

# FCC TEST REPORT (WLAN)

**REPORT NO.:** RF981217L06A

**MODEL NO.:** PB31200

**RECEIVED:** May 27, 2010

**TESTED:** May 27 ~ May 28, 2010

**ISSUED:** Jun. 01, 2010

**APPLICANT:** HTC Corporation

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R.O.C.

**ISSUED BY:** Bureau Veritas Consumer Products Services  
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R.O.C.

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## Table of Contents

1	CERTIFICATION.....	4
2	SUMMARY OF TEST RESULTS .....	5
2.1	MEASUREMENT UNCERTAINTY .....	5
3	GENERAL INFORMATION.....	6
3.1	GENERAL DESCRIPTION OF EUT.....	6
3.2	DESCRIPTION OF TEST MODES.....	7
3.2.1	CONFIGURATION OF SYSTEM UNDER TEST .....	8
3.2.2	TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL.....	9
3.3	GENERAL DESCRIPTION OF APPLIED STANDARDS .....	11
3.4	DESCRIPTION OF SUPPORT UNITS.....	12
4	TEST TYPES AND RESULTS .....	13
4.1	RADIATED EMISSION MEASUREMENT .....	13
4.1.1	LIMITS OF RADIATED EMISSION MEASUREMENT.....	13
4.1.2	TEST INSTRUMENTS .....	14
4.1.3	TEST PROCEDURES .....	15
4.1.4	DEVIATION FROM TEST STANDARD .....	15
4.1.5	TEST SETUP .....	16
4.1.6	EUT OPERATING CONDITIONS.....	16
4.1.7	TEST RESULTS .....	17
4.2	CONDUCTED EMISSION MEASUREMENT .....	22
4.2.1	LIMITS OF CONDUCTED EMISSION MEASUREMENT.....	22
4.2.2	TEST INSTRUMENTS .....	22
4.2.3	TEST PROCEDURES .....	23
4.2.4	DEVIATION FROM TEST STANDARD .....	23
4.2.5	TEST SETUP .....	24
4.2.6	EUT OPERATING CONDITIONS.....	24
4.2.7	TEST RESULTS .....	25
4.3	6dB BANDWIDTH MEASUREMENT .....	29
4.3.1	LIMITS OF 6dB BANDWIDTH MEASUREMENT.....	29
4.3.2	TEST INSTRUMENTS .....	29
4.3.3	TEST PROCEDURE .....	29
4.3.4	DEVIATION FROM TEST STANDARD .....	29
4.3.5	TEST SETUP .....	30
4.3.6	EUT OPERATING CONDITIONS.....	30



4.3.7	TEST RESULTS .....	31
4.4	MAXIMUM OUTPUT POWER.....	32
4.4.1	LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT .....	32
4.4.2	TEST INSTRUMENTS .....	32
4.4.3	TEST PROCEDURES .....	32
4.4.4	DEVIATION FROM TEST STANDARD .....	32
4.4.5	TEST SETUP .....	33
4.4.6	EUT OPERATING CONDITIONS.....	33
4.4.7	TEST RESULTS .....	34
4.5	POWER SPECTRAL DENSITY MEASUREMENT .....	35
4.5.1	LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT .....	35
4.5.2	TEST INSTRUMENTS .....	35
4.5.3	TEST PROCEDURE .....	35
4.5.4	DEVIATION FROM TEST STANDARD .....	35
4.5.5	TEST SETUP .....	36
4.5.6	EUT OPERATING CONDITIONS.....	36
4.5.7	TEST RESULTS .....	37
4.6	BAND EDGES MEASUREMENT .....	38
4.6.1	LIMITS OF BAND EDGES MEASUREMENT .....	38
4.6.2	TEST INSTRUMENTS .....	38
4.6.3	TEST PROCEDURE .....	38
4.6.4	DEVIATION FROM TEST STANDARD .....	38
4.6.5	EUT OPERATING CONDITION .....	38
4.6.6	TEST RESULTS .....	39
5	PHOTOGRAPHS OF THE TEST CONFIGURATION.....	43
6	INFORMATION ON THE TESTING LABORATORIES .....	44
7	APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB.....	45



## 1 CERTIFICATION

**PRODUCT:** Smartphone  
**MODEL NO.:** PB31200  
**APPLICANT:** HTC Corporation  
**TESTED :** May 27 ~ May 28, 2010  
**TEST SAMPLE:** ENGINEERING SAMPLE  
**STANDARDS:** **FCC Part 15, Subpart C (Section 15.247)**  
ANSI C63.4-2003

The above equipment (Model: PB31200) 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** : Pettie Chen , **DATE:** Jun. 01, 2010  
Pettie Chen / Specialist

**TECHNICAL ACCEPTANCE** : Long Chen , **DATE:** Jun. 01, 2010  
Responsible for RF Long Chen / Senior Engineer

**APPROVED BY** : Gary Chang , **DATE:** Jun. 01, 2010  
Gary Chang / Assistant Manager

## 2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C			
Standard Section	Test Type and Limit	Result	Remark
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -14.61dB at 0.171MHz.
15.247(a)(2)	Spectrum Bandwidth of a Direct Sequence Spread Spectrum System Limit: min. 500kHz	PASS	Meet the requirement of limit.
15.247(b)	Maximum Output Power Limit: max. 30dBm	PASS	Meet the requirement of limit.
15.247(d)	Radiated Emissions Limit: Table 15.209	PASS	Meet the requirement of limit. Minimum passing margin is -2.4dB at 2483.5MHz.
15.247(e)	Power Spectral Density Limit: max. 8dBm	PASS	Meet the requirement of limit.
15.247(d)	Band Edge Measurement Limit: 20dB less than the peak value of fundamental frequency	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	UNCERTAINTY
Conducted emissions	150kHz~30MHz	2.44 dB
Radiated emissions	30MHz ~ 200MHz	3.34 dB
	200MHz ~1000MHz	3.35 dB
	1GHz ~ 18GHz	2.26 dB
	18GHz ~ 40GHz	1.94 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

### 3 GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>EUT</b>	Smartphone
<b>MODEL NO.</b>	PB31200
<b>FCC ID</b>	NM8PB31200
<b>POWER SUPPLY</b>	3.7Vdc from rechargeable lithium battery 5.0Vdc from power adapter 5.0Vdc from host equipment
<b>MODULATION TYPE</b>	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
<b>MODULATION TECHNOLOGY</b>	DSSS, OFDM
<b>TRANSFER RATE</b>	802.11b: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n (20MHz): up to 65Mbps
<b>OPERATING FREQUENCY</b>	2412MHz ~ 2462MHz
<b>NUMBER OF CHANNEL</b>	11
<b>MAXIMUM OUTPUT POWER</b>	144.5mW
<b>ANTENNA TYPE</b>	PIFA
<b>MAX. ANTENNA GAIN</b>	-4dBi
<b>DATA CABLE</b>	Refer to NOTE 2
<b>I/O PORTS</b>	Refer to user's manual
<b>ACCESSORY DEVICES</b>	Refer to NOTE 2

**NOTE:**

- This report is issued as a supplementary report to the original BVADT report no.: RF981217L06-2. The EUT is identical to the original application one. The difference are adding a battery and adding 802.11n (20MHz) modulation by software. Therefore all test for 802.11n (20MHz) had been tested.
- The EUT has following accessories. (New battery is marked in boldface.)

NO.	PRODUCT	BRAND	MODEL	DESCRIPTION	REMARK
1	Power Adapter	Delta	TC P300	I/P: 100-240Vac, 50-60Hz, 0.2A O/P: 5Vdc, 1A	-
2			TC U250		-
3		Emerson	TC U250		-
4	USB cable	MEC	DC M410	1.4m shielded cable without core (For data transmission & charging use)	For TC P300 only
5		Foxlink			For TC U250 only
6	Battery	HT ENERGY	BB96100	Rating: 3.7Vdc, 1300mAh	-
7			BTR6300B		
8		Formosa	BB96100		
9			BTR6300B		
10			<b>TWS</b>		

3. The EUT provides one completed transmitter and one receiver.

MODULATION MODE	TX FUNCTION
802.11b	1TX
802.11g	1TX
802.11n (20MHz)	1TX

4. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

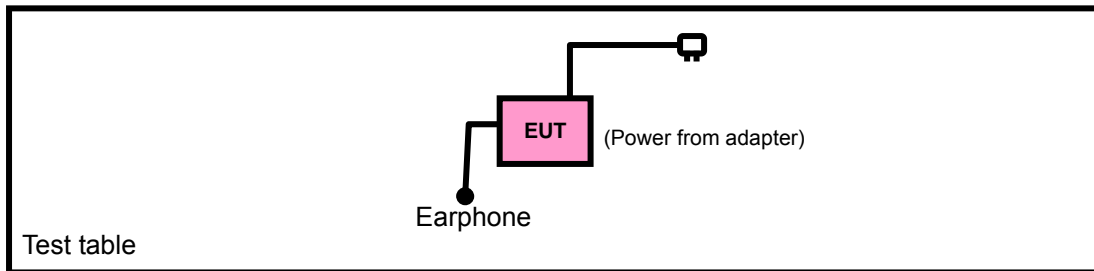
### 3.2 DESCRIPTION OF TEST MODES

Eleven channels are provided to this EUT.

