

## FCC Test Report

**Report No.:** RF150722C41

**FCC ID:** TE7WR741NXV6

**Test Model:** TL-WR740N

**Received Date:** Jul. 22, 2015

**Test Date:** Jul. 31 ~ Oct. 28, 2015

**Issued Date:** Oct. 29, 2015

**Applicant:** TP-LINK TECHNOLOGIES CO., LTD.

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

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**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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A D T

### Release Control Record

Issue No.	Description	Date Issued
RF150722C41	Original release.	Oct. 29, 2015

## 1 Certificate of Conformity

**Product:** 150Mbps Wireless N Router

**Brand:** TP-LINK

**Test Model:** TL-WR740N

**Sample Status:** Prototype

**Applicant:** TP-LINK TECHNOLOGIES CO., LTD.

**Test Date:** Jul. 31 ~ Oct. 28, 2015

**Standards:** 47 CFR FCC Part 15, Subpart C (Section 15.247)  
ANSI C63.10:2013

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

**Prepared by :**                     *Sunt Lee*                     , **Date:**                     Oct. 29, 2015                      
Sunt Lee / Specialist

**Approved by :**                     *Ken Liu*                     , **Date:**                     Oct. 29, 2015                      
Ken Liu / Senior Manager

## 2 Summary of Test Results

47 CFR FCC Part 15, Subpart C (Section 15.247)			
FCC Clause	Test Item	Result	Remarks
15.207	AC Power Conducted Emission	Pass	Meet the requirement of limit. Minimum passing margin is -21.89dB at 0.19301MHz
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	Pass	Meet the requirement of limit. Minimum passing margin is -0.2dB at 2390.00 & 2483.50 & 4874.00MHz.
15.247(d)	Antenna Port Emission	Pass	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	Pass	Meet the requirement of limit.
15.247(b)	Conducted power	Pass	Meet the requirement of limit.
15.247(e)	Power Spectral Density	Pass	Meet the requirement of limit.
15.203	Antenna Requirement	Pass	Antenna connector is Weld 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) ( $\pm$ )
Conducted Emissions at mains ports	150kHz ~ 30MHz	2.44 dB
Radiated Emissions up to 1 GHz	30MHz ~ 200MHz	3.86 dB
	200MHz ~ 1000MHz	3.87 dB
Radiated Emissions above 1 GHz	1GHz ~ 18GHz	2.29 dB
	18GHz ~ 40GHz	2.29 dB

### 2.2 Modification Record

There were no modifications required for compliance.

### 3 General Information

#### 3.1 General Description of EUT

Product	150Mbps Wireless N Router
Brand	TP-LINK
Test Model	TL-WR740N
Status of EUT	Prototype
Power Supply Rating	5Vdc (Adapter)
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	211.349mW
Antenna Type	Dipole antenna with 5dBi gain
Antenna Connector	Weld
Accessory Device	Adapter
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. EUT uses following adapter.

Brand	TP-LINK TECHNOLOGIES CO., LTD.
Model	T050060-2B1
Input Power	100-240Vac, 50/60Hz, 0.3A
Output Power	5Vdc, 0.6A
Power Line	1.45m cable without core attached on adapter

### 3.2 Description of Test Modes

11 channels are provided for 802.11b, 802.11g and 802.11n (HT20):

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

7 channels are provided for 802.11n (HT40):

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



### 3.2.1 Test Mode Applicability and Tested Channel Detail

EUT Configure Mode	Applicable to				Description
	RE≥1G	RE<1G	PLC	APCM	
-	√	√	√	√	-

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

Note:

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

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

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

EUT Configure Mode	Mode	Available Channel	Tested Channel	Modulation Technology	Modulation Type	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	6	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	6	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 $\geq$ 1G	19 deg. C, 70% RH 18 deg. C, 70% RH	120Vac, 60Hz	Jones Chang Nick Hsu
RE<1G	18 deg. C, 70% RH	120Vac, 60Hz	Nick Hsu
PLC	18 deg. C, 70% RH	120Vac, 60Hz	Chris Lin
APCM	25 deg. C, 60% RH	120Vac, 60Hz	Leo Tsai

### 3.3 Duty Cycle of Test Signal

If duty cycle of test signal is  $\geq 98\%$ , duty factor is not required.

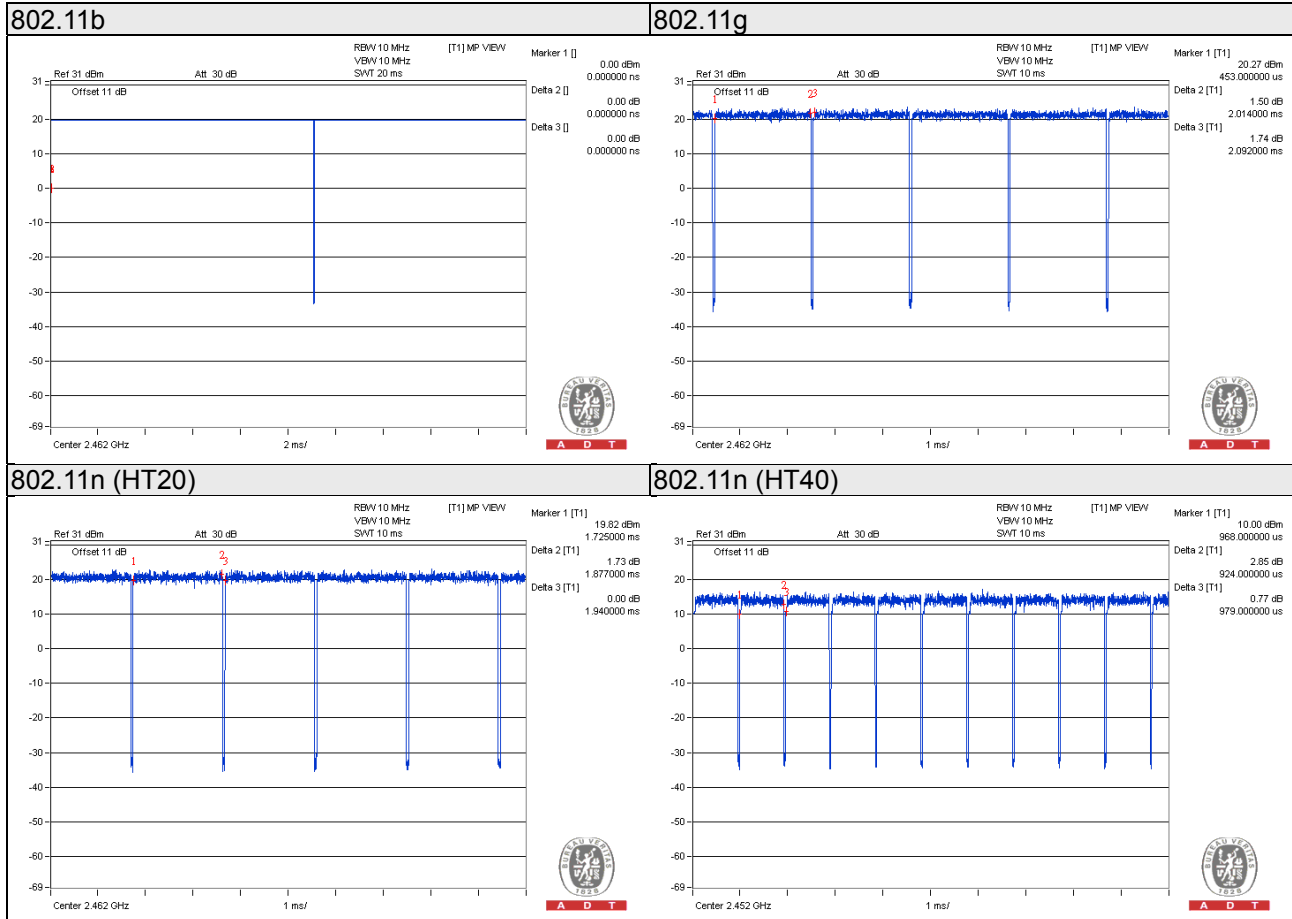
If duty cycle of test signal is  $< 98\%$ , duty factor shall be considered.

802.11b: Duty cycle  $\geq 98\%$

802.11g: Duty cycle =  $2.014/2.092 = 0.963$ , Duty factor =  $10 * \log(1/0.963) = 0.17$

802.11n (HT20): Duty cycle =  $1.877/1.94 = 0.968$ , Duty factor =  $10 * \log(1/0.968) = 0.14$

802.11n (HT40): Duty cycle =  $0.924/0.979 = 0.944$ , Duty factor =  $10 * \log(1/0.944) = 0.25$



