

## FCC Test Report

**Report No.:** RF151130C33

**FCC ID:** H8N-QB-EMS-US1

**Test Model:** QB-EMS-US

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

**Test Date:** Dec. 10, 2015 ~ Jan. 09, 2016

**Issued Date:** Jan. 12, 2016

**Applicant:** Askey Computer Corp

**Address:** 10F, No. 119, Chienkang Rd Chung-Ho Taipei Taiwan 235

**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, R.O.C.

**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
RF151130C33	Original release.	Jan. 12, 2016

## 1 Certificate of Conformity

**Product:** Smart plug  
**Brand:** Askey  
**Test Model:** QB-EMS-US  
**Sample Status:** Engineering sample  
**Applicant:** Askey Computer Corp  
**Test Date:** Dec. 10, 2015 ~ Jan. 09, 2016  
**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
ANSI C63.10:2013

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

**Prepared by :**                     *Suntee Liu*                    , **Date:**                     Jan. 12, 2016                      
Suntee Liu / Specialist

**Approved by :**                     *Ken Liu*                    , **Date:**                     Jan. 12, 2016                      
Ken Liu / Senior Manager

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -2.04 dB at 0.33046 MHz.
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 2483.50 MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is I-PEX (MHF) not a standard connector.

### 2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2:

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.44 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.59 dB
	200MHz ~ 1000MHz	3.60 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	Smart plug
Brand	Askey
Test Model	QB-EMS-US
Sample Status	Engineering sample
Power Supply Rating	100-120Vac
Modulation Type	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Modulation Technology	DSSS, OFDM
Transfer Rate	802.11b: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11n: up to 150Mbps
Operating Frequency	2412~2462MHz
Number of Channel	802.11b, 802.11g, 802.11n (HT20): 11 802.11n (HT40): 7
Output Power	165.577mW
Antenna Type	Refer to Note
Antenna Connector	Refer to Note
Accessory Device	NA
Data Cable Supplied	NA

Note:

1. The EUT provides 1 completed transmitter and 1 receiver.

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

2. The EUT uses following antenna.

No.	Type	Connector	Frequency Range (MHz)	Gain (dBi)
1	PIFA	I-PEX (MHF)	2412	4.5
			2442	4.8
			2472	5.1

### 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 $\geq$ 1G	RE $<$ 1G	PLC	APCM	
-	√	√	√	√	-

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

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

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

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Date 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	Date Rate (Mbps)
-	802.11g	1 to 11	11	OFDM	BPSK	6.0

#### Power Line Conducted Emission Test:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Date Rate (Mbps)
-	802.11g	1 to 11	11	OFDM	BPSK	6.0

#### Antenna Port Conducted Measurement:

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	Date 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	25 deg. C, 65% RH	120Vac, 60Hz	Chris Lin
RE<1G	23 deg. C, 66% RH	120Vac, 60Hz	Alan Wu
PLC	24 deg. C, 67% RH	120Vac, 60Hz	Scott Yang
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Frank Liu

**3.3 Duty Cycle of Test Signal**

802.11b: Duty cycle of test signal is ≥ 98%.

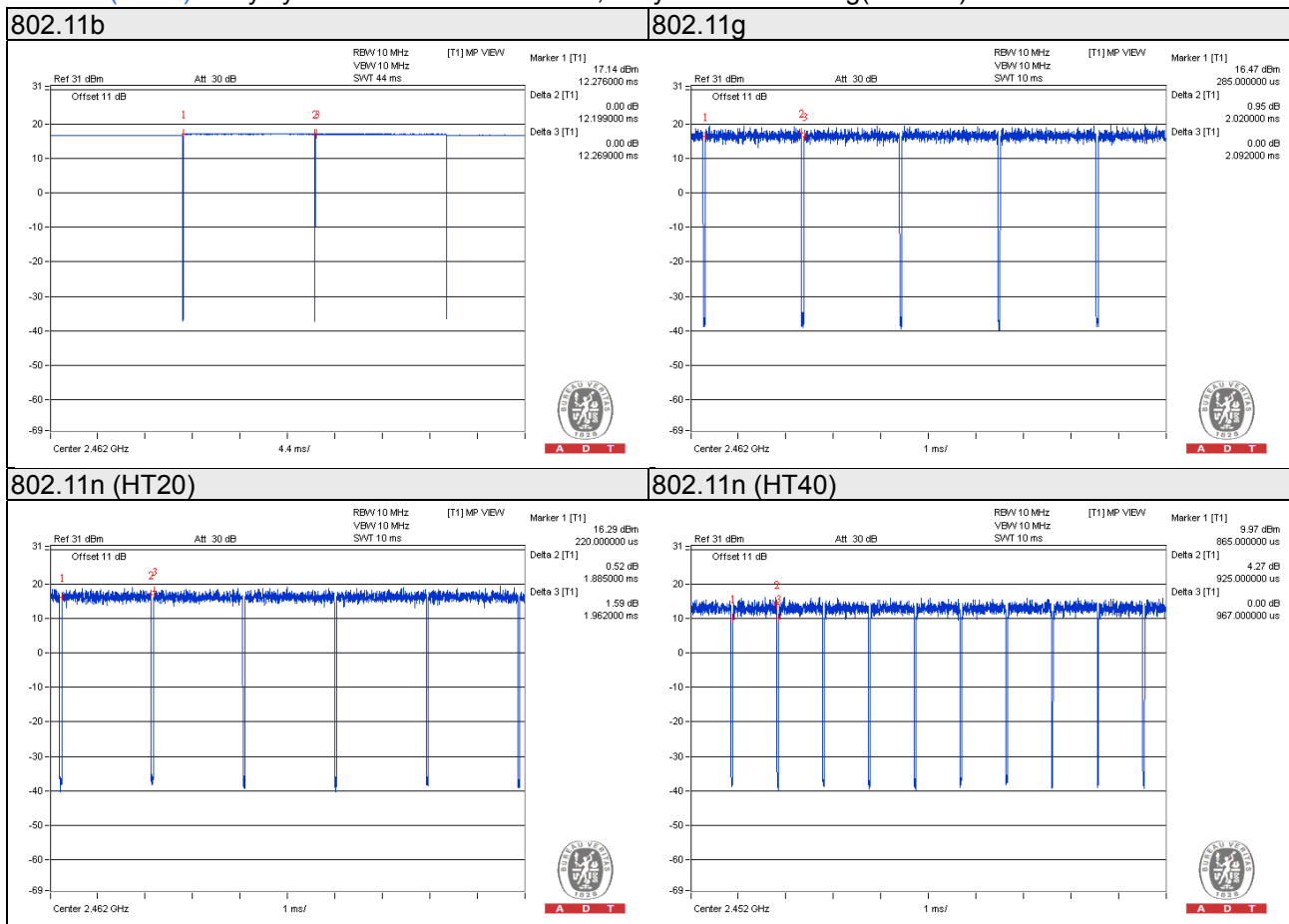
802.11g, 802.11n (HT20), 802.11n (HT40): Duty cycle of test signal is < 98%.

802.11b: Duty cycle = 12.199/12.269 = 0.994

802.11g: Duty cycle = 2.02/2.092 = 0.966, Duty factor = 10 \* log(1/0.966) = 0.15

802.11n (HT20): Duty cycle = 1.885/1.962 = 0.961, Duty factor = 10 \* log(1/0.961) = 0.17

802.11n (HT40): Duty cycle = 0.925/0.967 = 0.957, Duty factor = 10 \* log(1/0.957) = 0.19



### 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.

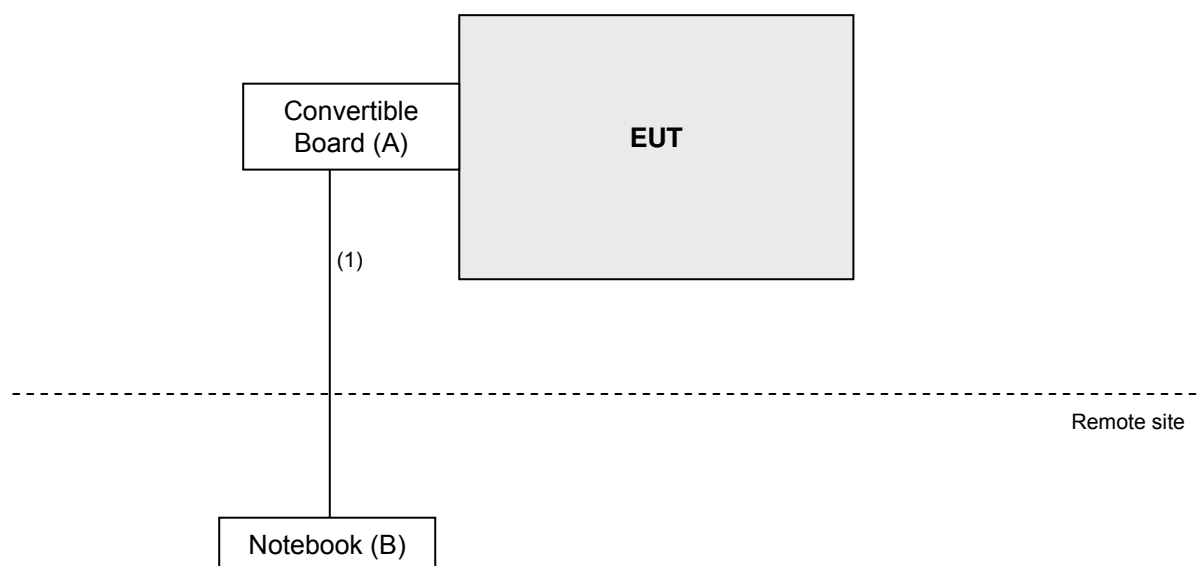
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Convertible Board	NA	NA	NA	NA	Provided by manufacturer
B.	Notebook	DELL	E5410	6RP2YM1	FCC DoC Approved	-

Note:

1. All power cords of the above support units are non-shielded (1.8m).
2. Item B acted as a communication partner to transfer data.

