



# FCC TEST REPORT

**REPORT NO.:** RF121015E03

**MODEL NO.:** TD-W8961ND

**FCC ID:** TE7TDW8961NDV3

**IC:** 8853A-W8961NDV3

**RECEIVED:** Oct. 15, 2012

**TESTED:** Oct. 18 to Dec. 20, 2012

**ISSUED:** Jan. 15, 2013

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

**ADDRESS:** Building 24 (floors 1,3,4,5) and 28  
(floors1-4) Central Science and Technology  
Park,Shennan Rd, Nanshan,  
Shenzhen,China

**ISSUED BY:** Bureau Veritas Consumer Products Services  
(H.K.) Ltd., Taoyuan Branch Hsin Chu Laboratory

**LAB ADDRESS :** No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen,  
Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan,  
R.O.C.

**TEST LOCATION (1):** No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Tsuen,  
Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan,  
R.O.C.

**TEST LOCATION (2):** No. 49, Ln. 206, Wende Rd., Shangshan Tsuen,  
Chiung Lin Hsiang, Hsin Chu Hsien 307, Taiwan,  
R.O.C.

This report should not be used by the client to claim  
product certification, approval, or endorsement by  
TAF or any government agencies.



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification



A D T

## Table of Contents

RELEASE CONTROL RECORD.....	4
1. CERTIFICATION.....	5
2. SUMMARY OF TEST RESULTS.....	6
2.1 MEASUREMENT UNCERTAINTY .....	7
3. GENERAL INFORMATION .....	8
3.1 GENERAL DESCRIPTION OF EUT.....	8
3.2 DESCRIPTION OF TEST MODES.....	10
3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL .....	11
3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS .....	13
3.4 DESCRIPTION OF SUPPORT UNITS.....	14
3.5 CONFIGURATION OF SYSTEM UNDER TEST .....	15
4. TEST TYPES AND RESULTS .....	16
4.1 CONDUCTED EMISSION MEASUREMENT .....	16
4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT.....	16
4.1.2 TEST INSTRUMENTS .....	16
4.1.3 TEST PROCEDURES.....	17
4.1.4 DEVIATION FROM TEST STANDARD .....	17
4.1.5 TEST SETUP .....	18
4.1.6 EUT OPERATING CONDITIONS.....	19
4.1.7 TEST RESULTS.....	20
4.2 RADIATED EMISSION AND BANDEDGE MEASUREMENT.....	22
4.2.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT ...	22
4.2.2 TEST INSTRUMENTS .....	23
4.2.3 TEST PROCEDURES.....	25
4.2.4 DEVIATION FROM TEST STANDARD .....	25
4.2.5 TEST SETUP .....	26
4.2.6 EUT OPERATING CONDITIONS.....	26
4.2.7 TEST RESULTS.....	27
4.3 6dB BANDWIDTH MEASUREMENT .....	40
4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT .....	40
4.3.2 TEST INSTRUMENTS .....	40
4.3.3 TEST PROCEDURE .....	40
4.3.4 DEVIATION FROM TEST STANDARD .....	40
4.3.5 TEST SETUP .....	40
4.3.6 EUT OPERATING CONDITIONS.....	40
4.3.7 TEST RESULTS.....	41
4.4 OCCUPIED BANDWIDTH MEASUREMENT .....	42



A D T

4.4.1	TEST INSTRUMENTS .....	42
4.4.2	TEST PROCEDURE .....	42
4.4.3	DEVIATION FROM TEST STANDARD .....	42
4.4.4	TEST SETUP .....	42
4.4.5	EUT OPERATING CONDITIONS.....	42
4.4.6	TEST RESULTS.....	43
4.5	CONDUCTED OUTPUT POWER MEASUREMENT .....	44
4.5.1	LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT .....	44
4.5.2	INSTRUMENTS .....	44
4.5.3	TEST PROCEDURES.....	44
4.5.4	DEVIATION FROM TEST STANDARD .....	44
4.5.5	TEST SETUP .....	44
4.5.6	EUT OPERATING CONDITIONS.....	45
4.5.7	TEST RESULTS.....	46
4.6	POWER SPECTRAL DENSITY MEASUREMENT.....	48
4.6.1	LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT .....	48
4.6.2	TEST INSTRUMENTS .....	48
4.6.3	TEST PROCEDURE .....	48
4.6.4	DEVIATION FROM TEST STANDARD .....	48
4.6.5	TEST SETUP .....	48
4.6.6	EUT OPERATING CONDITION .....	48
4.6.7	TEST RESULTS.....	49
4.7	CONDUCTED OUT-BAND EMISSION MEASUREMENT.....	50
4.7.1	LIMITS OF CONDUCTED OUT-BAND EMISSION MEASUREMENT .....	50
4.7.2	TEST INSTRUMENTS .....	50
4.7.3	TEST PROCEDURE .....	50
4.7.4	DEVIATION FROM TEST STANDARD .....	51
4.7.5	TEST SETUP .....	51
4.7.6	EUT OPERATING CONDITION .....	51
4.7.7	TEST RESULTS.....	51
5.	PHOTOGRAPHS OF THE TEST CONFIGURATION.....	64
6.	INFORMATION ON THE TESTING LABORATORIES .....	65
7.	APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB.....	66



## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF121015E03	Original release	Jan. 15, 2013



## 1. CERTIFICATION

**PRODUCT:** 300Mbps Wireless N ADSL2+ Modem Router  
**BRAND NAME:** TP-LINK  
**MODEL NO.:** TD-W8961ND  
**TEST SAMPLE:** ENGINEERING SAMPLE  
**APPLICANT:** TP-LINK TECHNOLOGIES CO., LTD.  
**TESTED:** Oct. 18 to Dec. 20, 2012  
**STANDARDS:** FCC Part 15, Subpart C. (15.247)  
ANSI C63.10-2009  
Canada RSS-210 Issue 8 (2010-12)  
Canada RSS-Gen Issue 3 (2010-12)

The above equipment (Model: TD-W8961ND) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**PREPARED BY** :  , **DATE:** Jan. 15 2013  
( Elsie Hsu, Specialist )

**APPROVED BY** :  , **DATE:** Jan. 15 2013  
( May Chen, Deputy Manager )

## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

<b>APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247) ; RSS-210; RSS-Gen</b>				
<b>STANDARD SECTION</b>		<b>TEST TYPE</b>	<b>RESULT</b>	<b>REMARK</b>
<b>FCC Part 15</b>	<b>RSS-Gen</b>			
15.207	RSS-Gen 7.2.4	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -8.19dB at 0.54453MHz
15.247(d) 15.209	RSS-210 A8.5	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -0.5dB at 4824.00MHz
15.247(d)	RSS-210 A8.5	Band Edge Measurement	PASS	Meet the requirement of limit.
15.247(a)(2)	RSS-210 A8.2 (a)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	RSS-210 A8.2 (4)	Conducted power	PASS	Meet the requirement of limit.
15.247(e)	RSS-210 A8.2 (b)	Power Spectral Density	PASS	Meet the requirement of limit.
-	RSS-Gen 4.6	Occupied Bandwidth Measurement	-	Meet the requirement
15.203	-	Antenna Requirement	PASS	Antenna connector is SMA Male Reverse not a standard connector.



A D T

## 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:

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

Measurement	Value
Conducted emissions	2.98 dB
Radiated emissions (30MHz-1GHz)	5.69 dB
Radiated emissions (1GHz -6GHz)	3.56 dB
Radiated emissions (6GHz -18GHz)	4.10 dB
Radiated emissions (18GHz -40GHz)	4.24 dB



A D T

### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>PRODUCT</b>	300Mbps Wireless N ADSL2+ Modem Router
<b>MODEL NO.</b>	TD-W8961ND
<b>POWER SUPPLY</b>	DC 9V from power adapter
<b>MODULATION TYPE</b>	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
<b>MODULATION TECHNOLOGY</b>	DSSS, OFDM
<b>TRANSFER RATE</b>	802.11b: up to 11Mbps 802.11g: up to 54Mbps 802.11n: up to 300Mbps
<b>OPERATING FREQUENCY</b>	2.412 ~ 2.462GHz
<b>NUMBER OF CHANNEL</b>	11 for 802.11b, 802.11g, 802.11n HT20 7 for 802.11n (HT40)
<b>MAXIMUM OUTPUT POWER</b>	802.11b: 81.283mW 802.11g: 323.594mW 802.11n (HT20): 332.005mW 802.11n (HT40): 157.307mW
<b>ANTENNA TYPE</b>	Please see NOTE
<b>DATA CABLE</b>	NA
<b>I/O PORTS</b>	Refer to user's manual
<b>ASSOCIATED DEVICES</b>	Adapter x 1



**NOTE:**

1. The EUT must be supplied with a power adapter as following table:

Brand	Model No.	Spec.
TP-LINK	T090085-2B1	Input: 100-240V, 0.3A, 50/60Hz Output: 9V, 0.85A

2. The antennas provided to the EUT, please refer to the following table:

Transmitter Circuit	Antenna Type	Gain (dBi) (Exclude cable loss)	Connector type	Cable Loss(dB)	Frequency range (MHz to MHz)
Chain (0)	Dipole	3	SMA Male Reverse	0.5	2400-2483.5
Chain (1)	Dipole	3	SMA Male Reverse	0.5	2400~2483.5

3. The EUT incorporates a MIMO function without beam forming.

MODULATION MODE	Tx/Rx FUNCTION
<b>802.11b</b>	<b>1Tx/2Rx</b>
<b>802.11g</b>	<b>1Tx/2Rx</b>
<b>802.11n (HT20)</b>	<b>2Tx/2Rx</b>
<b>802.11n (HT40)</b>	<b>2Tx/2Rx</b>

4. When the EUT operating in 802.11n, the software operation, which is defined by manufacturer, MCS (Modulation and Coding Schemes) from 0 to 15.
5. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.



A D T

### 3.2 DESCRIPTION OF TEST MODES

Eleven channels are provided for 802.11b, 802.11g, 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		

Seven 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
	PLC	RE < 1G	RE ≥ 1G	APCM	OB	
-	√	√	√	√	√	-

Where **PLC**: Power Line Conducted Emission      **RE < 1G**: Radiated Emission below 1GHz  
**RE ≥ 1G**: Radiated Emission above 1GHz      **APCM**: Antenna Port Conducted Measurement  
**OB**: Conducted Out-Band Emission Measurement

**Note:** The EUT had been pre-tested on the positioned of each 2 axis. The worst case was found when positioned on Y-plane

#### **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.

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11n (HT20)	1 to 11	6	OFDM	BPSK	6.5

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

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11n (HT20)	1 to 11	6	OFDM	BPSK	6.5

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

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
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

**ANTENNA PORT CONDUCTED MEASUREMENT:**

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
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

**CONDUCTED OUT-BAND EMISSION MEASUREMENT:**

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

MODE	AVAILABLE CHANNEL	TESTED CHANNEL	MODULATION TECHNOLOGY	MODULATION TYPE	DATA RATE (Mbps)
802.11b	1 to 11	1, 6, 11	DSSS	DBPSK	1
802.11g	1 to 11	1, 6, 11	OFDM	BPSK	6
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
PLC	25deg. C, 60%RH	120Vac, 60Hz	Timmy Hu
RE<1G	25deg. C, 76%RH	120Vac, 60Hz	Amos Chuang
RE <sup>3</sup> 1G	25deg. C, 66%RH	120Vac, 60Hz	Amos Chuang
APCM	25deg. C, 60%RH	120Vac, 60Hz	Amos Chuang
OB	25deg. C, 60%RH	120Vac, 60Hz	Amos Chuang

### **3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS**

The EUT is a RF product. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

FCC Part 15, Subpart C (Section 15.247)  
558074 D01 DTS Meas Guidance  
662911 D01 Multiple Transmitter Output  
ANSI C63.10-2009  
Canada RSS-210 Issue 8 (2010-12)  
Canada RSS-Gen Issue 3 (2010-12)