### 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.

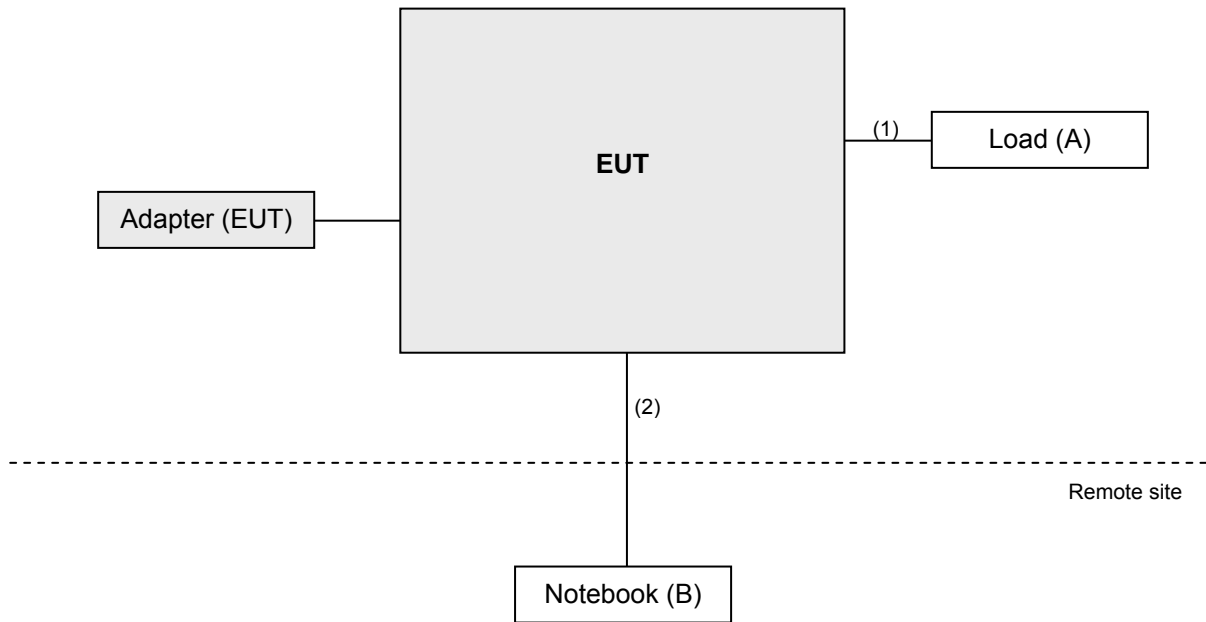
ID	Product	Brand	Model No.	Serial No.	FCC ID	Remarks
A.	Load	NA	NA	NA	NA	-
B.	Notebook	DELL	E5410	1HC2XM1	FCC DoC Approved	-

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	4	1.8	N	0	-
2.	RJ45	1	5	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 v03r03**

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 30dB below the highest level of the desired power:

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

**NOTE:**

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 30dB under any condition of modulation.

#### 4.1.2 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
Test Receiver ROHDE & SCHWARZ	ESIB7	100187	Apr. 10, 2015	Apr. 09, 2016
Spectrum Analyzer ROHDE & SCHWARZ	FSP40	100269	Mar. 30, 2015	Mar. 29, 2016
BILOG Antenna SCHWARZBECK	VULB9168	9168-160	Feb. 05, 2015	Feb. 04, 2016
HORN Antenna SCHWARZBECK	9120D	209	Feb. 09, 2015	Feb. 08, 2016
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170241	Feb. 09, 2015	Feb. 08, 2016
Preamplifier Agilent	8447D	2944A10738	Oct. 18, 2014	Oct. 17, 2015
			Oct. 18, 2015	Oct. 17, 2016
Preamplifier Agilent	8449B	3008A01964	Aug. 22, 2014	Aug. 21, 2015
			Aug. 22, 2015	Aug. 21, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-CH3-03(214378)	Aug. 22, 2014	Aug. 21, 2015
			Aug. 22, 2015	Aug. 21, 2016
RF signal cable HUBER+SUHNER	SUCOFLEX 106	Cable-CH3-03(309224+ 12738)	Aug. 22, 2014	Aug. 21, 2015
			Aug. 22, 2015	Aug. 21, 2016
Software BV ADT	ADT_Radiated_ V7.6.15.9.4	NA	NA	NA
Antenna Tower inn-co GmbH	MA 4000	013303	NA	NA
Antenna Tower Controller BV ADT	AT100	AT93021702	NA	NA
Turn Table BV ADT	TT100	TT93021702	NA	NA
Turn Table Controller BV ADT	SC100	SC93021702	NA	NA
High Speed Peak Power Meter	ML2495A	0824011	Jul. 26, 2014	Jul. 25, 2015
			Jul. 09, 2015	Jul. 08, 2016
Power Sensor	MA2411B	0738171	Jul. 26, 2014	Jul. 25, 2015
			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 3.
  3. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
  4. The FCC Site Registration No. is 988962.
  5. The IC Site Registration No. is IC 7450F-3.

#### 4.1.3 Test Procedures

- 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.

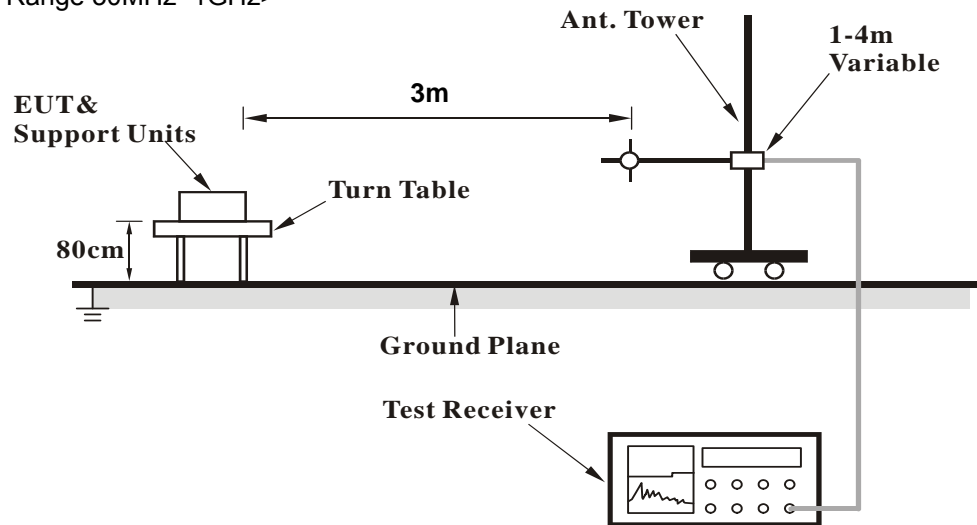
#### 4.1.4 Deviation from Test Standard

No deviation.

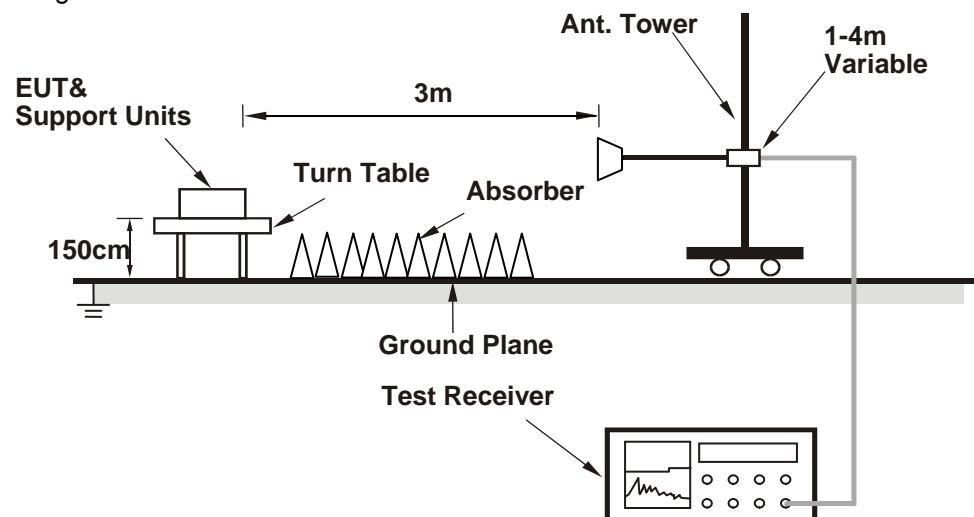


#### 4.1.5 Test Set Up

<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

- Placed the EUT on the testing table.
- Prepared a notebook to act as a communication partner and placed it outside of testing area.
- The communication partner connected with EUT via a RJ45 cable and ran a test program (provided by manufacturer) to enable EUT under transmission condition continuously at specific channel frequency.
- The communication partner sent data to EUT by command "PING".
- The necessary accessories enable the system in full functions.

#### 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	56.9 PK	74.0	-17.1	1.01 H	190	24.40	32.50
2	2390.00	45.0 AV	54.0	-9.0	1.01 H	190	12.50	32.50
3	*2412.00	92.7 PK			1.01 H	194	60.10	32.60
4	*2412.00	89.8 AV			1.01 H	194	57.20	32.60
5	4824.00	50.0 PK	74.0	-24.0	1.13 H	19	43.90	6.10
6	4824.00	42.3 AV	54.0	-11.7	1.13 H	19	36.20	6.10
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	57.5 PK	74.0	-16.5	1.57 V	0	25.00	32.50
2	2390.00	45.6 AV	54.0	-8.4	1.57 V	0	13.10	32.50
3	*2412.00	106.9 PK			1.57 V	355	74.30	32.60
4	*2412.00	103.1 AV			1.57 V	355	70.50	32.60
5	4824.00	55.8 PK	74.0	-18.2	1.78 V	343	49.70	6.10
6	4824.00	53.5 AV	54.0	-0.5	1.78 V	343	47.40	6.10

#### 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	92.4 PK			1.00 H	182	59.70	32.70
2	*2437.00	90.3 AV			1.00 H	182	57.60	32.70
3	4874.00	51.2 PK	74.0	-22.8	1.12 H	7	45.00	6.20
4	4874.00	45.2 AV	54.0	-8.8	1.12 H	7	39.00	6.20

**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	106.7 PK			1.72 V	354	74.00	32.70
2	*2437.00	102.6 AV			1.72 V	354	69.90	32.70
3	4874.00	56.6 PK	74.0	-17.4	1.40 V	331	50.40	6.20
4	4874.00	53.8 AV	54.0	-0.2	1.40 V	331	47.60	6.20

**REMARKS:**

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

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	92.7 PK			1.00 H	197	60.10	32.60
2	*2462.00	89.5 AV			1.00 H	197	56.90	32.60
3	2483.50	55.6 PK	74.0	-18.4	1.00 H	184	22.90	32.70
4	2483.50	44.4 AV	54.0	-9.6	1.00 H	184	11.70	32.70
5	4924.00	52.5 PK	74.0	-21.5	1.30 H	6	46.20	6.30
6	4924.00	47.4 AV	54.0	-6.6	1.30 H	6	41.10	6.30