ID	Descriptions	Qty.	Length (m)	Shielding (Yes/No)	Cores (Qty.)	Remarks
1.	RJ45	1	3	N	0	-

#### 3.4.1 Configuration of System under Test



### 3.5 General Description of Applied Standards

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

**FCC Part 15, Subpart C (15.247)**  
**558074 D01 DTS Meas Guidance v03r04**

ANSI C63.10:2013

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

**NOTE:** The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.

## 4 Test Types and Results

### 4.1 Radiated Emission and Bandedge Measurement

#### 4.1.1 Limits of Radiated Emission and Bandedge Measurement

Radiated emissions which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

#### 4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100424	Oct. 12, 2015	Oct. 11, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100040	Jul. 08, 2015	Jul. 07, 2016
BILOG Antenna SCHWARZBECK	VULB9168	9168-155	Feb. 06, 2015	Feb. 05, 2016
HORN Antenna SCHWARZBECK	BBHA 9120D	9120D-1170	Feb. 05, 2015	Feb. 04, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 09, 2015	Feb. 08, 2016
Preamplifier Agilent	8449B	3008A01960	Aug. 09, 2015	Aug. 08, 2016
Preamplifier Agilent	8447D	2944A10631	Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-02(295012+309220)	Aug. 09, 2015	Aug. 08, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH4-03(250724)	Aug. 09, 2015	Aug. 08, 2016
Software BV ADT	ADT_Radiated_V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	010303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021703	NA	NA
Turn Table BV ADT	TT100	TT93021703	NA	NA
Turn Table Controller BV ADT	SC100.	SC93021703	NA	NA
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 4.
  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 460141.
  5. The IC Site Registration No. is IC7450F-4.

#### 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:**

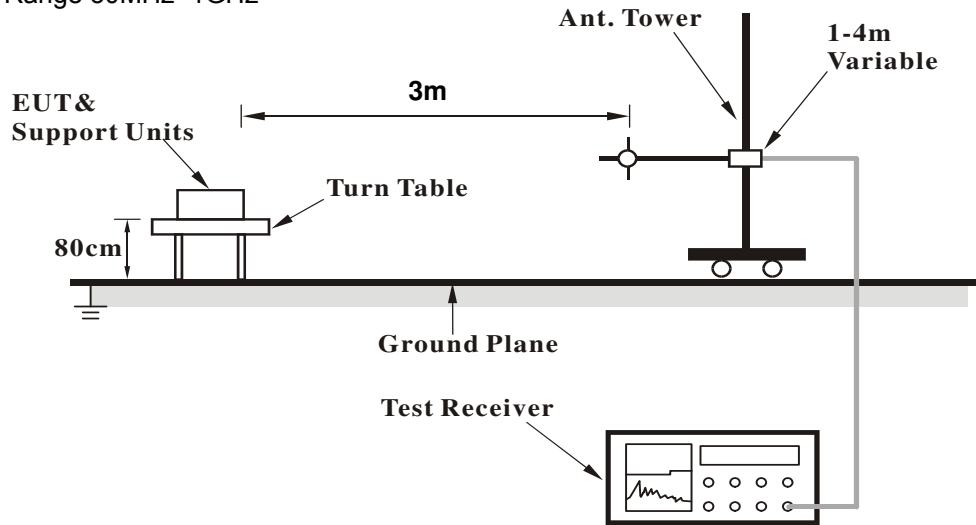
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

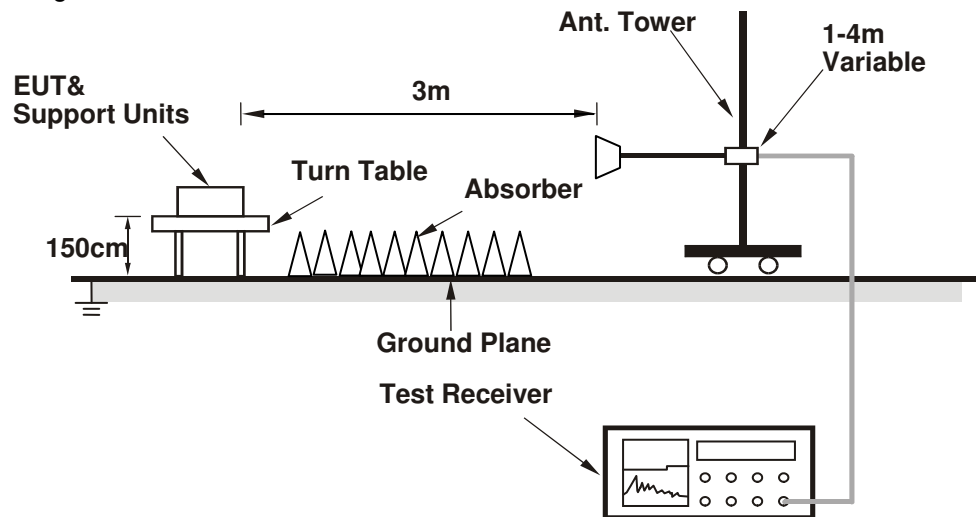
No deviation.

#### 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. Set the EUT under transmission condition continuously at specific channel frequency.

#### 4.1.7 Test Results

Above 1GHz Worst-Case Data:

802.11b

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	56.1 PK	74.0	-17.9	2.80 H	5	24.50	31.60
2	2390.00	44.2 AV	54.0	-9.8	2.80 H	5	12.60	31.60
3	*2412.00	94.9 PK			2.71 H	5	63.10	31.80
4	*2412.00	91.2 AV			2.71 H	5	59.40	31.80
5	4824.00	56.1 PK	74.0	-17.9	2.38 H	97	51.20	4.90
6	4824.00	52.4 AV	54.0	-1.6	2.38 H	97	47.50	4.90

#### 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	58.0 PK	74.0	-16.0	1.65 V	40	26.40	31.60
2	2390.00	44.3 AV	54.0	-9.7	1.65 V	40	12.70	31.60
3	*2412.00	100.6 PK			1.62 V	36	68.80	31.80
4	*2412.00	97.1 AV			1.62 V	36	65.30	31.80
5	4824.00	56.1 PK	74.0	-17.9	1.01 V	81	51.20	4.90
6	4824.00	52.5 AV	54.0	-1.5	1.01 V	81	47.60	4.90

#### REMARKS:

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



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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	92.9 PK			1.64 H	6	61.00	31.90
2	*2437.00	89.0 AV			1.64 H	6	57.10	31.90
3	4874.00	56.1 PK	74.0	-17.9	2.36 H	98	51.10	5.00
4	4874.00	52.7 AV	54.0	-1.3	2.36 H	98	47.70	5.00

**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	100.0 PK			1.63 V	30	68.10	31.90
2	*2437.00	95.3 AV			1.63 V	30	63.40	31.90
3	4874.00	54.6 PK	74.0	-19.4	1.00 V	107	49.60	5.00
4	4874.00	50.9 AV	54.0	-3.1	1.00 V	107	45.90	5.00

**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.

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	55.6 PK	74.0	-18.4	1.56 H	10	24.00	31.60
2	2390.00	44.2 AV	54.0	-9.8	1.56 H	10	12.60	31.60
3	*2462.00	92.8 PK			1.54 H	4	60.80	32.00
4	*2462.00	89.2 AV			1.54 H	4	57.20	32.00
5	4924.00	55.9 PK	74.0	-18.1	1.35 H	99	50.80	5.10
6	4924.00	52.6 AV	54.0	-1.4	1.35 H	99	47.50	5.10

**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	*2462.00	100.0 PK			1.60 V	35	68.00	32.00
2	*2462.00	96.4 AV			1.60 V	35	64.40	32.00
3	2483.50	55.4 PK	74.0	-18.6	1.65 V	40	23.40	32.00
4	2483.50	44.5 AV	54.0	-9.5	1.65 V	40	12.50	32.00
5	4924.00	57.0 PK	74.0	-17.0	1.62 V	325	51.90	5.10
6	4924.00	53.5 AV	54.0	-0.5	1.62 V	325	48.40	5.10

