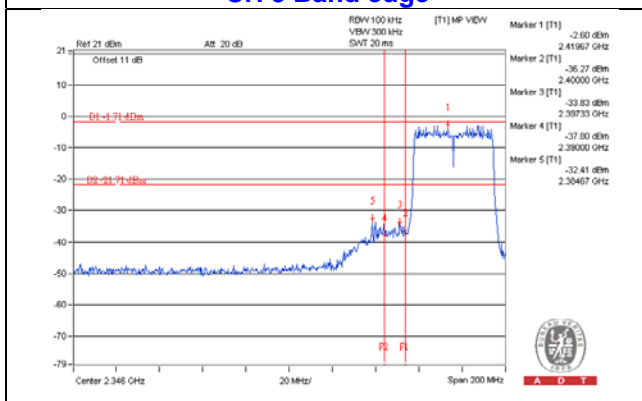
CH 6



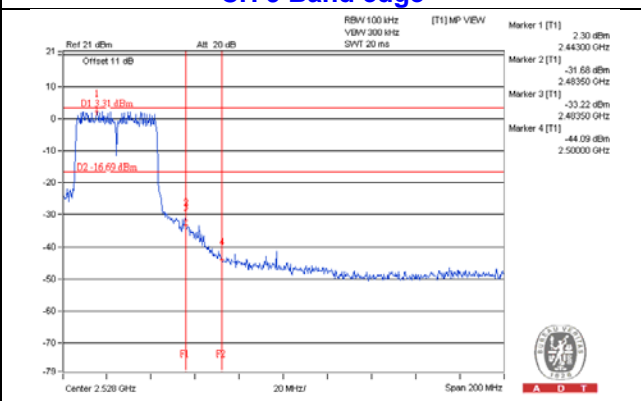
CH 9



CH 3 Band edge

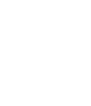


CH 9 Band edge



## 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.

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

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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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