**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	107.3 PK			1.82 V	321	74.70	32.60
2	*2462.00	103.0 AV			1.82 V	321	70.40	32.60
3	2483.50	59.4 PK	74.0	-14.6	1.77 V	341	26.70	32.70
4	2483.50	48.6 AV	54.0	-5.4	1.77 V	341	15.90	32.70
5	4924.00	56.2 PK	74.0	-17.8	1.47 V	330	49.90	6.30
6	4924.00	53.5 AV	54.0	-0.5	1.47 V	330	47.20	6.30

**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.

**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	56.3 PK	74.0	-17.7	1.08 H	93	23.80	32.50
2	2390.00	45.0 AV	54.0	-9.0	1.08 H	93	12.50	32.50
3	*2412.00	95.7 PK			1.00 H	98	63.10	32.60
4	*2412.00	85.8 AV			1.00 H	98	53.20	32.60
5	4824.00	49.5 PK	74.0	-24.5	1.14 H	256	43.60	5.90
6	4824.00	37.4 AV	54.0	-16.6	1.14 H	256	31.50	5.90

**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	67.5 PK	74.0	-6.5	1.81 V	252	35.00	32.50
2	2390.00	53.5 AV	54.0	-0.5	1.81 V	252	21.00	32.50
3	*2412.00	111.0 PK			1.82 V	238	78.40	32.60
4	*2412.00	101.0 AV			1.82 V	238	68.40	32.60
5	4824.00	58.4 PK	74.0	-15.6	1.55 V	338	52.50	5.90
6	4824.00	44.5 AV	54.0	-9.5	1.55 V	338	38.60	5.90

**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	55.9 PK	74.0	-18.1	1.46 H	106	23.40	32.50
2	2390.00	44.8 AV	54.0	-9.2	1.46 H	106	12.30	32.50
3	*2437.00	103.5 PK			1.81 H	103	70.80	32.70
4	*2437.00	92.6 AV			1.81 H	103	59.90	32.70
5	2483.50	56.0 PK	74.0	-18.0	1.49 H	134	23.30	32.70
6	2483.50	44.9 AV	54.0	-9.1	1.49 H	134	12.20	32.70
7	4874.00	55.8 PK	74.0	-18.2	1.07 H	222	49.90	5.90
8	4874.00	42.5 AV	54.0	-11.5	1.07 H	222	36.60	5.90
9	7311.00	62.9 PK	74.0	-11.1	1.00 H	303	51.20	11.70
10	7311.00	49.1 AV	54.0	-4.9	1.00 H	303	37.40	11.70

**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	68.0 PK	74.0	-6.0	1.87 V	11	35.50	32.50
2	2390.00	53.5 AV	54.0	-0.5	1.87 V	11	21.00	32.50
3	*2437.00	117.5 PK			1.79 V	240	84.80	32.70
4	*2437.00	107.1 AV			1.79 V	240	74.40	32.70
5	2483.50	63.7 PK	74.0	-10.3	1.76 V	237	31.00	32.70
6	2483.50	50.1 AV	54.0	-3.9	1.76 V	237	17.40	32.70
7	4874.00	62.1 PK	74.0	-11.9	1.98 V	353	56.20	5.90
8	4874.00	49.9 AV	54.0	-4.1	1.98 V	353	44.00	5.90
9	7311.00	67.3 PK	74.0	-6.7	1.91 V	192	55.60	11.70
10	7311.00	52.5 AV	54.0	-1.5	1.91 V	192	40.80	11.70

**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	98.3 PK			1.00 H	3	65.70	32.60
2	*2462.00	88.4 AV			1.00 H	3	55.80	32.60
3	2483.50	56.1 PK	74.0	-17.9	1.00 H	7	23.40	32.70
4	2483.50	45.5 AV	54.0	-8.5	1.00 H	7	12.80	32.70
5	4924.00	49.6 PK	74.0	-24.4	1.00 H	210	43.60	6.00
6	4924.00	37.8 AV	54.0	-16.2	1.00 H	210	31.80	6.00

**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	*2462.00	112.3 PK			2.09 V	228	79.70	32.60
2	*2462.00	101.9 AV			2.09 V	228	69.30	32.60
3	2483.50	66.3 PK	74.0	-7.7	2.09 V	235	33.60	32.70
4	2483.50	53.5 AV	54.0	-0.5	2.09 V	235	20.80	32.70
5	4924.00	58.4 PK	74.0	-15.6	2.26 V	8	52.40	6.00
6	4924.00	45.4 AV	54.0	-8.6	2.26 V	8	39.40	6.00

**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.

**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	55.8 PK	74.0	-18.2	1.03 H	97	23.30	32.50
2	2390.00	44.9 AV	54.0	-9.1	1.03 H	97	12.40	32.50
3	*2412.00	94.3 PK			1.00 H	98	61.70	32.60
4	*2412.00	84.4 AV			1.00 H	98	51.80	32.60
5	4824.00	49.5 PK	74.0	-24.5	1.31 H	220	43.60	5.90
6	4824.00	36.9 AV	54.0	-17.1	1.31 H	220	31.00	5.90

**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	67.3 PK	74.0	-6.7	1.52 V	20	34.80	32.50
2	2390.00	53.7 AV	54.0	-0.3	1.52 V	20	21.20	32.50
3	*2412.00	110.7 PK			1.98 V	301	78.10	32.60
4	*2412.00	100.1 AV			1.98 V	301	67.50	32.60
5	4824.00	57.7 PK	74.0	-16.3	2.22 V	8	51.80	5.90
6	4824.00	43.1 AV	54.0	-10.9	2.22 V	8	37.20	5.90

**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	55.9 PK	74.0	-18.1	1.09 H	117	23.40	32.50
2	2390.00	44.7 AV	54.0	-9.3	1.09 H	117	12.20	32.50
3	*2437.00	101.6 PK			1.00 H	104	68.90	32.70
4	*2437.00	92.2 AV			1.00 H	104	59.50	32.70
5	2483.50	55.9 PK	74.0	-18.1	1.06 H	80	23.20	32.70
6	2483.50	44.8 AV	54.0	-9.2	1.06 H	80	12.10	32.70
7	4874.00	54.9 PK	74.0	-19.1	1.06 H	223	49.00	5.90
8	4874.00	41.5 AV	54.0	-12.5	1.06 H	223	35.60	5.90
9	7311.00	62.1 PK	74.0	-11.9	1.11 H	280	50.40	11.70
10	7311.00	49.1 AV	54.0	-4.9	1.11 H	280	37.40	11.70

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	66.2 PK	74.0	-7.8	1.37 V	5	33.70	32.50
2	2390.00	53.6 AV	54.0	-0.4	1.37 V	5	21.10	32.50
3	*2437.00	115.9 PK			1.65 V	8	83.20	32.70
4	*2437.00	105.8 AV			1.65 V	8	73.10	32.70
5	2483.50	64.2 PK	74.0	-9.8	1.41 V	251	31.50	32.70
6	2483.50	51.1 AV	54.0	-2.9	1.41 V	251	18.40	32.70
7	4874.00	62.5 PK	74.0	-11.5	2.18 V	7	56.60	5.90
8	4874.00	49.6 AV	54.0	-4.4	2.18 V	7	43.70	5.90
9	7311.00	64.9 PK	74.0	-9.1	1.48 V	339	53.20	11.70
10	7311.00	51.4 AV	54.0	-2.6	1.48 V	339	39.70	11.70

**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	97.5 PK			1.00 H	14	64.90	32.60
2	*2462.00	86.6 AV			1.00 H	14	54.00	32.60
3	2483.50	56.0 PK	74.0	-18.0	1.00 H	343	23.30	32.70
4	2483.50	45.3 AV	54.0	-8.7	1.00 H	343	12.60	32.70
5	4924.00	50.4 PK	74.0	-23.6	1.53 H	128	44.40	6.00
6	4924.00	37.7 AV	54.0	-16.3	1.53 H	128	31.70	6.00

**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	*2462.00	111.6 PK			2.10 V	231	79.00	32.60
2	*2462.00	101.1 AV			2.10 V	231	68.50	32.60
3	2483.50	66.1 PK	74.0	-7.9	2.26 V	268	33.40	32.70
4	2483.50	53.5 AV	54.0	-0.5	2.26 V	268	20.80	32.70
5	4924.00	57.4 PK	74.0	-16.6	1.87 V	350	51.40	6.00
6	4924.00	44.9 AV	54.0	-9.1	1.87 V	350	38.90	6.00

**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.

**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	56.0 PK	74.0	-18.0	1.07 H	118	23.50	32.50
2	2390.00	45.1 AV	54.0	-8.9	1.07 H	118	12.60	32.50
3	*2422.00	87.2 PK			1.00 H	103	54.60	32.60
4	*2422.00	78.6 AV			1.00 H	103	46.00	32.60
5	4844.00	47.5 PK	74.0	-26.5	1.30 H	303	41.60	5.90
6	4844.00	35.2 AV	54.0	-18.8	1.30 H	303	29.30	5.90

**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	65.6 PK	74.0	-8.4	1.53 V	18	33.10	32.50
2	2390.00	53.8 AV	54.0	-0.2	1.53 V	18	21.30	32.50
3	*2422.00	103.7 PK			1.67 V	11	71.10	32.60
4	*2422.00	94.3 AV			1.67 V	11	61.70	32.60
5	4844.00	47.9 PK	74.0	-26.1	1.79 V	324	42.00	5.90
6	4844.00	36.0 AV	54.0	-18.0	1.79 V	324	30.10	5.90

