



# FCC TEST REPORT

**REPORT NO.:** RF130904E04

**MODEL NO.:** DIR-619L

**FCC ID:** KA2IR619LB1

**RECEIVED:** Sep. 04, 2013

**TESTED:** Sep. 11 to Nov. 08, 2013

**ISSUED:** Nov. 21, 2013

**APPLICANT:** D-Link Corporation

**ADDRESS:** No.289, Sinhu 3rd Rd., Neihu District, Taipei  
City 114, Taiwan, R.O.C.

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

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## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF130904E04	Original release	Nov. 21, 2013



## 1. CERTIFICATION

**PRODUCT:** Wireless N 300 Cloud Router  
**BRAND NAME:** D-Link  
**MODEL NO.:** DIR-619L  
**TEST SAMPLE:** ENGINEERING SAMPLE  
**APPLICANT:** D-Link Corporation  
**TESTED:** Sep. 11 to Nov. 08, 2013  
**STANDARDS:** **FCC Part 15, Subpart C (Section 15.247)**  
ANSI C63.10-2009

The above equipment (Model: DIR-619L) 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:** Nov. 21, 2013  
( Elsie Hsu, Specialist )

**APPROVED BY** :  , **DATE:** Nov. 21, 2013  
( May Chen, Manager )



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## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247)			
STANDARD SECTION	TEST TYPE	RESULT	REMARK
15.207	AC Power Conducted Emission	PASS	Meet the requirement of limit. Minimum passing margin is -6.30dB at 0.466411MHz
15.247(d) 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -0.2 dB at 2390.00MHz & 2483.50 MHz
15.247(d)	Band Edge Measurement	PASS	Meet the requirement of limit.
15.247(a)(2)	6dB bandwidth	PASS	Meet the requirement of limit.
15.247(b)	Conducted output power	PASS	Meet the requirement of limit.
15.247(e)	Power Spectral Density	PASS	Meet the requirement of limit.
15.203	Antenna Requirement	PASS	No antenna connector is used.



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## 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)	5.63 dB
Radiated emissions (1GHz -6GHz)	3.73 dB
Radiated emissions (6GHz -18GHz)	3.90 dB
Radiated emissions (18GHz -40GHz)	4.11 dB



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### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>PRODUCT</b>	Wireless N 300 Cloud Router
<b>MODEL NO.</b>	DIR-619L
<b>POWER SUPPLY</b>	DC 12V 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 802.11a/g: 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: 248.927mW 802.11g: 537.348mW 802.11n (HT20): 575.870mW 802.11n (HT40): 216.062mW
<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 x1



**NOTE:**

- The EUT must be supplied with a power adapter and following two different model names could be chosen:

No	Brand	Model No.	Spec.
1	D-LINK	AMS9-1201000FU2	Input: 100-240V, 0.5A, 50/60Hz Output: 12V, 1A DC power cable: 1.3m, unshielded
2	D-LINK	F12W3-120100SPAU	Input: 100-240V, 0.3A, 50/60Hz Output: 12V, 1A DC power cable: 1.3m, unshielded

**NOTE:**

- For radiated emissions test, the EUT was pre-tested with above adapters 1 & 2, the worst case was found in adapter 2. Therefore only the test data of the adapter was recorded in this report.

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

Chain	Brand Name	Model Name	Net Gain (dBi)	Antenna Gain(dBi) excluding cable loss	Antenna Type	Cable Loss(dB)	Cable Length	Connect or Type	Frequency range (GHz to GHz)
Chain (0)	WHA YU	C037-511292-A(SRF2 013019)(X2)	3.5	4.5	Dipole	1	225	NA	2.4~2.5
Chain (1)	WHA YU	C037-511291-A(SRF2 013018)(X2)	4	4.5	Dipole	0.5	80	NA	2.4~2.5
Chain (2)	WHA YU	C037-511291-A(SRF2 013018)(X2)	4	4.5	Dipole	0.5	80	NA	2.4~2.5

**NOTE:**

- From the above antennas, Chain (0) + Chain (1) or Chain (0) + Chain (2) combination modes could be chosen.
- From above antennas, the worst case was found in Chain (0) + Chain (1). Therefore only the test data of the mode was recorded in this report.

- The EUT incorporates a MIMO function without beam forming.

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

- When the EUT operating in 802.11n, the software operation, which is defined by manufacturer, MCS (Modulation and Coding Schemes) from 0 to 15.
- 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.



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### 3.2 DESCRIPTION OF TEST MODES

11 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		

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
	PLC	RE < 1G	RE ≥ 1G	APCM	OB	
MODE 1	√	√	√	√	√	With Adapter 2
MODE 2	√	-	-	-	-	With Adapter 1

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:** 1. "-" means no effect.  
2. The EUT had been pre-tested on the positioned of each 2 axis. The worst case was found when positioned on Y-Z-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)
802.11g	1 to 11	6	OFDM	BPSK	6

#### **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)
802.11g	1 to 11	6	OFDM	BPSK	6



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**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



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**TEST CONDITION:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
PLC	27deg. C, 53%RH	120Vac, 60Hz	Eagle Chen
RE<1G	23deg. C, 68%RH	120Vac, 60Hz	Tim Ho
RE <sup>3</sup> 1G	26deg. C, 70%RH	120Vac, 60Hz	Tim Ho
APCM	25deg. C, 60%RH	120Vac, 60Hz	Chilin Lee
OB	25deg. C, 60%RH	120Vac, 60Hz	Chilin Lee

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

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

**FCC Part 15, Subpart C (15.247)**

**558074 D01 DTS Meas Guidance v03r01**

**662911 D01 Multiple Transmitter Output v01 r02**

**ANSI C63.10-2009**

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

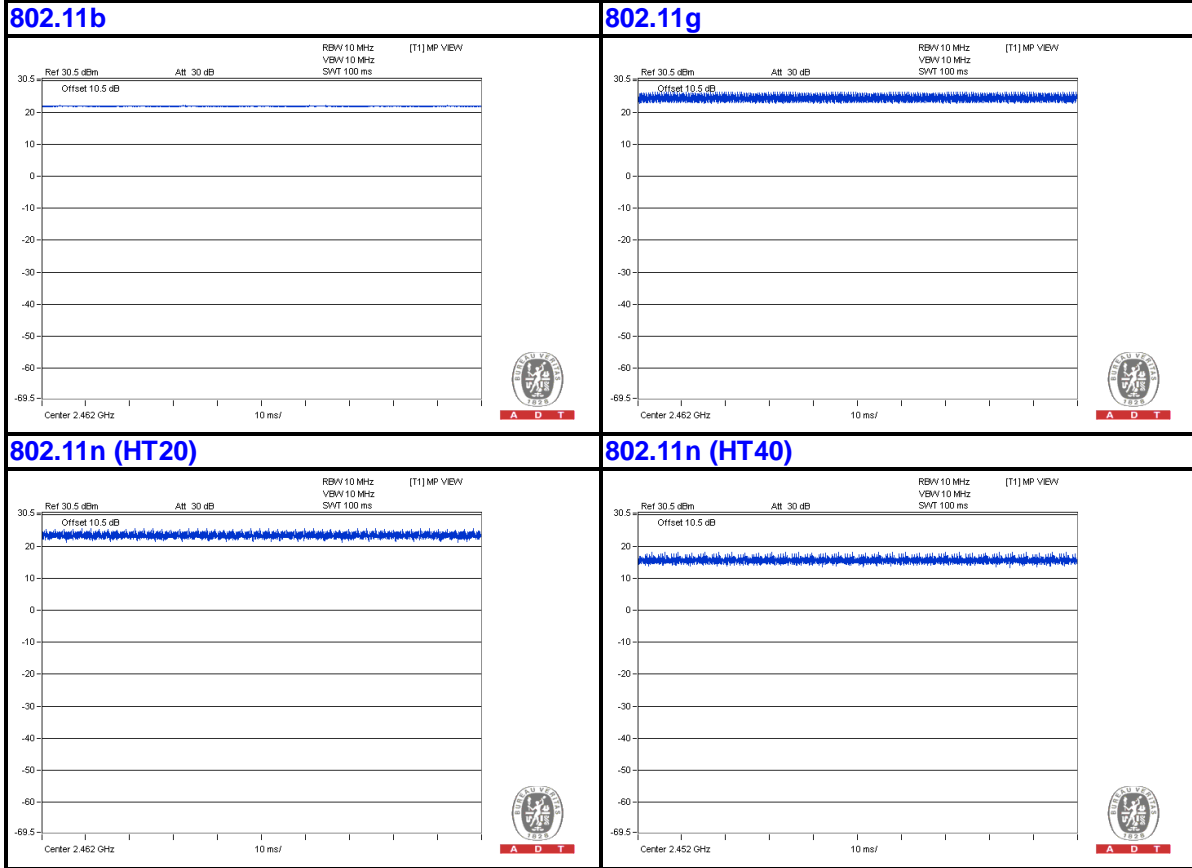
**Note:** The EUT has been verified to comply with the requirements of FCC Part 15, Subpart B, Class B (DoC). The test report has been issued separately.



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### 3.4 DUTY CYCLE OF TEST SIGNAL

Duty cycle of test signal is 100 %, duty factor is not required.





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### 3.5 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.