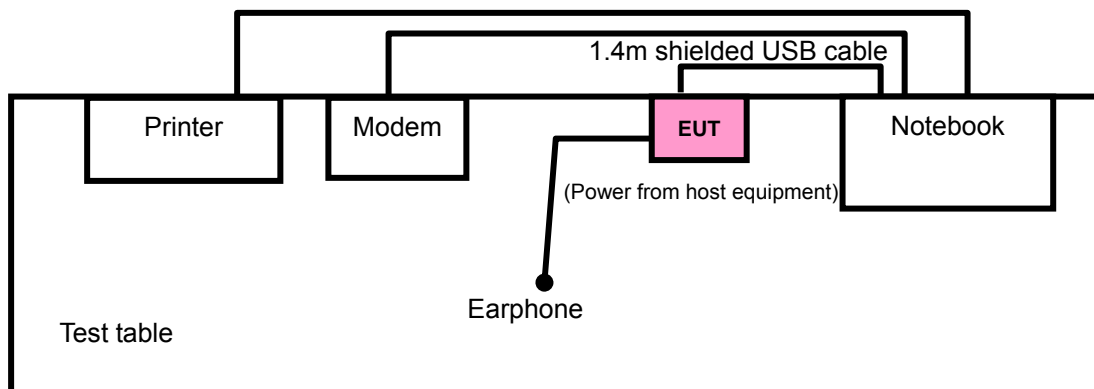
CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
1	2412 MHz	7	2442 MHz
2	2417 MHz	8	2447 MHz
3	2422 MHz	9	2452 MHz
4	2427 MHz	10	2457 MHz
5	2432 MHz	11	2462 MHz
6	2437 MHz		

### 3.2.1 CONFIGURATION OF SYSTEM UNDER TEST

#### TEST MODE A



#### TEST MODE B, C





### 3.2.2 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO				DESCRIPTION
	RE $\geq$ 1G	RE $<$ 1G	PLC	APCM	
A	√	-	-	√	Power from Adapter (Brand: Delta, Model: TC P300) Battery: Formosa
B	-	√	√	-	Power from host equipment (USB cable brand: Foxlink) Battery: Formosa
C	-	√	√	-	Power from host equipment (USB cable brand: Foxlink) Battery: TWS

Where **RE $\geq$ 1G**: Radiated Emission above 1GHz

**RE $<$ 1G**: Radiated Emission below 1GHz

**PLC**: Power Line Conducted Emission

**APCM**: Antenna Port Conducted Measurement

**NOTE**: "-" means no effect.

#### RADIATED EMISSION TEST (ABOVE 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ Axis 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)	AXIS
A	802.11n (20MHz)	1 to 11	1, 6, 11	OFDM	BPSK	6.5	X

#### RADIATED EMISSION TEST (BELOW 1 GHz):

- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates, XYZ Axis 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)	AXIS
B	802.11n (20MHz)	1 to 11	6	OFDM	BPSK	6.5	X
C	802.11n (20MHz)	1 to 11	6	OFDM	BPSK	6.5	X

**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)
B	802.11n (20MHz)	1 to 11	6	OFDM	BPSK	6.5
C	802.11n (20MHz)	1 to 11	6	OFDM	BPSK	6.5

**BANDEDGE MEASUREMENT:**

- 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)
A	802.11n (20MHz)	1 to 11	1, 11	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)
A	802.11n (20MHz)	1 to 11	1, 6, 11	OFDM	BPSK	6.5

**TEST CONDITION:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER (SYSTEM)	TESTED BY
RE $\geq$ 1G	26deg. C, 66%RH, 1006 hPa	120Vac, 60Hz	Brad Wu
RE $<$ 1G	26deg. C, 66%RH, 1006 hPa	120Vac, 60Hz	Brad Wu
PLC	25deg. C, 66%RH, 1005 hPa	120Vac, 60Hz	Lori Chiu
APCM	25deg. C, 63%RH, 1005 hPa	120Vac, 60Hz	Dean Wang

**3.3 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)**

**ANSI C63.4- 2003**

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

**NOTE:** The EUT is also considered as a kind of computer peripheral, because the connection to computer is necessary for typical use. It has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

### 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.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK	DELL	D600	CN-0G5152-48643-49C-8226	FCC DoC Approved
2	PRINTER	EPSON	LQ-300+	DCGY054146	FCC DoC Approved
3	MODEM	ACEEX	1414V/3	0401008277	IFAXDM1414
4	EARPHONE	NA	NA	NA	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	1.8m braid shielded wire, DB25 connector, w/o core.
3	1.2m braid shielded wire, DB25 & DB9 connector, w/o core.
4	1.3m non-shielded audio cable without core.

**NOTE:**

1. All power cords of the above support units are non shielded (1.8m).
2. Item 4 was provided by client.

## 4 TEST TYPES AND RESULTS

### 4.1 RADIATED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

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. As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

#### 4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESI7	100033	Jul. 06, 2009	Jul. 05, 2010
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Dec. 31, 2009	Dec. 30, 2010
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Apr. 27, 2010	Apr. 26, 2011
HORN Antenna SCHWARZBECK	9120D	9120D-209	Jul. 01, 2009	Jun. 30, 2010
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170243	Dec. 25, 2009	Dec. 24, 2010
Preamplifier Agilent	8447D	2944A10633	Nov. 10, 2009	Nov. 09, 2010
Preamplifier Agilent	8449B	3008A01964	Nov. 09, 2009	Nov. 08, 2010
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	238141/4	May 14, 2010	May 13, 2011
RF signal cable HUBER+SUHNNER	SUCOFLEX 104	12738/6	May 14, 2010	May 13, 2011
Software ADT.	ADT_Radiated_ V7.6.15.9.2	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller inn-co GmbH	CO2000	017303	NA	NA
Turn Table ADT.	TT100.	TT93021703	NA	NA
Turn Table Controller ADT.	SC100.	SC93021703	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 Chamber 3.
  3. The horn antenna and HP 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

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meters semi-anechoic chamber. 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 antenna is a broadband antenna, and its height 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 Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions would be re-tested one by one using peak, quasi-peak method or average method as specified and then reported in data sheet.

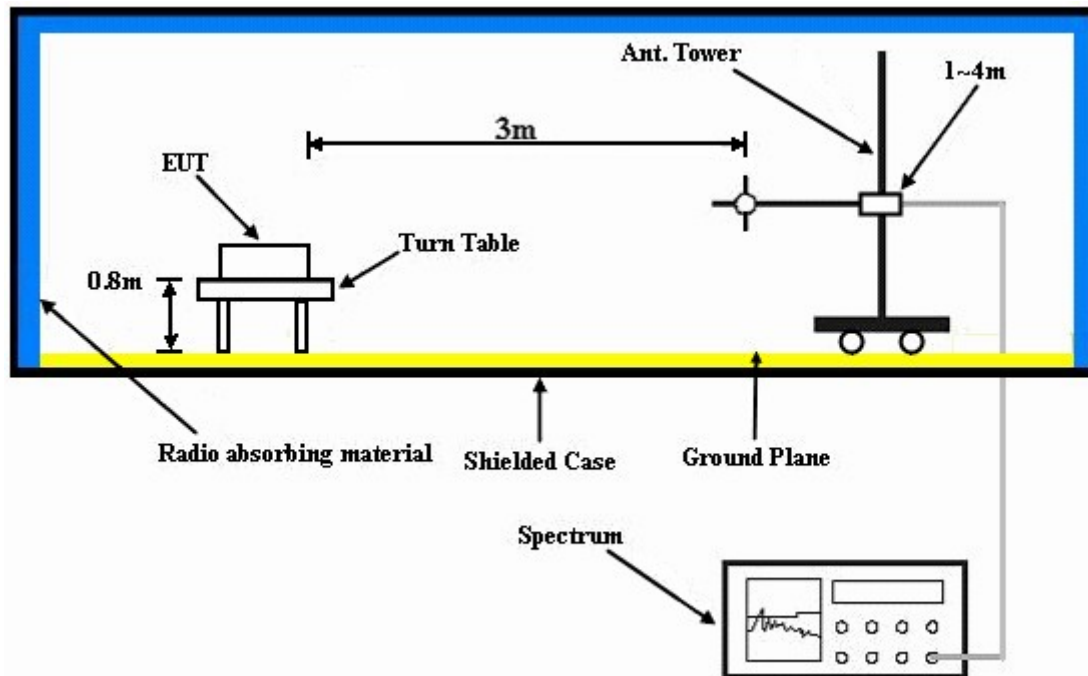
**NOTE:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and video bandwidth is 3MHz for Peak detection at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.1.5 TEST SETUP



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

#### 4.1.6 EUT OPERATING CONDITIONS

##### TEST MODE A

- Placed the EUT on a testing table.
- Use the software to control the EUT under transmission condition continuously at specific channel frequency.