**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	55.4 PK	74.0	-18.6	2.01 H	114	22.90	32.50
2	2390.00	45.0 AV	54.0	-9.0	2.01 H	114	12.50	32.50
3	*2437.00	91.8 PK			2.18 H	102	59.10	32.70
4	*2437.00	81.6 AV			2.18 H	102	48.90	32.70
5	2483.50	56.8 PK	74.0	-17.2	1.85 H	126	24.10	32.70
6	2483.50	45.6 AV	54.0	-8.4	1.85 H	126	12.90	32.70
7	4874.00	47.4 PK	74.0	-26.6	1.34 H	31	41.50	5.90
8	4874.00	35.7 AV	54.0	-18.3	1.34 H	31	29.80	5.90
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	63.8 PK	74.0	-10.2	1.85 V	319	31.30	32.50
2	2390.00	52.5 AV	54.0	-1.5	1.85 V	319	20.00	32.50
3	*2437.00	106.2 PK			1.80 V	4	73.50	32.70
4	*2437.00	95.8 AV			1.80 V	4	63.10	32.70
5	2483.50	66.6 PK	74.0	-7.4	1.77 V	52	33.90	32.70
<b>6</b>	<b>2483.50</b>	<b>53.8 AV</b>	<b>54.0</b>	<b>-0.2</b>	<b>1.77 V</b>	<b>52</b>	<b>21.10</b>	<b>32.70</b>
7	4874.00	51.9 PK	74.0	-22.1	1.97 V	353	46.00	5.90
8	4874.00	40.2 AV	54.0	-13.8	1.97 V	353	34.30	5.90

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 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	89.4 PK			2.39 H	103	56.70	32.70
2	*2452.00	79.5 AV			2.39 H	103	46.80	32.70
3	2483.50	57.7 PK	74.0	-16.3	1.96 H	103	25.00	32.70
4	2483.50	46.0 AV	54.0	-8.0	1.96 H	103	13.30	32.70
5	4904.00	46.8 PK	74.0	-27.2	1.19 H	331	41.00	5.80
6	4904.00	35.2 AV	54.0	-18.8	1.19 H	331	29.40	5.80

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	103.1 PK			1.92 V	217	70.40	32.70
2	*2452.00	93.4 AV			1.92 V	217	60.70	32.70
3	2483.50	65.6 PK	74.0	-8.4	2.26 V	276	32.90	32.70
4	2483.50	53.5 AV	54.0	-0.5	2.26 V	276	20.80	32.70
5	4904.00	48.9 PK	74.0	-25.1	1.64 V	291	43.10	5.80
6	4904.00	35.3 AV	54.0	-18.7	1.64 V	291	29.50	5.80

**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 6	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	29.90	36.8 QP	40.0	-3.2	1.00 H	271	52.90	-16.10
2	49.34	33.2 QP	40.0	-6.8	1.99 H	10	47.80	-14.60
3	101.84	30.7 QP	43.5	-12.8	1.00 H	129	49.60	-18.90
4	393.48	32.6 QP	46.0	-13.4	1.00 H	113	43.40	-10.80
5	795.95	36.9 QP	46.0	-9.1	1.49 H	10	39.10	-2.20
6	891.22	37.3 QP	46.0	-8.7	1.99 H	10	38.20	-0.90
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	29.90	36.4 QP	40.0	-3.6	1.50 V	6	52.50	-16.10
2	66.84	33.6 QP	40.0	-6.4	1.00 V	179	49.30	-15.70
3	111.56	31.4 QP	43.5	-12.1	1.00 V	353	48.60	-17.20
4	391.54	32.3 QP	46.0	-13.7	1.50 V	119	43.00	-10.70
5	788.17	36.6 QP	46.0	-9.4	1.00 V	43	39.00	-2.40
6	895.11	41.0 QP	46.0	-5.0	1.00 V	112	41.80	-0.80

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. 11, 2014	Nov. 10, 2015
RF signal cable (with 10dB PAD) Woken	5D-FB	Cable-cond1-01	Dec. 26, 2014	Dec. 25, 2015
LISN ROHDE & SCHWARZ (EUT)	ESH3-Z5	835239/001	Feb. 26, 2015	Feb. 25, 2016
LISN ROHDE & SCHWARZ (Peripheral)	ESH3-Z5	100311	Jul. 24, 2015	Jul. 23, 2016
Software ADT	BV ADT_Cond_ V7.3.7.3	NA	NA	NA

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

2. The test was performed in HwaYa Shielded Room 1.

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

#### 4.2.3 Test Procedures

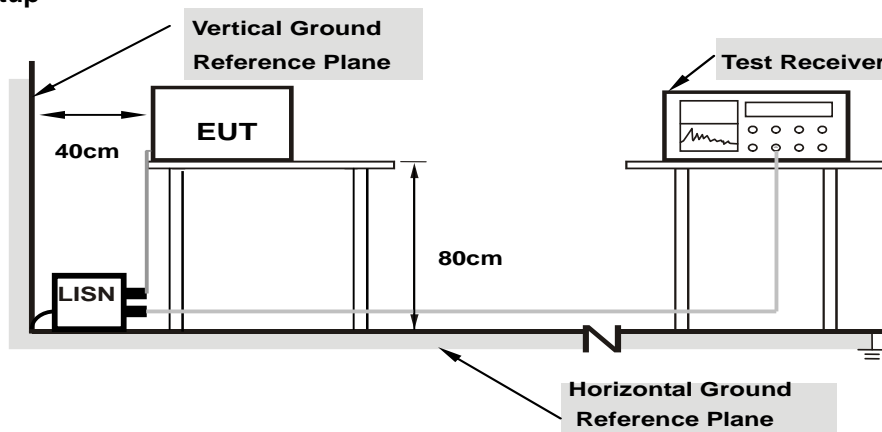
- The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) 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.



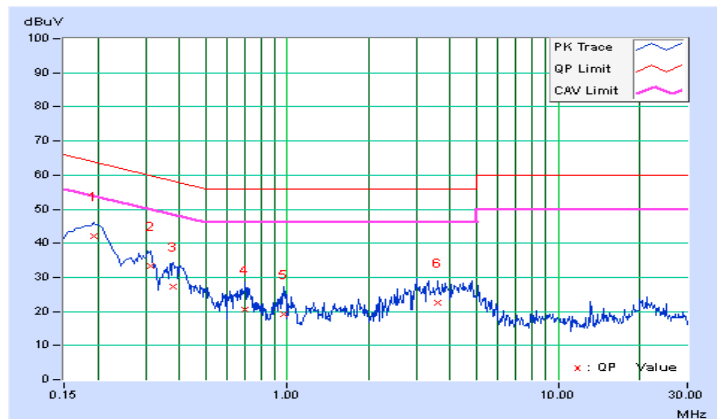
### 4.2.7 Test Results

Phase	Line (L)	Detector Function	Quasi-Peak (QP) / Average (AV)
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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.
	<b>1</b>	<b>0.19301</b>	<b>9.92</b>	<b>32.10</b>	<b>18.78</b>	<b>42.02</b>	<b>28.70</b>	<b>63.91</b>	<b>53.91</b>	<b>-21.89</b>
2	0.31422	9.91	23.45	12.42	33.36	22.33	59.86	49.86	-26.50	-27.53
3	0.38069	9.90	17.37	6.05	27.27	15.95	58.26	48.26	-30.99	-32.31
4	0.69740	9.96	10.54	3.35	20.50	13.31	56.00	46.00	-35.50	-32.69
5	0.96719	10.02	9.24	3.32	19.26	13.34	56.00	46.00	-36.74	-32.66
6	3.61579	10.17	12.54	5.05	22.71	15.22	56.00	46.00	-33.29	-30.78

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.

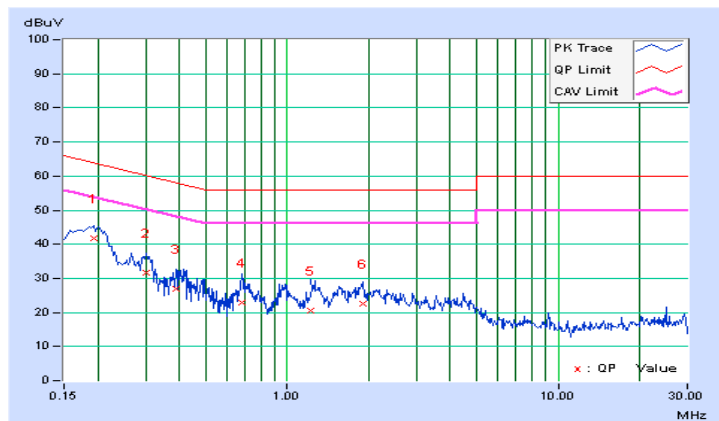


Phase	Neutral (N)	Detector Function	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
			1	0.19301	10.01	31.63	19.81	41.64	29.82	63.91
2	0.30249	10.01	21.75	12.82	31.76	22.83	60.17	50.17	-28.41	-27.34
3	0.38851	9.99	16.92	9.08	26.91	19.07	58.10	48.10	-31.18	-29.02
4	0.68176	10.01	12.84	7.35	22.85	17.36	56.00	46.00	-33.15	-28.64
5	1.22678	10.04	10.34	6.08	20.38	16.12	56.00	46.00	-35.62	-29.88
6	1.89508	10.08	12.50	8.01	22.58	18.09	56.00	46.00	-33.42	-27.91

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.