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



A D T

### 3.4 DESCRIPTION OF SUPPORT UNITS

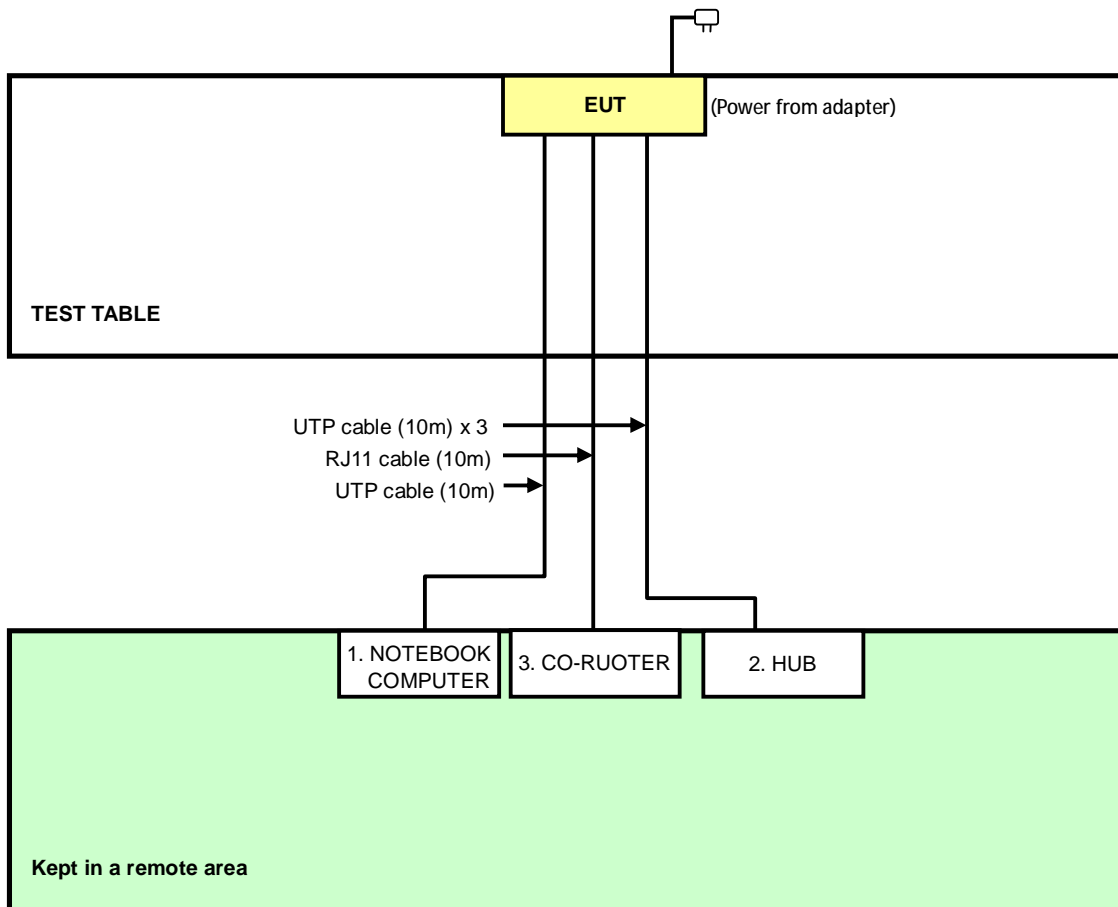
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP32LA	GSLB32S	FCC DoC
2	HUB	ZyXEL	ES-116P	S060H02000215	FCC DoC
3	CO-ROUTER	ZyXEL	IES-1000	S4Z3112558	NA

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	UTP cable (10m)
2	UTP cable (10m)
3	RJ11 cable (10m)

**NOTE:** All power cords of the above support units are non shielded (1.8m).

### 3.5 CONFIGURATION OF SYSTEM UNDER TEST





A D T

## 4. TEST TYPES AND RESULTS

### 4.1 CONDUCTED EMISSION MEASUREMENT

#### 4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dB $\mu$ V)	
	Quasi-peak	Average
0.15-0.5		
0.5-5	66 to 56	56 to 46
5-30	56	46
	60	50

- NOTE:**
1. The lower limit shall apply at the transition frequencies.
  2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

#### 4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver	ESCS 30	100375	Mar. 12, 2012	Mar.11, 2013
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK8127	8127-522	Sep. 06, 2012	Sep. 05, 2013
Line-Impedance Stabilization Network (for Peripheral)	ENV216	100072	June 08, 2012	June 07, 2013
RF Cable (JYBAO)	5DFB	COCCAB-001	Aug. 28, 2012	Aug. 27, 2013
50 ohms Terminator	50	EMC-3	Sep. 25, 2012	Sep. 24, 2013
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 Shielded Room No. C.
3. The VCCI Con C Registration No. is C-3611.
4. Tested Date: Oct. 18, 2012



#### 4.1.3 TEST PROCEDURES

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

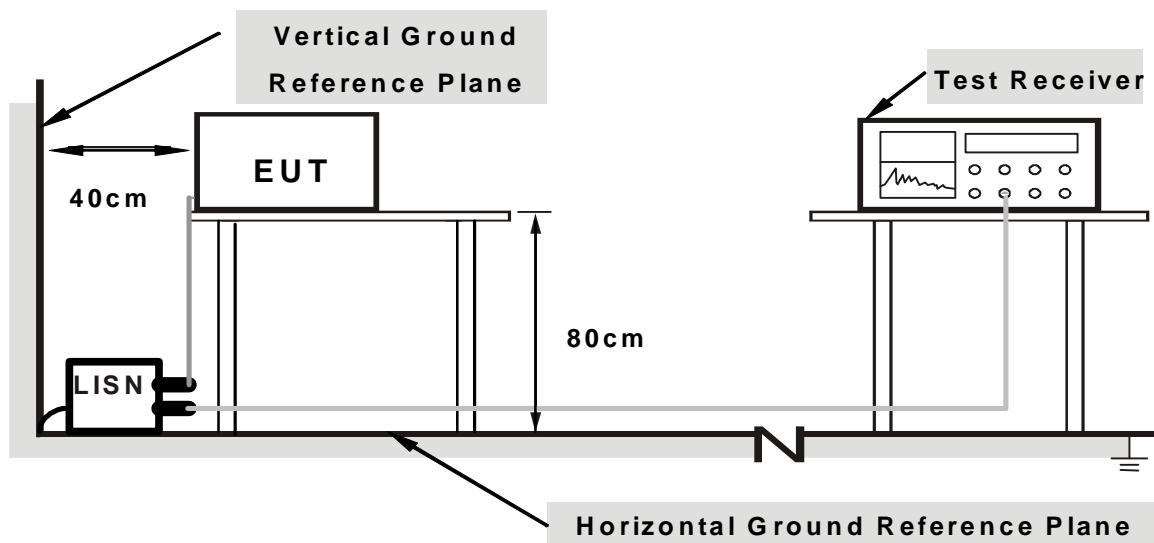
#### **NOTE:**

1. The resolution bandwidth of test receiver is 9kHz for Quasi-peak detection (QP) & Average detection (AV).

#### 4.1.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.1.5 TEST SETUP



**Note: 1.Support units were connected to second LISN.**

For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.



A D T

#### 4.1.6 EUT OPERATING CONDITIONS

1. Connect the EUT with the support unit 1 (Notebook Computer) which is placed on a testing table.
2. The communication partner run test program “Telnet 192.168.1.1 Ralink Command” to enable EUT under transmission/receiving condition continuously at specific channel frequency.

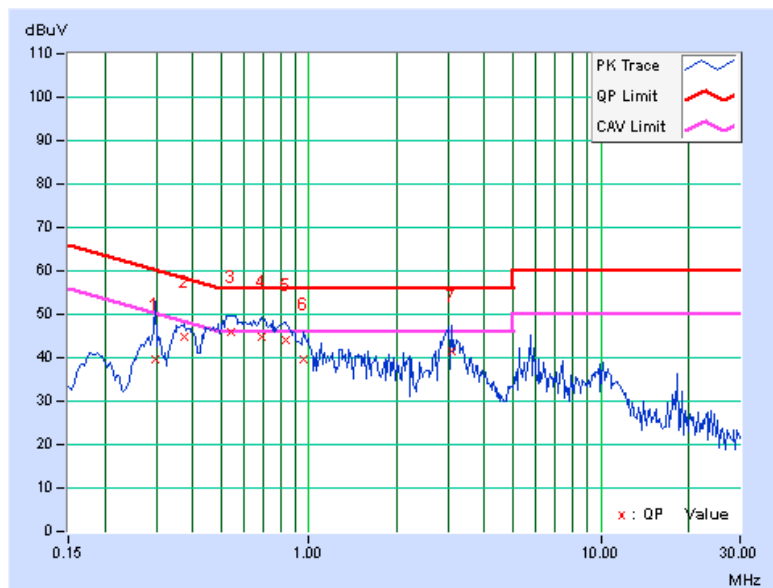
### 4.1.7 TEST RESULTS

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	0.29844	0.14	39.34	30.78	39.48	30.92	60.29	50.29	-20.81
2	0.37266	0.15	44.72	36.40	44.87	36.55	58.44	48.44	-13.57	-11.89
<b>3</b>	<b>0.54453</b>	<b>0.17</b>	<b>45.66</b>	<b>37.64</b>	<b>45.83</b>	<b>37.81</b>	<b>56.00</b>	<b>46.00</b>	<b>-10.17</b>	<b>-8.19</b>
4	0.68516	0.17	44.62	35.14	44.79	35.31	56.00	46.00	-11.21	-10.69
5	0.83359	0.18	43.74	34.60	43.92	34.78	56.00	46.00	-12.08	-11.22
6	0.96250	0.19	39.38	31.16	39.57	31.35	56.00	46.00	-16.43	-14.65
7	3.07813	0.25	41.18	33.60	41.43	33.85	56.00	46.00	-14.57	-12.15

### 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.

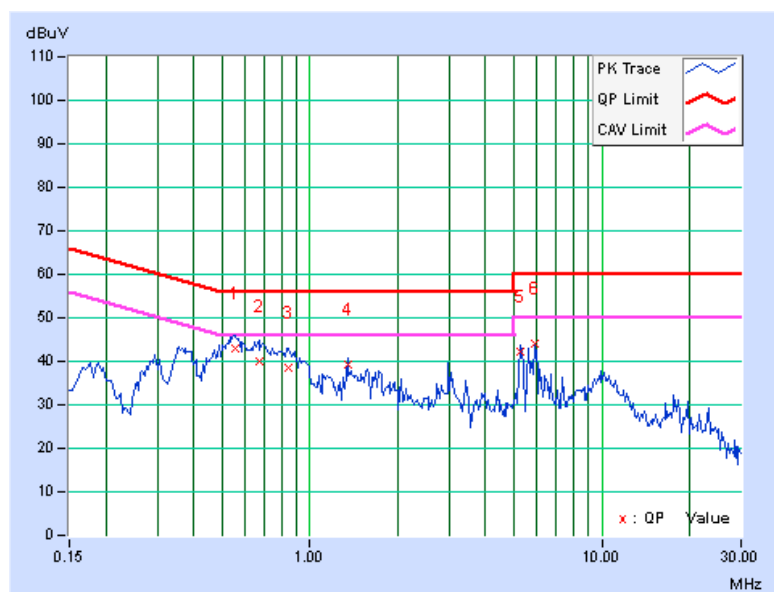


<b>PHASE</b>	Neutral (N)	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP) / Average (AV)
--------------	-------------	--------------------------	--------------------------------

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	0.55625	0.16	42.70	33.74	42.86	33.90	56.00	46.00	-13.14
2	0.66953	0.16	39.72	29.92	39.88	30.08	56.00	46.00	-16.12	-15.92
3	0.84141	0.16	38.30	28.92	38.46	29.08	56.00	46.00	-17.54	-16.92
4	1.34766	0.18	39.00	30.62	39.18	30.80	56.00	46.00	-16.82	-15.20
5	5.23828	0.28	42.10	36.66	42.38	36.94	60.00	50.00	-17.62	-13.06
6	5.90778	0.30	43.68	38.22	43.98	38.52	60.00	50.00	-16.02	-11.48

**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.



## 4.2 RADIATED EMISSION AND BANDEDGE MEASUREMENT

### 4.2.1 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.



## 4.2.2 TEST INSTRUMENTS

### For below 1GHz

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Agilent	E4446A	MY48250253	Sep. 03, 2012	Sep. 02, 2013
Pre-Selector Agilent	N9039A	MY46520310	Sep. 03, 2012	Sep. 02, 2013
Signal Generator Agilent	N5181A	MY49060347	July 24, 2012	July 23, 2013
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-04	Nov. 15, 2011	Nov. 14, 2012
Pre-Amplifier Agilent	8449B	3008A02465	Feb. 27, 2012	Feb. 26, 2013
SPACEK LABS	SLKKa-48-6	9K16	Nov. 15, 2011	Nov. 14, 2012
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Apr. 06, 2012	Apr. 05, 2013
Horn_Antenna AISI	AIH.8018	0000220091110	Nov. 23, 2011	Nov. 22, 2012
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 12, 2012	Oct. 11, 2013
RF Cable	NA	RF104-205 RF104-207 RF104-202	Dec. 27, 2011	Dec. 26, 2012
RF Cable	NA	CHHCAB_001	Oct. 07, 2012	Oct. 06, 2013
Software	ADT_Radiated _V8.7.05	NA	NA	NA
Antenna Tower & Turn Table CT	NA	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 horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
- 3 The test was performed in 966 Chamber No. H.
4. The FCC Site Registration No. is 797305.
- 5 The CANADA Site Registration No. is IC 7450H-3.
- 6 Tested Date: Oct. 28, 2012