**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)  
– 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**

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	60.6 PK	74.0	-13.4	1.50 H	21	29.00	31.60
2	2390.00	47.0 AV	54.0	-7.0	1.50 H	21	15.40	31.60
3	*2412.00	93.0 PK			1.48 H	19	61.20	31.80
4	*2412.00	83.4 AV			1.48 H	19	51.60	31.80
5	4824.00	59.2 PK	74.0	-14.8	2.38 H	103	54.30	4.90
6	4824.00	43.7 AV	54.0	-10.3	2.38 H	103	38.80	4.90

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	69.2 PK	74.0	-4.8	1.32 V	43	37.60	31.60
2	2390.00	53.2 AV	54.0	-0.8	1.32 V	43	21.60	31.60
3	*2412.00	102.1 PK			1.16 V	143	70.30	31.80
4	*2412.00	92.0 AV			1.16 V	143	60.20	31.80
5	4824.00	53.4 PK	74.0	-20.6	1.00 V	246	48.50	4.90
6	4824.00	41.2 AV	54.0	-12.8	1.00 V	246	36.30	4.90

**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.

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	97.5 PK			1.39 H	7	65.60	31.90
2	*2437.00	87.5 AV			1.39 H	7	55.60	31.90
3	4874.00	66.6 PK	74.0	-7.4	2.02 H	90	61.60	5.00
4	4874.00	52.4 AV	54.0	-1.6	2.02 H	90	47.40	5.00

**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	103.8 PK			1.64 V	31	71.90	31.90
2	*2437.00	93.8 AV			1.64 V	31	61.90	31.90
3	4874.00	63.6 PK	74.0	-10.4	1.00 V	108	58.60	5.00
4	4874.00	50.3 AV	54.0	-3.7	1.00 V	108	45.30	5.00

**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.

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	94.3 PK			1.57 H	1	62.30	32.00
2	*2462.00	84.6 AV			1.57 H	1	52.60	32.00
3	2483.50	63.6 PK	74.0	-10.4	1.60 H	10	31.60	32.00
4	2483.50	49.0 AV	54.0	-5.0	1.60 H	10	17.00	32.00
5	4924.00	55.0 PK	74.0	-19.0	2.08 H	97	49.90	5.10
6	4924.00	40.0 AV	54.0	-14.0	2.08 H	97	34.90	5.10

**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	*2462.00	98.6 PK			1.47 V	140	66.60	32.00
2	*2462.00	88.9 AV			1.47 V	140	56.90	32.00
3	2483.50	69.1 PK	74.0	-4.9	1.42 V	32	37.10	32.00
<b>4</b>	<b>2483.50</b>	<b>53.7 AV</b>	<b>54.0</b>	<b>-0.3</b>	<b>1.42 V</b>	<b>32</b>	<b>21.70</b>	<b>32.00</b>
5	4924.00	54.1 PK	74.0	-19.9	1.87 V	10	49.00	5.10
6	4924.00	41.5 AV	54.0	-12.5	1.87 V	10	36.40	5.10

**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)  
– 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)**

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.5 PK	74.0	-14.5	1.25 H	360	27.90	31.60
2	2390.00	47.6 AV	54.0	-6.4	1.25 H	360	16.00	31.60
3	*2412.00	94.8 PK			1.21 H	354	63.00	31.80
4	*2412.00	84.9 AV			1.21 H	354	53.10	31.80
5	4824.00	56.6 PK	74.0	-17.4	1.92 H	95	51.70	4.90
6	4824.00	42.1 AV	54.0	-11.9	1.92 H	95	37.20	4.90

**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	70.6 PK	74.0	-3.4	1.50 V	41	39.00	31.60
2	2390.00	52.8 AV	54.0	-1.2	1.50 V	41	21.20	31.60
3	*2412.00	100.4 PK			1.55 V	42	68.60	31.80
4	*2412.00	89.6 AV			1.55 V	42	57.80	31.80
5	4824.00	55.2 PK	74.0	-18.8	1.96 V	346	50.30	4.90
6	4824.00	41.6 AV	54.0	-12.4	1.96 V	346	36.70	4.90

**REMARKS:**

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

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2437.00	98.8 PK			1.64 H	7	66.90	31.90
2	*2437.00	87.4 AV			1.64 H	7	55.50	31.90
3	4874.00	66.2 PK	74.0	-7.8	2.02 H	97	61.20	5.00
4	4874.00	52.7 AV	54.0	-1.3	2.02 H	97	47.70	5.00

**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	103.7 PK			1.64 V	39	71.80	31.90
2	*2437.00	93.9 AV			1.64 V	39	62.00	31.90
3	4874.00	63.2 PK	74.0	-10.8	1.00 V	109	58.20	5.00
4	4874.00	49.9 AV	54.0	-4.1	1.00 V	109	44.90	5.00

**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.

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	94.7 PK			1.55 H	4	62.70	32.00
2	*2462.00	84.5 AV			1.55 H	4	52.50	32.00
3	2483.50	62.6 PK	74.0	-11.4	1.55 H	5	30.60	32.00
4	2483.50	48.5 AV	54.0	-5.5	1.55 H	5	16.50	32.00
5	4924.00	55.6 PK	74.0	-18.4	1.89 H	100	50.50	5.10
6	4924.00	40.4 AV	54.0	-13.6	1.89 H	100	35.30	5.10

**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	*2462.00	101.0 PK			1.65 V	36	69.00	32.00
2	*2462.00	90.0 AV			1.65 V	36	58.00	32.00
3	2483.50	69.6 PK	74.0	-4.4	1.60 V	40	37.60	32.00
4	2483.50	52.8 AV	54.0	-1.2	1.60 V	40	20.80	32.00
5	4924.00	54.2 PK	74.0	-19.8	1.89 V	355	49.10	5.10
6	4924.00	40.6 AV	54.0	-13.4	1.89 V	355	35.50	5.10

**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)  
– 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)**

CHANNEL	TX Channel 3	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	62.2 PK	74.0	-11.8	1.75 H	350	30.60	31.60
2	2390.00	47.3 AV	54.0	-6.7	1.75 H	350	15.70	31.60
3	*2422.00	89.9 PK			1.71 H	353	58.10	31.80
4	*2422.00	80.9 AV			1.71 H	353	49.10	31.80
5	4844.00	47.5 PK	74.0	-26.5	1.50 H	40	42.60	4.90
6	4844.00	34.9 AV	54.0	-19.1	1.50 H	40	30.00	4.90

**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	68.6 PK	74.0	-5.4	1.50 V	139	37.00	31.60
2	2390.00	53.2 AV	54.0	-0.8	1.50 V	139	21.60	31.60
3	*2422.00	93.7 PK			1.55 V	142	61.90	31.80
4	*2422.00	84.8 AV			1.55 V	142	53.00	31.80
5	4844.00	50.8 PK	74.0	-23.2	1.55 V	360	45.90	4.90
6	4844.00	37.0 AV	54.0	-17.0	1.55 V	360	32.10	4.90

**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.

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.0 PK	74.0	-17.0	1.70 H	295	25.40	31.60
2	2390.00	46.6 AV	54.0	-7.4	1.70 H	295	15.00	31.60
3	*2437.00	92.5 PK			1.68 H	291	60.60	31.90
4	*2437.00	82.0 AV			1.68 H	291	50.10	31.90
5	4874.00	56.3 PK	74.0	-17.7	2.33 H	88	51.30	5.00
6	4874.00	42.9 AV	54.0	-11.1	2.33 H	88	37.90	5.00

**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	70.5 PK	74.0	-3.5	1.00 V	45	38.90	31.60
2	2390.00	52.8 AV	54.0	-1.2	1.00 V	45	21.20	31.60
3	*2437.00	98.9 PK			1.02 V	50	67.00	31.90
4	*2437.00	89.8 AV			1.02 V	50	57.90	31.90
5	4874.00	55.6 PK	74.0	-18.4	1.00 V	105	50.60	5.00
6	4874.00	42.4 AV	54.0	-11.6	1.00 V	105	37.40	5.00

**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.

CHANNEL	TX Channel 9	DETECTOR FUNCTION	Peak (PK)
FREQUENCY RANGE	1GHz ~ 25GHz		Average (AV)

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	90.5 PK			1.58 H	1	58.60	31.90
2	*2452.00	81.4 AV			1.58 H	1	49.50	31.90
3	2483.50	62.4 PK	74.0	-11.6	1.60 H	10	30.40	32.00
4	2483.50	49.0 AV	54.0	-5.0	1.60 H	10	17.00	32.00
5	4904.00	51.6 PK	74.0	-22.4	1.88 H	101	46.60	5.00
6	4904.00	37.9 AV	54.0	-16.1	1.88 H	101	32.90	5.00

**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	*2452.00	95.4 PK			1.78 V	30	63.50	31.90
2	*2452.00	85.2 AV			1.78 V	30	53.30	31.90
3	2483.50	66.9 PK	74.0	-7.1	1.75 V	27	34.90	32.00
4	2483.50	53.1 AV	54.0	-0.9	1.75 V	27	21.10	32.00
5	4904.00	52.0 PK	74.0	-22.0	1.91 V	325	47.00	5.00
6	4904.00	38.4 AV	54.0	-15.6	1.91 V	325	33.40	5.00