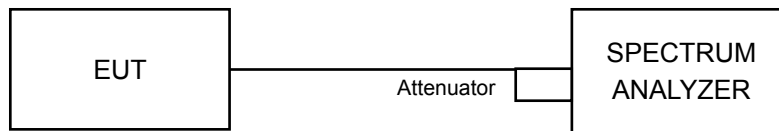


### 4.3 6dB Bandwidth Measurement

#### 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

558074 D01 DTS Meas Guidance v03r03 section 8.1

- 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	10.05	0.5	Pass
6	2437	10.07	0.5	Pass
11	2462	10.07	0.5	Pass

##### 802.11g

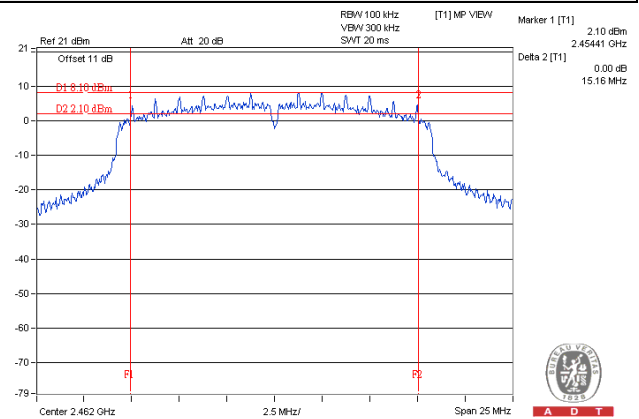
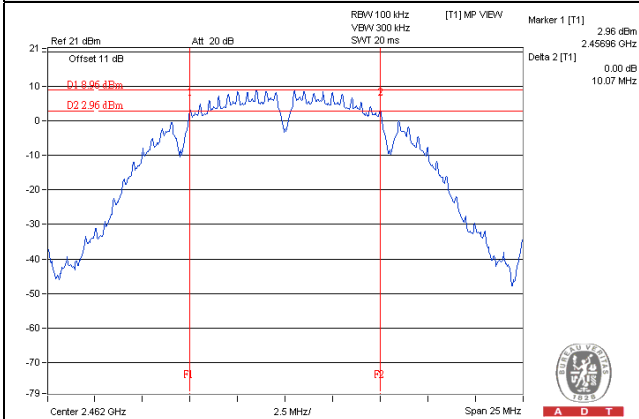
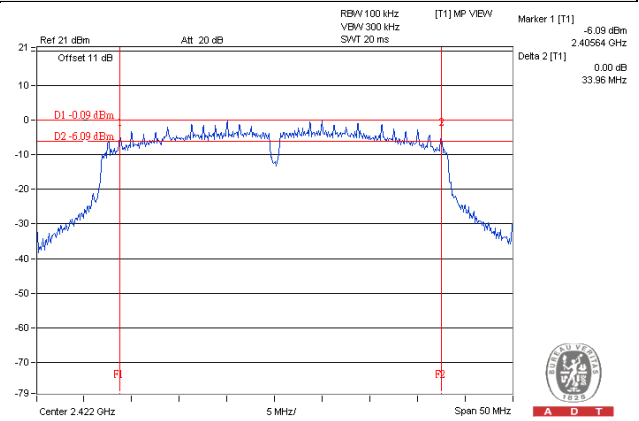
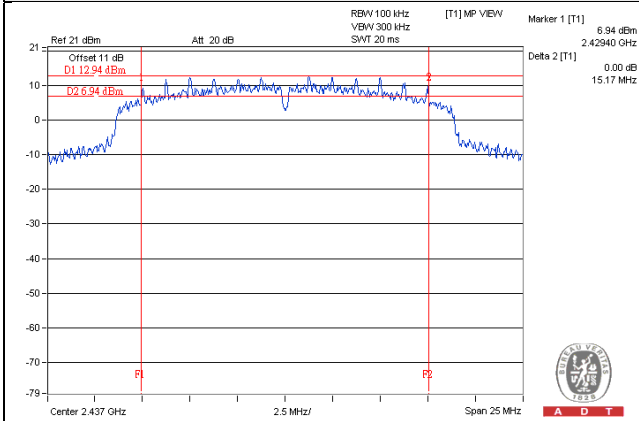
Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	15.14	0.5	Pass
6	2437	15.16	0.5	Pass
11	2462	15.16	0.5	Pass

##### 802.11n (HT20)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
1	2412	15.16	0.5	Pass
6	2437	15.17	0.5	Pass
11	2462	15.16	0.5	Pass

##### 802.11n (HT40)

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	Minimum Limit (MHz)	Pass / Fail
3	2422	33.96	0.5	Pass
6	2437	33.87	0.5	Pass
9	2452	33.92	0.5	Pass

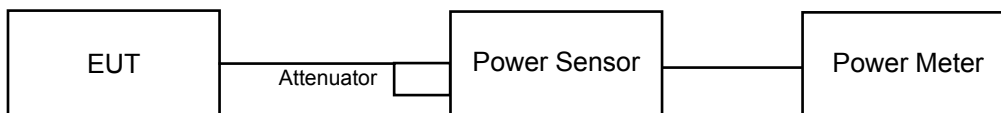
**Spectrum Plot of Worst Value****802.11b****802.11g****802.11n (HT20)****802.11n (HT40)**

## 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

558074 D01 DTS Meas Guidance v03r03 section 9.2.3.2

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

### 4.4.5 Deviation from Test Standard

No deviation.

### 4.4.6 EUT Operating Conditions

Same as item 4.3.6.

#### 4.4.7 Test Results

##### FOR AVERAGE POWER

##### 802.11b

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	39.811	16.00	30	Pass
6	2437	46.881	16.71	30	Pass
11	2462	48.641	16.87	30	Pass

##### 802.11g

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	57.943	17.63	30	Pass
6	2437	<b>211.349</b>	23.25	30	Pass
11	2462	66.988	18.26	30	Pass

##### 802.11n (HT20)

Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
1	2412	48.417	16.85	30	Pass
6	2437	208.93	23.20	30	Pass
11	2462	91.201	19.60	30	Pass

##### 802.11n (HT40)

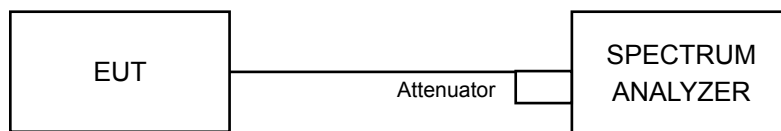
Channel	Frequency (MHz)	Average Power (mW)	Average Power (dBm)	Limit (dBm)	Pass / Fail
3	2422	19.454	12.89	30	Pass
6	2437	39.174	15.93	30	Pass
9	2452	21.429	13.31	30	Pass

## 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 Setup



### 4.5.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.5.4 Test Procedure

558074 D01 DTS Meas Guidance v03r03 section 10.3

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

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

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

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



#### **4.5.5 Deviation from Test Standard**

No deviation.

#### **4.5.6 EUT Operating Condition**

Same as item 4.3.6.

#### 4.5.7 Test Results

##### 802.11b

Channel	Freq. (MHz)	PSD (dBm/10kHz)	Limit (dBm/3kHz)	Pass/Fail
1	2412	-11.63	8	Pass
6	2437	-10.93	8	Pass
11	2462	-10.58	8	Pass

##### 802.11g

Channel	Freq. (MHz)	PSD w/o Duty Factor (dBm/10kHz)	Duty Factor	PSD with Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass/Fail
1	2412	-12.52	0.17	-12.35	8	Pass
6	2437	-6.87	0.17	-6.70	8	Pass
11	2462	-12.00	0.17	-11.83	8	Pass

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Refer to section 3.3 for duty cycle spectrum plot.

##### 802.11n (HT20)

Channel	Freq. (MHz)	PSD w/o Duty Factor (dBm/10kHz)	Duty Factor	PSD with Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass/Fail
1	2412	-13.66	0.14	-13.52	8	Pass
6	2437	-7.34	0.14	-7.20	8	Pass
11	2462	-12.80	0.14	-12.66	8	Pass

Note:

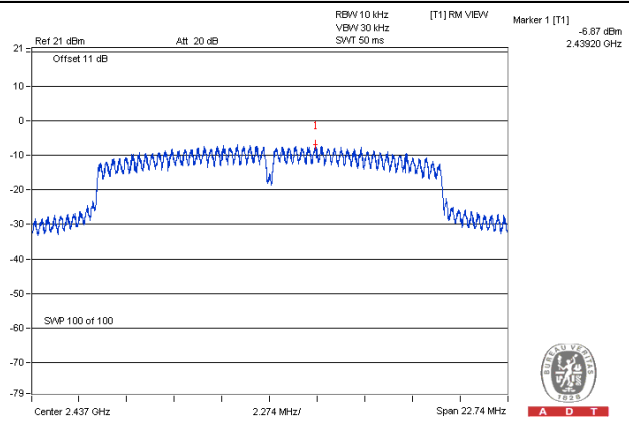
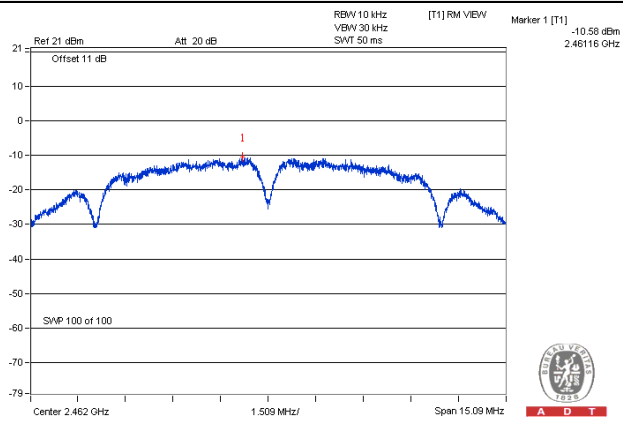
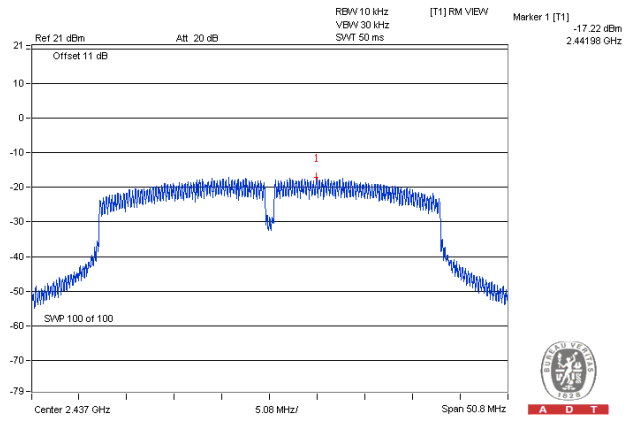
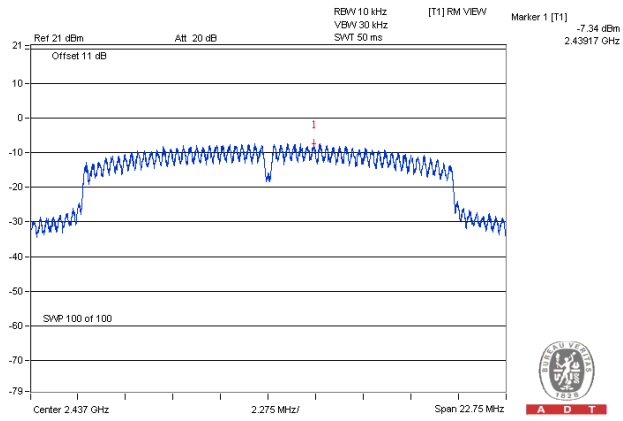
1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Refer to section 3.3 for duty cycle spectrum plot.