A D T

**For above 1GHz test**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer Agilent	E4446A	MY48250254	July 09, 2012	July 08, 2013
Pre-Selector Agilent	N9039A	MY46520311	July 09, 2012	July 08, 2013
Signal Generator Agilent	N5181A	MY49060517	July 09, 2012	July 08, 2013
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-03	Nov. 14, 2012	Nov. 13, 2013
Pre-Amplifier Agilent	8449B	3008A02578	June 26, 2012	June 25, 2013
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Nov. 14, 2012	Nov. 13, 2013
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Apr. 09, 2012	Apr. 08, 2013
Horn_Antenna AISI	AIH.8018	0000320091110	Nov. 19, 2012	Nov. 18, 2013
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 12, 2012	Oct. 11, 2013
RF Cable	NA	RF104-201 RF104-203 RF104-204	Dec. 26, 2011	Dec. 25, 2012
RF Cable	NA	CHGCAB_001	Oct. 06, 2012	Oct. 05, 2013
Software	ADT_Radiated _V8.7.05	NA	NA	NA
Antenna Tower & Turn Table CT	NA	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 horn antenna, preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1GHz if tested.
3. The test was performed in 966 Chamber No. G.
4. The FCC Site Registration No. is 966073.
5. The VCCI Site Registration No. is G-137.
6. The CANADA Site Registration No. is IC 7450H-2.
7. Tested Date: Dec. 14, 2012



#### 4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The 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.

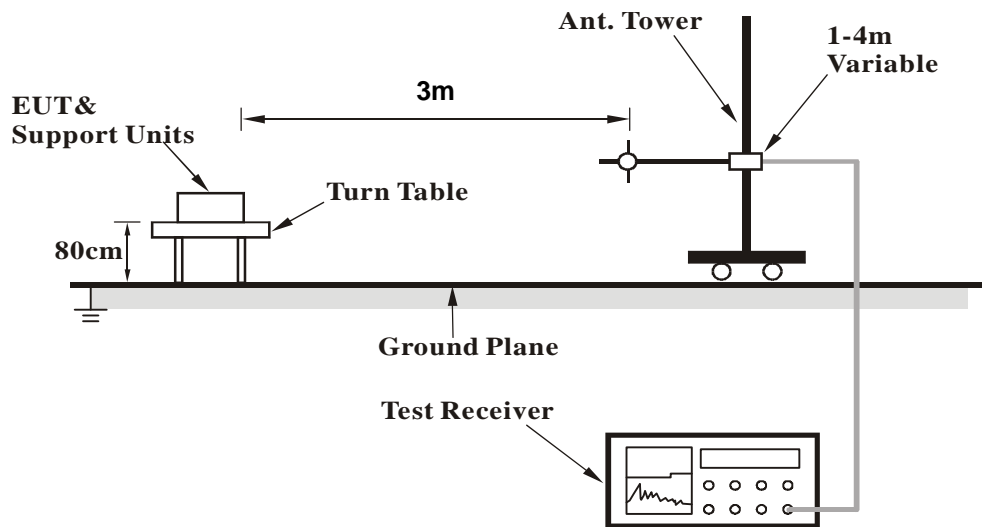
#### NOTE:

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 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

#### 4.2.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.2.5 TEST SETUP



For the actual test configuration, please refer to the related item – Photographs of the Test Configuration.

#### 4.2.6 EUT OPERATING CONDITIONS

Same as 4.1.6

## 4.2.7 TEST RESULTS

### BELOW 1GHz WORST-CASE DATA

#### 802.11n (HT20)

<b>CHANNEL</b>	TX Channel 6	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP)
<b>FREQUENCY RANGE</b>	Below 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	140.01	32.8 QP	43.5	-10.7	1.50 H	50	19.81	12.98
2	250.03	32.1 QP	46.0	-14.0	1.00 H	244	20.37	11.68
3	282.71	31.2 QP	46.0	-14.8	1.00 H	244	18.30	12.86
4	419.97	39.1 QP	46.0	-6.9	2.00 H	317	23.11	15.98
5	565.51	28.9 QP	46.0	-17.1	1.50 H	316	10.05	18.86
6	700.04	32.6 QP	46.0	-13.4	1.00 H	215	12.00	20.60
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	74.53	34.0 QP	40.0	-6.0	1.50 V	241	23.98	10.04
2	140.01	26.5 QP	43.5	-17.0	1.00 V	281	13.54	12.98
3	250.03	32.1 QP	46.0	-13.9	1.50 V	177	20.39	11.68
4	419.97	42.0 QP	46.0	-4.0	1.50 V	46	26.00	15.98
5	700.04	28.7 QP	46.0	-17.3	1.50 V	288	8.12	20.60
6	847.95	30.3 QP	46.0	-15.7	1.00 V	103	7.61	22.70

#### 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).
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.



A D T

ABOVE 1GHz DATA

802.11b

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2337.00	57.8 PK	74.0	-16.2	1.01 H	211	25.59	32.21
2	2337.00	47.2 AV	54.0	-6.8	1.01 H	211	14.99	32.21
3	*2412.00	102.3 PK			1.01 H	210	69.86	32.44
4	*2412.00	95.8 AV			1.01 H	210	63.36	32.44
5	4824.00	54.9 PK	74.0	-19.1	1.36 H	266	12.96	41.94
6	4824.00	50.6 AV	54.0	-3.4	1.36 H	266	8.66	41.94

**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	2337.00	58.2 PK	74.0	-15.8	1.00 V	333	25.99	32.21
2	2337.00	48.4 AV	54.0	-5.6	1.00 V	333	16.19	32.21
3	*2412.00	104.5 PK			1.07 V	37	72.06	32.44
4	*2412.00	102.1 AV			1.07 V	37	69.66	32.44
5	4824.00	57.5 PK	74.0	-16.5	1.82 V	350	15.56	41.94
6	4824.00	53.5 AV	54.0	-0.5	1.82 V	350	11.56	41.94

REMARKS:

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



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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2360.30	58.3 PK	74.0	-15.7	1.01 H	221	26.02	32.28
2	2360.30	48.2 AV	54.0	-5.8	1.01 H	221	15.92	32.28
3	*2437.00	103.2 PK			1.01 H	214	70.69	32.51
4	*2437.00	96.8 AV			1.01 H	214	64.29	32.51
5	4874.00	55.3 PK	74.0	-18.7	1.32 H	254	13.31	41.99
6	4874.00	51.2 AV	54.0	-2.8	1.32 H	254	9.21	41.99
7	7311.00	52.8 PK	74.0	-21.2	1.01 H	1	6.27	46.53
8	7311.00	40.7 AV	54.0	-13.3	1.01 H	1	-5.83	46.53

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	2360.30	59.9 PK	74.0	-14.1	1.10 V	38	27.62	32.28
2	2360.30	49.8 AV	54.0	-4.2	1.10 V	38	17.52	32.28
3	*2437.00	105.3 PK			1.10 V	37	72.79	32.51
4	*2437.00	102.8 AV			1.10 V	37	70.27	32.51
5	4874.00	56.6 PK	74.0	-17.4	1.08 V	350	14.61	41.99
6	4874.00	53.3 AV	54.0	-0.7	1.08 V	350	11.31	41.99
7	7311.00	53.7 PK	74.0	-20.3	1.02 V	165	7.17	46.53
8	7311.00	41.8 AV	54.0	-12.2	1.02 V	165	-4.73	46.53

**REMARKS:**

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



A D T

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2384.00	57.2 PK	74.0	-16.8	1.00 H	215	24.84	32.36
2	2384.00	50.2 AV	54.0	-3.8	1.00 H	215	17.84	32.36
3	*2462.00	106.2 PK			1.00 H	216	73.63	32.57
4	*2462.00	98.3 AV			1.00 H	216	65.73	32.57
5	2483.50	56.9 PK	74.0	-17.1	1.01 H	216	24.27	32.63
6	2483.50	44.8 AV	54.0	-9.2	1.01 H	216	12.17	32.63
7	4924.00	56.3 PK	74.0	-17.7	1.02 H	287	14.29	42.01
8	4924.00	51.2 AV	54.0	-2.8	1.02 H	287	9.19	42.01
9	7386.00	53.1 PK	74.0	-20.9	1.00 H	11	6.37	46.73
10	7386.00	40.9 AV	54.0	-13.1	1.00 H	11	-5.83	46.73

**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	2384.00	59.8 PK	74.0	-14.2	1.00 V	336	27.44	32.36
2	2384.00	51.3 AV	54.0	-2.7	1.00 V	336	18.94	32.36
3	*2462.00	107.3 PK			1.00 V	336	74.73	32.57
4	*2462.00	104.9 AV			1.00 V	336	72.33	32.57
5	2483.50	57.5 PK	74.0	-16.5	1.00 V	336	24.87	32.63
6	2483.50	45.7 AV	54.0	-8.3	1.00 V	336	13.07	32.63
7	4924.00	56.7 PK	74.0	-17.3	1.76 V	350	14.69	42.01
8	4924.00	53.1 AV	54.0	-0.9	1.76 V	350	11.09	42.01
9	7386.00	53.5 PK	74.0	-20.5	1.00 V	151	6.77	46.73
10	7386.00	41.7 AV	54.0	-12.3	1.00 V	151	-5.03	46.73

**REMARKS:**

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



A D T

802.11g

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	59.7 PK	74.0	-14.3	1.00 H	214	27.32	32.38
2	2390.00	46.9 AV	54.0	-7.1	1.00 H	214	14.52	32.38
3	*2412.00	102.1 PK			1.00 H	213	69.66	32.44
4	*2412.00	94.9 AV			1.00 H	213	62.42	32.44
5	4874.00	51.3 PK	74.0	-22.7	1.06 H	46	9.31	41.99
6	4874.00	38.3 AV	54.0	-15.7	1.06 H	46	-3.69	41.99

**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	67.9 PK	74.0	-6.1	1.00 V	339	35.52	32.38
2	2390.00	51.3 AV	54.0	-2.7	1.00 V	339	18.92	32.38
3	*2412.00	109.5 PK			1.00 V	339	77.06	32.44
4	*2412.00	100.2 AV			1.00 V	339	67.76	32.44
5	4874.00	54.5 PK	74.0	-19.5	1.02 V	127	12.51	41.99
6	4874.00	41.2 AV	54.0	-12.8	1.02 V	127	-0.79	41.99

**REMARKS:**

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



A D T

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2385.00	57.2 PK	74.0	-16.8	1.00 H	214	24.84	32.36
2	2385.00	49.5 AV	54.0	-4.5	1.00 H	214	17.14	32.36
3	2385.20	62.1 PK	74.0	-11.9	1.01 H	215	29.74	32.36
4	2385.20	51.9 AV	54.0	-2.1	1.01 H	215	19.54	32.36
5	*2437.00	102.9 PK			1.00 H	215	70.39	32.51
6	*2437.00	94.2 AV			1.00 H	215	61.69	32.51
7	4874.00	51.1 PK	74.0	-22.9	1.00 H	41	9.11	41.99
8	4874.00	38.4 AV	54.0	-15.6	1.00 H	41	-3.59	41.99
9	7311.00	52.9 PK	74.0	-21.1	1.03 H	232	6.37	46.53
10	7311.00	41.6 AV	54.0	-12.4	1.03 H	232	-4.93	46.53

**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	2385.00	61.3 PK	74.0	-12.7	1.00 V	337	28.94	32.36
2	2385.00	50.9 AV	54.0	-3.1	1.00 V	337	18.54	32.36
3	*2437.00	110.1 PK			1.00 V	337	77.59	32.51
4	*2437.00	100.5 AV			1.00 V	337	67.99	32.51
5	2489.00	66.7 PK	74.0	-7.3	1.00 V	337	34.06	32.64
6	2489.00	52.7 AV	54.0	-1.3	1.00 V	337	20.06	32.64
7	4874.00	53.7 PK	74.0	-20.3	1.01 V	106	11.71	41.99
8	4874.00	40.6 AV	54.0	-13.4	1.01 V	106	-1.39	41.99
9	7311.00	52.3 PK	74.0	-21.7	1.01 V	322	5.77	46.53
10	7311.00	42.4 AV	54.0	-11.6	1.01 V	322	-4.13	46.53