**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.

Below 1GHz Worst-Case Data: 802.11g

CHANNEL	TX Channel 11	DETECTOR FUNCTION	Quasi-Peak (QP)
FREQUENCY RANGE	30MHz ~ 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	33.78	34.6 QP	40.0	-5.4	1.50 H	331	49.60	-15.00
2	115.28	32.9 QP	43.5	-10.6	1.50 H	277	49.50	-16.60
3	185.13	36.1 QP	43.5	-7.4	1.24 H	279	51.90	-15.80
4	332.60	32.9 QP	46.0	-13.1	1.00 H	256	45.00	-12.10
5	400.52	34.8 QP	46.0	-11.2	1.00 H	240	46.00	-11.20
6	800.24	35.8 QP	46.0	-10.2	1.24 H	7	38.80	-3.00

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	37.66	35.5 QP	40.0	-4.5	1.25 V	218	50.20	-14.70
2	49.30	35.6 QP	40.0	-4.4	1.00 V	333	49.50	-13.90
3	189.01	35.1 QP	43.5	-8.4	1.00 V	337	51.30	-16.20
4	319.02	34.1 QP	46.0	-11.9	1.24 V	193	46.30	-12.20
5	400.52	35.3 QP	46.0	-10.7	1.24 V	227	46.50	-11.20
6	707.10	27.1 QP	46.0	-18.9	1.24 V	13	32.30	-5.20

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

## 4.2 Conducted Emission Measurement

### 4.2.1 Limits of Conducted Emission Measurement

Frequency (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

**Note:** 1. The lower limit shall apply at the transition frequencies.

2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

### 4.2.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESCI	100613	Nov. 16, 2015	Nov. 15, 2016
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 26, 2014	Dec. 25, 2015
			Dec. 26, 2015	Dec. 25, 2016
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

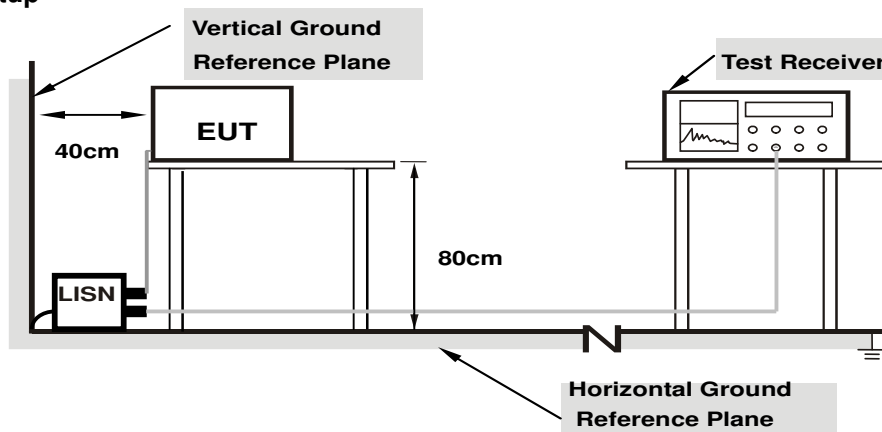
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance 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) were 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 item 4.1.6.

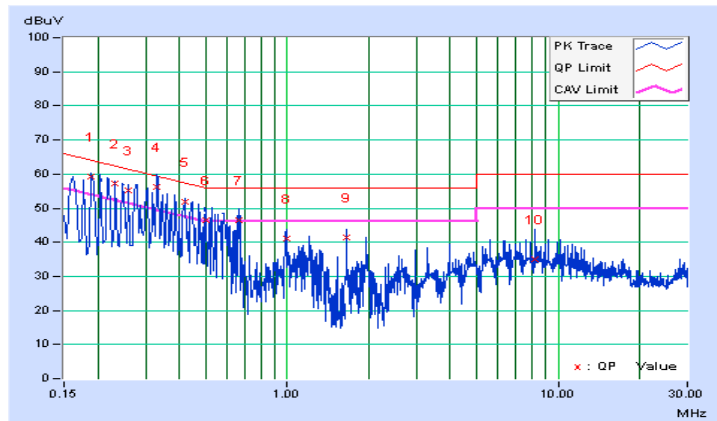
### 4.2.7 Test Results

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

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.18910	9.91	49.21	35.00	59.12	44.91	64.08	54.08	-4.96	-9.17
2	0.23216	9.93	47.15	33.63	57.08	43.56	62.37	52.37	-5.30	-8.82
3	0.25948	9.92	45.46	31.85	55.38	41.77	61.45	51.45	-6.07	-9.68
<b>4</b>	<b>0.33046</b>	<b>9.91</b>	<b>46.32</b>	<b>37.49</b>	<b>56.23</b>	<b>47.40</b>	<b>59.44</b>	<b>49.44</b>	<b>-3.21</b>	<b>-2.04</b>
5	0.41979	9.90	42.04	28.75	51.94	38.65	57.45	47.45	-5.51	-8.80
6	0.50000	9.92	36.40	22.23	46.32	32.15	56.00	46.00	-9.68	-13.85
7	0.66605	9.96	36.36	26.48	46.32	36.44	56.00	46.00	-9.68	-9.56
8	0.99065	10.03	31.14	23.25	41.17	33.28	56.00	46.00	-14.83	-12.72
9	1.65144	10.08	31.34	22.19	41.42	32.27	56.00	46.00	-14.58	-13.73
10	8.25934	10.44	24.59	19.46	35.03	29.90	60.00	50.00	-24.97	-20.10

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.

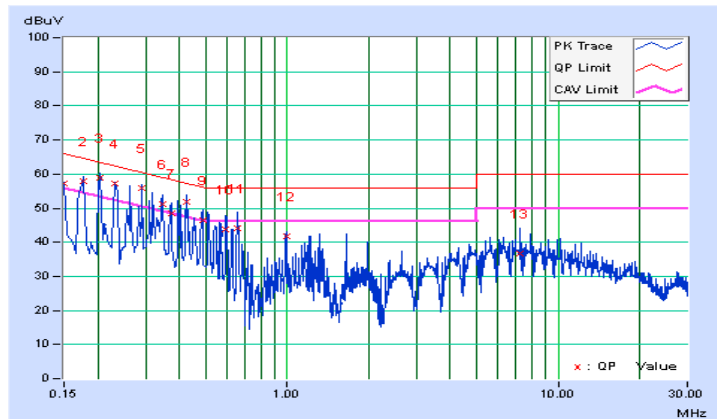


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

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	0.15000	9.89	47.42	32.21	57.31	42.10	66.00
2	0.17737	9.97	47.96	33.38	57.93	43.35	64.61	54.61	-6.68	-11.26
3	0.20458	10.03	48.99	34.88	59.02	44.91	63.42	53.42	-4.40	-8.51
4	0.23216	10.02	47.17	33.13	57.19	43.15	62.37	52.37	-5.18	-9.22
5	0.29076	10.01	45.96	32.62	55.97	42.63	60.50	50.50	-4.53	-7.87
6	0.34550	10.00	41.28	26.93	51.28	36.93	59.07	49.07	-7.79	-12.14
7	0.37287	10.00	38.55	23.34	48.55	33.34	58.44	48.44	-9.89	-15.10
8	0.42370	9.99	41.97	28.87	51.96	38.86	57.38	47.38	-5.41	-8.51
9	0.48626	10.00	36.36	22.05	46.36	32.05	56.23	46.23	-9.88	-14.19
10	0.59183	10.00	33.68	17.70	43.68	27.70	56.00	46.00	-12.32	-18.30
11	0.65439	10.01	34.25	22.88	44.26	32.89	56.00	46.00	-11.74	-13.11
12	0.99065	10.03	31.75	23.41	41.78	33.44	56.00	46.00	-14.22	-12.56
13	7.26620	10.47	26.30	20.06	36.77	30.53	60.00	50.00	-23.23	-19.47

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.