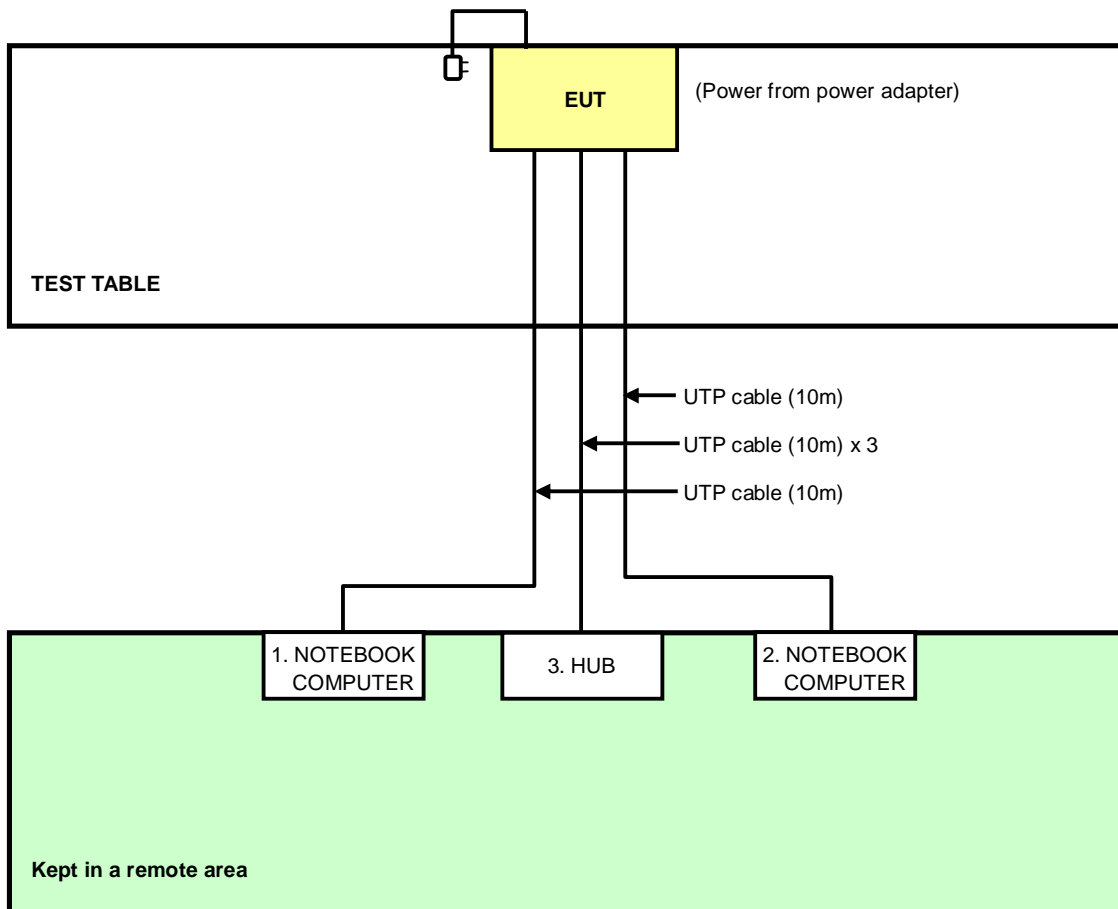
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP32LA	GSLB32S	FCC DoC
2	NOTEBOOK COMPUTER	DELL	PP32LA	FSLB32S	FCC DoC
3	HUB	ZyXEL	ES-116P	S060H02000215	FCC DoC

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

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



### 3.6 CONFIGURATION OF SYSTEM UNDER TEST



## 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	66 to 56	56 to 46
0.5-5	56	46
5-30	60	50

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

#### 4.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESCS 30	100287	Feb. 28, 2013	Feb. 27, 2014
Line-Impedance Stabilization Network (for EUT) ROHDE & SCHWARZ	NSLK-8127	5127-523	Oct. 02, 2013	Oct. 01, 2014
Line-Impedance Stabilization Network (for Peripheral) ROHDE & SCHWARZ	ENV216	100071	Nov. 09, 2012	Nov. 08, 2013
RF Cable (JYEBAO)	5DFB	COACAB-001	May 27, 2013	May 26, 2014
50 ohms Terminator	50	3	Oct. 23, 2012	Oct. 22, 2013
50 ohms Terminator	N/A	EMC-04	Oct. 16, 2012	Oct. 15, 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. A.
3. The VCCI Con A Registration No. is C-817.
4. Tested Date: Sep. 14, 2013

#### 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) were not recorded.

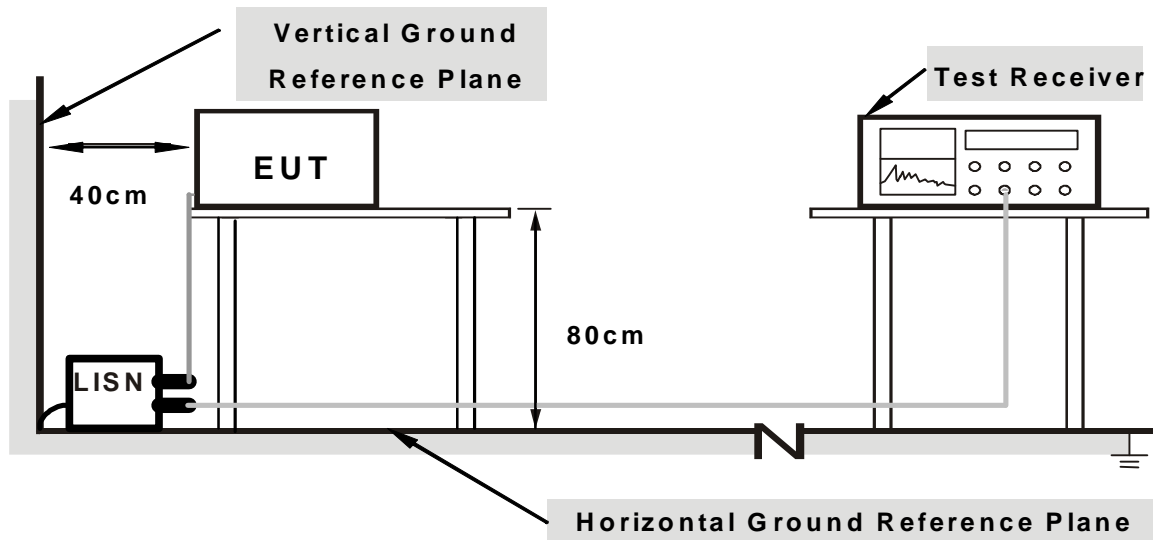
**NOTE:**

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.

#### 4.1.6 EUT OPERATING CONDITIONS

1. Connect the EUT with the support unit 1 (Notebook Computer) which is placed on a remote area.
2. The communication partner run test program “RTL819x 2.3 – 13/07/04” to enable EUT under transmission/receiving condition continuously at specific channel frequency.

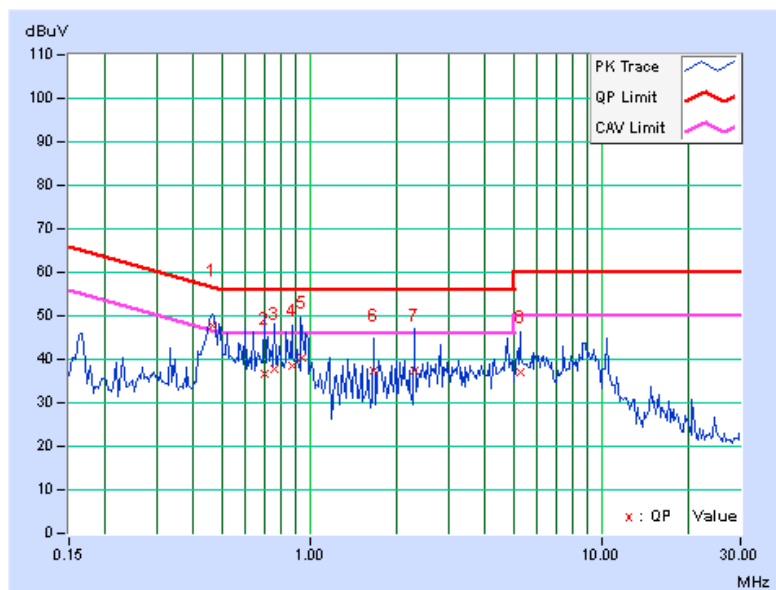
### 4.1.7 TEST RESULTS (MODE 1)

<b>PHASE</b>	Line (L)	<b>DETECTOR FUNCTION</b>	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	0.46641	9.80	37.81	30.48	47.61	40.28	56.58
2	0.70469	9.81	26.97	15.53	36.78	25.34	56.00	46.00	-19.22	-20.66
3	0.75547	9.81	27.84	18.75	37.65	28.56	56.00	46.00	-18.35	-17.44
4	0.86875	9.82	28.53	17.88	38.35	27.70	56.00	46.00	-17.65	-18.30
5	0.94416	9.82	30.51	18.32	40.33	28.14	56.00	46.00	-15.67	-17.86
6	1.65625	9.84	27.59	16.41	37.43	26.25	56.00	46.00	-18.57	-19.75
7	2.29297	9.86	27.62	17.37	37.48	27.23	56.00	46.00	-18.52	-18.77
8	5.28125	9.93	27.00	18.79	36.93	28.72	60.00	50.00	-23.07	-21.28