**REMARKS:**

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





A D T

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	68.2 PK			1.00 H	215	35.63	32.57
2	*2462.00	52.1 AV			1.00 H	215	19.53	32.57
3	2483.50	69.5 PK	74.0	-4.5	1.00 H	218	36.87	32.63
4	2483.50	52.1 AV	54.0	-1.9	1.00 H	218	19.47	32.63
5	4924.00	51.6 PK	74.0	-22.4	1.01 H	33	9.59	42.01
6	4924.00	38.6 AV	54.0	-15.4	1.01 H	33	-3.41	42.01
7	7386.00	52.2 PK	74.0	-21.8	1.00 H	232	5.47	46.73
8	7386.00	41.4 AV	54.0	-12.6	1.00 H	232	-5.33	46.73

**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	107.8 PK			1.00 V	338	75.23	32.57
2	*2462.00	99.1 AV			1.00 V	338	66.53	32.57
3	2483.50	70.2 PK	74.0	-3.8	1.00 V	338	37.57	32.63
4	2483.50	53.2 AV	54.0	-0.8	1.00 V	338	20.57	32.63
5	4924.00	54.3 PK	74.0	-19.7	1.02 V	122	12.29	42.01
6	4924.00	40.6 AV	54.0	-13.4	1.02 V	122	-1.41	42.01
7	7386.00	52.6 PK	74.0	-21.4	1.01 V	350	5.87	46.73
8	7386.00	42.3 AV	54.0	-11.7	1.01 V	350	-4.43	46.73

**REMARKS:**

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



A D T

802.11n (HT20)

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2360.10	61.4 PK	74.0	-12.6	1.02 H	213	29.12	32.28
2	2360.10	47.5 AV	54.0	-6.5	1.02 H	213	15.22	32.28
3	*2412.00	104.2 PK			1.01 H	213	71.76	32.44
4	*2412.00	95.7 AV			1.01 H	213	63.26	32.44
5	4824.00	51.5 PK	74.0	-22.5	1.00 H	44	9.56	41.94
6	4824.00	38.7 AV	54.0	-15.3	1.00 H	44	-3.24	41.94

**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	1.00 V	337	36.22	32.38
2	2390.00	53.3 AV	54.0	-0.7	1.00 V	337	20.92	32.38
3	*2412.00	110.1 PK			1.00 V	337	77.66	32.44
4	*2412.00	101.1 AV			1.00 V	337	68.66	32.44
5	4824.00	53.9 PK	74.0	-20.1	1.02 V	102	11.96	41.94
6	4824.00	40.7 AV	54.0	-13.3	1.02 V	102	-1.24	41.94

**REMARKS:**

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



A D T

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2385.00	59.1 PK	74.0	-14.9	1.00 H	212	26.74	32.36
2	2385.00	49.3 AV	54.0	-4.7	1.00 H	212	16.94	32.36
3	*2437.00	105.5 PK			1.01 H	214	72.99	32.51
4	*2437.00	96.8 AV			1.01 H	214	64.29	32.51
5	2489.00	58.9 PK	74.0	-15.1	1.00 H	215	26.26	32.64
6	2489.00	48.5 AV	54.0	-5.5	1.00 H	215	15.86	32.64
7	4874.00	51.5 PK	74.0	-22.5	1.00 H	40	9.51	41.99
8	4874.00	38.6 AV	54.0	-15.4	1.00 H	40	-3.39	41.99
9	7311.00	52.3 PK	74.0	-21.7	1.02 H	224	5.77	46.53
10	7311.00	41.2 AV	54.0	-12.8	1.02 H	224	-5.33	46.53

**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	2356.00	61.4 PK	74.0	-12.6	1.00 V	336	29.13	32.27
2	2356.00	50.4 AV	54.0	-3.6	1.00 V	336	18.13	32.27
3	*2437.00	112.8 PK			1.00 V	336	80.29	32.51
4	*2437.00	103.1 AV			1.00 V	336	70.59	32.51
5	2489.00	62.5 PK	74.0	-11.5	1.00 V	336	29.86	32.64
6	2489.00	52.2 AV	54.0	-1.8	1.00 V	336	19.56	32.64
7	4874.00	54.2 PK	74.0	-19.8	1.05 V	115	12.21	41.99
8	4874.00	40.8 AV	54.0	-13.2	1.05 V	115	-1.19	41.99
9	7311.00	52.3 PK	74.0	-21.7	1.00 V	334	5.77	46.53
10	7311.00	42.1 AV	54.0	-11.9	1.00 V	334	-4.43	46.53

**REMARKS:**

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



A D T

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	103.2 PK			1.00 H	215	70.63	32.57
2	*2462.00	94.1 AV			1.00 H	215	61.53	32.57
3	2483.50	58.8 PK	74.0	-15.2	1.00 H	214	26.17	32.63
4	2483.50	48.4 AV	54.0	-5.6	1.00 H	214	15.80	32.63
5	4924.00	51.5 PK	74.0	-22.5	1.01 H	48	9.49	42.01
6	4924.00	38.7 AV	54.0	-15.3	1.01 H	48	-3.31	42.01
7	7386.00	52.8 PK	74.0	-21.2	1.03 H	211	6.07	46.73
8	7386.00	41.4 AV	54.0	-12.6	1.03 H	211	-5.33	46.73

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2462.00	109.7 PK			1.00 V	335	77.13	32.57
2	*2462.00	100.4 AV			1.00 V	335	67.83	32.57
3	2483.50	72.3 PK	74.0	-1.7	1.00 V	335	39.67	32.63
4	2483.50	50.8 AV	54.0	-3.2	1.00 V	335	18.17	32.63
5	4924.00	54.6 PK	74.0	-19.4	1.06 V	116	12.59	42.01
6	4924.00	41.3 AV	54.0	-12.7	1.06 V	116	-0.71	42.01
7	7386.00	51.6 PK	74.0	-22.4	1.02 V	348	4.87	46.73
8	7386.00	41.6 AV	54.0	-12.4	1.02 V	348	-5.13	46.73

**REMARKS:**

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

**802.11n (HT40)**

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.4 PK	74.0	-16.6	1.00 H	213	25.02	32.38
2	2390.00	44.9 AV	54.0	-9.1	1.00 H	213	12.52	32.38
3	*2422.00	93.7 PK			1.00 H	213	61.23	32.47
4	*2422.00	85.9 AV			1.00 H	213	53.43	32.47
5	4844.00	51.5 PK	74.0	-22.5	1.03 H	37	9.54	41.96
6	4844.00	38.7 AV	54.0	-15.3	1.03 H	37	-3.26	41.96
7	7266.00	51.9 PK	74.0	-22.1	1.01 H	214	5.50	46.40
8	7266.00	41.0 AV	54.0	-13.0	1.01 H	214	-5.40	46.40

**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	71.3 PK	74.0	-2.7	1.00 V	336	38.92	32.38
2	2390.00	52.9 AV	54.0	-1.1	1.00 V	336	20.52	32.38
3	*2422.00	102.3 PK			1.00 V	336	69.83	32.47
4	*2422.00	93.6 AV			1.00 V	336	61.13	32.47
5	4844.00	54.2 PK	74.0	-19.8	1.09 V	109	12.24	41.96
6	4844.00	40.5 AV	54.0	-13.5	1.09 V	109	-1.46	41.96
7	7266.00	51.6 PK	74.0	-22.4	1.02 V	345	5.20	46.40
8	7266.00	41.6 AV	54.0	-12.4	1.02 V	345	-4.80	46.40

**REMARKS:**

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



A D T

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.1 PK	74.0	-16.9	1.00 H	202	24.72	32.38
2	2390.00	45.8 AV	54.0	-8.2	1.00 H	202	13.42	32.38
3	*2437.00	96.9 PK			1.00 H	215	64.39	32.51
4	*2437.00	87.8 AV			1.00 H	215	55.29	32.51
5	2483.50	57.8 PK	74.0	-16.2	1.00 H	215	25.17	32.63
6	2483.50	44.5 AV	54.0	-9.5	1.00 H	215	11.87	32.63
7	4874.00	50.9 PK	74.0	-23.1	1.02 H	40	8.91	41.99
8	4874.00	38.2 AV	54.0	-15.8	1.02 H	40	-3.79	41.99
9	7311.00	52.0 PK	74.0	-22.0	1.01 H	218	5.47	46.53
10	7311.00	41.2 AV	54.0	-12.8	1.01 H	218	-5.33	46.53

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	65.8 PK	74.0	-8.2	1.00 V	333	33.42	32.38
2	2390.00	49.1 AV	54.0	-4.9	1.00 V	333	16.72	32.38
3	*2437.00	105.5 PK			1.00 V	333	72.99	32.51
4	*2437.00	95.8 AV			1.00 V	333	63.29	32.51
5	2483.50	70.1 PK	74.0	-3.9	1.00 V	333	37.47	32.63
6	2483.50	52.4 AV	54.0	-1.6	1.00 V	333	19.77	32.63
7	4874.00	54.0 PK	74.0	-20.0	1.10 V	119	12.01	41.99
8	4874.00	40.7 AV	54.0	-13.3	1.10 V	119	-1.29	41.99
9	7311.00	52.2 PK	74.0	-21.8	1.00 V	346	5.67	46.53
10	7311.00	42.1 AV	54.0	-11.9	1.00 V	346	-4.43	46.53

**REMARKS:**

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



A D T

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

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	94.7 PK			1.00 H	213	62.15	32.55
2	*2452.00	85.6 AV			1.00 H	213	53.05	32.55
3	2483.50	59.5 PK	74.0	-14.5	1.00 H	212	26.87	32.63
4	2483.50	48.3 AV	54.0	-5.7	1.00 H	212	15.69	32.63
5	4904.00	51.6 PK	74.0	-22.4	1.03 H	26	9.58	42.02
6	4904.00	38.8 AV	54.0	-15.2	1.03 H	26	-3.22	42.02
7	7356.00	52.1 PK	74.0	-21.9	1.04 H	215	5.45	46.65
8	7356.00	41.3 AV	54.0	-12.7	1.04 H	215	-5.35	46.65

**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	101.1 PK			1.00 V	335	68.55	32.55
2	*2452.00	91.6 AV			1.00 V	335	59.05	32.55
3	2483.50	70.9 PK	74.0	-3.1	1.00 V	335	38.27	32.63
4	2483.50	52.6 AV	54.0	-1.4	1.00 V	335	19.97	32.63
5	4904.00	54.2 PK	74.0	-19.8	1.04 V	122	12.18	42.02
6	4904.00	40.6 AV	54.0	-13.4	1.04 V	122	-1.42	42.02
7	7356.00	51.7 PK	74.0	-22.3	1.03 V	322	5.05	46.65
8	7356.00	41.6 AV	54.0	-12.4	1.03 V	322	-5.05	46.65

**REMARKS:**

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

### 4.3 6dB BANDWIDTH MEASUREMENT

#### 4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

#### 4.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S SPECTRUM ANALYZER	FSP40	100060	May 09, 2012	May 08, 2013

**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. Tested date : Dec. 20, 2012

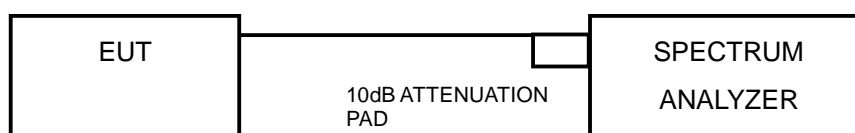
#### 4.3.3 TEST PROCEDURE

1. Set resolution bandwidth (RBW) = approximately 1% of the emission bandwidth
2. Set the video bandwidth (VBW)  $\geq 3 \times$  RBW, Detector = Peak.
3. Trace mode = max hold.
4. Sweep = auto couple.
5. 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

#### 4.3.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.3.5 TEST SETUP



#### 4.3.6 EUT OPERATING CONDITIONS

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





A D T

### 4.3.7 TEST RESULTS

#### 802.11b

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	11.23	0.5	PASS
6	2437	11.23	0.5	PASS
11	2462	11.23	0.5	PASS

#### 802.11g

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS / FAIL
1	2412	16.58	0.5	PASS
6	2437	16.58	0.5	PASS
11	2462	16.57	0.5	PASS

#### 802.11n (HT20)

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
1	2412	17.68	17.69	0.5	PASS
6	2437	17.68	17.65	0.5	PASS
11	2462	17.67	17.66	0.5	PASS

#### 802.11n (HT40)

CHANNEL	FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
3	2422	36.51	36.49	0.5	PASS
6	2437	36.54	36.53	0.5	PASS
9	2452	36.53	36.51	0.5	PASS

## 4.4 OCCUPIED BANDWIDTH MEASUREMENT

### 4.4.1 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP40	100060	May 09, 2012	May 08, 2013

**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. Tested date : Dec. 20, 2012

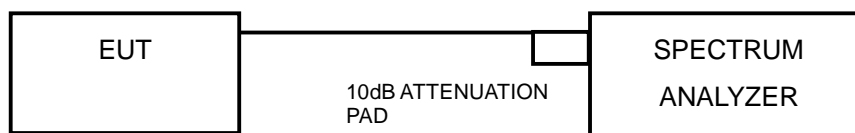
### 4.4.2 TEST PROCEDURE

- 1) Set RBW  $\geq$  1% of the emission bandwidth.
- 2) Set the VBW  $\geq$  3 x RBW.
- 3) Detector = Peak.
- 4) Trace mode = max hold.
- 5) Record the 99% emission bandwidth.