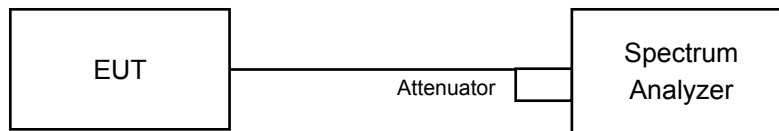


### 4.3 6dB Bandwidth Measurement

#### 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	7.12	0.5	Pass
6	2437	7.08	0.5	Pass
11	2462	7.55	0.5	Pass

##### 802.11g

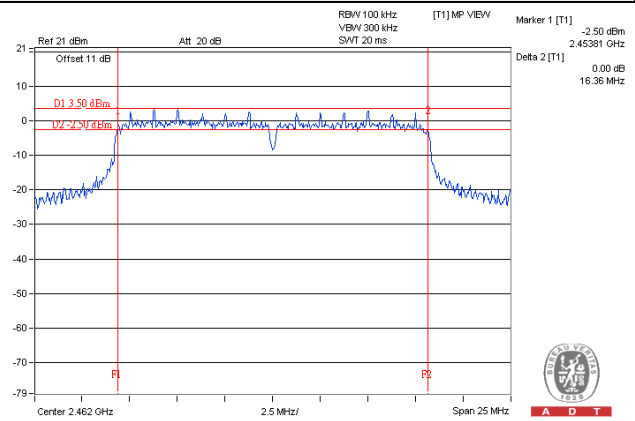
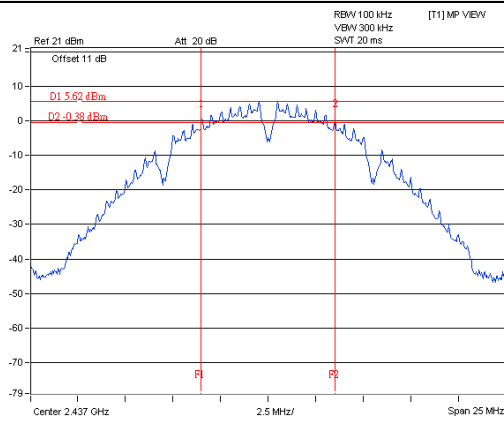
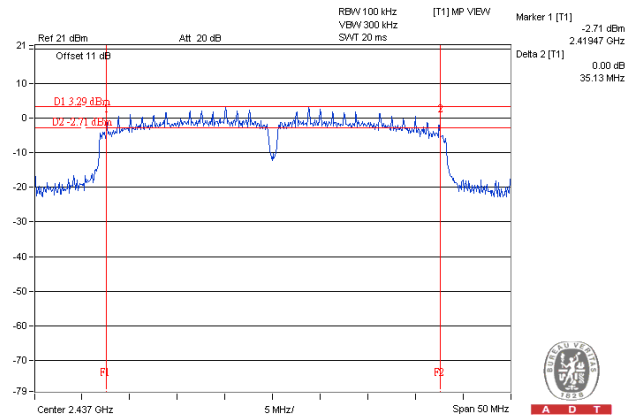
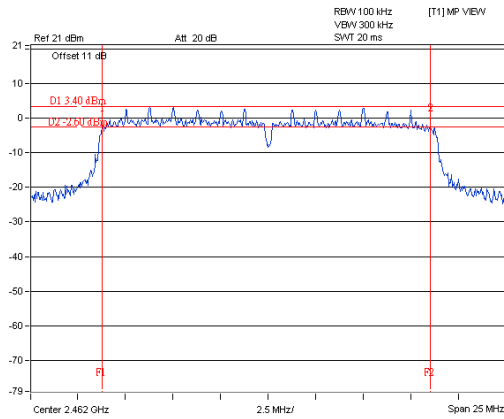
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	16.40	0.5	Pass
6	2437	16.37	0.5	Pass
11	2462	16.36	0.5	Pass

##### 802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	17.58	0.5	Pass
6	2437	17.60	0.5	Pass
11	2462	17.34	0.5	Pass

##### 802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
3	2422	35.27	0.5	Pass
6	2437	35.13	0.5	Pass
9	2452	35.21	0.5	Pass

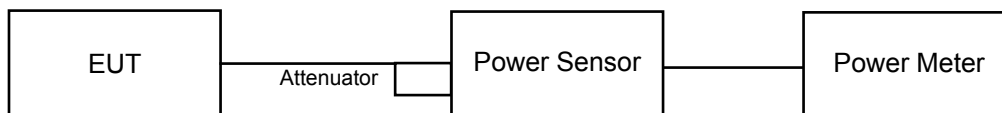
**Spectrum Plot of Worst Value****802.11b****802.11g****802.11n (HT20)****802.11n (HT40)**

## 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)

### 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	24.66	13.92	30	Pass
6	2437	32.584	15.13	30	Pass
11	2462	40.272	16.05	30	Pass

##### 802.11g

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	72.778	18.62	30	Pass
6	2437	153.815	21.87	30	Pass
11	2462	92.897	19.68	30	Pass

##### 802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	68.077	18.33	30	Pass
6	2437	<b>165.577</b>	22.19	30	Pass
11	2462	85.507	19.32	30	Pass

##### 802.11n (HT40)

Channel	Frequency (MHz)	Peak Power (mW)	Peak Power (dBm)	Limit (dBm)	Pass / Fail
3	2422	53.951	17.32	30	Pass
6	2437	111.173	20.46	30	Pass
9	2452	73.961	18.69	30	Pass

For Average Power

802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power(dBm)
1	2412	12.823	11.08
6	2437	17.179	12.35
11	2462	21.528	13.33

802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power(dBm)
1	2412	17.579	12.45
6	2437	60.117	17.79
11	2462	21.038	13.23

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (mW)	Average Power(dBm)
1	2412	16.482	12.17
6	2437	62.230	17.94
11	2462	21.281	13.28

802.11n (HT40)

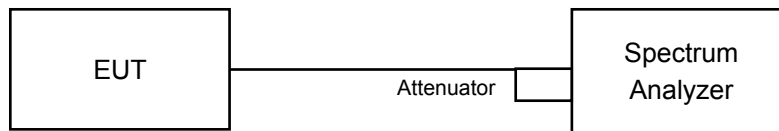
Channel	Frequency (MHz)	Average Power (mW)	Average Power(dBm)
3	2422	12.823	11.08
6	2437	33.037	15.19
9	2452	21.827	13.39

## 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	-8.51	8	Pass
6	2437	-9.21	8	Pass
11	2462	-7.12	8	Pass

##### 802.11g

Channel	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Pass / Fail
1	2412	-10.83	8	Pass
6	2437	-8.16	8	Pass
11	2462	-12.53	8	Pass

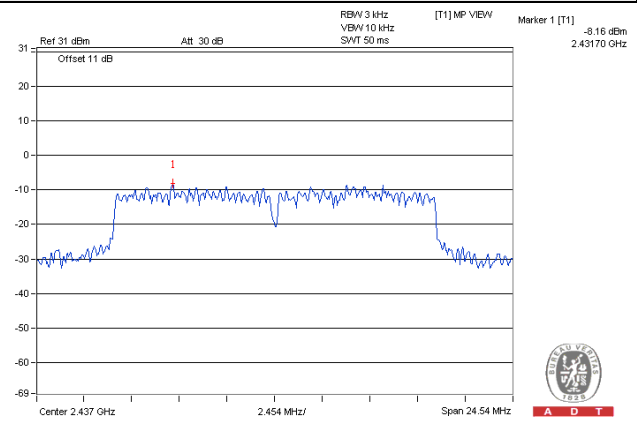
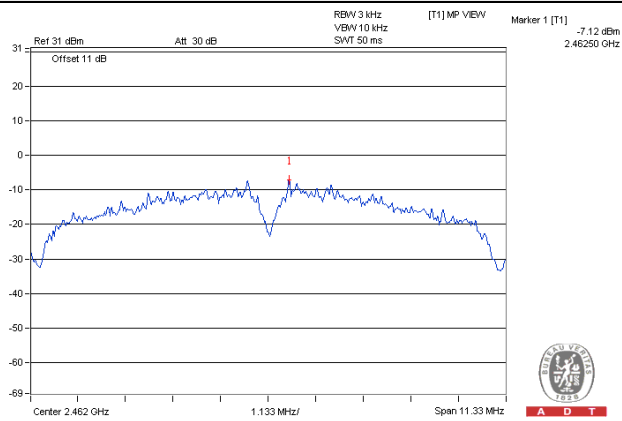
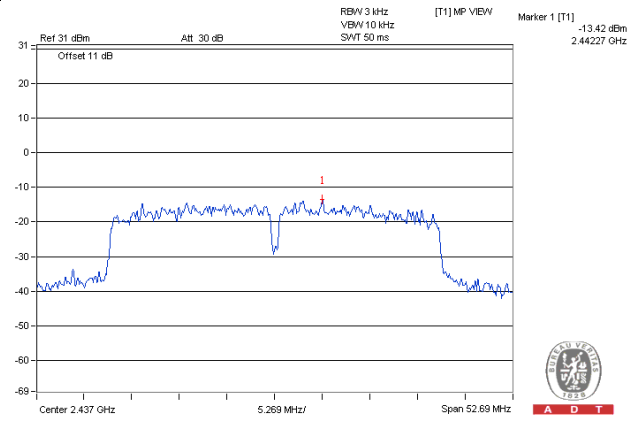
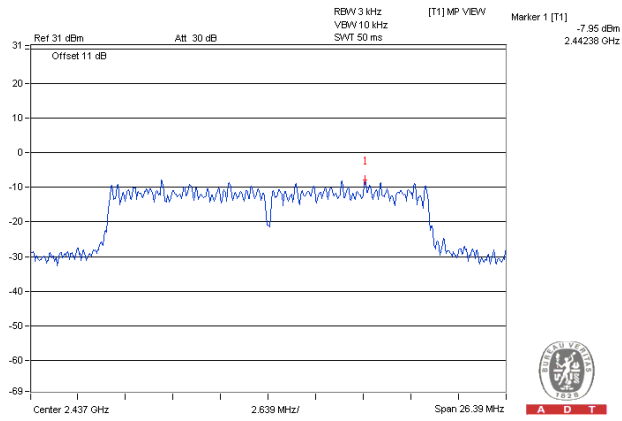
##### 802.11n (HT20)

Channel	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Pass / Fail
1	2412	-12.16	8	Pass
6	2437	-7.95	8	Pass
11	2462	-11.25	8	Pass

##### 802.11n (HT40)

Channel	Freq. (MHz)	PSD (dBm)	Limit (dBm)	Pass / Fail
3	2422	-17.71	8	Pass
6	2437	-13.42	8	Pass
9	2452	-16.65	8	Pass



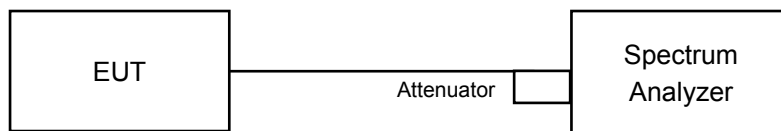
**Spectrum Plot of Worst Value****802.11b****802.11g****802.11n (HT20)****802.11n (HT40)**

## 4.6 Conducted Out of Band Emission Measurement

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

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

### 4.6.2 Test Setup



### 4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.6.4 Test Procedure

#### MEASUREMENT PROCEDURE REF

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

#### MEASUREMENT PROCEDURE OOB

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

### 4.6.5 Deviation from Test Standard

No deviation.