#### 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

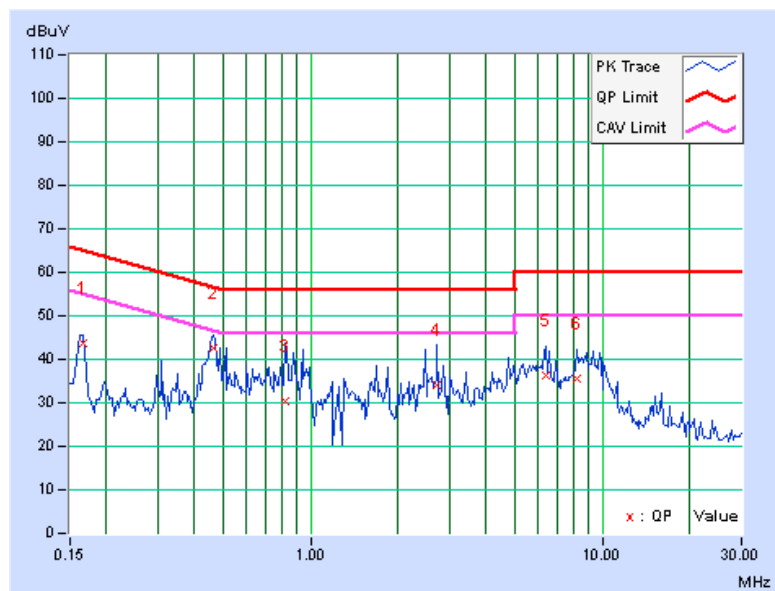


<b>PHASE</b>	Neutral (N)	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
	1	0.16562	9.75	34.08	33.46	43.83	43.21	65.18	55.18	-21.35
2	0.46641	9.80	32.82	27.20	42.62	37.00	56.58	46.58	-13.96	-9.58
3	0.82188	9.81	20.47	13.82	30.28	23.63	56.00	46.00	-25.72	-22.37
4	2.69531	9.87	24.02	14.84	33.89	24.71	56.00	46.00	-22.11	-21.29
5	6.44531	9.97	26.18	15.62	36.15	25.59	60.00	50.00	-23.85	-24.41
6	8.21484	10.02	25.71	15.23	35.73	25.25	60.00	50.00	-24.27	-24.75

**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



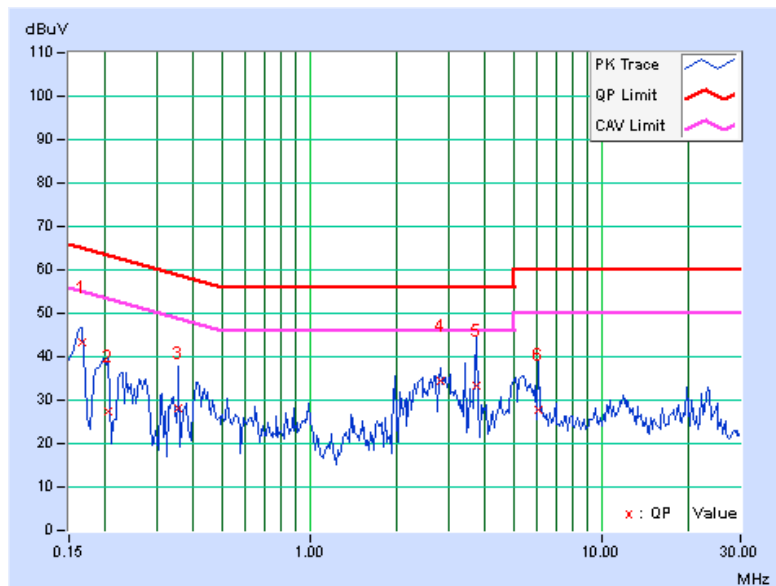
### 4.1.8 TEST RESULTS (MODE 2)

<b>PHASE</b>	Line (L)	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value		Emission Level		Limit		Margin	
			[dB (uV)]		[dB (uV)]		[dB (uV)]		(dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.16562	9.75	33.49	32.73	43.24	42.48	65.18	55.18	-21.93	-12.69
2	0.20469	9.76	17.75	4.67	27.51	14.43	63.42	53.42	-35.91	-38.99
3	0.35703	9.79	18.26	2.20	28.05	11.99	58.80	48.80	-30.75	-36.81
4	2.81641	9.87	24.41	13.02	34.28	22.89	56.00	46.00	-21.72	-23.11
5	3.72266	9.89	23.50	7.74	33.39	17.63	56.00	46.00	-22.61	-28.37
6	6.08984	9.95	17.80	4.15	27.75	14.10	60.00	50.00	-32.25	-35.90

**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

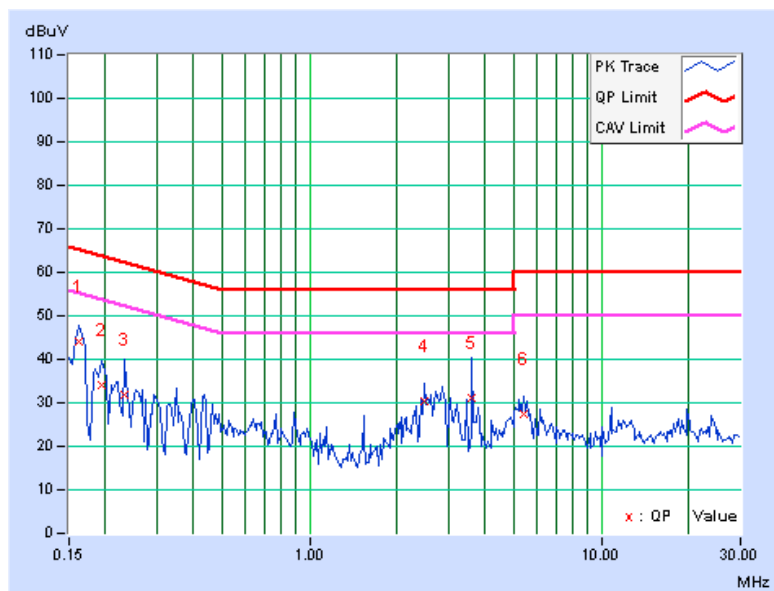


<b>PHASE</b>	Neutral (N)	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
	1	0.16172	9.75	34.43	33.68	44.18	43.43	65.38	55.38	-21.20
2	0.19297	9.75	24.19	16.79	33.94	26.54	63.91	53.91	-29.97	-27.37
3	0.23203	9.76	22.27	9.71	32.03	19.47	62.38	52.38	-30.35	-32.91
4	2.46875	9.86	20.43	8.10	30.29	17.96	56.00	46.00	-25.71	-28.04
5	3.60938	9.90	21.24	2.54	31.14	12.44	56.00	46.00	-24.86	-33.56
6	5.39063	9.94	17.29	5.18	27.23	15.12	60.00	50.00	-32.77	-34.88

**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







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## 4.2 RADIATED EMISSION AND BANDEGE MEASUREMENT

### 4.2.1 LIMITS OF RADIATED EMISSION AND BANDEGE 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 20dB.



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#### 4.2.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY51210105	Jan. 29,2013	Jan. 28,2014
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-03	Nov. 14, 2012	Nov. 13, 2013
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Mar. 19, 2013	Mar. 18, 2014
RF Cable	NA	CHGCAB_001	Oct. 06, 2012	Oct. 05, 2013
Horn_Antenna AISI	AIH.8018	0000320091110	Nov. 19, 2012	Nov. 18, 2013
Pre-Amplifier Agilent	8449B	3008A02578	June 25, 2013	June 24, 2014
RF Cable	NA	RF104-201 RF104-203 RF104-204	Dec. 25, 2012	Dec. 24, 2013
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 28, 2013	Aug. 27, 2014
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Nov. 14, 2012	Nov. 13, 2013
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 12, 2012	Oct. 11, 2013
Software	ADT_Radiated _V8.7.07	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: Sep. 11 to 28, 2013

#### 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 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:**

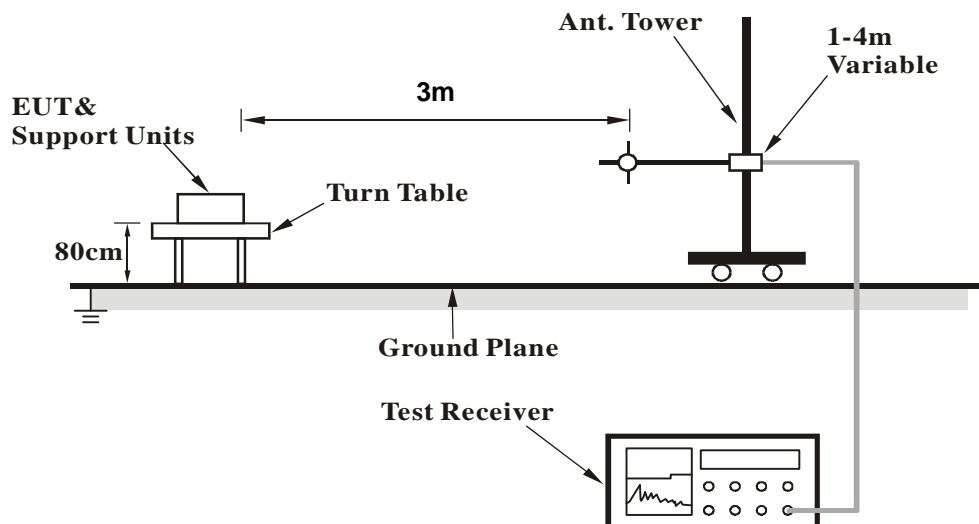
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is  $\geq 1/T$  (Duty cycle < 98%) or 10Hz (Duty cycle  $\geq 98\%$ ) 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