### 4.4.3 DEVIATION FROM TEST STANDARD

No deviation

### 4.4.4 TEST SETUP



### 4.4.5 EUT OPERATING CONDITIONS

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



A D T

#### 4.4.6 TEST RESULTS

##### 802.11b

CHANNEL	FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)
1	2412	13.92
6	2437	13.80
11	2462	13.80

##### 802.11g

CHANNEL	FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)
1	2412	16.80
6	2437	16.80
11	2462	17.16

##### 802.11n (HT20)

CHANNEL	FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)	
		CHAIN 0	CHAIN 1
1	2412	17.52	17.76
6	2437	17.52	17.52
11	2462	17.52	17.52

##### 802.11n (HT40)

CHANNEL	FREQUENCY (MHz)	OCCUPIED BANDWIDTH (MHz)	
		CHAIN 0	CHAIN 1
3	2422	36.40	36.40
6	2437	36.40	36.40
9	2452	36.20	36.40

## 4.5 CONDUCTED OUTPUT POWER MEASUREMENT

### 4.5.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

For systems using digital modulation in the 2400–2483.5 MHz band: 1 Watt (30dBm)

Per KDB 662911 D01 Multiple Transmitter Output v01r02 Method of conducted output power measurement on IEEE 802.11 devices,

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

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

Array Gain = 5 log(NANT/NSS) dB or 3 dB, whichever is less for 20-MHz channel widths with NANT  $\geq$  5.

For power measurements on all other devices: Array Gain = 10 log(NANT/NSS) dB.

### 4.5.2 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Power Meter	ML2495A	0824006	May 10, 2012	May 09, 2013
Power Sensor	MA2411B	0738172	May 10, 2012	May 09, 2013

**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. Tested date : Dec. 20, 2012

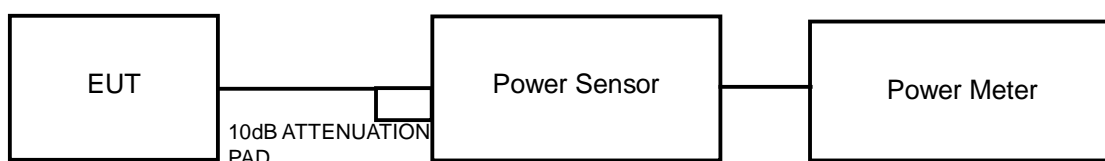
### 4.5.3 TEST PROCEDURES

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

### 4.5.4 DEVIATION FROM TEST STANDARD

No deviation

### 4.5.5 TEST SETUP



#### 4.5.6 EUT OPERATING CONDITIONS

Same as Item 4.3.6



A D T

## 4.5.7 TEST RESULTS

### FOR PEAK POWER

#### 802.11b

CHANNEL	FREQUENCY (MHz)	PEAK POWER (mW)	PEAK POWER (dBm)	LIMIT (dBm)	PASS/FAIL
1	2412	61.660	17.90	30	PASS
6	2437	75.858	18.80	30	PASS
11	2462	81.283	19.10	30	PASS

#### 802.11g

CHANNEL	FREQUENCY (MHz)	PEAK POWER (mW)	PEAK POWER (dBm)	LIMIT (dBm)	PASS/FAIL
1	2412	301.995	24.80	30	PASS
6	2437	323.594	25.10	30	PASS
11	2462	309.030	24.90	30	PASS

#### 802.11n (HT20)

CHAN.	FREQUENCY (MHz)	PEAK POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
1	2412	21.50	22.40	315.034	24.98	30	PASS
6	2437	22.10	22.30	332.005	25.21	30	PASS
11	2462	20.10	19.20	185.505	22.68	30	PASS

#### 802.11n (HT40)

CHAN.	FREQUENCY (MHz)	PEAK POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
3	2422	17.10	17.80	111.542	20.47	30	PASS
6	2437	18.70	19.20	157.307	21.97	30	PASS
9	2452	14.20	13.80	50.291	17.01	30	PASS



A D T

**FOR AVERAGE POWER**

**802.11b**

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)
1	2412	34.674	15.40
6	2437	42.658	16.30
11	2462	45.709	16.60

**802.11g**

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (mW)	AVERAGE POWER (dBm)
1	2412	60.256	17.80
6	2437	61.660	17.90
11	2462	61.660	17.90

**802.11n (HT20)**

CHAN.	FREQUENCY (MHz)	AVG. POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		CHAIN 0	CHAIN 1		
1	2412	14.40	14.50	55.726	17.46
6	2437	14.90	15.10	63.262	18.01
11	2462	12.30	11.70	31.773	15.02

**802.11n (HT40)**

CHAN.	FREQUENCY (MHz)	AVG. POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		CHAIN 0	CHAIN 1		
3	2422	8.80	9.60	16.706	12.23
6	2437	10.80	11.30	25.513	14.07
9	2452	6.40	6.10	8.439	9.26

## 4.6 POWER SPECTRAL DENSITY MEASUREMENT

### 4.6.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

### 4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP40	100060	May 09, 2012	May 08, 2013

**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. Tested date : Dec. 20, 2012

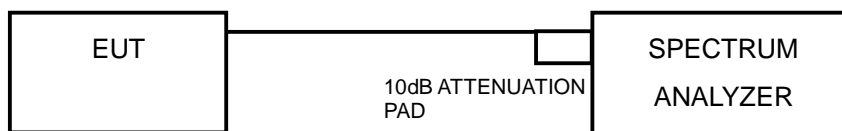
### 4.6.3 TEST PROCEDURE

1. Set the RBW = 3 kHz, VBW =10 kHz, Detector = peak.
2. Sweep time = auto couple, Trace mode = max hold, allow trace to fully stabilize.
3. Use the peak marker function to determine the maximum amplitude level.

### 4.6.4 DEVIATION FROM TEST STANDARD

No deviation

### 4.6.5 TEST SETUP



### 4.6.6 EUT OPERATING CONDITION

Same as Item 4.3.6





A D T

## 4.6.7 TEST RESULTS

### 802.11b

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
1	2412	-9.72	8	PASS
6	2437	-9.13	8	PASS
11	2462	-8.89	8	PASS

### 802.11g

Channel	FREQ. (MHz)	PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
1	2412	-11.13	8	PASS
6	2437	-12.17	8	PASS
11	2462	-11.00	8	PASS

### 802.11n (HT20)

TX chain	Channel	FREQ. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	1	2412	-13.67	3.01	-10.66	8.00	PASS
	6	2437	-13.20	3.01	-10.19	8.00	PASS
	11	2462	-16.86	3.01	-13.85	8.00	PASS
1	1	2412	-13.83	3.01	-10.82	8.00	PASS
	6	2437	-14.16	3.01	-11.15	8.00	PASS
	11	2462	-17.04	3.01	-14.03	8.00	PASS

**NOTE:** Directional gain = 2.5dBi + 10log(2) = 5.51dBi < 6dBi , so the power density limit shall not be reduced.

### 802.11n (HT40)

TX chain	Channel	FREQ. (MHz)	PSD (dBm/3kHz)	10 log (N=2) dB	Total PSD (dBm/3kHz)	Limit (dBm/3kHz)	PASS /FAIL
0	3	2422	-20.10	3.01	-17.09	8.00	PASS
	6	2437	-17.54	3.01	-14.53	8.00	PASS
	9	2452	-22.48	3.01	-19.47	8.00	PASS
1	3	2422	-22.25	3.01	-19.24	8.00	PASS
	6	2437	-19.38	3.01	-16.37	8.00	PASS
	9	2452	-24.58	3.01	-21.57	8.00	PASS

**NOTE:** Directional gain = 2.5dBi + 10log(2) = 5.51dBi < 6dBi , so the power density limit shall not be reduced.



A D T

## 4.7 CONDUCTED OUT-BAND EMISSION MEASUREMENT

### 4.7.1 LIMITS OF CONDUCTED OUT-BAND EMISSION MEASUREMENT

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

### 4.7.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP40	100060	May 09, 2012	May 08, 2013

**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. Tested date : Dec. 20, 2012

### 4.7.3 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.

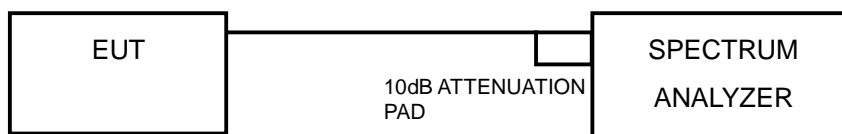
## MEASUREMENT PROCEDURE OOB

1. Set RBW = 100 kHz.
2. Set VBW  $\geq$  300 kHz.
3. Set span to encompass the spectrum to be examined
4. Detector = peak.
5. Trace Mode = max hold.
6. Sweep = auto couple.

### 4.7.4 DEVIATION FROM TEST STANDARD

No deviation

### 4.7.5 TEST SETUP



### 4.7.6 EUT OPERATING CONDITION

Same as Item 4.3.6

### 4.7.7 TEST RESULTS

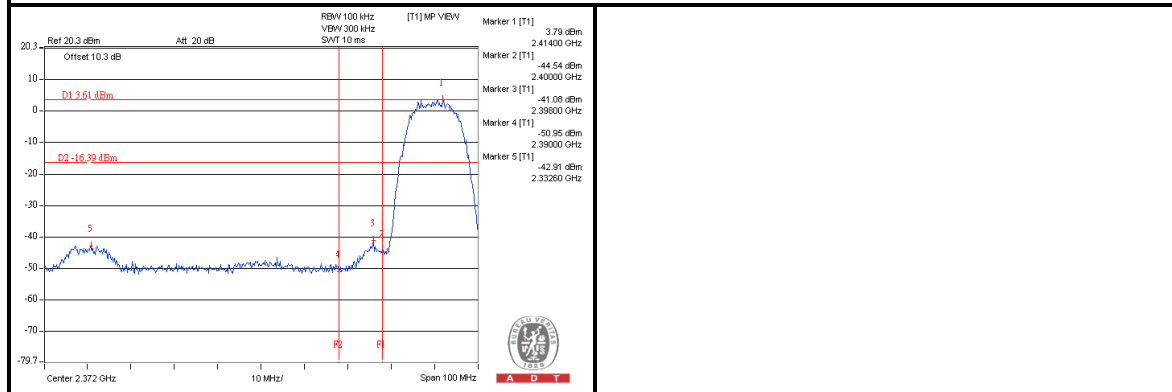
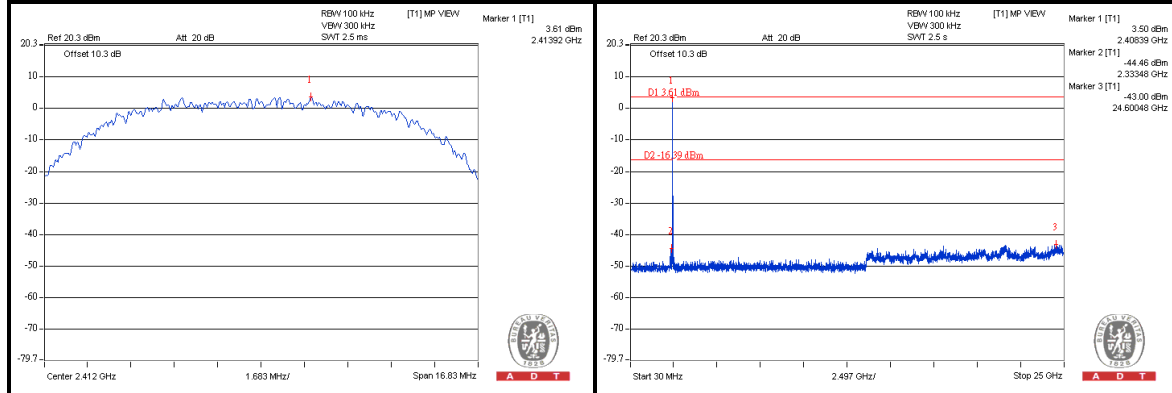
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.