### 4.6.6 EUT Operating Condition

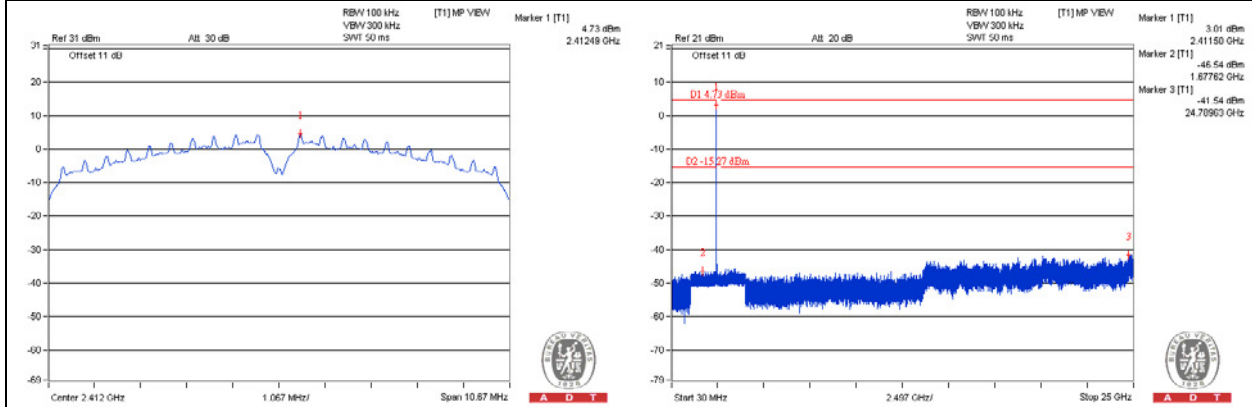
Same as item 4.3.6.

### 4.6.7 Test Results

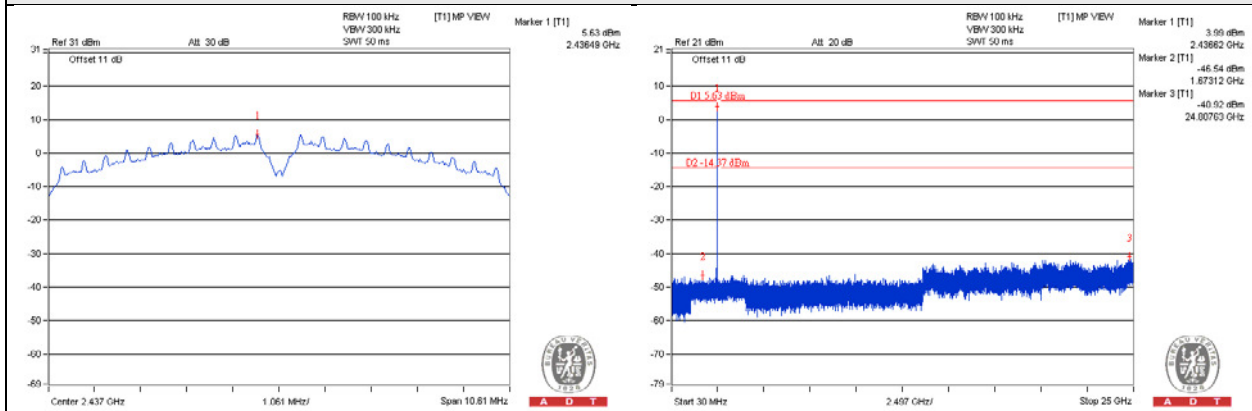
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.