##### TEST MODE B, C

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





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#### 4.1.7 TEST RESULTS

##### 802.11n (20MHz)

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 1	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 66%RH 1006 hPa	TESTED BY	Brad Wu

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	67.4 PK	74.0	-6.6	1.98 H	138	36.90	30.50
2	2390.00	51.1 AV	54.0	-2.9	1.98 H	138	20.60	30.50
3	*2412.00	106.4 PK			1.98 H	138	75.80	30.60
4	*2412.00	93.3 AV			1.98 H	138	62.70	30.60
5	4824.00	51.2 PK	74.0	-22.8	1.23 H	229	15.10	36.10
6	4824.00	37.2 AV	54.0	-16.8	1.23 H	229	1.10	36.10
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	63.6 PK	74.0	-10.4	1.00 V	308	33.10	30.50
2	2390.00	48.7 AV	54.0	-5.3	1.00 V	308	18.20	30.50
3	*2412.00	104.1 PK			1.00 V	308	73.50	30.60
4	*2412.00	91.0 AV			1.00 V	308	60.40	30.60
5	4824.00	52.2 PK	74.0	-21.8	1.12 V	301	16.10	36.10
6	4824.00	39.0 AV	54.0	-15.0	1.12 V	301	2.90	36.10

- 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.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 6	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 66%RH 1006 hPa	TESTED BY	Brad Wu

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	106.7 PK			1.97 H	141	76.10	30.60
2	*2437.00	93.6 AV			1.97 H	141	63.00	30.60
3	4874.00	51.4 PK	74.0	-22.6	1.20 H	232	15.20	36.20
4	4874.00	37.3 AV	54.0	-16.7	1.20 H	232	1.10	36.20
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	*2437.00	104.4 PK			1.00 V	304	73.80	30.60
2	*2437.00	91.3 AV			1.00 V	304	60.70	30.60
3	4874.00	52.4 PK	74.0	-21.6	1.11 V	306	16.20	36.20
4	4874.00	39.2 AV	54.0	-14.8	1.11 V	306	3.00	36.20

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



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 11	FREQUENCY RANGE	1 ~ 25GHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Peak (PK) Average (AV)
ENVIRONMENTAL CONDITIONS	26deg. C, 66%RH 1006 hPa	TESTED BY	Brad Wu

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	107.2 PK			1.91 H	133	76.50	30.70
2	*2462.00	94.1 AV			1.91 H	133	63.40	30.70
3	2483.50	66.8 PK	74.0	-7.2	1.91 H	133	36.00	30.80
4	2483.50	51.6 AV	54.0	-2.4	1.91 H	133	20.80	30.80
5	4924.00	51.7 PK	74.0	-22.3	1.21 H	236	15.40	36.30
6	4924.00	37.5 AV	54.0	-16.5	1.21 H	236	1.20	36.30
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	104.8 PK			1.00 V	305	74.10	30.70
2	*2462.00	91.7 AV			1.00 V	305	61.00	30.70
3	2483.50	64.9 PK	74.0	-9.1	1.00 V	305	34.10	30.80
4	2483.50	48.5 AV	54.0	-5.5	1.00 V	305	17.70	30.80
5	4924.00	52.7 PK	74.0	-21.3	1.11 V	302	16.40	36.30
6	4924.00	39.4 AV	54.0	-14.6	1.11 V	302	3.10	36.30

- 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.



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**BELOW 1GHz WORST-CASE DATA : 802.11n (20MHz)**

EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 6	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	26deg. C, 66%RH 1006 hPa	TESTED BY	Brad Wu
TEST MODE	B		

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	175.72	38.3 QP	43.5	-5.2	1.25 H	172	25.10	13.20
2	214.61	34.4 QP	43.5	-9.1	1.25 H	352	22.90	11.50
3	459.59	35.3 QP	46.0	-10.7	1.50 H	124	15.70	19.60
4	799.84	38.8 QP	46.0	-7.2	1.00 H	37	12.70	26.10
5	918.44	33.4 QP	46.0	-12.6	1.50 H	16	5.20	28.20
6	949.55	33.9 QP	46.0	-12.1	2.00 H	241	5.30	28.60
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	45.45	35.9 QP	40.0	-4.1	1.00 V	235	21.70	14.20
2	66.84	33.8 QP	40.0	-6.2	1.00 V	49	20.60	13.20
3	99.89	32.0 QP	43.5	-11.5	1.00 V	40	20.40	11.60
4	797.89	40.2 QP	46.0	-5.8	1.25 V	73	14.20	26.00
5	899.00	35.0 QP	46.0	-11.0	1.00 V	103	7.10	27.90
6	947.60	36.3 QP	46.0	-9.7	1.50 V	118	7.70	28.60

- 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.



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EUT TEST CONDITION		MEASUREMENT DETAIL	
CHANNEL	Channel 6	FREQUENCY RANGE	Below 1000MHz
INPUT POWER (SYSTEM)	120Vac, 60Hz	DETECTOR FUNCTION	Quasi-Peak
ENVIRONMENTAL CONDITIONS	26deg. C, 66%RH 1006 hPa	TESTED BY	Brad Wu
TEST MODE	C		

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	175.72	31.8 QP	43.5	-11.7	1.50 H	199	18.60	13.20
2	224.33	41.8 QP	46.0	-4.2	1.25 H	358	29.60	12.20
3	247.66	34.0 QP	46.0	-12.0	1.00 H	10	20.30	13.70
4	453.75	42.0 QP	46.0	-4.0	1.50 H	109	22.60	19.40
5	799.84	40.3 QP	46.0	-5.7	1.25 H	25	14.20	26.10
6	947.60	33.9 QP	46.0	-12.1	1.25 H	133	5.30	28.60
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	455.70	36.9 QP	46.0	-9.1	2.00 V	130	17.40	19.50
2	799.84	41.7 QP	46.0	-4.3	1.00 V	130	15.60	26.10
3	875.67	34.4 QP	46.0	-11.6	1.00 V	100	6.90	27.50
4	891.22	32.8 QP	46.0	-13.2	1.50 V	133	5.00	27.80
5	928.16	34.2 QP	46.0	-11.8	1.50 V	106	5.90	28.30
6	947.60	37.1 QP	46.0	-8.9	1.25 V	109	8.50	28.60

- 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 OF EMISSION (MHz)	CONDUCTED LIMIT (dB $\mu$ V)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	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 0.50 MHz.
  3. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

### 4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
Test Receiver ROHDE & SCHWARZ	ESCS30	100291	Dec. 16, 2009	Dec. 15, 2010
RF signal cable Woken	5D-FB	Cable-HYC01-01	Nov. 12, 2009	Nov. 11, 2010
LISN ROHDE & SCHWARZ	ESH3-Z5	100312	Jun. 18, 2009	Jun. 17, 2010
LISN SCHWARZBECK	NNBL 8226-2	8226-142	Jun. 03, 2009	Jun. 02, 2010
Software ADT	ADT_Cond_ V7.3.7	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

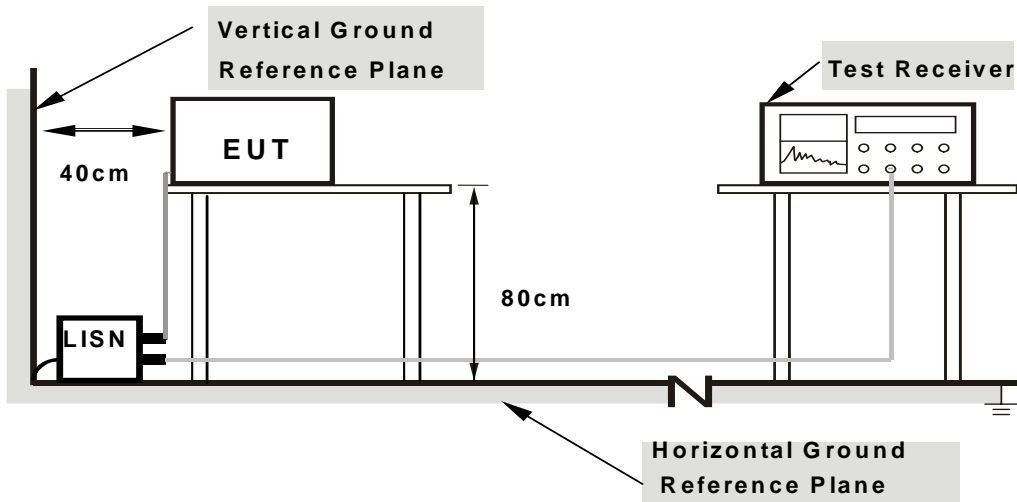
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling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

**NOTE:** All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.2.5 TEST SETUP



- Note:**
1. Support units were connected to second LISN.
  2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

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.