##### 802.11n (HT40)

Channel	Freq. (MHz)	PSD w/o Duty Factor (dBm/10kHz)	Duty Factor	PSD with Duty Factor (dBm/10kHz)	Limit (dBm/3kHz)	Pass/Fail
3	2422	-20.28	0.25	-20.03	8	Pass
6	2437	-17.22	0.25	-16.97	8	Pass
9	2452	-19.26	0.25	-19.01	8	Pass

Note:

1. Method 1 of power density measurement of KDB 662911 is using for calculating total power density. Total power density is summing entire spectra across corresponding frequency bins on the various outputs by computer.
2. Refer to section 3.3 for duty cycle spectrum plot.

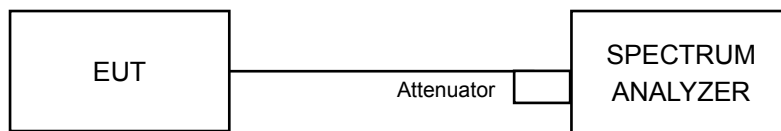
**Spectrum Plot of Worst Value****802.11b****802.11g****802.11n (HT20)****802.11n (HT40)**

## 4.6 Conducted Out of Band Emission Measurement

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

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

### 4.6.2 Test Setup



### 4.6.3 Test Instruments

Refer to section 4.1.2 to get information of above instrument.

### 4.6.4 Test Procedure

#### MEASUREMENT PROCEDURE REF

558074 D01 DTS Meas Guidance v03r03 section 11.2

1. Set the RBW = 100 kHz.
2. Set the VBW  $\geq$  300 kHz.
3. Detector = average.
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

558074 D01 DTS Meas Guidance v03r03 section 11.3

1. Set RBW = 100 kHz.
2. Set VBW  $\geq$  300 kHz.
3. Ensure that the number of measurement points  $\geq$  span/RBW
4. According to measurement points to set differ measurement span.
5. Detector = peak.
6. Trace Mode = max hold.
7. Sweep = auto couple.

#### **4.6.5 Deviation from Test Standard**

No deviation.

#### **4.6.6 EUT Operating Condition**

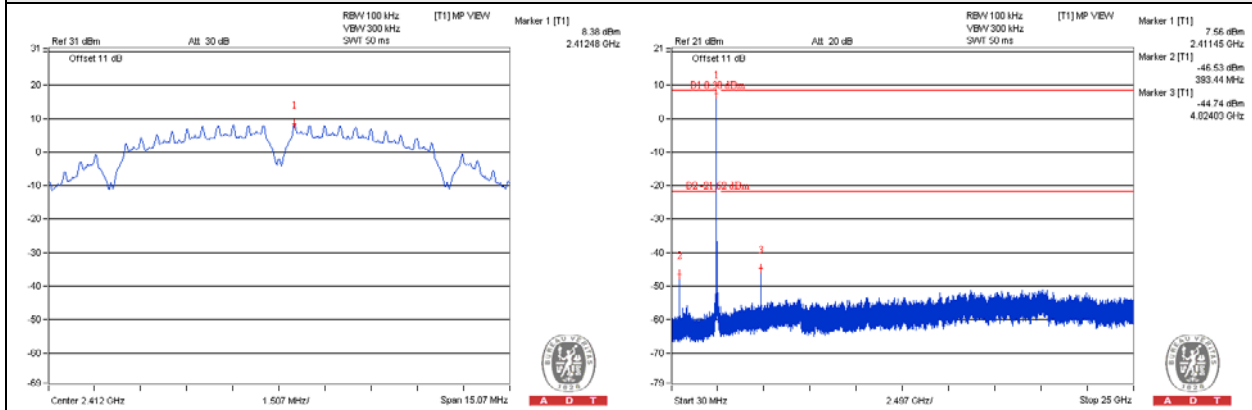
Same as item 4.3.6.

#### **4.6.7 Test Results**

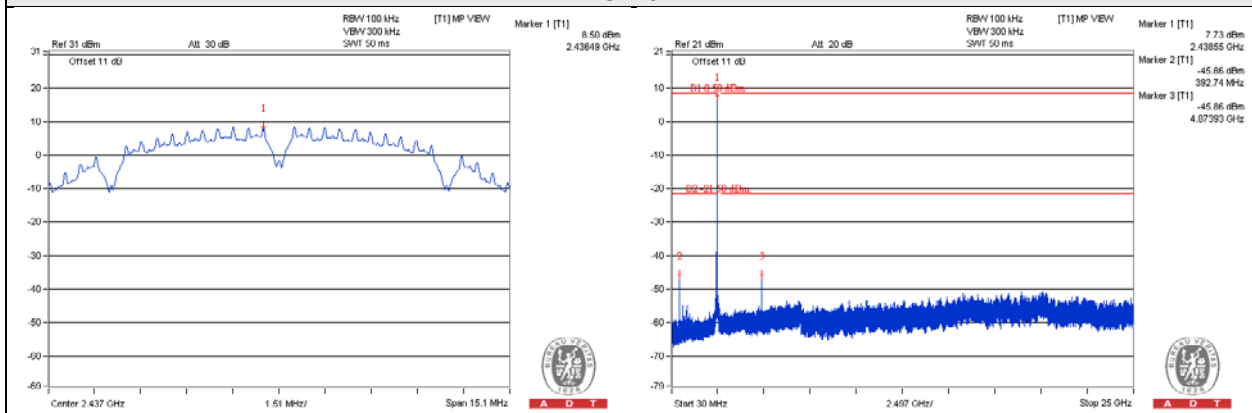
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 30dB offset below D1. It shows compliance with the requirement.