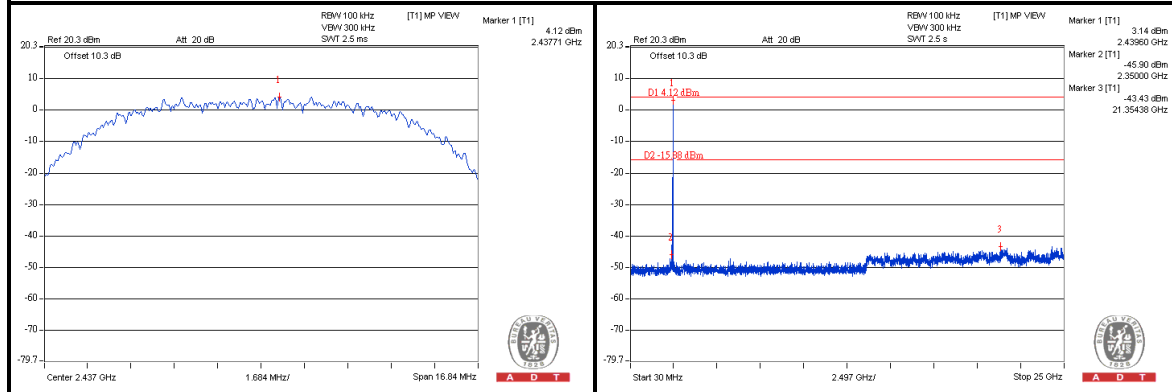
A D T

### 802.11b

#### CH 1



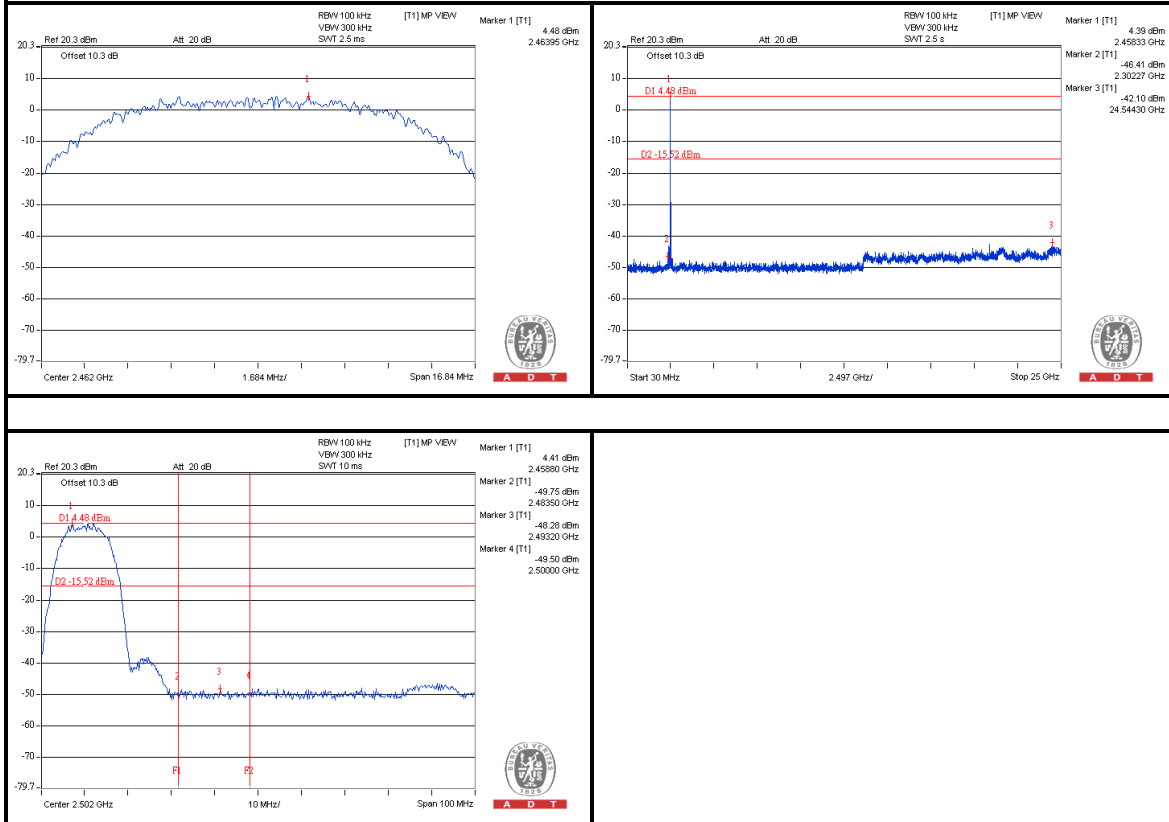
#### CH 6





A D T

### CH 11

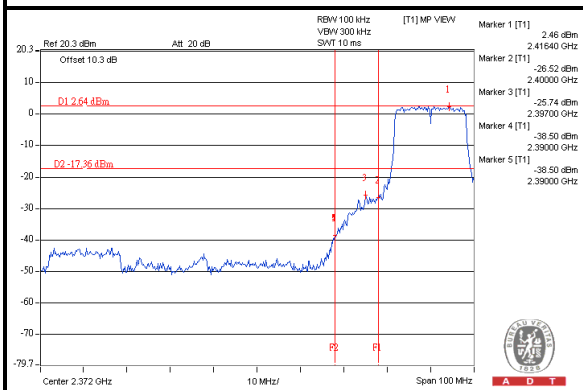
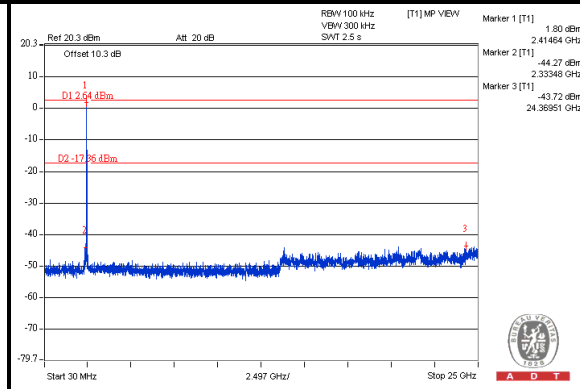
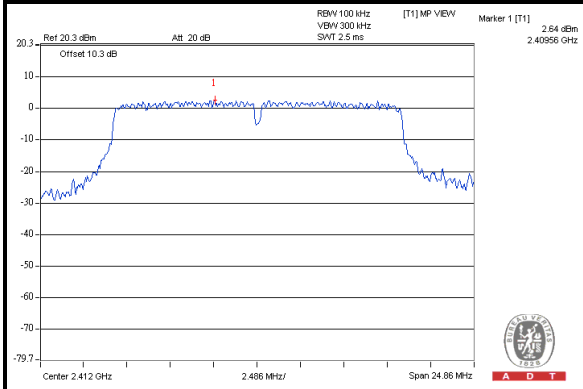




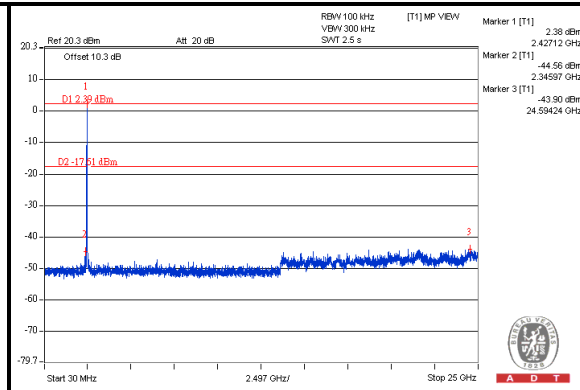
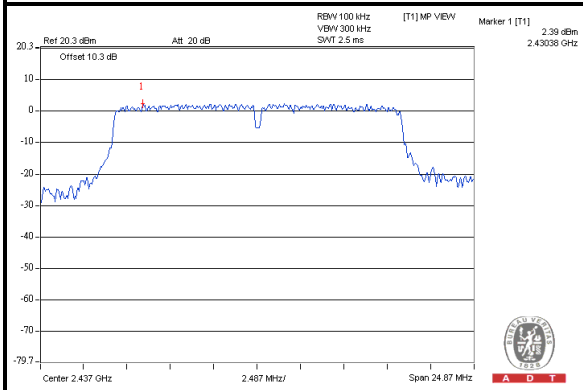
A D T

### 802.11g

#### CH 1



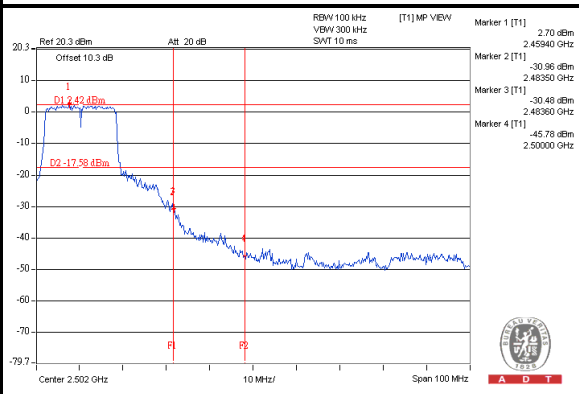
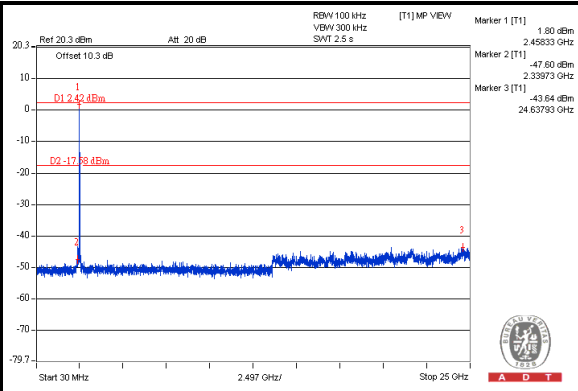
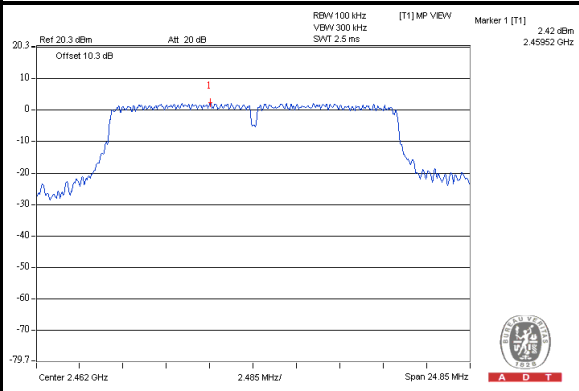
#### CH 6





A D T

### CH 11



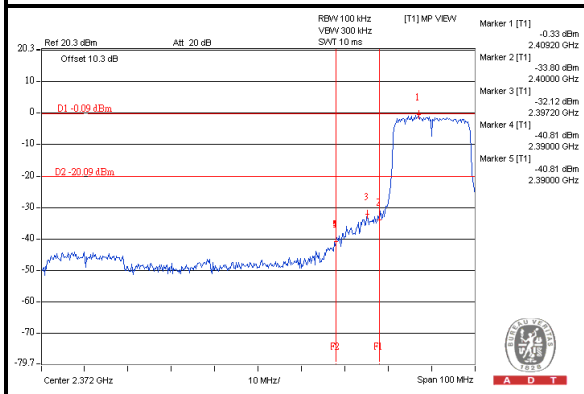
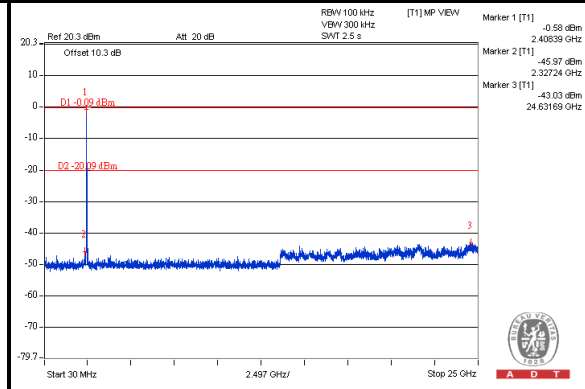
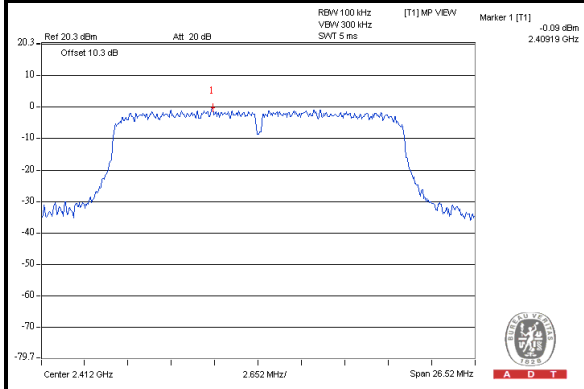