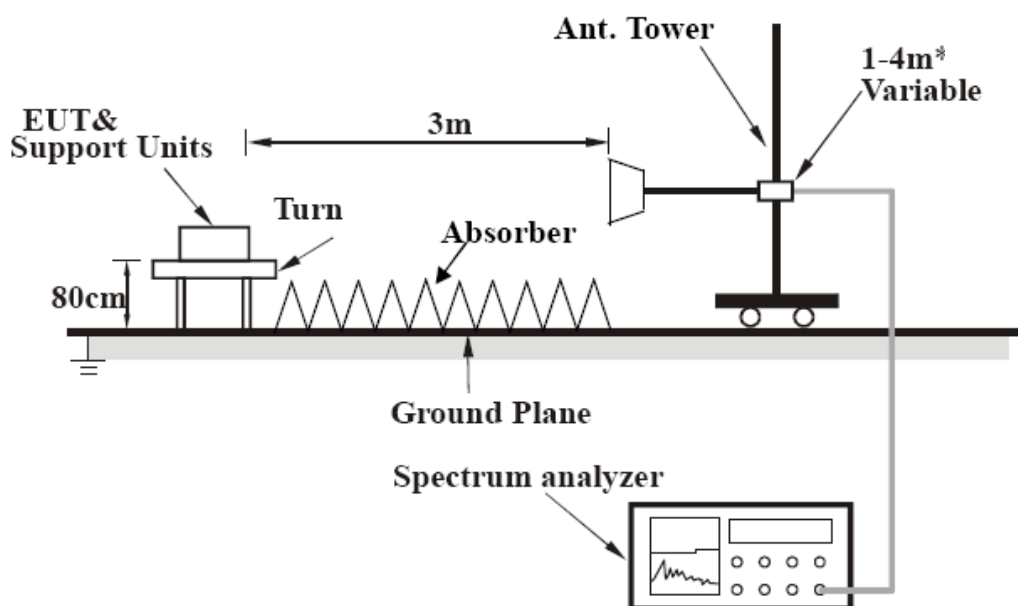
No deviation

#### 4.2.5 TEST SETUP

##### <Frequency Range below 1GHz>



##### <Frequency Range above 1GHz>



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

#### 802.11g

<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	117.06	30.5 QP	43.5	-13.0	1.50 H	90	46.03	-15.54
2	151.35	32.6 QP	43.5	-10.9	2.00 H	89	45.70	-13.12
3	162.21	32.3 QP	43.5	-11.2	1.50 H	86	45.55	-13.27
4	310.14	40.7 QP	46.0	-5.3	1.00 H	38	53.02	-12.28
5	500.01	34.8 QP	46.0	-11.2	1.50 H	360	42.57	-7.76
6	894.08	38.6 QP	46.0	-7.4	2.00 H	14	39.17	-0.55
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	47.80	34.1 QP	40.0	-5.9	1.00 V	360	47.74	-13.61
2	64.82	33.1 QP	40.0	-6.9	1.00 V	255	47.86	-14.72
3	106.73	33.3 QP	43.5	-10.2	1.00 V	360	50.16	-16.90
4	146.01	29.9 QP	43.5	-13.6	1.00 V	334	43.46	-13.55
5	310.14	40.4 QP	46.0	-5.6	1.50 V	106	52.66	-12.28
6	500.01	33.0 QP	46.0	-13.0	1.50 V	360	40.73	-7.76

#### 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



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**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	2320.00	57.1 PK	74.0	-16.9	1.10 H	20	58.61	-1.51
2	2320.00	44.1 AV	54.0	-9.9	1.10 H	20	45.61	-1.51
3	2390.00	59.1 PK	74.0	-14.9	1.00 H	26	60.29	-1.19
4	2390.00	45.0 AV	54.0	-9.0	1.00 H	26	46.19	-1.19
5	*2412.00	104.1 PK			1.00 H	26	105.19	-1.09
6	*2412.00	101.6 AV			1.00 H	26	102.69	-1.09
7	4824.00	54.9 PK	74.0	-19.1	1.03 H	156	47.31	7.59
8	4824.00	50.8 AV	54.0	-3.2	1.03 H	156	43.21	7.59

**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	2320.00	56.8 PK	74.0	-17.2	1.30 V	197	58.31	-1.51
2	2320.00	51.1 AV	54.0	-2.9	1.30 V	197	52.61	-1.51
3	2390.00	62.3 PK	74.0	-11.7	1.00 V	166	63.49	-1.19
4	2390.00	50.6 AV	54.0	-3.4	1.00 V	166	51.79	-1.19
5	*2412.00	117.1 PK			1.00 V	166	118.19	-1.09
6	*2412.00	114.7 AV			1.00 V	166	115.79	-1.09
7	4824.00	56.2 PK	74.0	-17.8	1.00 V	172	48.61	7.59
8	4824.00	53.3 AV	54.0	-0.7	1.00 V	172	45.71	7.59

**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.



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<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	2320.00	51.1 PK	74.0	-22.9	1.00 H	6	52.61	-1.51
2	2320.00	42.4 AV	54.0	-11.6	1.00 H	6	43.91	-1.51
3	2390.00	58.9 PK	74.0	-15.1	1.01 H	29	60.09	-1.19
4	2390.00	45.0 AV	54.0	-9.0	1.01 H	29	46.19	-1.19
5	*2437.00	105.1 PK			1.01 H	29	106.09	-0.99
6	*2437.00	102.5 AV			1.01 H	29	103.49	-0.99
7	2483.50	56.7 PK	74.0	-17.3	1.01 H	29	57.50	-0.80
8	2483.50	43.9 AV	54.0	-10.1	1.01 H	29	44.70	-0.80
9	4874.00	55.3 PK	74.0	-18.7	1.09 H	153	47.53	7.77
10	4874.00	50.9 AV	54.0	-3.1	1.09 H	153	43.13	7.77
11	7311.00	55.3 PK	74.0	-18.7	1.00 H	231	39.81	15.49
12	7311.00	43.0 AV	54.0	-11.0	1.00 H	231	27.51	15.49

**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	2320.00	58.2 PK	74.0	-15.8	1.00 V	66	59.71	-1.51
2	2320.00	51.7 AV	54.0	-2.3	1.00 V	66	53.21	-1.51
3	2390.00	58.7 PK	74.0	-15.3	1.16 V	163	59.89	-1.19
4	2390.00	44.9 AV	54.0	-9.1	1.16 V	163	46.09	-1.19
5	*2437.00	117.5 PK			1.16 V	163	118.49	-0.99
6	*2437.00	115.1 AV			1.16 V	163	116.09	-0.99
7	2483.50	57.2 PK	74.0	-16.8	1.16 V	163	58.00	-0.80
8	2483.50	44.3 AV	54.0	-9.7	1.16 V	163	45.10	-0.80
9	4874.00	56.2 PK	74.0	-17.8	1.10 V	169	48.43	7.77
10	4874.00	53.0 AV	54.0	-1.0	1.10 V	169	45.23	7.77
11	7311.00	57.1 PK	74.0	-16.9	1.00 V	139	41.61	15.49
12	7311.00	44.9 AV	54.0	-9.1	1.00 V	139	29.41	15.49

**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.



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<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	2320.00	57.2 PK	74.0	-16.8	1.04 H	15	58.71	-1.51
2	2320.00	44.4 AV	54.0	-9.6	1.04 H	15	45.91	-1.51
3	*2462.00	103.7 PK			1.00 H	25	104.59	-0.89
4	*2462.00	101.2 AV			1.00 H	25	102.09	-0.89
5	2483.50	54.0 PK	74.0	-20.0	1.00 H	25	54.80	-0.80
6	2483.50	40.8 AV	54.0	-13.2	1.00 H	25	41.60	-0.80
7	4924.00	54.7 PK	74.0	-19.3	1.07 H	160	46.76	7.94
8	4924.00	50.6 AV	54.0	-3.4	1.07 H	160	42.66	7.94
9	7386.00	55.8 PK	74.0	-18.2	1.00 H	231	40.29	15.51
10	7386.00	43.3 AV	54.0	-10.7	1.00 H	231	27.79	15.51

**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	2320.00	58.1 PK	74.0	-15.9	1.02 V	67	59.61	-1.51
2	2320.00	53.0 AV	54.0	-1.0	1.02 V	67	54.51	-1.51
3	*2462.00	116.2 PK			1.00 V	94	117.09	-0.89
4	*2462.00	113.9 AV			1.00 V	94	114.79	-0.89
5	2483.50	61.1 PK	74.0	-12.9	1.00 V	94	61.90	-0.80
6	2483.50	48.9 AV	54.0	-5.1	1.00 V	94	49.70	-0.80
7	4924.00	56.6 PK	74.0	-17.4	1.22 V	167	48.66	7.94
8	4924.00	53.2 AV	54.0	-0.8	1.22 V	167	45.26	7.94
9	7386.00	57.5 PK	74.0	-16.5	1.02 V	126	41.99	15.51
10	7386.00	45.3 AV	54.0	-8.7	1.02 V	126	29.79	15.51

**REMARKS:**

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



**802.11g**

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

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2320.00	57.5 PK	74.0	-16.5	1.00 H	8	59.01	-1.51
2	2320.00	44.2 AV	54.0	-9.8	1.00 H	8	45.71	-1.51
3	2332.00	57.8 PK	74.0	-16.2	1.00 H	347	59.25	-1.45
4	2332.00	43.7 AV	54.0	-10.3	1.00 H	347	45.15	-1.45
5	2390.00	58.9 PK	74.0	-15.1	1.00 H	31	60.09	-1.19
6	2390.00	45.1 AV	54.0	-8.9	1.00 H	31	46.29	-1.19
7	*2412.00	103.1 PK			1.00 H	31	104.19	-1.09
8	*2412.00	93.7 AV			1.00 H	31	94.79	-1.09
9	4824.00	50.8 PK	74.0	-23.2	1.03 H	170	43.21	7.59
10	4824.00	44.6 AV	54.0	-9.4	1.03 H	170	37.01	7.59
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	2320.00	61.0 PK	74.0	-13.0	1.28 V	195	62.51	-1.51
2	2320.00	49.2 AV	54.0	-4.8	1.28 V	195	50.71	-1.51
3	2332.00	62.0 PK	74.0	-12.0	1.00 V	68	63.45	-1.45
4	2332.00	51.3 AV	54.0	-2.7	1.00 V	68	52.75	-1.45
5	2390.00	69.7 PK	74.0	-4.3	1.00 V	98	70.89	-1.19
6	2390.00	53.3 AV	54.0	-0.7	1.00 V	98	54.49	-1.19
7	*2412.00	116.0 PK			1.00 V	98	117.09	-1.09
8	*2412.00	106.8 AV			1.00 V	98	107.89	-1.09
9	4824.00	51.1 PK	74.0	-22.9	1.07 V	170	43.51	7.59
10	4824.00	44.9 AV	54.0	-9.1	1.07 V	170	37.31	7.59