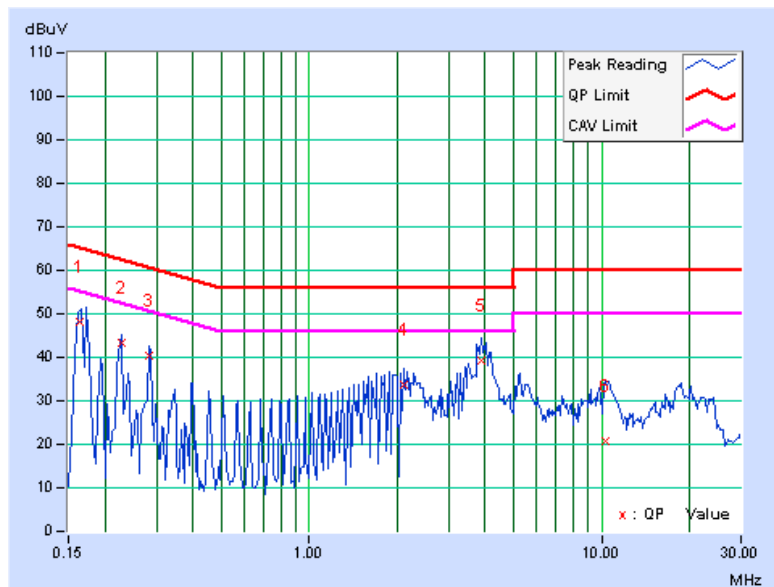
### 4.2.7 TEST RESULTS

#### CONDUCTED WORST-CASE DATA : 802.11n(20MHz)

PHASE	Line 1	6dB BANDWIDTH	9 kHz
TEST MODE	B		

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	0.163	0.13	48.03	-	48.16	-	65.30	55.30	-17.14	-
2	0.228	0.13	43.11	-	43.24	-	62.54	52.54	-19.30	-
3	0.284	0.13	40.28	-	40.41	-	60.71	50.71	-20.30	-
4	2.101	0.24	33.59	-	33.83	-	56.00	46.00	-22.17	-
5	3.868	0.36	39.05	-	39.41	-	56.00	46.00	-16.59	-
6	10.366	0.68	20.17	-	20.85	-	60.00	50.00	-39.15	-

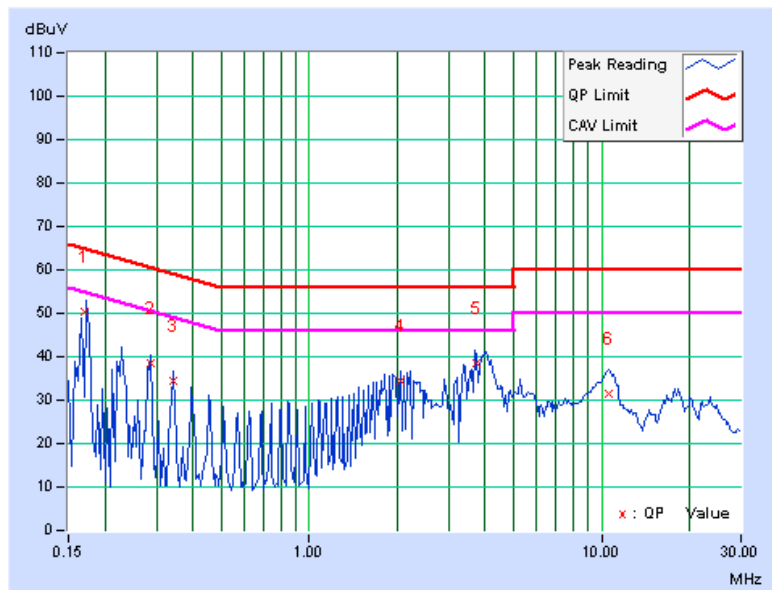
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



PHASE	Line 2	6dB BANDWIDTH	9 kHz
TEST MODE	B		

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	0.171	0.14	50.15	-	50.29	-	64.90	54.90	-14.61	-
2	0.285	0.15	38.34	-	38.49	-	60.66	50.66	-22.16	-
3	0.341	0.16	34.18	-	34.34	-	59.18	49.18	-24.84	-
4	2.053	0.25	34.25	-	34.50	-	56.00	46.00	-21.50	-
5	3.711	0.37	38.08	-	38.45	-	56.00	46.00	-17.55	-
6	10.585	0.68	30.83	-	31.51	-	60.00	50.00	-28.49	-

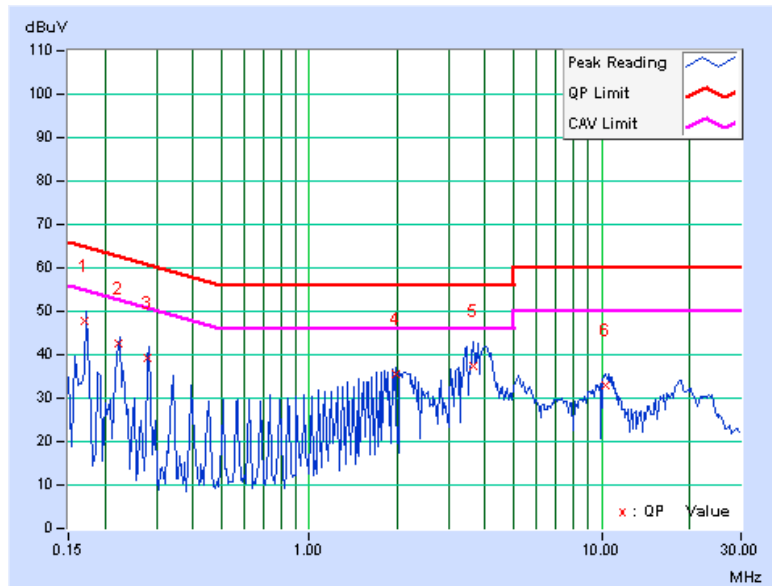
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



PHASE	Line 1	6dB BANDWIDTH	9 kHz
TEST MODE	C		

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	0.171	0.13	47.75	-	47.88	-	64.90	54.90	-17.02	-
2	0.223	0.13	42.46	-	42.59	-	62.70	52.70	-20.11	-
3	0.281	0.13	38.95	-	39.08	-	60.80	50.80	-21.72	-
4	1.980	0.23	35.34	-	35.57	-	56.00	46.00	-20.43	-
5	3.633	0.34	37.08	-	37.42	-	56.00	46.00	-18.58	-
6	10.375	0.68	32.11	-	32.79	-	60.00	50.00	-27.21	-

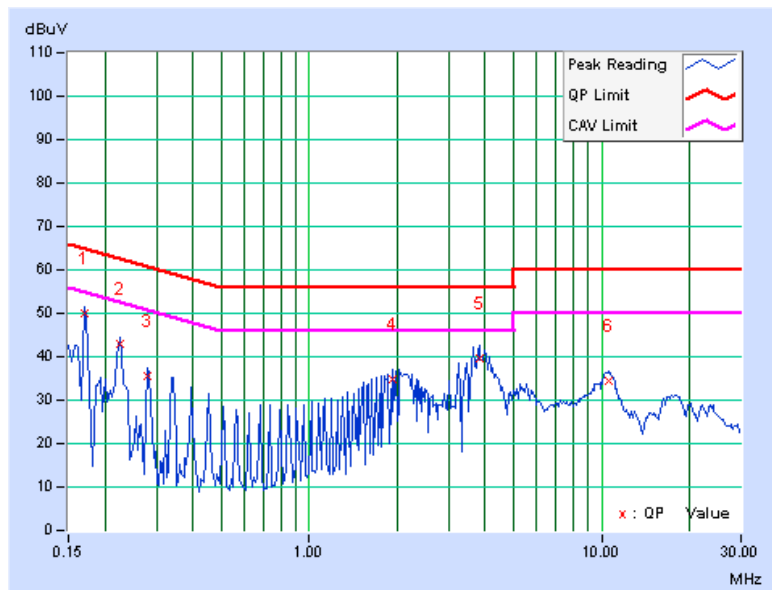
- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. Emission Level = Correction Factor + Reading Value.