A D T

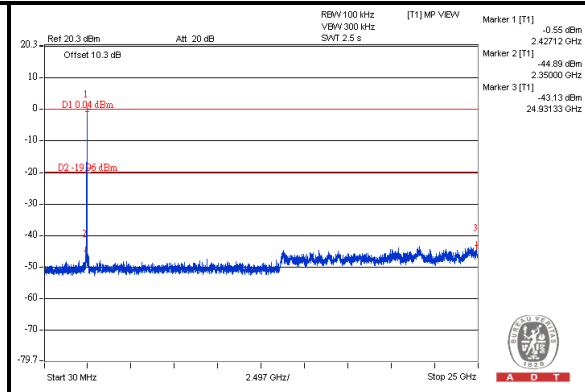
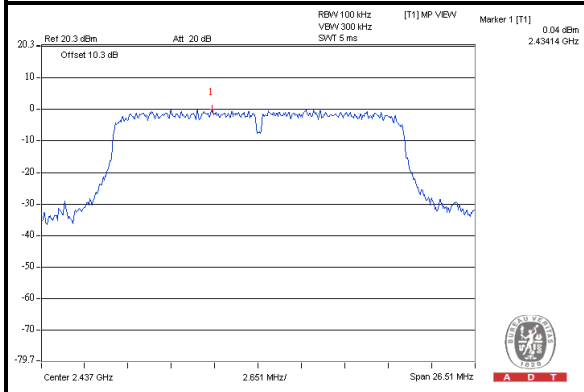
### 802.11n (HT20)

#### Chain (0)

#### CH 1



#### CH 6

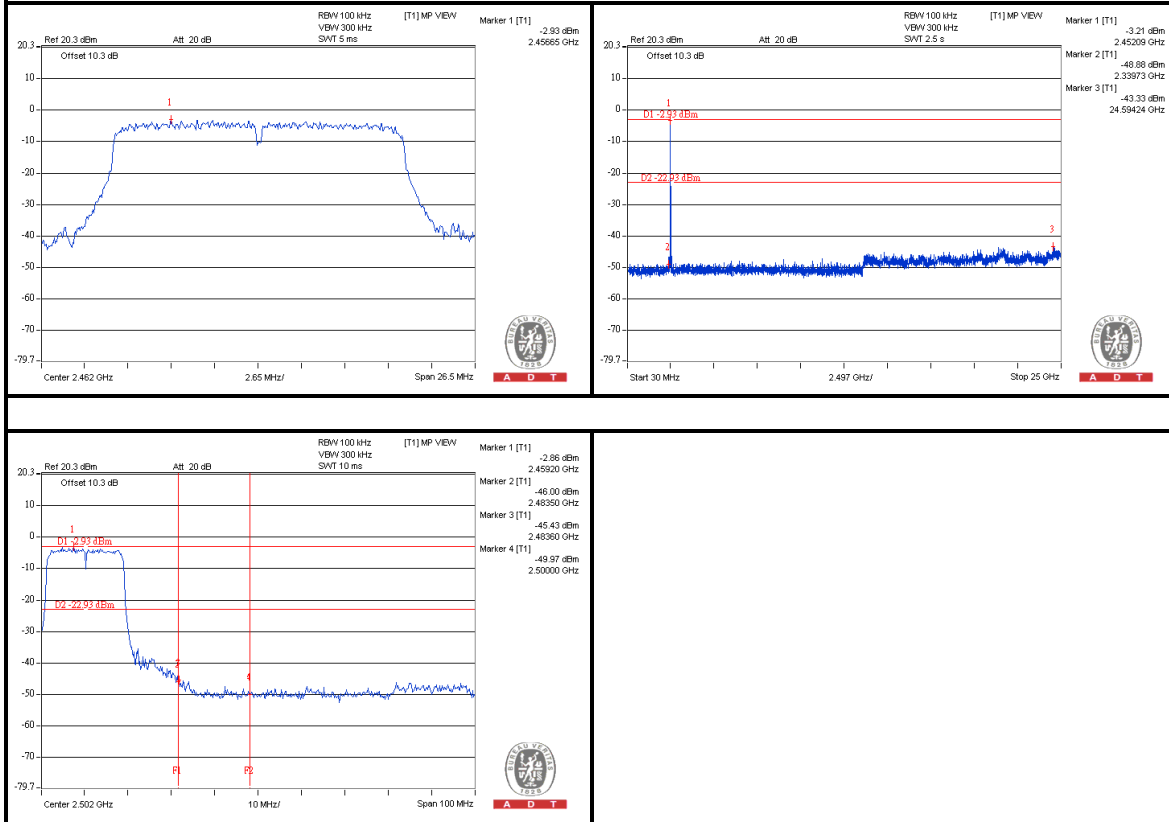






A D T

### CH 11



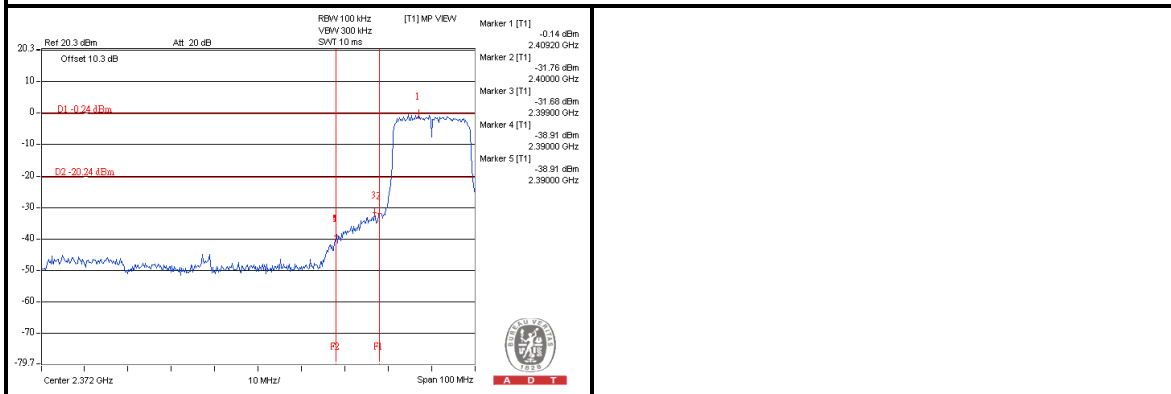
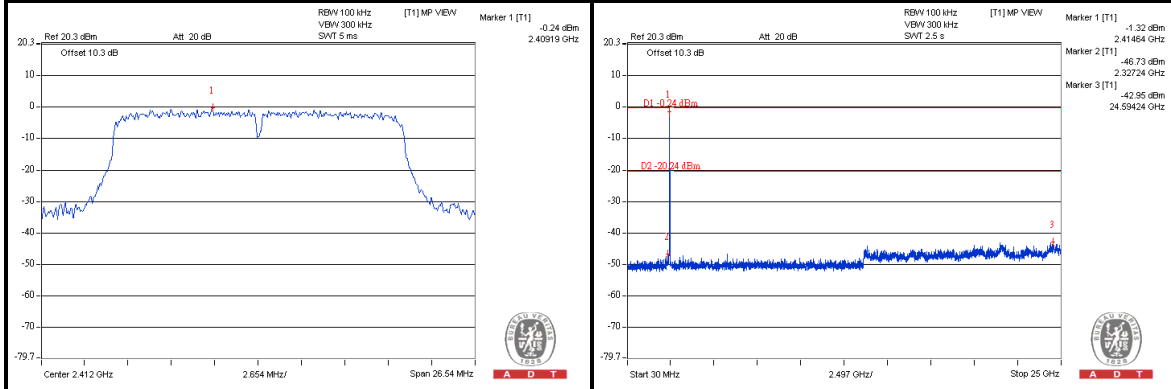


A D T

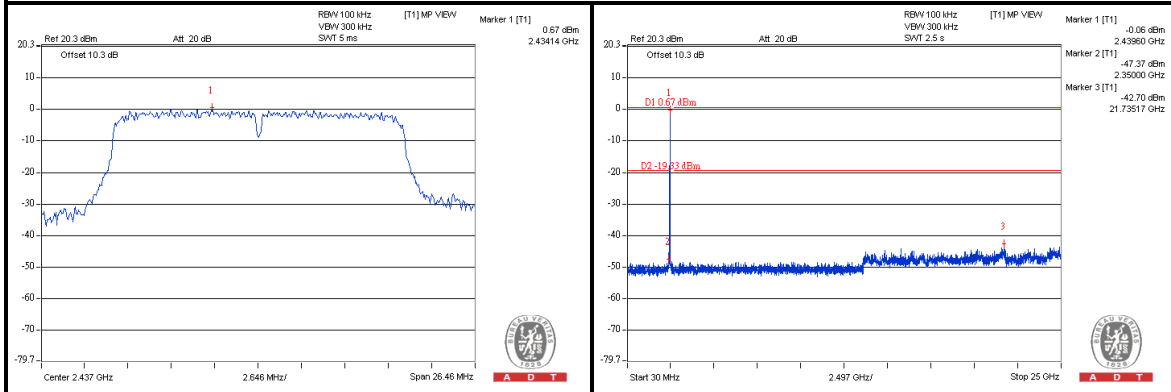
### 802.11n (HT20)

#### Chain (1)

#### CH 1



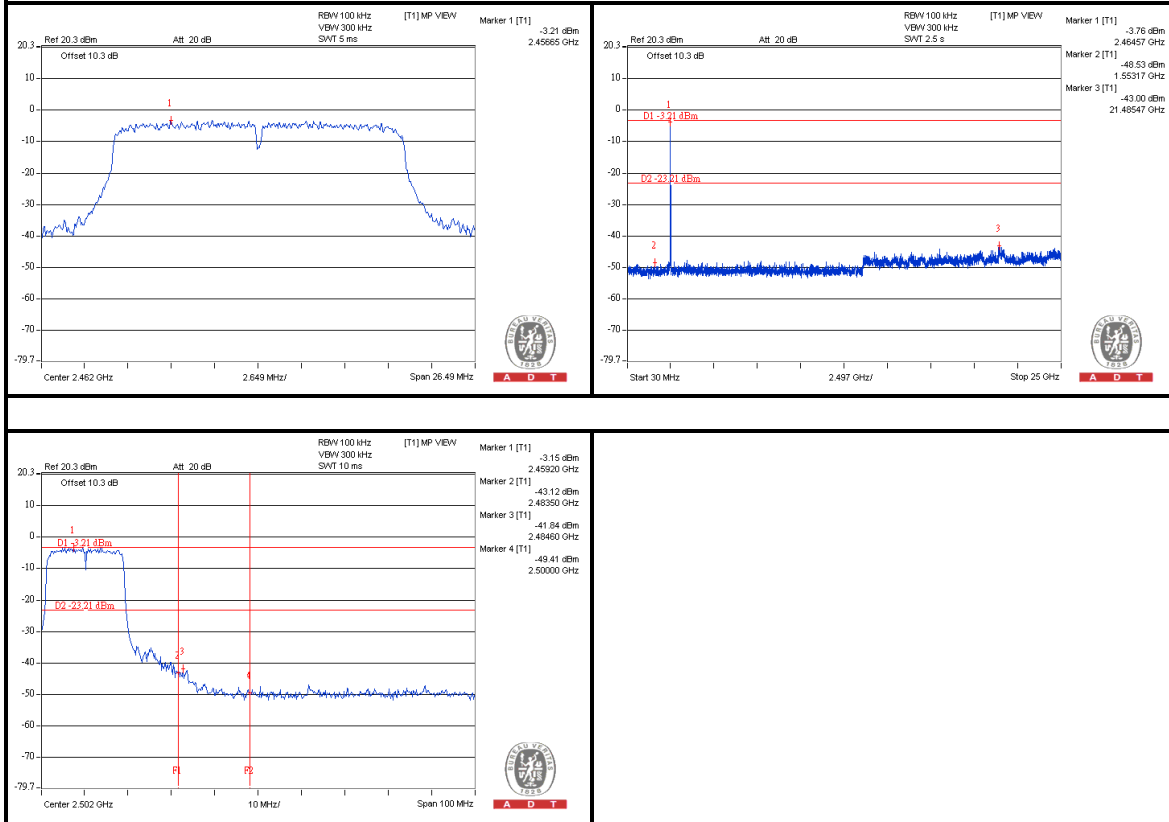
#### CH 6





A D T

### CH 11



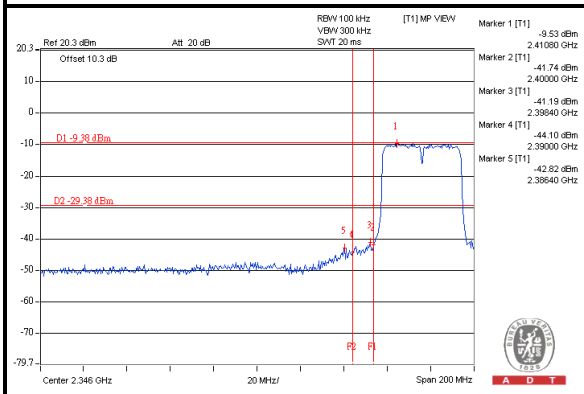
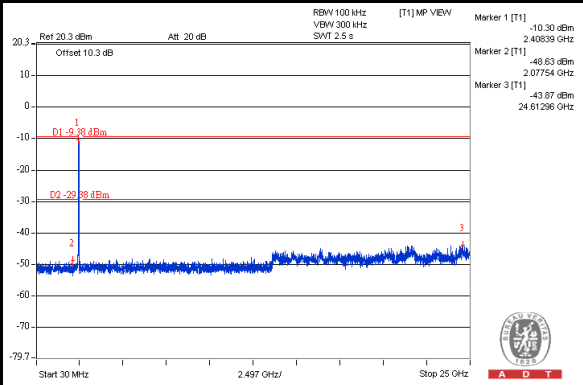
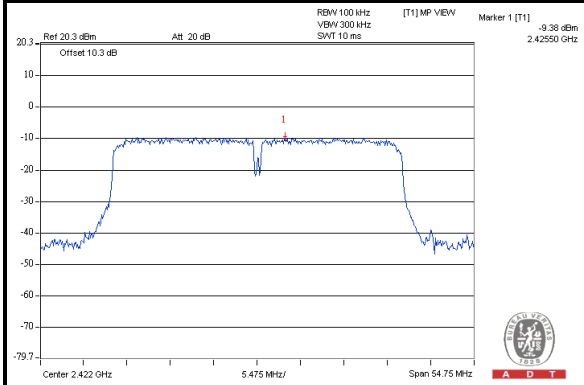