**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.



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<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	2357.00	50.7 PK	74.0	-23.3	1.07 H	38	52.03	-1.33
2	2357.00	42.2 AV	54.0	-11.8	1.07 H	38	43.53	-1.33
3	2390.00	58.7 PK	74.0	-15.3	1.04 H	28	59.89	-1.19
4	2390.00	44.7 AV	54.0	-9.3	1.04 H	28	45.89	-1.19
5	*2437.00	110.7 PK			1.04 H	28	111.69	-0.99
6	*2437.00	101.1 AV			1.04 H	28	102.09	-0.99
7	2483.50	57.0 PK	74.0	-17.0	1.04 H	28	57.80	-0.80
8	2483.50	43.9 AV	54.0	-10.1	1.04 H	28	44.70	-0.80
9	4874.00	50.6 PK	74.0	-23.4	1.00 H	184	42.83	7.77
10	4874.00	44.2 AV	54.0	-9.8	1.00 H	184	36.43	7.77
11	7311.00	57.4 PK	74.0	-16.6	1.00 H	3	41.91	15.49
12	7311.00	43.9 AV	54.0	-10.1	1.00 H	3	28.41	15.49

**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	2357.00	64.2 PK	74.0	-9.8	1.38 V	158	65.53	-1.33
2	2357.00	53.7 AV	54.0	-0.3	1.38 V	158	55.03	-1.33
3	2390.00	71.0 PK	74.0	-3.0	1.04 V	97	72.19	-1.19
4	2390.00	51.9 AV	54.0	-2.1	1.04 V	97	53.09	-1.19
5	*2437.00	124.1 PK			1.04 V	97	125.09	-0.99
6	*2437.00	114.3 AV			1.04 V	97	115.29	-0.99
7	2483.50	72.5 PK	74.0	-1.5	1.04 V	97	73.30	-0.80
8	2483.50	53.0 AV	54.0	-1.0	1.04 V	97	53.80	-0.80
9	4874.00	50.7 PK	74.0	-23.3	1.09 V	164	42.93	7.77
10	4874.00	44.8 AV	54.0	-9.2	1.09 V	164	37.03	7.77
11	7311.00	57.5 PK	74.0	-16.5	1.10 V	140	42.01	15.49
12	7311.00	45.0 AV	54.0	-9.0	1.10 V	140	29.51	15.49

**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.



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<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	102.3 PK			1.02 H	23	103.19	-0.89
2	*2462.00	93.7 AV			1.02 H	23	94.59	-0.89
3	2483.50	57.1 PK	74.0	-16.9	1.02 H	23	57.90	-0.80
4	2483.50	44.2 AV	54.0	-9.8	1.02 H	23	45.00	-0.80
5	4924.00	50.4 PK	74.0	-23.6	1.12 H	172	42.46	7.94
6	4924.00	44.2 AV	54.0	-9.8	1.12 H	172	36.26	7.94
7	7386.00	57.3 PK	74.0	-16.7	1.10 H	1	41.79	15.51
8	7386.00	43.7 AV	54.0	-10.3	1.10 H	1	28.19	15.51

**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	115.5 PK			1.00 V	90	116.39	-0.89
2	*2462.00	106.7 AV			1.00 V	90	107.59	-0.89
3	2483.50	67.8 PK	74.0	-6.2	1.00 V	90	68.60	-0.80
4	2483.50	53.0 AV	54.0	-1.0	1.00 V	90	53.80	-0.80
5	4924.00	50.3 PK	74.0	-23.7	1.08 V	164	42.36	7.94
6	4924.00	44.7 AV	54.0	-9.3	1.08 V	164	36.76	7.94
7	7386.00	57.8 PK	74.0	-16.2	1.15 V	124	42.29	15.51
8	7386.00	45.3 AV	54.0	-8.7	1.15 V	124	29.79	15.51

**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.



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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	2320.00	54.3 PK	74.0	-19.7	1.00 H	86	55.81	-1.51
2	2320.00	42.4 AV	54.0	-11.6	1.00 H	86	43.91	-1.51
3	2390.00	57.1 PK	74.0	-16.9	1.00 H	21	58.29	-1.19
4	2390.00	44.4 AV	54.0	-9.6	1.00 H	21	45.59	-1.19
5	*2412.00	101.2 PK			1.00 H	21	102.29	-1.09
6	*2412.00	91.2 AV			1.00 H	21	92.29	-1.09
7	4824.00	50.2 PK	74.0	-23.8	1.16 H	177	42.61	7.59
8	4824.00	44.2 AV	54.0	-9.8	1.16 H	177	36.61	7.59

**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	2320.00	59.4 PK	74.0	-14.6	1.01 V	65	60.91	-1.51
2	2320.00	50.8 AV	54.0	-3.2	1.01 V	65	52.31	-1.51
3	2390.00	70.0 PK	74.0	-4.0	1.22 V	71	71.19	-1.19
4	2390.00	53.0 AV	54.0	-1.0	1.22 V	71	54.19	-1.19
5	*2412.00	114.3 PK			1.22 V	71	115.39	-1.09
6	*2412.00	104.6 AV			1.22 V	71	105.69	-1.09
7	4824.00	51.2 PK	74.0	-22.8	1.10 V	151	43.61	7.59
8	4824.00	45.1 AV	54.0	-8.9	1.10 V	151	37.51	7.59

**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.



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<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	2357.00	57.0 PK	74.0	-17.0	1.20 H	45	58.33	-1.33
2	2357.00	46.0 AV	54.0	-8.0	1.20 H	45	47.33	-1.33
3	2390.00	58.7 PK	74.0	-15.3	1.02 H	73	59.89	-1.19
4	2390.00	44.7 AV	54.0	-9.3	1.02 H	73	45.89	-1.19
5	*2437.00	111.5 PK			1.02 H	73	112.49	-0.99
6	*2437.00	101.8 AV			1.02 H	73	102.79	-0.99
7	2483.50	57.0 PK	74.0	-17.0	1.02 H	73	57.80	-0.80
8	2483.50	43.9 AV	54.0	-10.1	1.02 H	73	44.70	-0.80
9	4874.00	50.2 PK	74.0	-23.8	1.14 H	175	42.43	7.77
10	4874.00	43.8 AV	54.0	-10.2	1.14 H	175	36.03	7.77
11	7311.00	57.1 PK	74.0	-16.9	1.10 H	93	41.61	15.49
12	7311.00	43.6 AV	54.0	-10.4	1.10 H	93	28.11	15.49

**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	2357.00	64.5 PK	74.0	-9.5	1.42 V	162	65.83	-1.33
2	2357.00	53.7 AV	54.0	-0.3	1.42 V	162	55.03	-1.33
3	2390.00	71.1 PK	74.0	-2.9	1.16 V	162	72.29	-1.19
4	2390.00	52.1 AV	54.0	-1.9	1.16 V	162	53.29	-1.19
5	*2437.00	124.0 PK			1.16 V	162	124.99	-0.99
6	*2437.00	114.4 AV			1.16 V	162	115.39	-0.99
7	2483.50	72.3 PK	74.0	-1.7	1.16 V	162	73.10	-0.80
8	2483.50	53.0 AV	54.0	-1.0	1.16 V	162	53.80	-0.80
9	4874.00	51.2 PK	74.0	-22.8	1.15 V	176	43.43	7.77
10	4874.00	45.0 AV	54.0	-9.0	1.15 V	176	37.23	7.77
11	7311.00	57.0 PK	74.0	-17.0	1.12 V	131	41.51	15.49
12	7311.00	44.5 AV	54.0	-9.5	1.12 V	131	29.01	15.49

**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.



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<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	2320.00	57.7 PK	74.0	-16.3	1.02 H	87	59.21	-1.51
2	2320.00	46.4 AV	54.0	-7.6	1.02 H	87	47.91	-1.51
3	2382.00	56.9 PK	74.0	-17.1	1.07 H	69	58.12	-1.22
4	2382.00	43.9 AV	54.0	-10.1	1.07 H	69	45.12	-1.22
5	*2462.00	104.2 PK			1.02 H	84	105.09	-0.89
6	*2462.00	94.1 AV			1.02 H	84	94.99	-0.89
7	2483.50	58.6 PK	74.0	-15.4	1.02 H	84	59.40	-0.80
8	2483.50	44.9 AV	54.0	-9.1	1.02 H	84	45.70	-0.80
9	4924.00	50.1 PK	74.0	-23.9	1.17 H	160	42.16	7.94
10	4924.00	43.6 AV	54.0	-10.4	1.17 H	160	35.66	7.94
11	7386.00	57.1 PK	74.0	-16.9	1.07 H	91	41.59	15.51
12	7386.00	43.9 AV	54.0	-10.1	1.07 H	91	28.39	15.51