802.11b

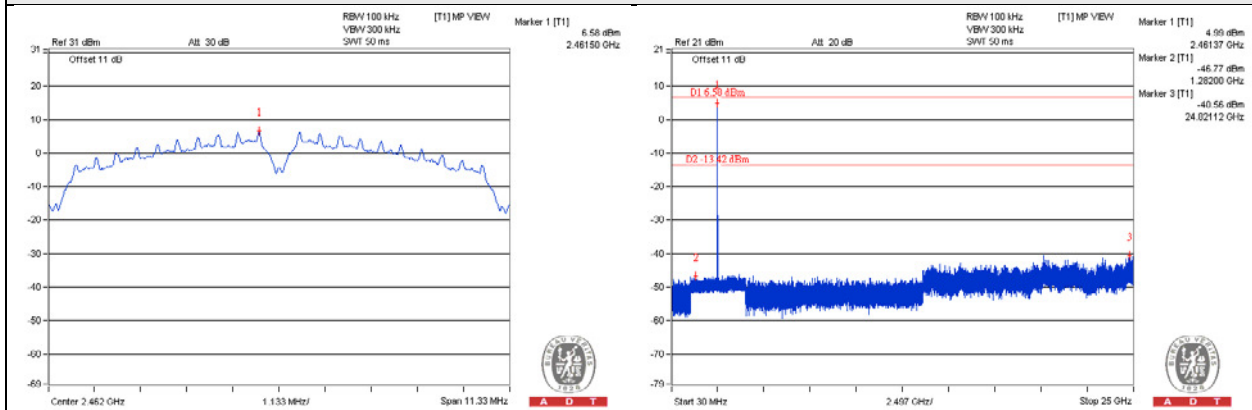
CH 1



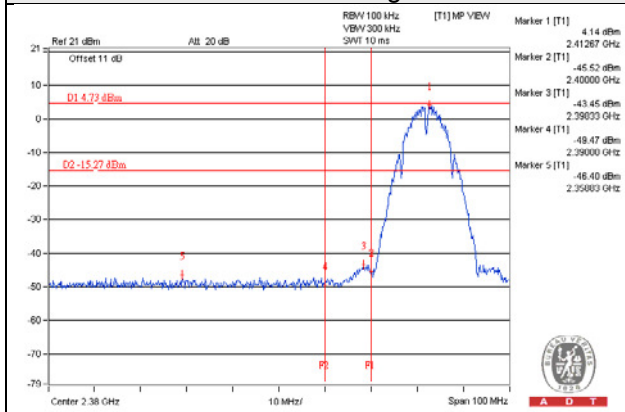
CH 6



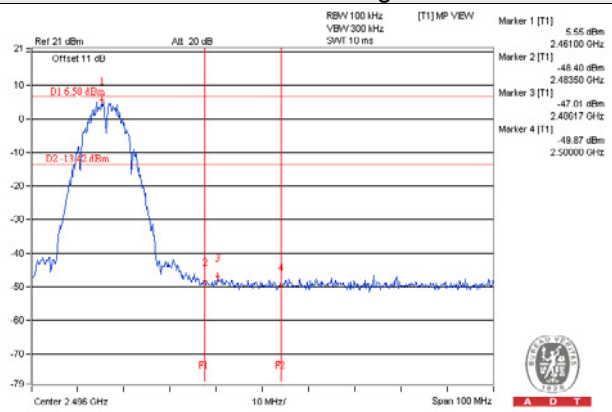
CH 11



CH 1 Band edge

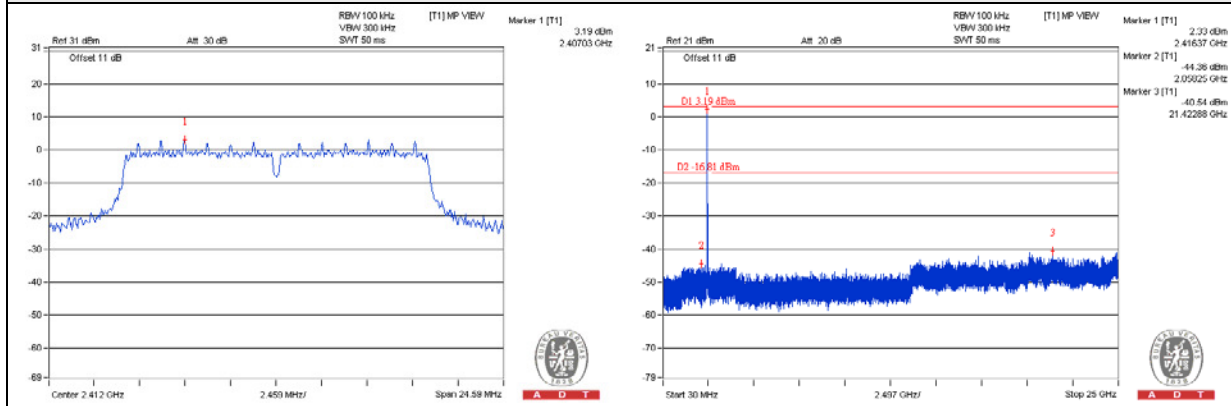


CH 11 Band edge

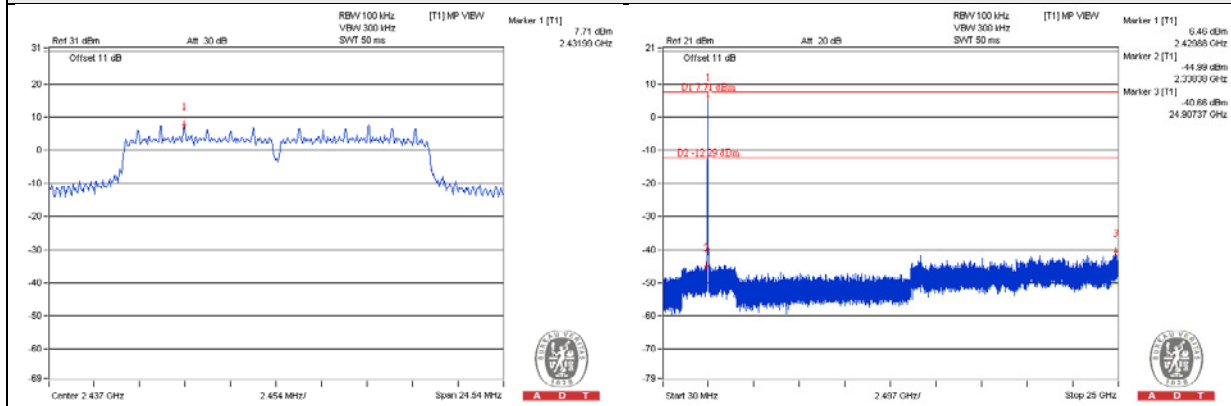


802.11g

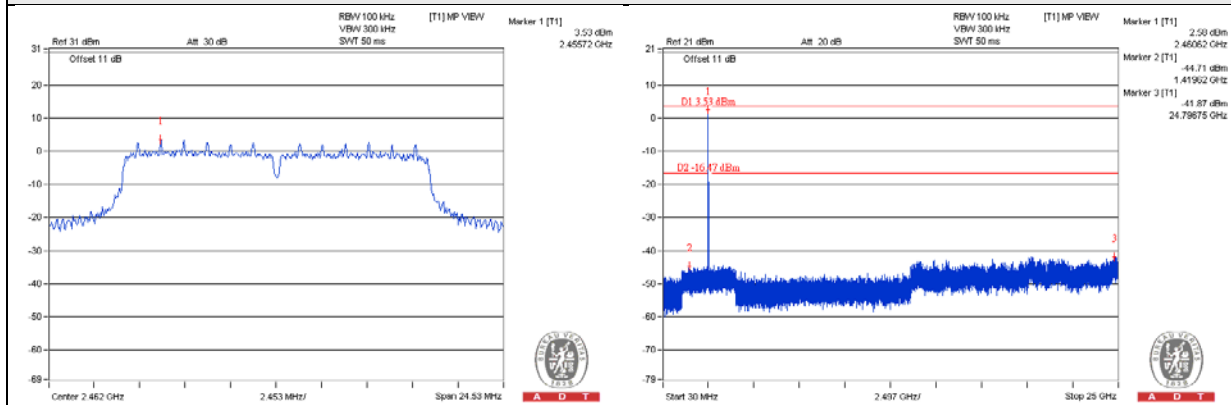
CH 1



CH 6

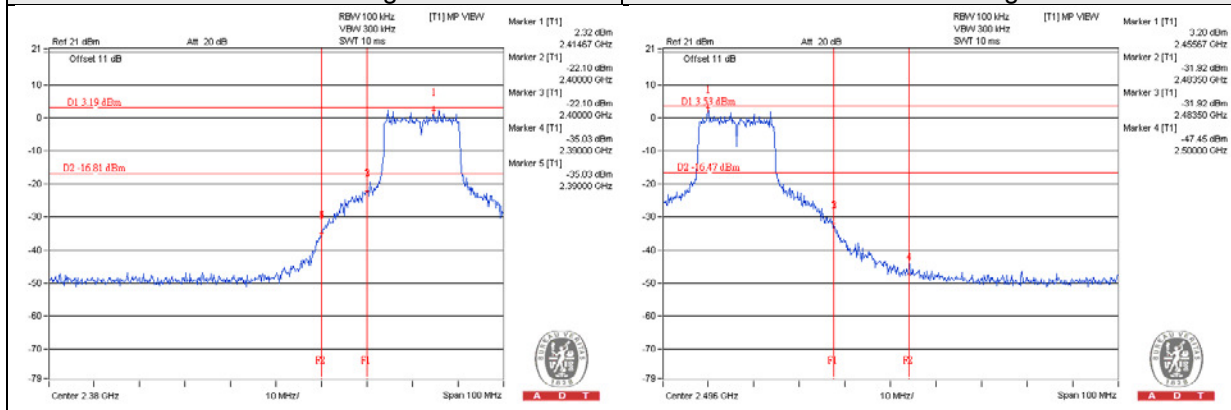


CH 11



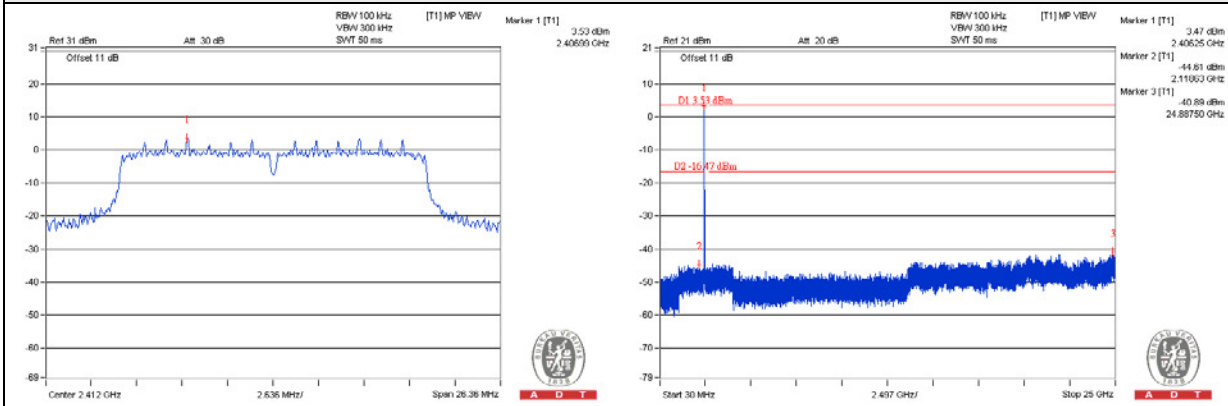
CH 1 Band edge

CH 11 Band edge

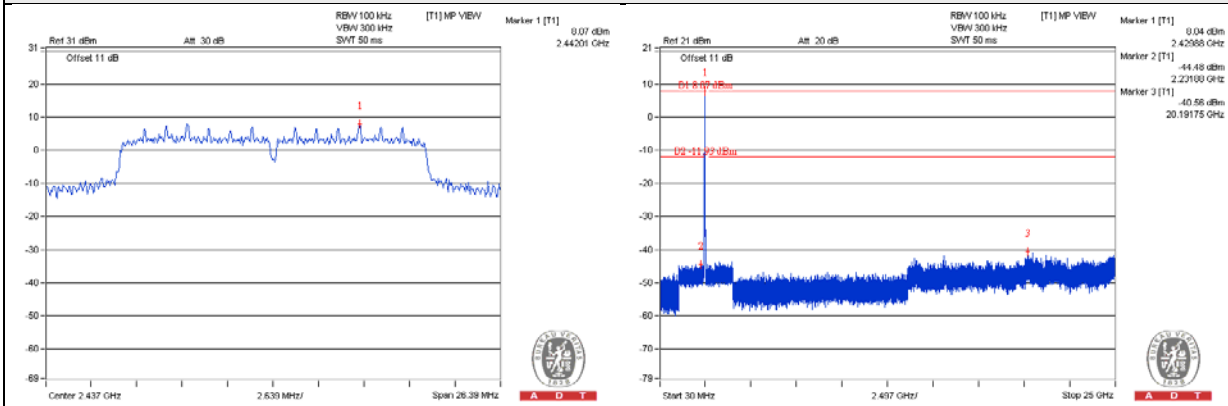


802.11n (HT20)