A D T

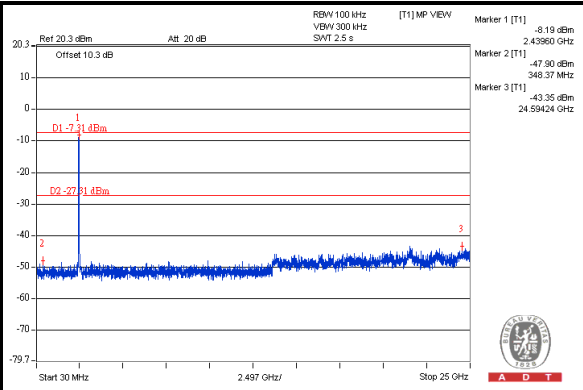
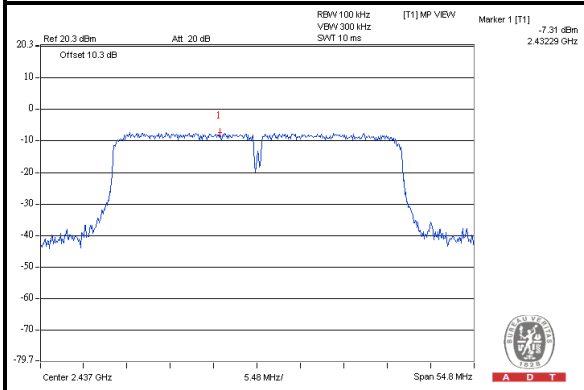
### 802.11n (HT40)

#### Chain (0)

#### CH 3



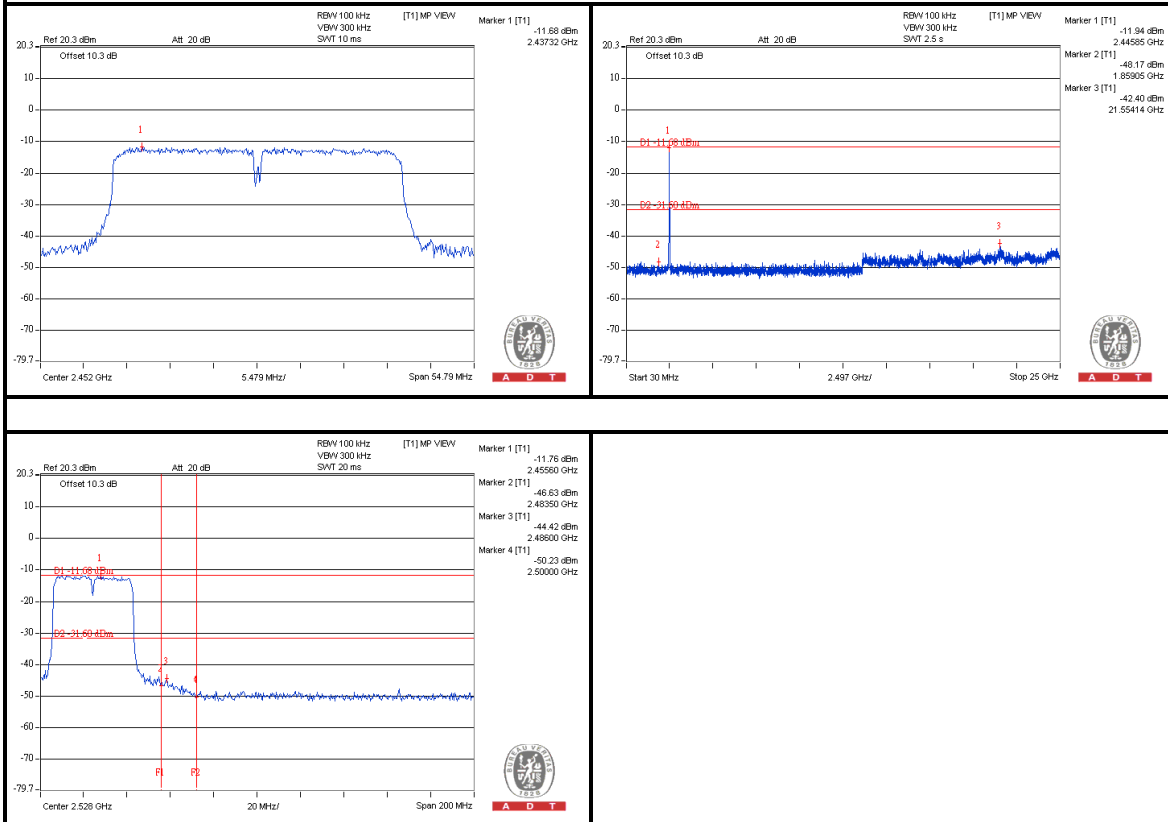
#### CH 6





A D T

### CH 9



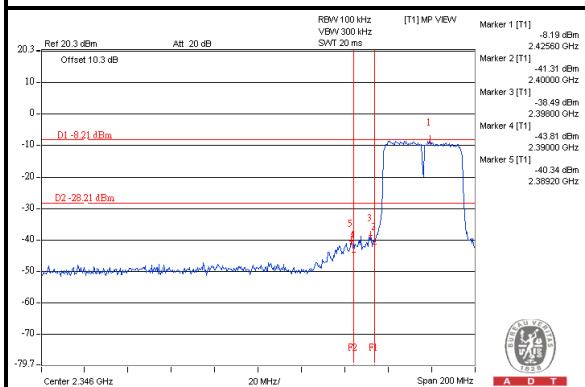
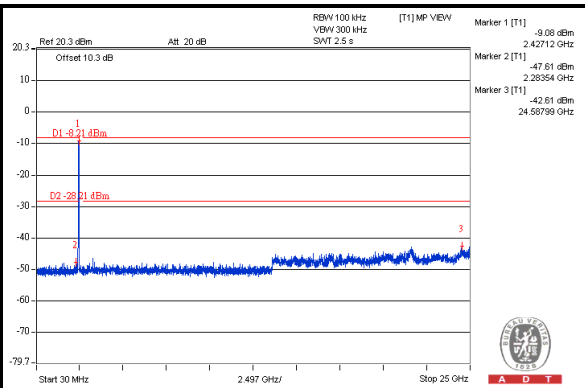
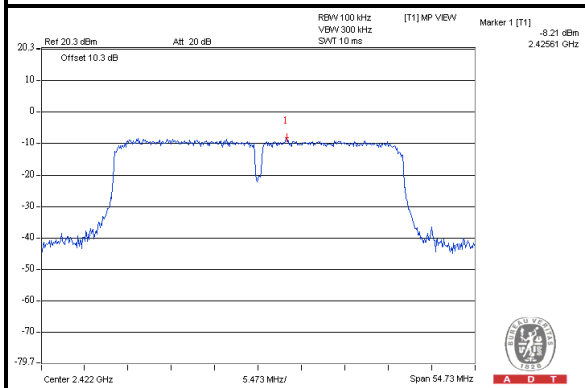


A D T

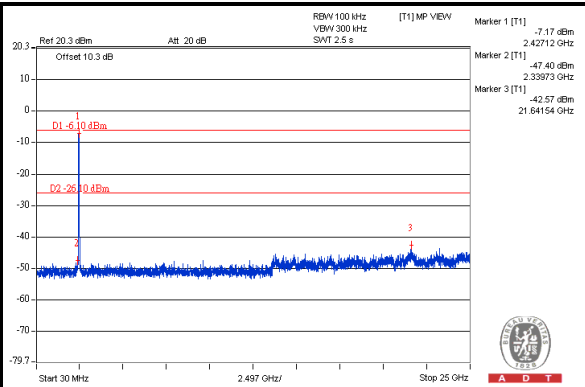
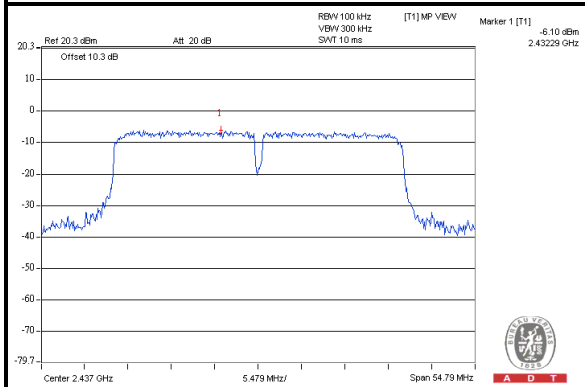
### 802.11n (HT40)

#### Chain (1)

#### CH 3



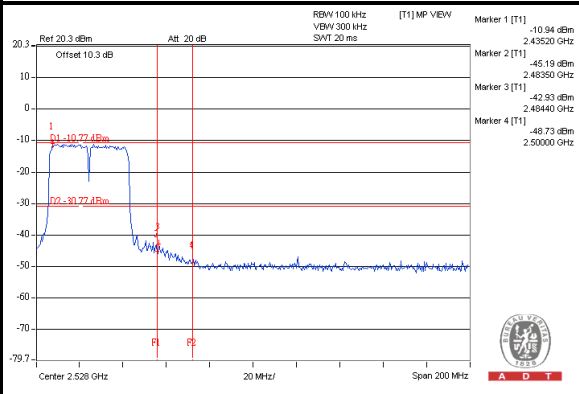
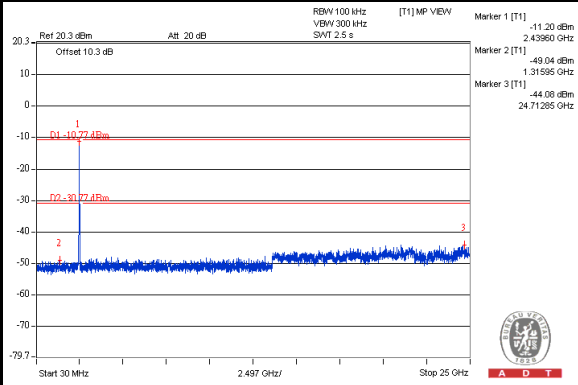
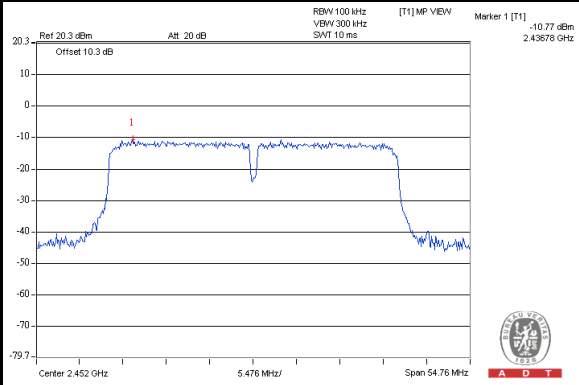
#### CH 6





A D T

### CH 9





A D T

## 5. PHOTOGRAPHS OF THE TEST CONFIGURATION

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





## 6. INFORMATION ON THE TESTING LABORATORIES

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

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

**Linko EMC/RF Lab:**

Tel: 886-2-26052180

Fax: 886-2-26052943

**Hsin Chu EMC/RF Lab:**

Tel: 886-3-5935343

Fax: 886-3-5935342

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

Tel: 886-3-3183232

Fax: 886-3-3270892

**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.



A D T

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

No modifications were made to the EUT by the lab during the test.

**--- END ---**