**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	2320.00	59.1 PK	74.0	-14.9	1.01 V	66	60.61	-1.51
2	2320.00	52.3 AV	54.0	-1.7	1.01 V	66	53.81	-1.51
3	2382.00	59.7 PK	74.0	-14.3	1.46 V	160	60.92	-1.22
4	2382.00	47.4 AV	54.0	-6.6	1.46 V	160	48.62	-1.22
5	*2462.00	116.9 PK			1.17 V	162	117.79	-0.89
6	*2462.00	106.8 AV			1.17 V	162	107.69	-0.89
7	2483.50	67.9 PK	74.0	-6.1	1.17 V	162	68.70	-0.80
8	2483.50	53.0 AV	54.0	-1.0	1.17 V	162	53.80	-0.80
9	4924.00	51.1 PK	74.0	-22.9	1.06 V	177	43.16	7.94
10	4924.00	45.0 AV	54.0	-9.0	1.06 V	177	37.06	7.94
11	7386.00	57.3 PK	74.0	-16.7	1.07 V	128	41.79	15.51
12	7386.00	44.9 AV	54.0	-9.1	1.07 V	128	29.39	15.51

**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.



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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	2320.00	57.6 PK	74.0	-16.4	1.00 H	26	59.11	-1.51
2	2320.00	46.0 AV	54.0	-8.0	1.00 H	26	47.51	-1.51
3	2390.00	56.4 PK	74.0	-17.6	1.02 H	11	57.59	-1.19
4	2390.00	43.9 AV	54.0	-10.1	1.02 H	11	45.09	-1.19
5	*2422.00	97.7 PK			1.02 H	11	98.75	-1.05
6	*2422.00	88.2 AV			1.02 H	11	89.25	-1.05
7	4844.00	50.2 PK	74.0	-23.8	1.11 H	183	42.54	7.66
8	4844.00	43.8 AV	54.0	-10.2	1.11 H	183	36.14	7.66
9	7266.00	57.1 PK	74.0	-16.9	1.05 H	79	41.59	15.51
10	7266.00	43.5 AV	54.0	-10.5	1.05 H	79	27.99	15.51

**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	2320.00	59.3 PK	74.0	-14.7	1.34 V	91	60.81	-1.51
2	2320.00	53.0 AV	54.0	-1.0	1.34 V	91	54.51	-1.51
3	2390.00	69.1 PK	74.0	-4.9	1.44 V	96	70.29	-1.19
4	<b>2390.00</b>	<b>53.8 AV</b>	<b>54.0</b>	<b>-0.2</b>	<b>1.44 V</b>	<b>96</b>	<b>54.99</b>	<b>-1.19</b>
5	*2422.00	111.1 PK			1.44 V	96	112.15	-1.05
6	*2422.00	101.4 AV			1.44 V	96	102.45	-1.05
7	4844.00	50.5 PK	74.0	-23.5	1.09 V	178	42.84	7.66
8	4844.00	44.4 AV	54.0	-9.6	1.09 V	178	36.74	7.66
9	7266.00	57.5 PK	74.0	-16.5	1.15 V	141	41.99	15.51
10	7266.00	45.3 AV	54.0	-8.7	1.15 V	141	29.79	15.51

**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.



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<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	2357.00	57.4 PK	74.0	-16.6	1.01 H	41	58.73	-1.33
2	2357.00	46.4 AV	54.0	-7.6	1.01 H	41	47.73	-1.33
3	2390.00	58.7 PK	74.0	-15.3	1.00 H	26	59.89	-1.19
4	2390.00	45.2 AV	54.0	-8.8	1.00 H	26	46.39	-1.19
5	*2437.00	101.2 PK			1.00 H	26	102.19	-0.99
6	*2437.00	91.7 AV			1.00 H	26	92.69	-0.99
7	2483.50	56.3 PK	74.0	-17.7	1.00 H	26	57.10	-0.80
8	2483.50	43.4 AV	54.0	-10.6	1.00 H	26	44.20	-0.80
9	4874.00	49.8 PK	74.0	-24.2	1.16 H	178	42.03	7.77
10	4874.00	43.5 AV	54.0	-10.5	1.16 H	178	35.73	7.77
11	7311.00	56.8 PK	74.0	-17.2	1.11 H	89	41.31	15.49
12	7311.00	43.2 AV	54.0	-10.8	1.11 H	89	27.71	15.49

**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	2357.00	62.9 PK	74.0	-11.1	1.18 V	160	64.23	-1.33
2	2357.00	52.8 AV	54.0	-1.2	1.18 V	160	54.13	-1.33
3	2390.00	69.5 PK	74.0	-4.5	1.13 V	24	70.69	-1.19
4	2390.00	53.0 AV	54.0	-1.0	1.13 V	24	54.19	-1.19
5	*2437.00	114.3 PK			1.13 V	24	115.29	-0.99
6	*2437.00	104.6 AV			1.13 V	24	105.59	-0.99
7	2483.50	66.4 PK	74.0	-7.6	1.13 V	24	67.20	-0.80
8	2483.50	48.5 AV	54.0	-5.5	1.13 V	24	49.30	-0.80
9	4874.00	50.5 PK	74.0	-23.5	1.04 V	148	42.73	7.77
10	4874.00	44.8 AV	54.0	-9.2	1.04 V	148	37.03	7.77
11	7311.00	57.0 PK	74.0	-17.0	1.04 V	155	41.51	15.49
12	7311.00	44.6 AV	54.0	-9.4	1.04 V	155	29.11	15.49

**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.





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<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	100.3 PK			1.00 H	36	101.22	-0.92
2	*2452.00	90.4 AV			1.00 H	36	91.32	-0.92
3	2483.50	56.3 PK	74.0	-17.7	1.00 H	36	57.10	-0.80
4	2483.50	43.3 AV	54.0	-10.7	1.00 H	36	44.10	-0.80
5	4904.00	50.2 PK	74.0	-23.8	1.12 H	185	42.32	7.88
6	4904.00	43.6 AV	54.0	-10.4	1.12 H	185	35.72	7.88
7	7356.00	56.9 PK	74.0	-17.1	1.04 H	97	41.41	15.49
8	7356.00	43.4 AV	54.0	-10.6	1.04 H	97	27.91	15.49

**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	113.6 PK			1.17 V	162	114.52	-0.92
2	*2452.00	103.8 AV			1.17 V	162	104.72	-0.92
3	2483.50	67.4 PK	74.0	-6.6	1.17 V	162	68.20	-0.80
4	<b>2483.50</b>	<b>53.8 AV</b>	<b>54.0</b>	<b>-0.2</b>	<b>1.17 V</b>	<b>162</b>	<b>54.60</b>	<b>-0.80</b>
5	4904.00	50.8 PK	74.0	-23.2	1.15 V	166	42.92	7.88
6	4904.00	45.0 AV	54.0	-9.0	1.15 V	166	37.12	7.88
7	7356.00	57.8 PK	74.0	-16.2	1.15 V	128	42.31	15.49
8	7356.00	45.5 AV	54.0	-8.5	1.15 V	128	30.01	15.49

**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.

### 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	100037	Nov. 01, 2012	Oct. 31, 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 : Sep. 30, 2013

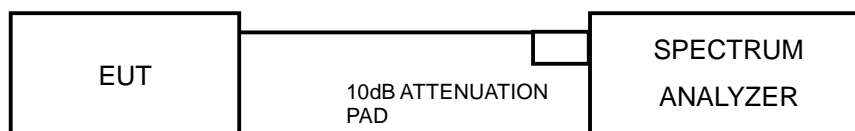
#### 4.3.3 TEST PROCEDURE

1. Set resolution bandwidth (RBW) = 100kHz
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.



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### 4.3.7 TEST RESULTS

#### 802.11b

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
1	2412	10.12	10.12	0.5	PASS
6	2437	10.13	10.14	0.5	PASS
11	2462	10.14	10.14	0.5	PASS

#### 802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
1	2412	16.64	16.64	0.5	PASS
6	2437	16.62	16.64	0.5	PASS
11	2462	16.64	16.64	0.5	PASS

#### 802.11n (HT20)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
1	2412	17.88	17.88	0.5	PASS
6	2437	17.88	17.87	0.5	PASS
11	2462	17.90	17.87	0.5	PASS

#### 802.11n (HT40)

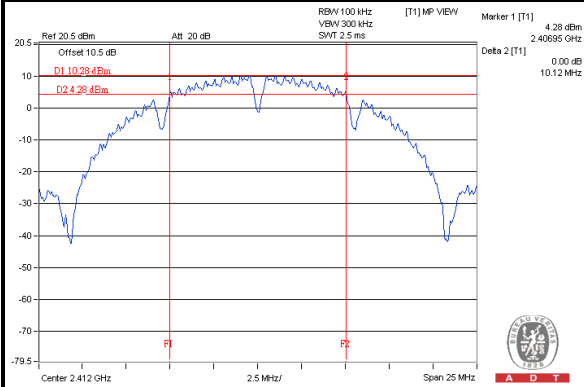
CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
3	2422	36.56	36.57	0.5	PASS
6	2437	36.58	36.59	0.5	PASS
9	2452	36.58	36.61	0.5	PASS



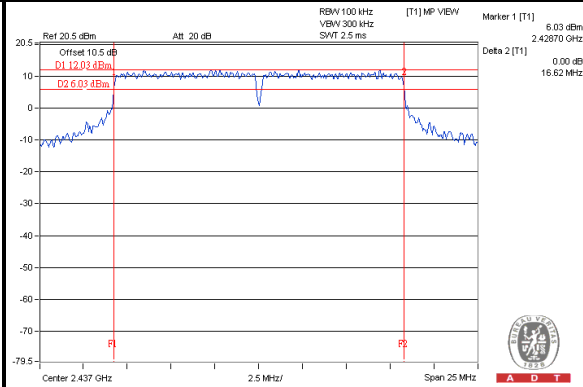
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### SPECTRUM PLOT OF WORST VALUE