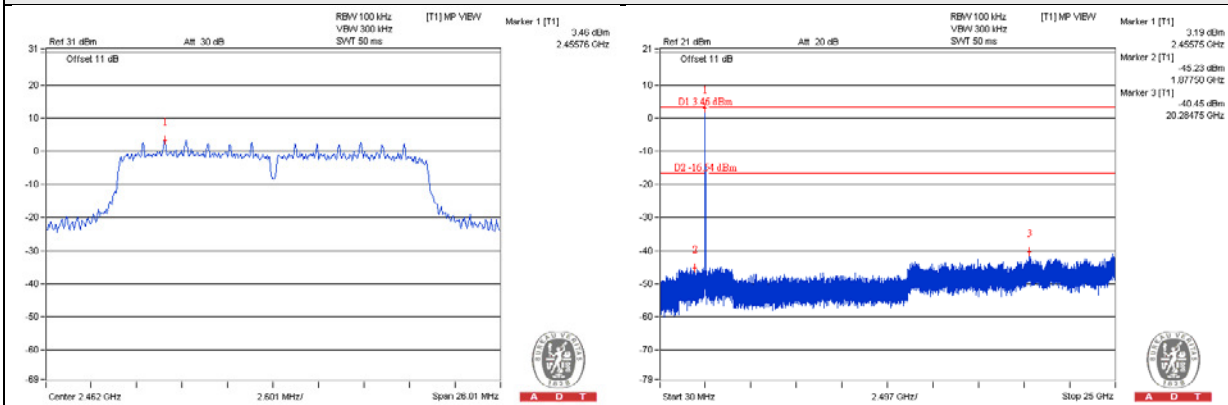
CH 1



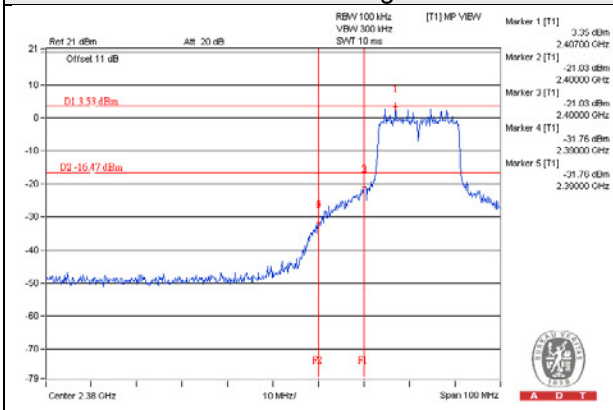
CH 6



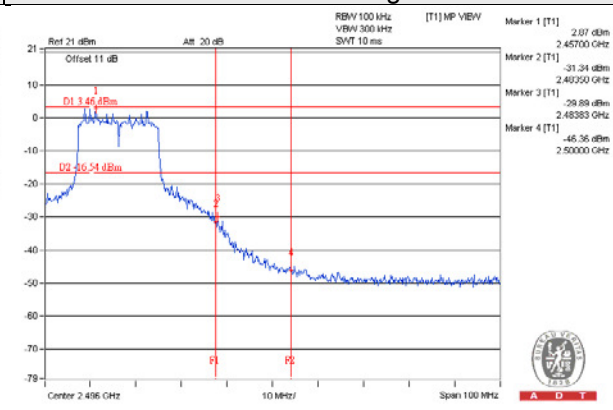
CH 11



CH 1 Band edge

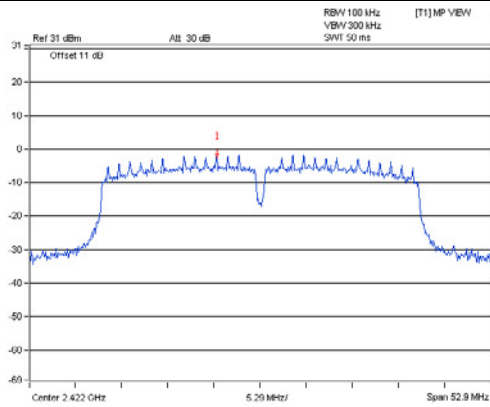


CH 11 Band edge

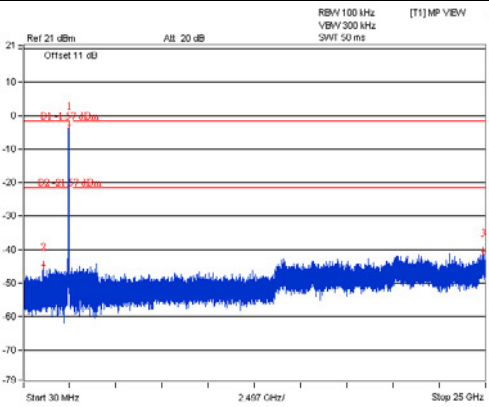


802.11n (HT40)

CH 3

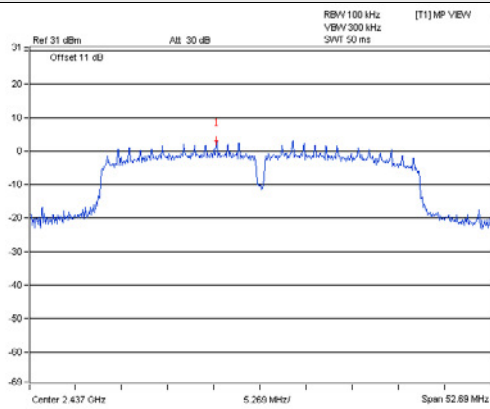


A D T

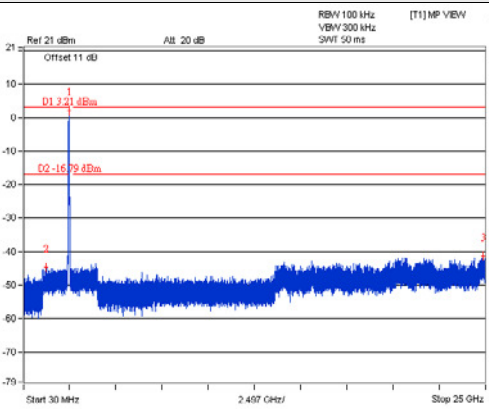


A D T

CH 6

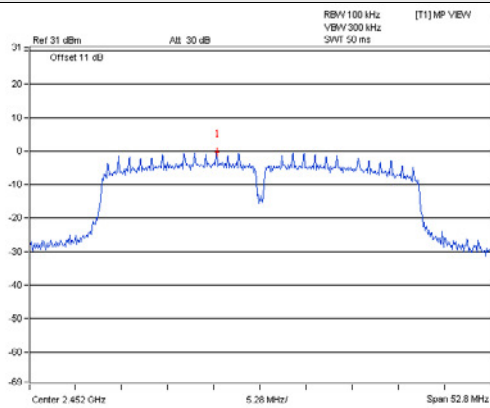


A D T

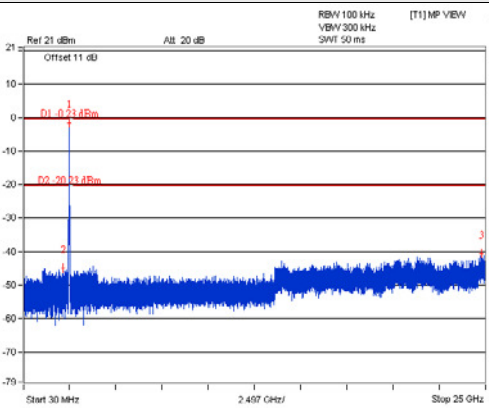


A D T

CH 9



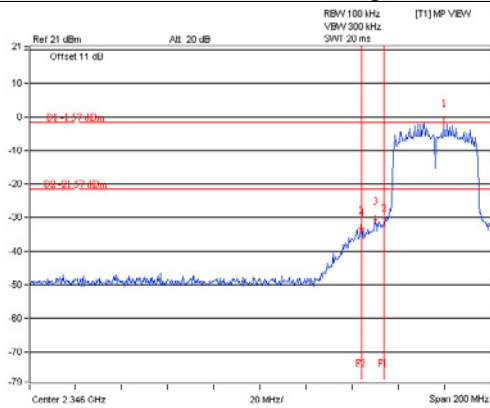
A D T



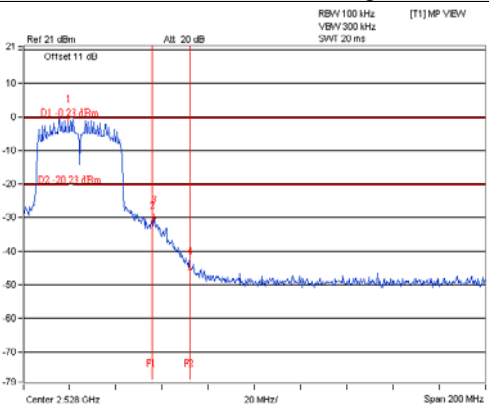
A D T

CH 3 Band edge

CH 9 Band edge



A D T



A D T

## 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:

### **Linko EMC/RF Lab**

Tel: 886-2-26052180

Fax: 886-2-26051924

### **Hsin Chu EMC/RF/Telecom Lab**

Tel: 886-3-6668565

Fax: 886-3-6668323

### **Hwa Ya EMC/RF/Safety Lab**

Tel: 886-3-3183232

Fax: 886-3-3270892

**Email:** [service.adt@tw.bureauveritas.com](mailto:service.adt@tw.bureauveritas.com)

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

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

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