802.11b

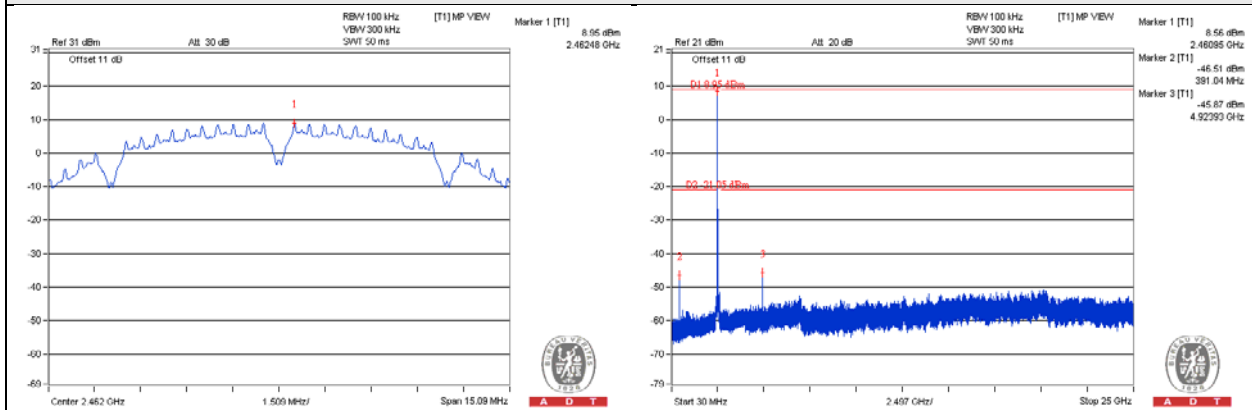
CH 1



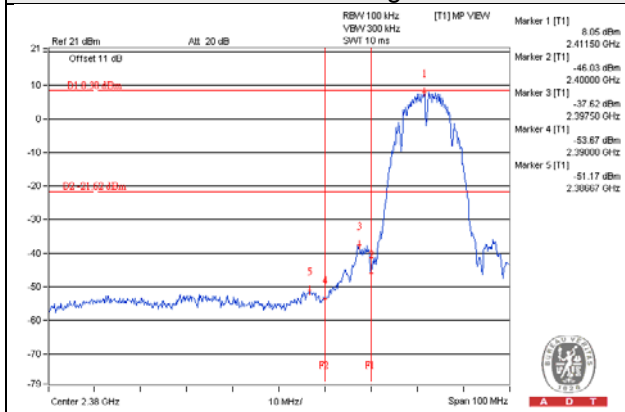
CH 6



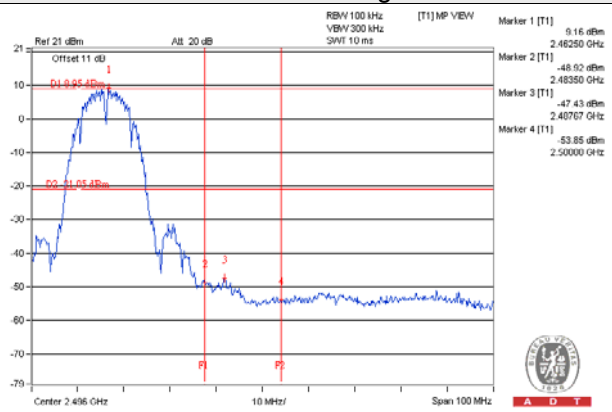
CH 11



CH 1 Band edge

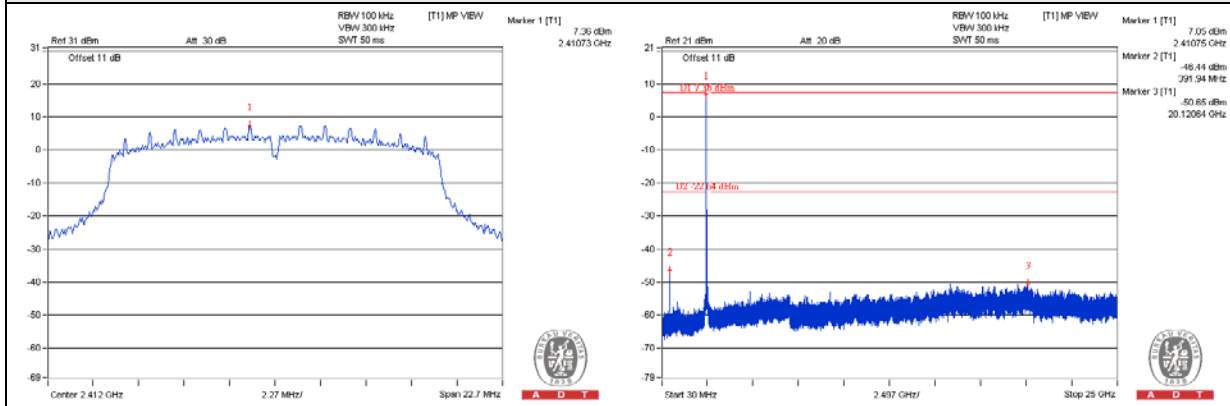


CH 11 Band edge

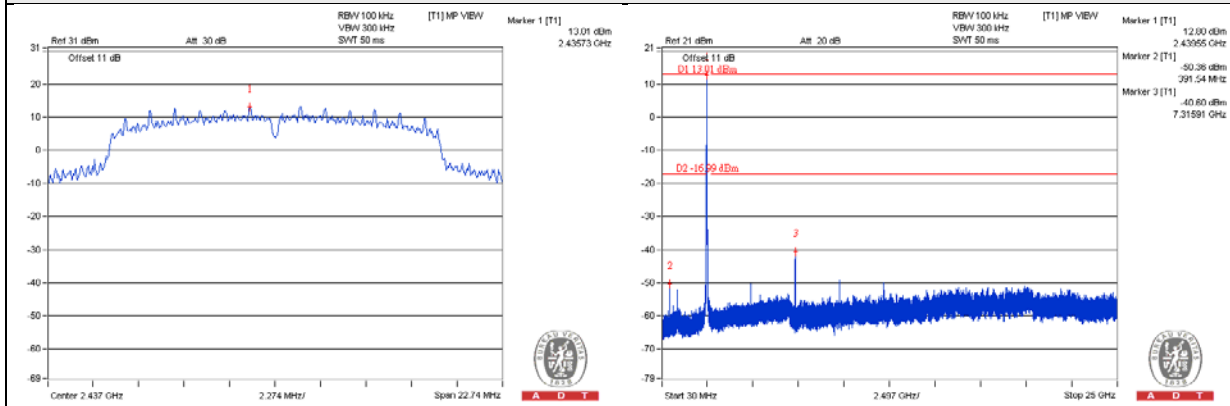


802.11g

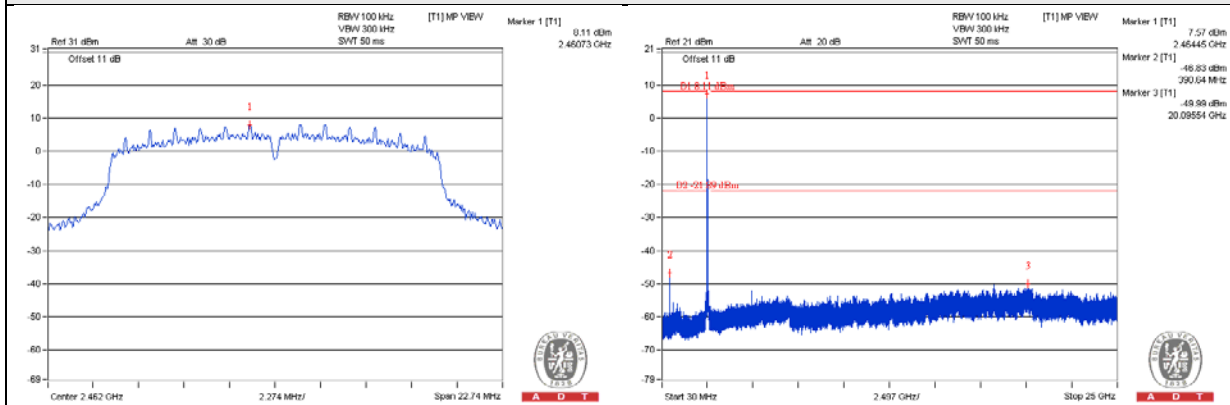
CH 1



CH 6

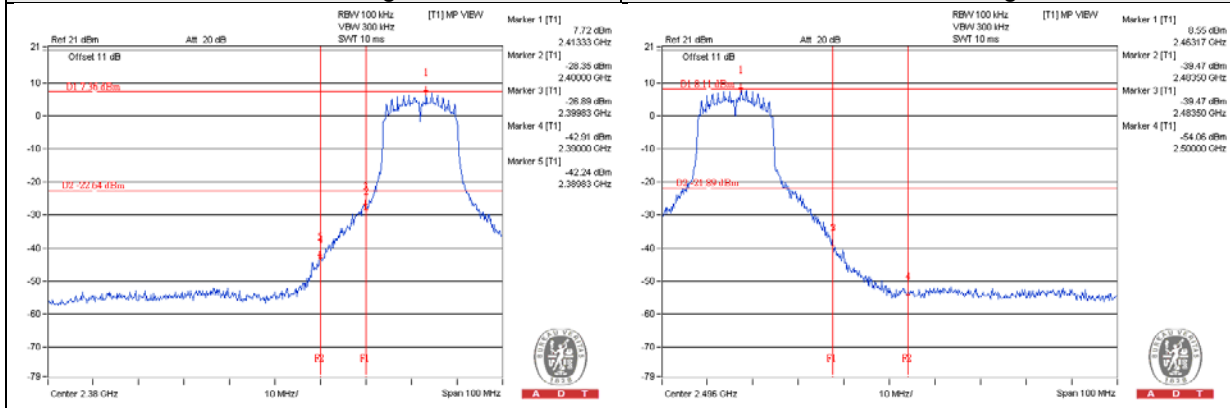


CH 11



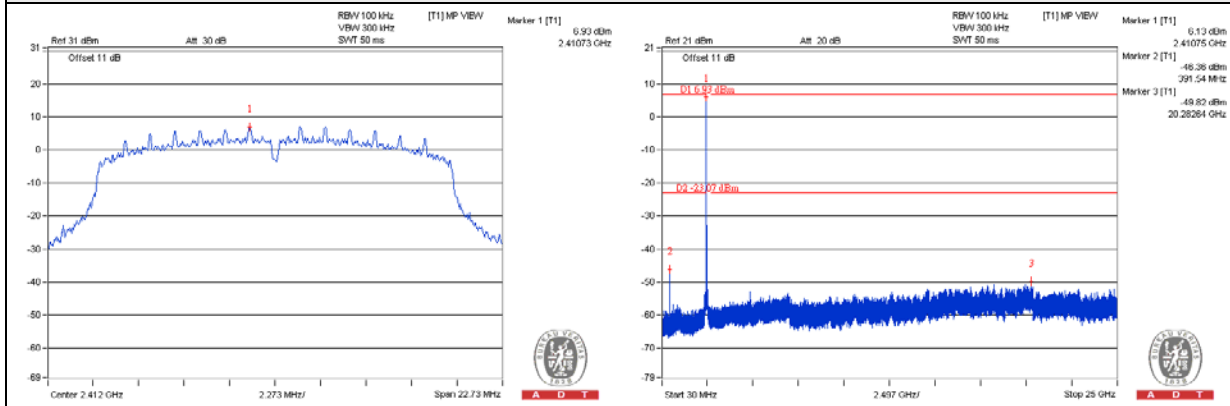
CH 1 Band edge

CH 11 Band edge

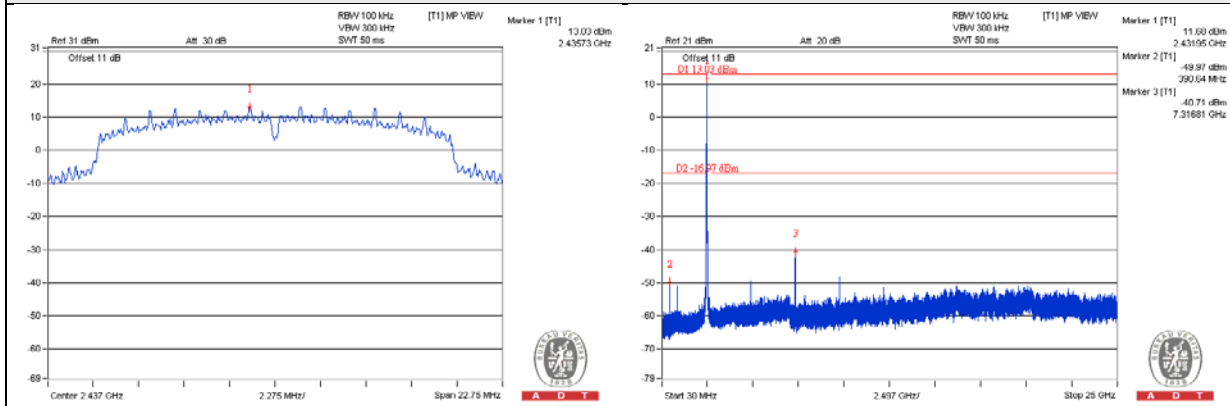


802.11n (HT20)