PHASE	Line 2	6dB BANDWIDTH	9 kHz
TEST MODE	C		

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	0.170	0.14	49.82	-	49.96	-	64.95	54.95	-14.98	-
2	0.226	0.15	42.89	-	43.04	-	62.59	52.59	-19.55	-
3	0.280	0.15	35.28	-	35.43	-	60.83	50.83	-25.39	-
4	1.931	0.25	34.53	-	34.78	-	56.00	46.00	-21.22	-
5	3.842	0.38	39.24	-	39.62	-	56.00	46.00	-16.38	-
6	10.639	0.68	33.75	-	34.43	-	60.00	50.00	-25.57	-

- REMARKS:**
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
  2. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.
  3. The emission levels of other frequencies were very low against the limit.
  4. Margin value = Emission level - Limit value
  5. Correction factor = Insertion loss + Cable loss
  6. 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 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
R&S SPECTRUM ANALYZER	FSP40	100040	Jul. 07, 2009	Jul. 06, 2010

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

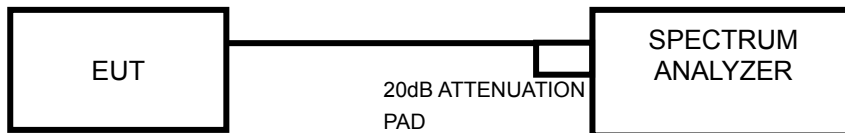
#### 4.3.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 kHz RBW and 300kHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

#### 4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.3.5 TEST SETUP



#### 4.3.6 EUT OPERATING CONDITIONS

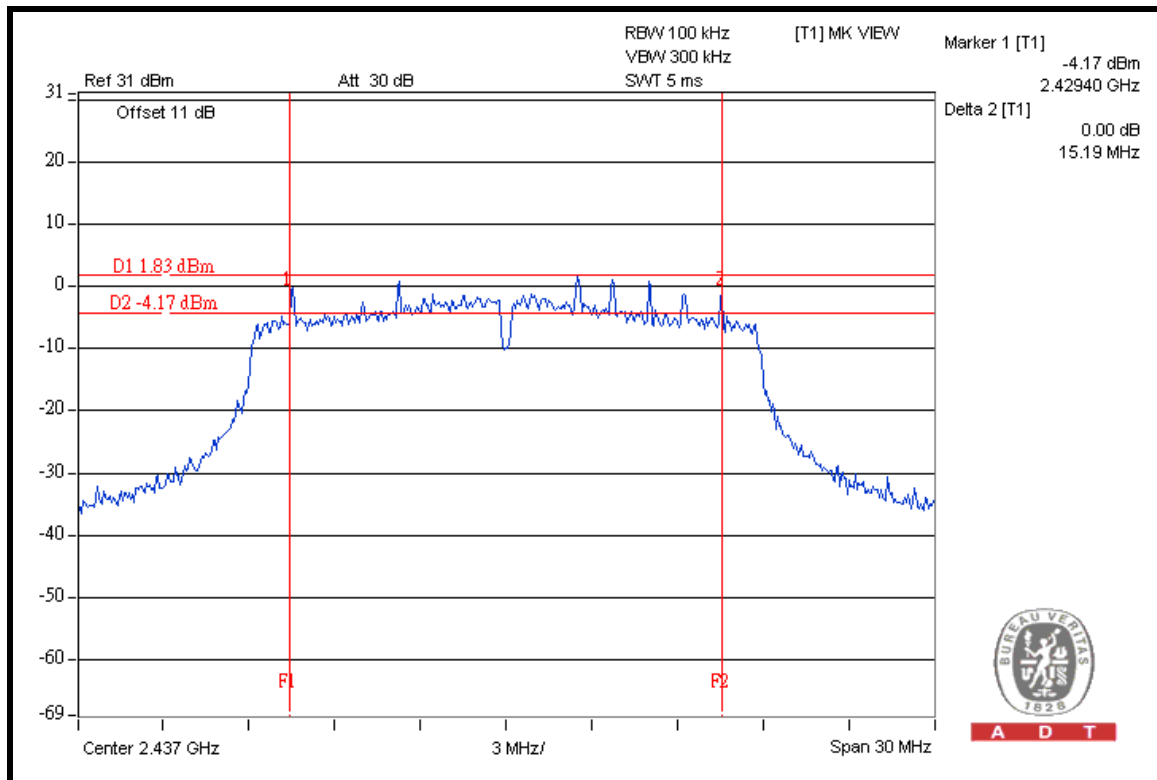
The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies individually.

### 4.3.7 TEST RESULTS

#### 802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	15.11	0.5	PASS
6	2437	15.19	0.5	PASS
11	2462	13.96	0.5	PASS

#### CH 6



#### 4.4 MAXIMUM OUTPUT POWER

##### 4.4.1 LIMITS OF MAXIMUM OUTPUT POWER MEASUREMENT

The Maximum Output Power Measurement is 30dBm.

##### 4.4.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
High Speed Peak Power Meter	ML2495A	0824011	Jul. 30, 2009	Jul. 29, 2010
Power Sensor	MA2411B	0738171	Jul. 30, 2009	Jul. 29, 2010

**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. Measurement Bandwidth of ML2495A is 65MHz greater than 6dB bandwidth of emission.

##### 4.4.3 TEST PROCEDURES

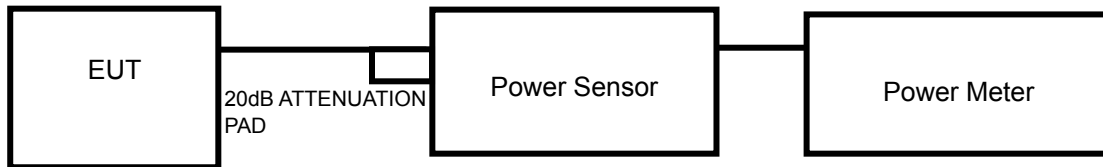
A power sensor was used on the output port of the EUT. A power meter was used to read the response of the power sensor. Record the power level.

##### 4.4.4 DEVIATION FROM TEST STANDARD

No deviation.



#### 4.4.5 TEST SETUP



#### 4.4.6 EUT OPERATING CONDITIONS

Same as 4.3.6.



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#### 4.4.7 TEST RESULTS

##### 802.11n (20MHz)

CHAN	CHANNEL FREQUENCY (MHz)	POWER OUTPUT (mW)	POWER OUTPUT (dBm)	POWER LIMIT (dBm)	PASS/FAIL
1	2412	141.3	21.5	30	PASS
6	2437	144.5	21.6	30	PASS
11	2462	138.0	21.4	30	PASS



## 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 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
R&S SPECTRUM ANALYZER	FSP40	100040	Jul. 07, 2009	Jul. 06, 2010

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

### 4.5.3 TEST PROCEDURE

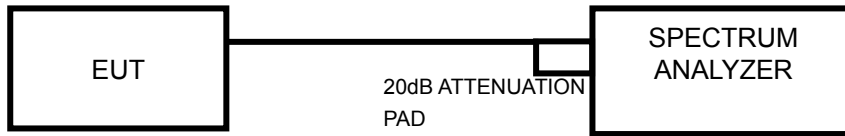
The transmitter output was connected to the spectrum analyzer through an attenuator, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3kHz RBW and 30kHz VBW, set sweep time = span/3kHz. The power spectral density was measured and recorded.

The sweep time is allowed to be longer than span/3kHz for a full response of the mixer in the spectrum analyzer.

### 4.5.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.5.5 TEST SETUP



#### 4.5.6 EUT OPERATING CONDITIONS

Same as 4.3.6.