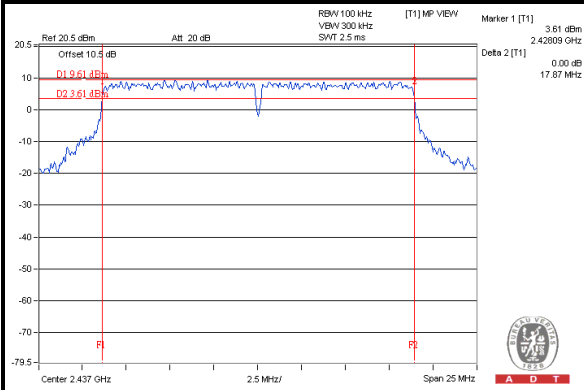
#### 802.11b / CH1



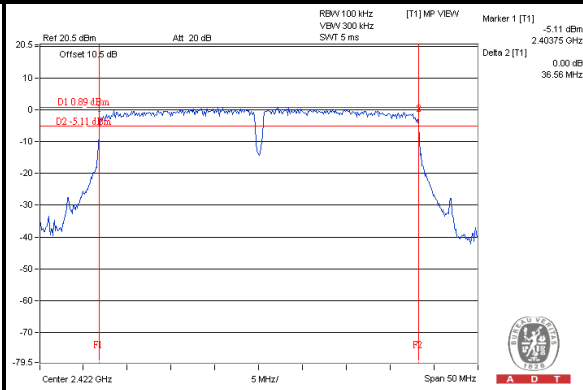
#### 802.11g / CH6



#### 802.11n (HT20) / CH6



#### 802.11n (HT40) / CH3



## 4.4 CONDUCTED OUTPUT POWER MEASUREMENT

### 4.4.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

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

Per KDB 662911 D01 Multiple Transmitter Output 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.

### 4.4.2 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Power Meter	ML2495A	1014008	Apr. 23, 2013	Apr. 22, 2014
Power Sensor	MA2411B	0917122	Apr. 23, 2013	Apr. 22, 2014

**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 : Nov. 08, 2013

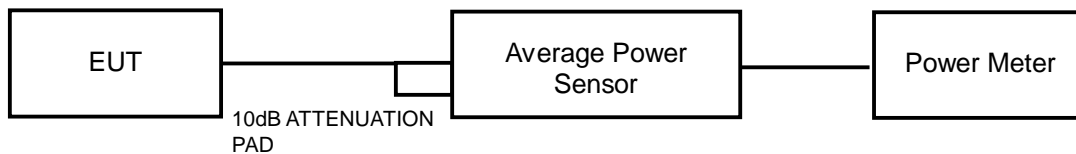
### 4.4.3 TEST PROCEDURES

Method PM is used to perform output power measurement, trigger and gating function of wide band power meter is enabled to measure max output power of TX on burst. Duty factor is not added to measured value.

#### 4.4.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 4.4.5 TEST SETUP



#### 4.4.6 EUT OPERATING CONDITIONS

Same as Item 4.3.6



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#### 4.4.7 TEST RESULTS

##### 802.11b

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
1	2412	21.00	20.80	246.119	23.91	30	PASS
6	2437	21.01	20.89	248.927	23.96	30	PASS
11	2462	19.67	19.55	182.840	22.62	30	PASS

##### 802.11g

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
1	2412	19.18	18.98	161.862	22.09	30	PASS
6	2437	24.43	24.15	537.348	27.30	30	PASS
11	2462	18.84	18.63	149.506	21.75	30	PASS

##### 802.11n (HT20)

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
1	2412	18.14	18.73	139.808	21.46	30	PASS
6	2437	24.43	24.75	575.870	27.60	30	PASS
11	2462	18.79	18.66	149.134	21.74	30	PASS

##### 802.11n (HT40)

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
3	2422	17.12	17.47	107.370	20.31	30	PASS
6	2437	20.40	20.27	216.062	23.35	30	PASS
9	2452	17.22	17.87	113.958	20.57	30	PASS

## 4.5 POWER SPECTRAL DENSITY MEASUREMENT

### 4.5.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

### 4.5.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP40	100037	Nov. 01, 2012	Oct. 31, 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 : Sep. 30, 2013

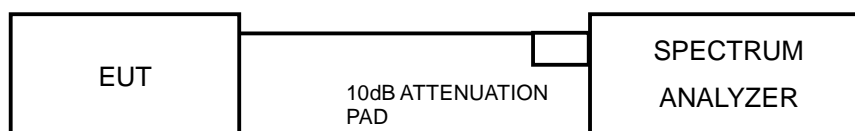
### 4.5.3 TEST PROCEDURE

1. Set the RBW = 30 kHz, VBW =100 kHz, Detector = power averaging (RMS) .
2. Ensure that the number of measurement points in the sweep  $\geq 2 \times$  span/RBW
3. Sweep time = auto couple,
4. Employ trace averaging (RMS) mode over a minimum of 100 traces.
5. Use the peak marker function to determine the maximum amplitude level.

### 4.5.4 DEVIATION FROM TEST STANDARD

No deviation

### 4.5.5 TEST SETUP



### 4.5.6 EUT OPERATING CONDITION

Same as Item 4.3.6



#### 4.5.7 TEST RESULTS

##### 802.11b

TX CHAIN	CHANNEL	FREQUENCY (MHz)	PSD (dBm)	10 log (N=2) dB	TOTAL PSD (dBm)	LIMIT (dBm)	PASS /FAIL
0	1	2412	-2.82	3.01	0.19	7.24	PASS
	6	2437	-3.55	3.01	-0.54	7.24	PASS
	11	2462	-3.70	3.01	-0.69	7.24	PASS
1	1	2412	-3.37	3.01	-0.36	7.24	PASS
	6	2437	-4.11	3.01	-1.10	7.24	PASS
	11	2462	-2.36	3.01	0.65	7.24	PASS

**NOTE:** Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 6.76\text{dBi} > 6\text{dBi}$  , so the power density limit shall be reduced to  $8-(6.76-6) = 7.24\text{dBm}$ .

##### 802.11g

TX CHAIN	CHANNEL	FREQUENCY (MHz)	PSD (dBm)	10 log (N=2) dB	TOTAL PSD (dBm)	LIMIT (dBm)	PASS /FAIL
0	1	2412	-4.70	3.01	-1.69	7.24	PASS
	6	2437	0.21	3.01	3.22	7.24	PASS
	11	2462	-4.93	3.01	-1.92	7.24	PASS
1	1	2412	-5.65	3.01	-2.64	7.24	PASS
	6	2437	-1.63	3.01	1.38	7.24	PASS
	11	2462	-5.29	3.01	-2.28	7.24	PASS

**NOTE:** Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 6.76\text{dBi} > 6\text{dBi}$  , so the power density limit shall be reduced to  $8-(6.76-6) = 7.24\text{dBm}$ .

##### 802.11n (HT20)

TX CHAIN	CHANNEL	FREQUENCY (MHz)	PSD (dBm)	10 log (N=2) dB	TOTAL PSD (dBm)	LIMIT (dBm)	PASS /FAIL
0	1	2412	-6.21	3.01	-3.20	7.24	PASS
	6	2437	0.05	3.01	3.06	7.24	PASS
	11	2462	-6.76	3.01	-3.75	7.24	PASS
1	1	2412	-4.29	3.01	-1.28	7.24	PASS
	6	2437	-2.68	3.01	0.33	7.24	PASS
	11	2462	-6.50	3.01	-3.49	7.24	PASS

**NOTE:** Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 6.76\text{dBi} > 6\text{dBi}$  , so the power density limit shall be reduced to  $8-(6.76-6) = 7.24\text{dBm}$ .



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### 802.11n (HT40)

TX CHAIN	CHANNEL	FREQUENCY (MHz)	PSD (dBm)	10 log (N=2) dB	TOTAL PSD (dBm)	LIMIT (dBm)	PASS /FAIL
0	3	2422	-10.77	3.01	-7.76	7.24	PASS
	6	2437	-10.71	3.01	-7.70	7.24	PASS
	9	2452	-14.04	3.01	-11.03	7.24	PASS
1	3	2422	-11.56	3.01	-8.55	7.24	PASS
	6	2437	-11.11	3.01	-8.10	7.24	PASS
	9	2452	-13.80	3.01	-10.79	7.24	PASS

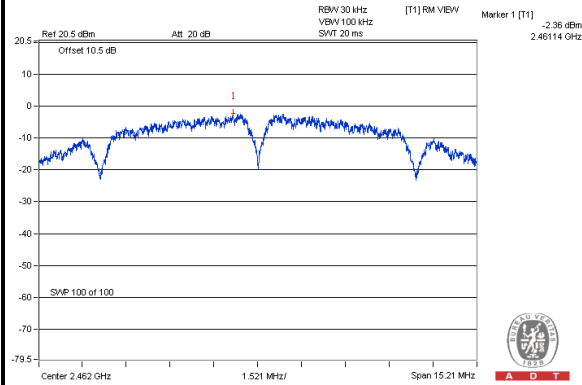
**NOTE:** Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 6.76\text{dBi} > 6\text{dBi}$ , so the power density limit shall be reduced to  $8 - (6.76 - 6) = 7.24\text{dBm}$ .