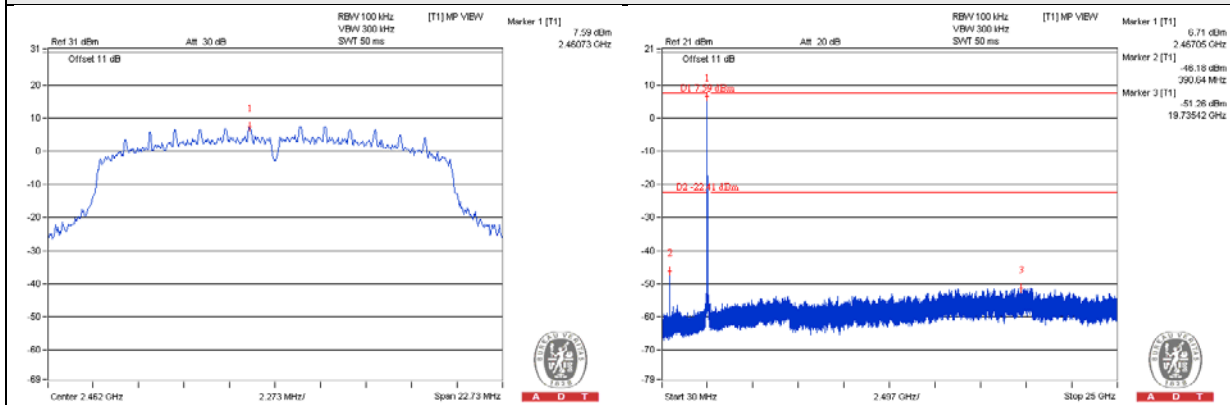
CH 1



CH 6

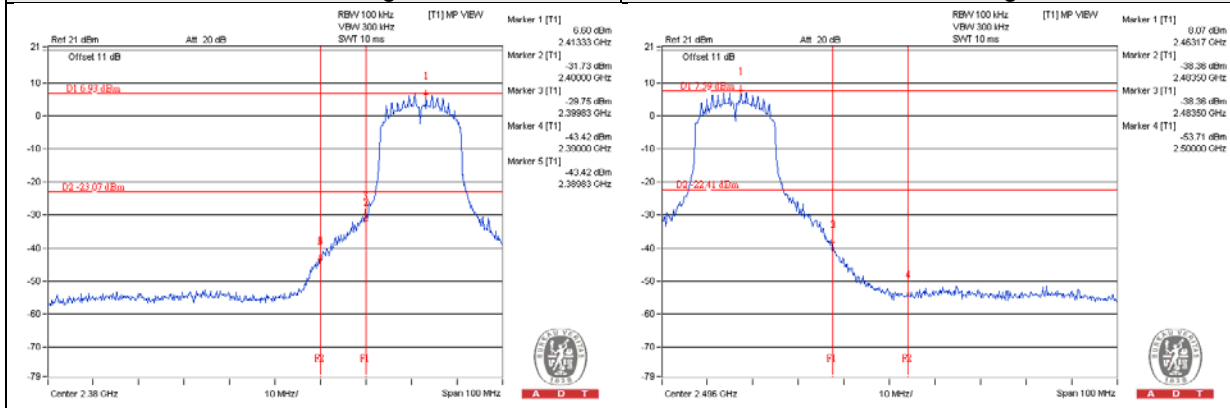


CH 11



CH 1 Band edge

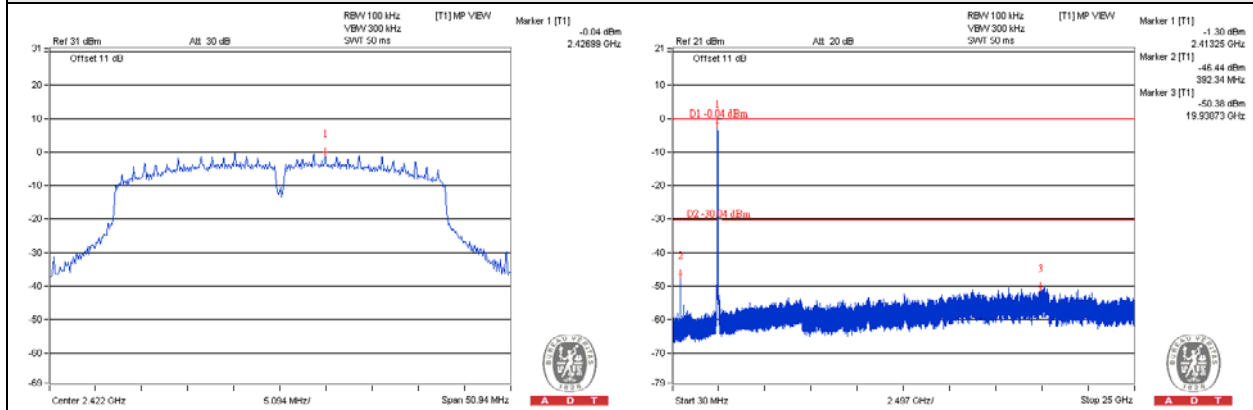
CH 11 Band edge



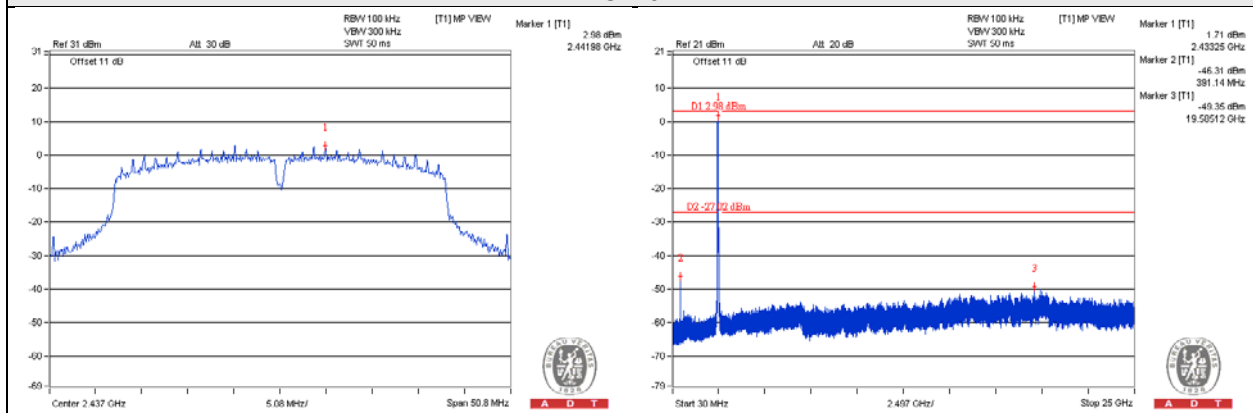


802.11n (HT40)

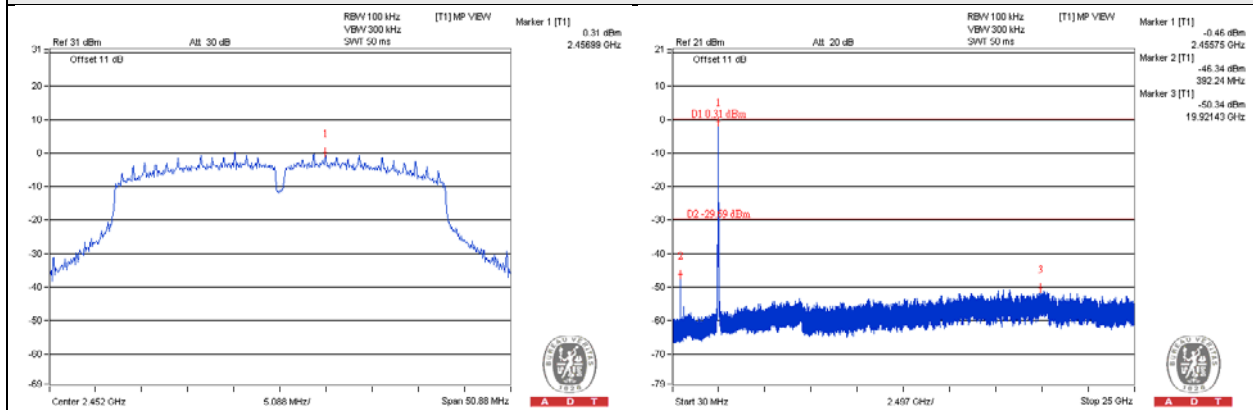
CH 3



CH 6

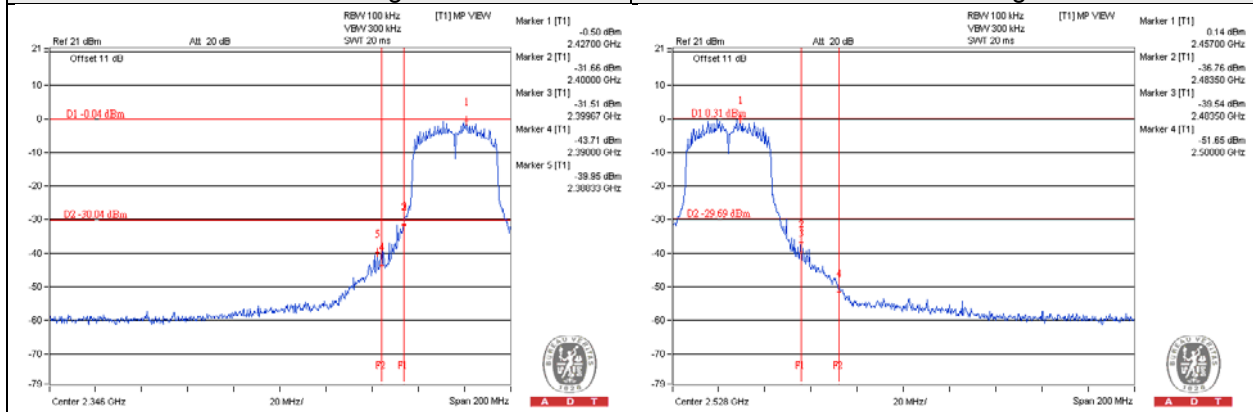


CH 9



CH 3 Band edge

CH 9 Band edge



## 5 Pictures of Test Arrangements

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

## Appendix – Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

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

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

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