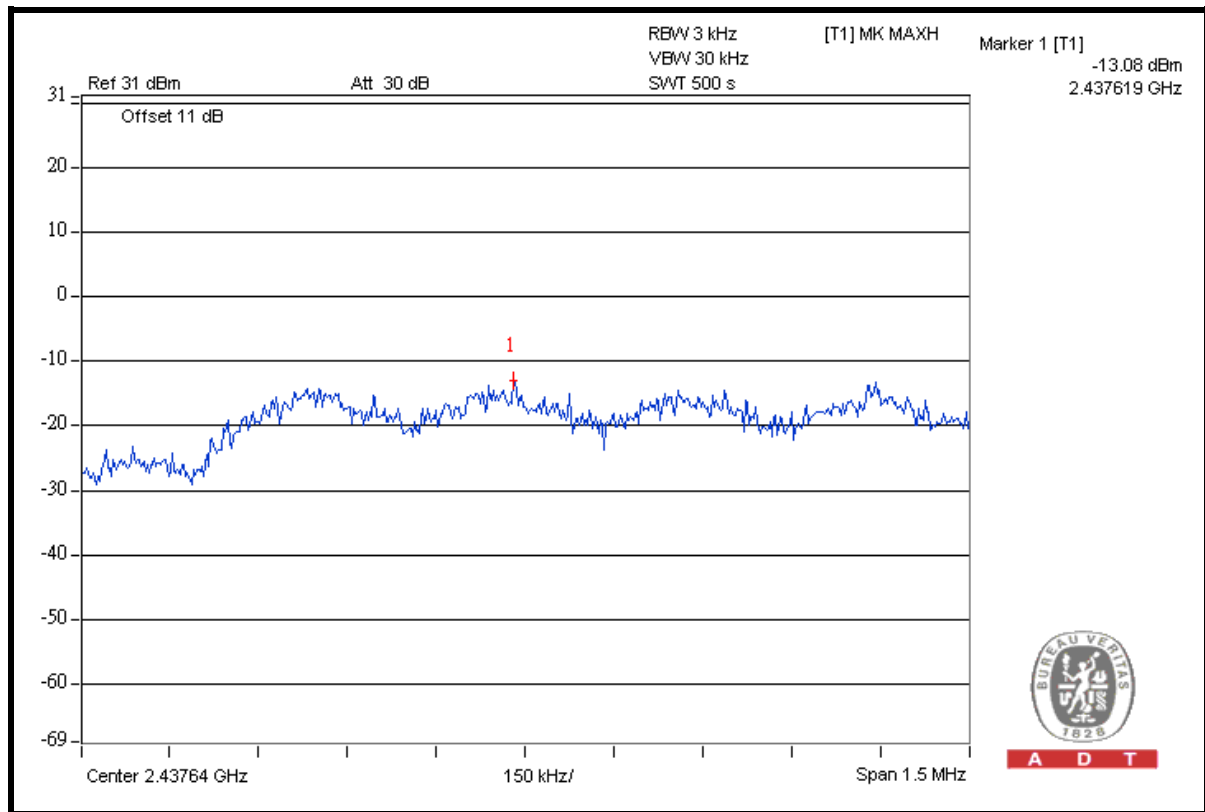
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### 4.5.7 TEST RESULTS

#### 802.11n (20MHz)

CHANNEL	CHANNEL FREQUENCY (MHz)	RF POWER LEVEL IN 3 kHz BW (dBm)	MAXIMUM LIMIT (dBm)	PASS/FAIL
1	2412	-13.36	8	PASS
6	2437	-13.08	8	PASS
11	2462	-13.44	8	PASS

#### CH 6



## 4.6 BAND EDGES MEASUREMENT

### 4.6.1 LIMITS OF BAND EDGES MEASUREMENT

Below  $-20\text{dB}$  of the highest emission level of operating band (in 100kHz Resolution Bandwidth).

### 4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
R&S SPECTRUM ANALYZER	FSP40	100040	Jul. 07, 2009	Jul. 06, 2010

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

### 4.6.3 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100kHz and 300kHz with suitable frequency span including 100MHz bandwidth from band edge. The band edges was measured and recorded.

The spectrum plots (Peak RBW=100kHz, VBW=300kHz; Average RBW=1MHz, VBW= 10Hz are attached on the following pages.

### 4.6.4 DEVIATION FROM TEST STANDARD

No deviation.

### 4.6.5 EUT OPERATING CONDITION

Same as 4.3.6.

#### 4.6.6 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 in part 15.247(d).

#### 802.11n (20MHz)

##### RESTRICT BAND (2310 ~ 2390 MHz)

FREQUENCY (MHz)	FUNDAMENTAL EMISSION (dBuV/m)	DELTA (dB)	MAXIMUM FIELD STRENGTH IN RESTRICT BAND (dBuV/m)	LIMIT (dBuV/m)
2412.00 (PK)	106.4	36.35	70.05	74.00
2412.00 (AV)	93.3	41.57	51.73	54.00

##### RESTRICT BAND (2483.5 ~ 2500 MHz)

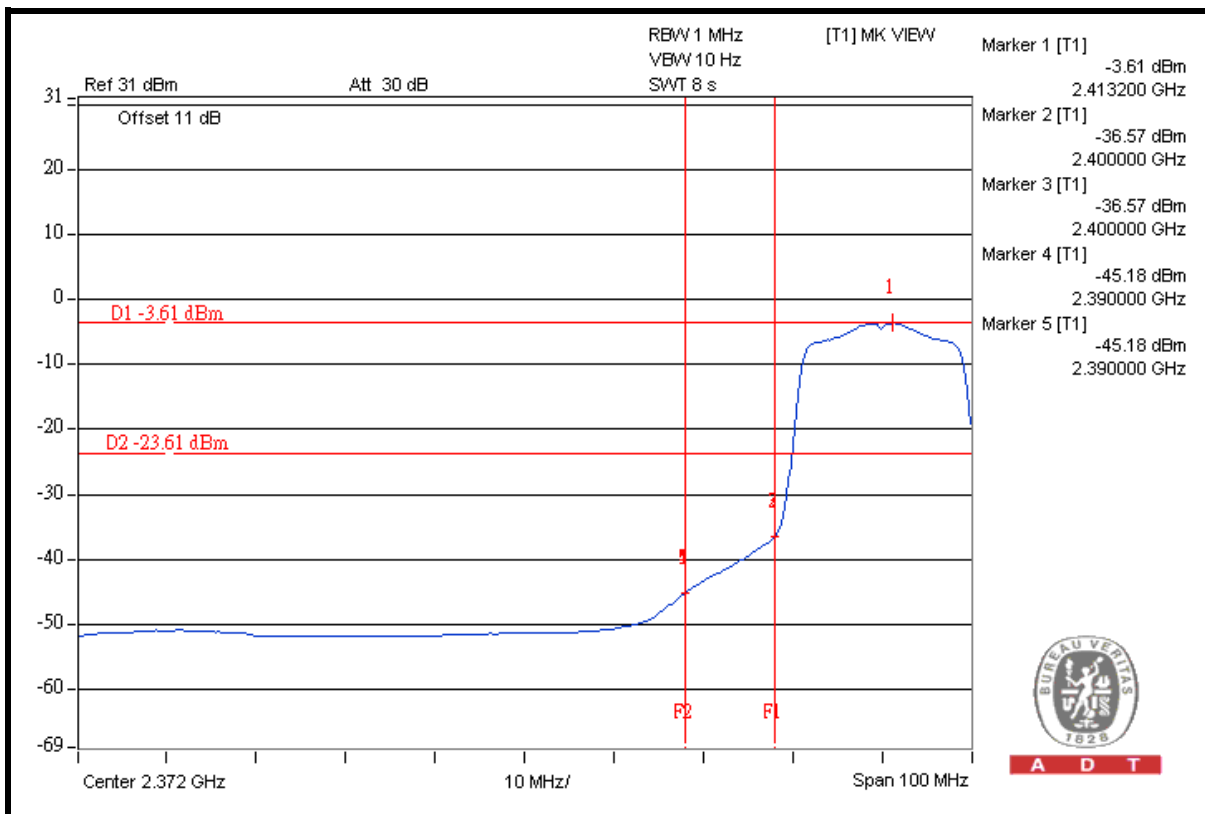
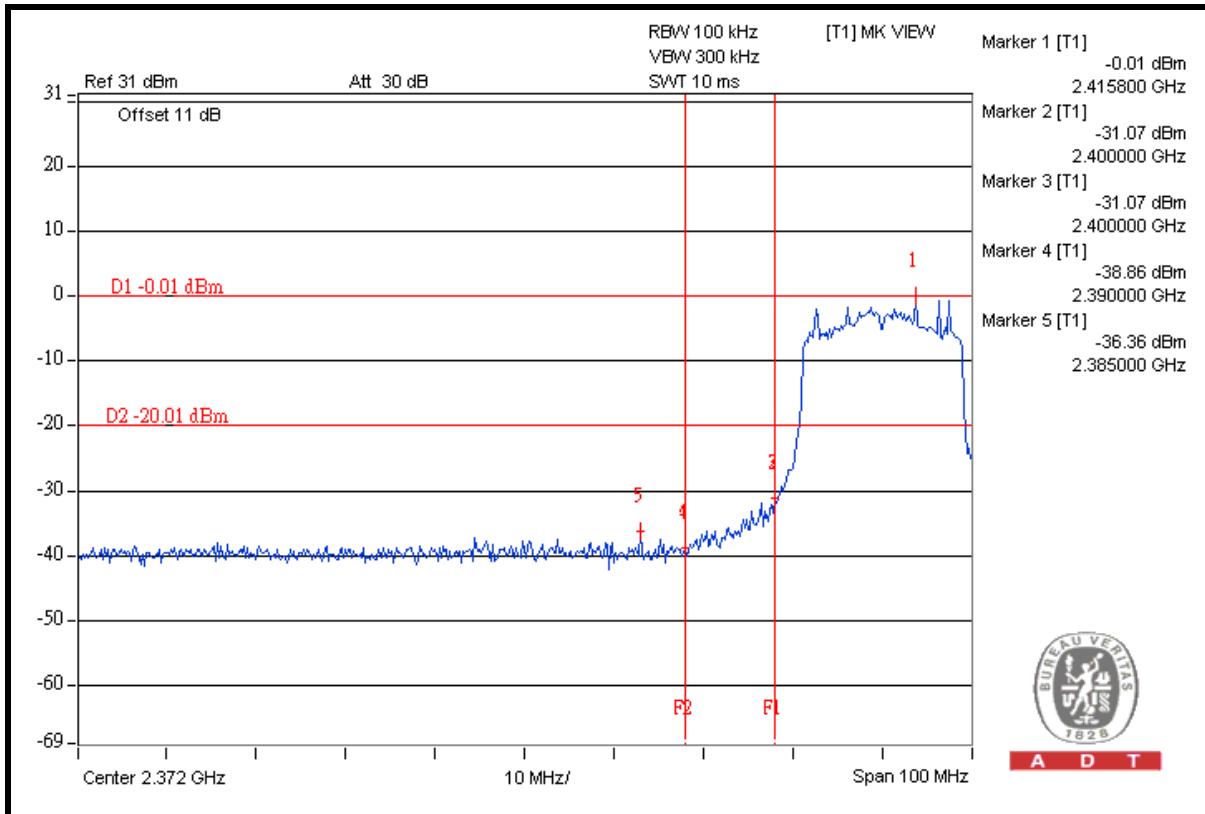
FREQUENCY (MHz)	FUNDAMENTAL EMISSION (dBuV/m)	DELTA (dB)	MAXIMUM FIELD STRENGTH IN RESTRICT BAND (dBuV/m)	LIMIT (dBuV/m)
2462.00 (PK)	107.2	36.87	70.33	74.00
2462.00 (AV)	94.1	41.95	52.15	54.00

**NOTE:**

- Delta = Amplitude between the peak of the fundamental and the peak of the band edge emission. Please check following 3 pages.
- Maximum field strength in restrict band = Fundamental emission – Delta.



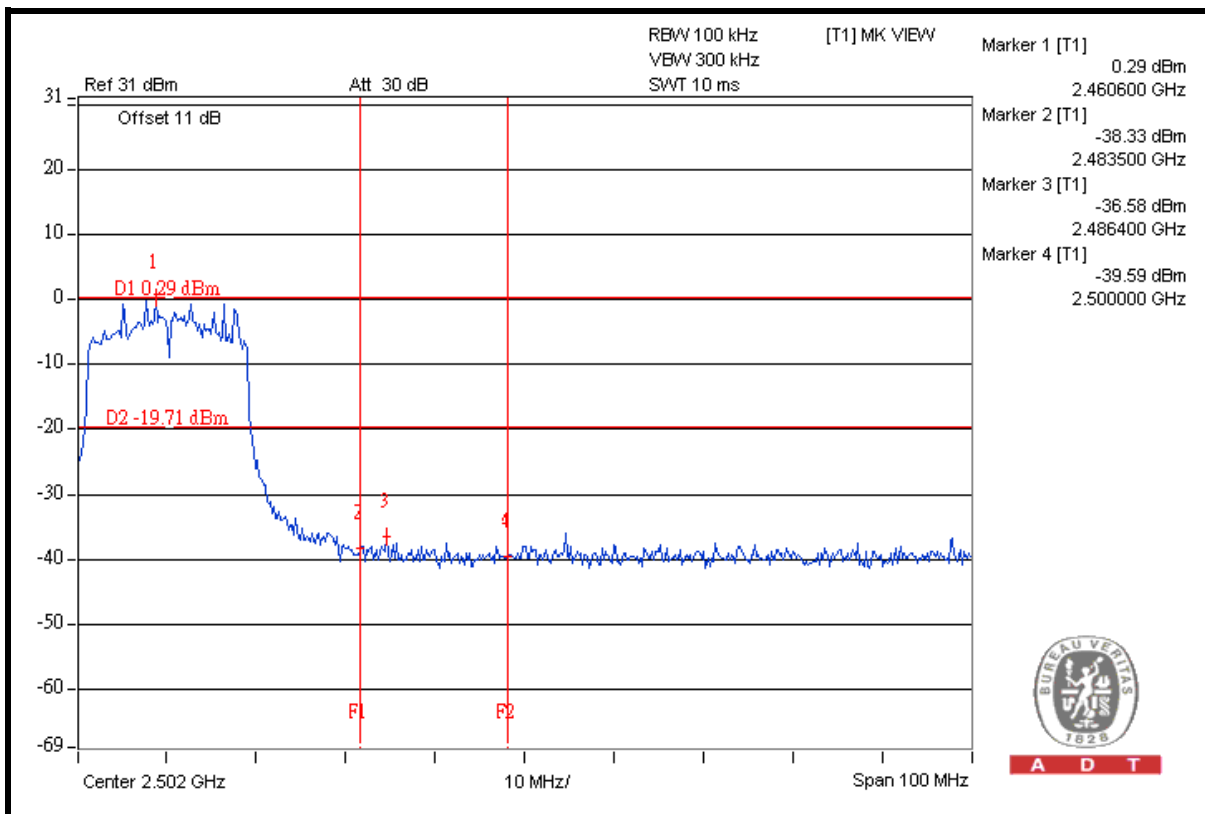
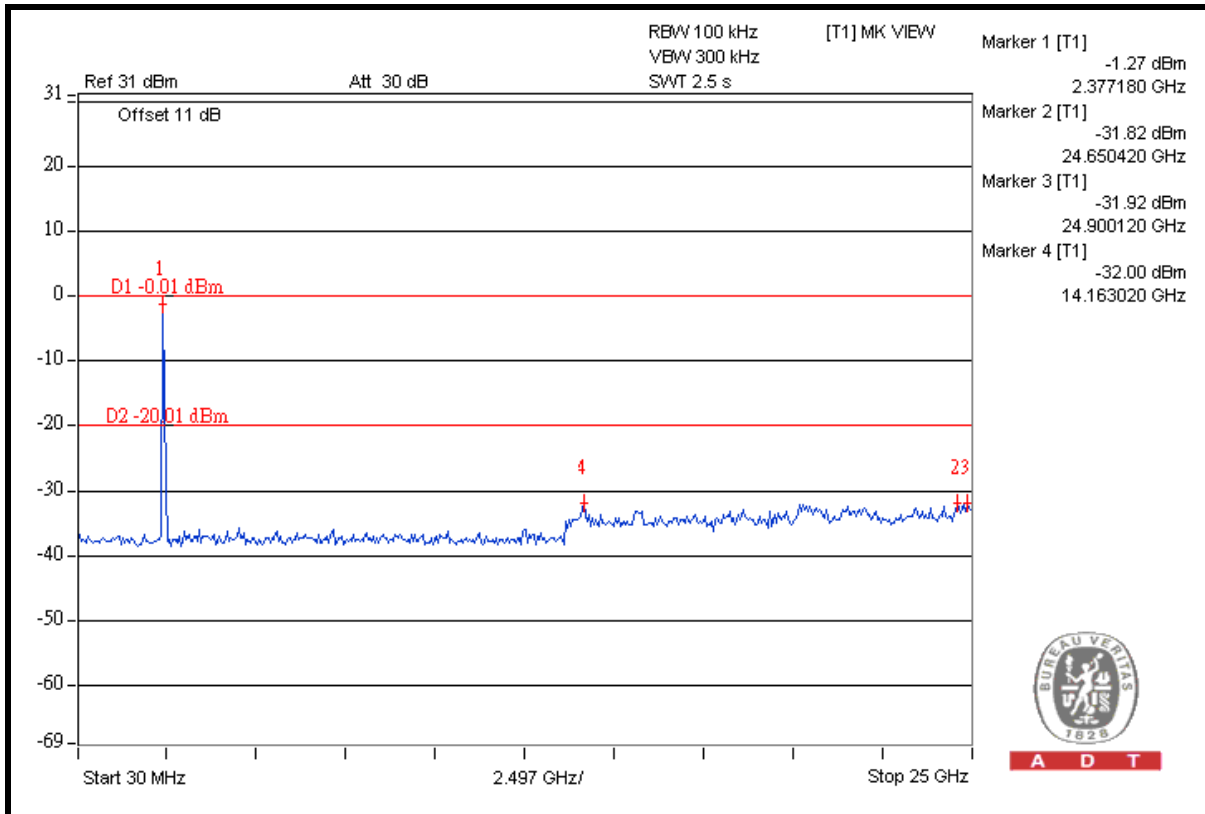
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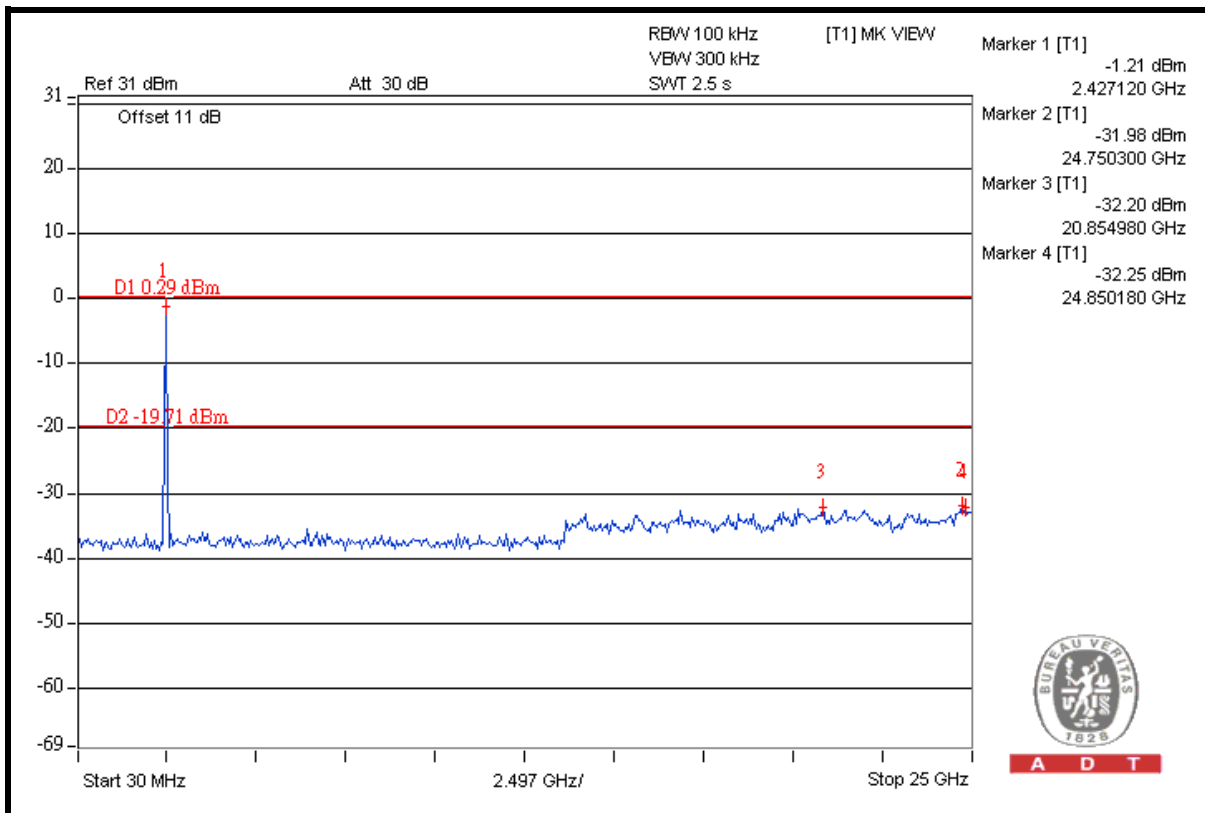
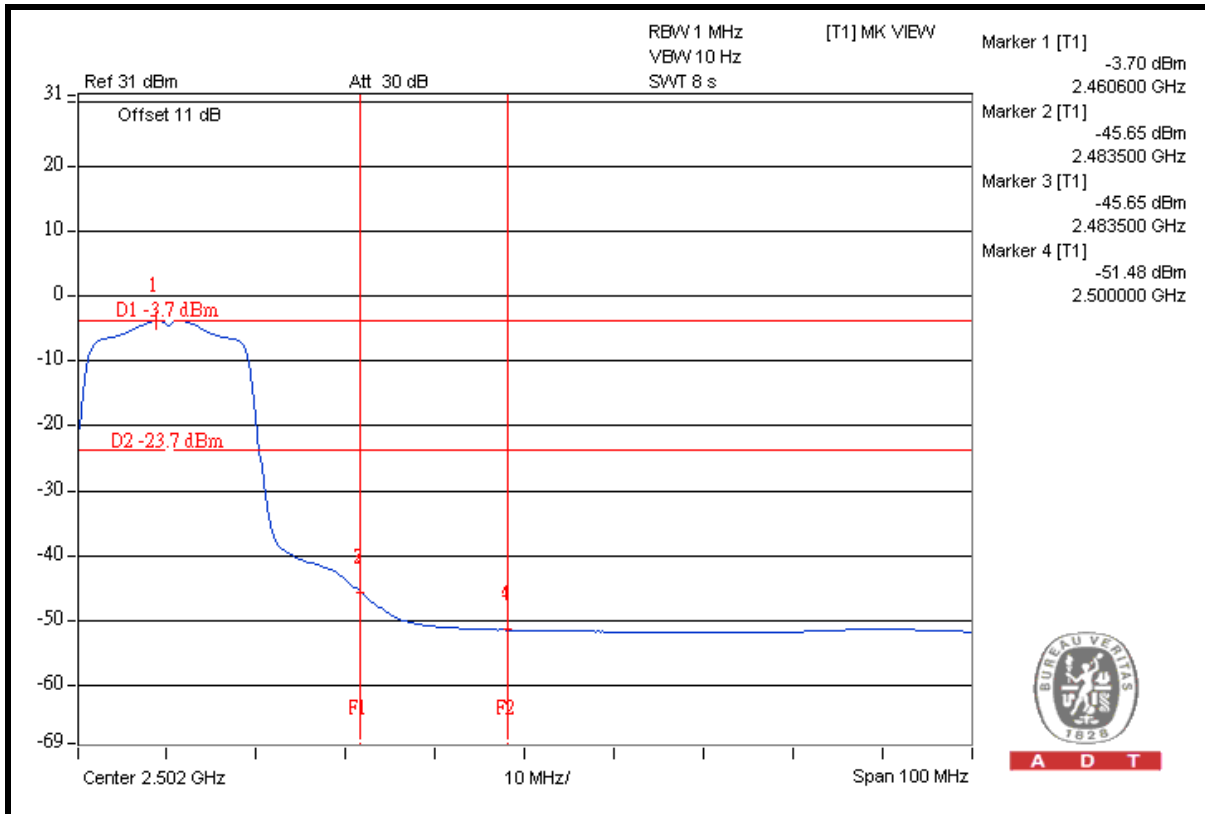


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## 5 PHOTOGRAPHS OF THE TEST CONFIGURATION

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



## 6 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.

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site:

[www.adt.com.tw/index.5/phtml](http://www.adt.com.tw/index.5/phtml). If you have any comments, please feel free to contact us at the following:

**Linko EMC/RF Lab:**

Tel: 886-2-26052180

Fax: 886-2-26051924

**Hsin Chu EMC/RF Lab:**

Tel: 886-3-5935343

Fax: 886-3-5935342

**Hwa Ya EMC/RF/Safety Telecom Lab:**

Tel: 886-3-3183232

Fax: 886-3-3185050

**Web Site:** [www.adt.com.tw](http://www.adt.com.tw)

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



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## **7 APPENDIX A – MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB**

No any modifications are made to the EUT by the lab during the test.

**---END---**