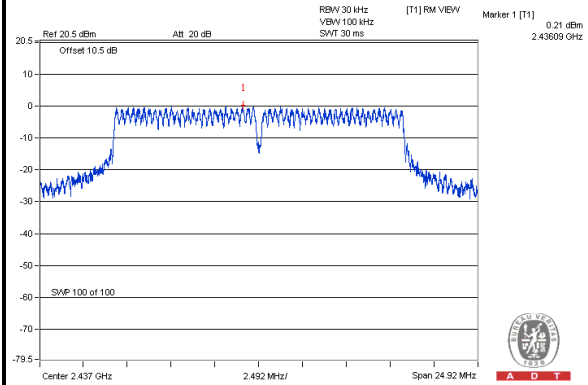
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### SPECTRUM PLOT OF WORST VALUE

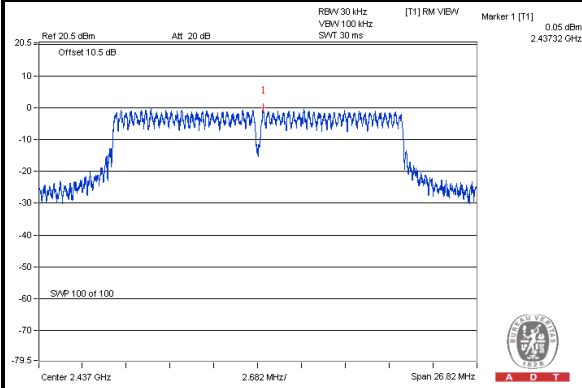
#### 802.11b / CH11



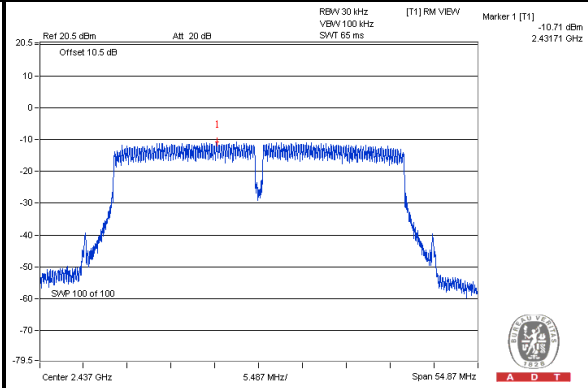
#### 802.11g / CH6



#### 802.11n (HT20) / CH6



#### 802.11n (HT40) / CH6





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## 4.6 CONDUCTED OUT-BAND EMISSION MEASUREMENT

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

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

### 4.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
R&S Spectrum Analyzer	FSP40	100036	Jan. 21, 2013	Jan. 20, 2014

**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 : Nov. 08, 2013

### 4.6.3 TEST PROCEDURE

#### Measurement Procedure - Reference Level

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.

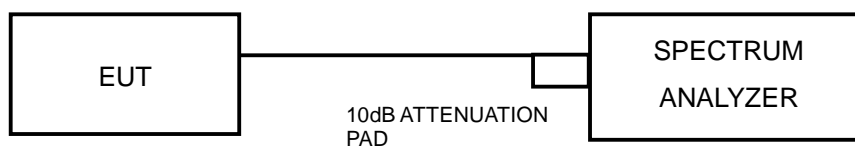
#### Measurement Procedure –Unwanted Emission Level

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.

#### 4.6.4 DEVIATION FROM TEST STANDARD

No deviation

#### 4.6.5 TEST SETUP



#### 4.6.6 EUT OPERATING CONDITION

Same as Item 4.3.6

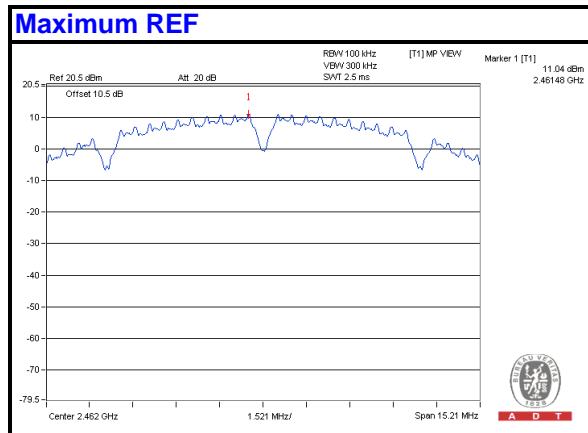
#### 4.6.7 TEST RESULTS

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.



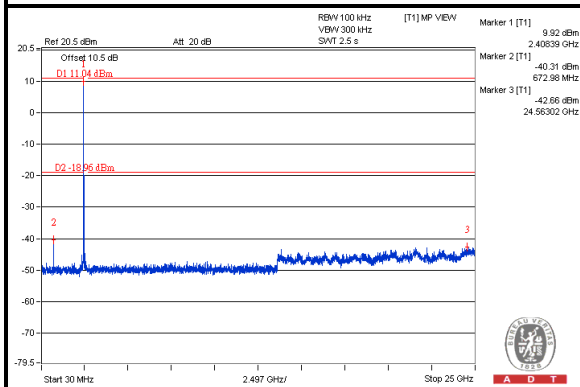
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802.11b:

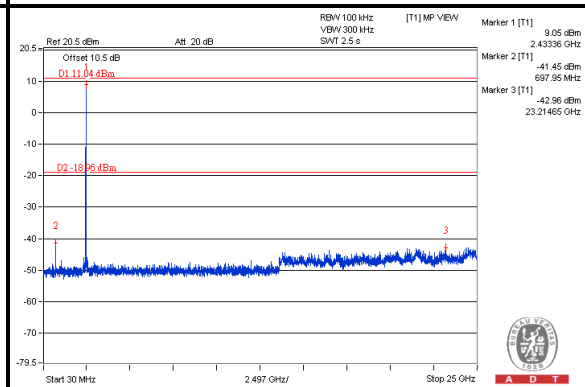


### Chain(0)

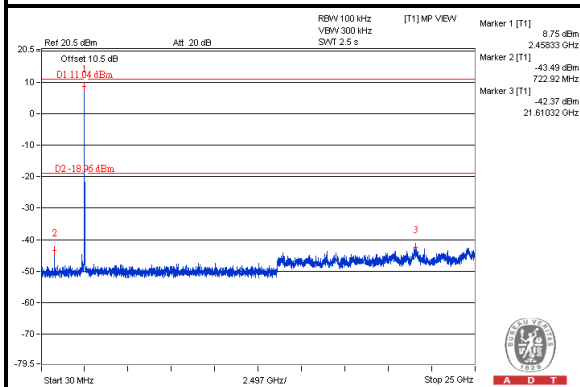
#### CH 1



#### CH 6



#### CH 11

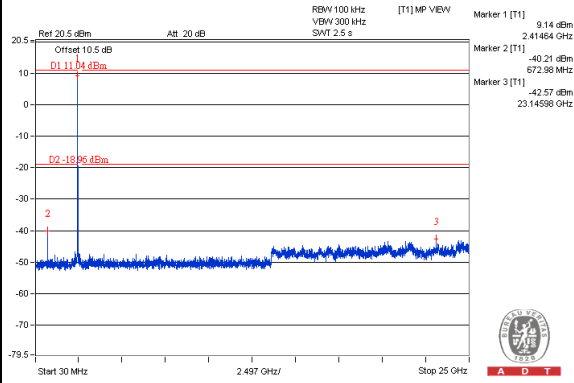




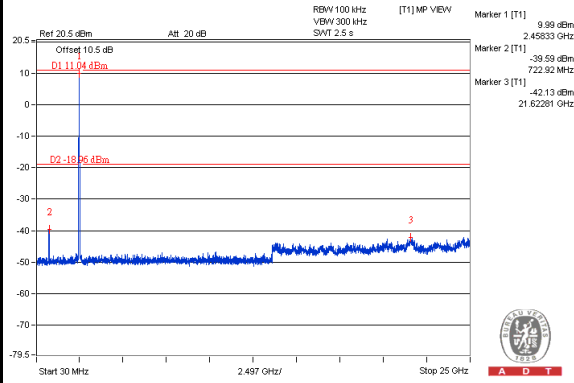
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### Chain(1)

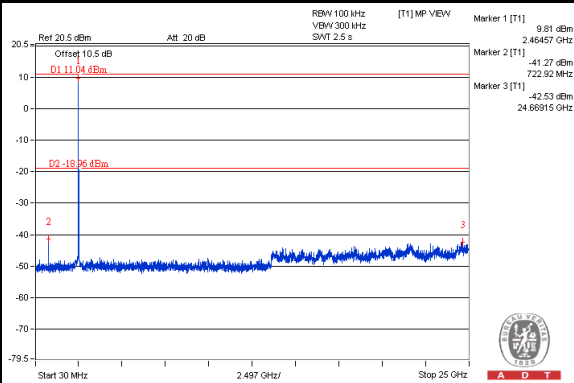
#### CH 1



#### CH 6



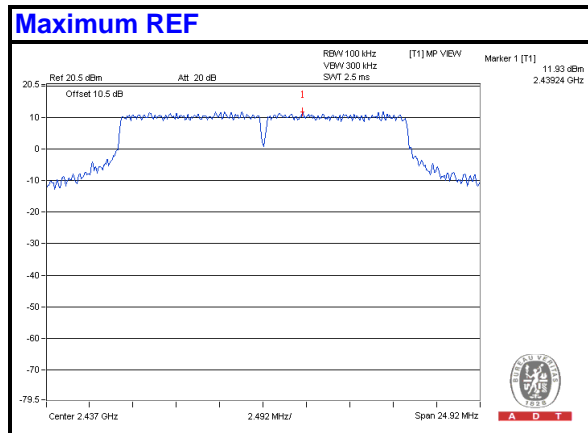
#### CH 11





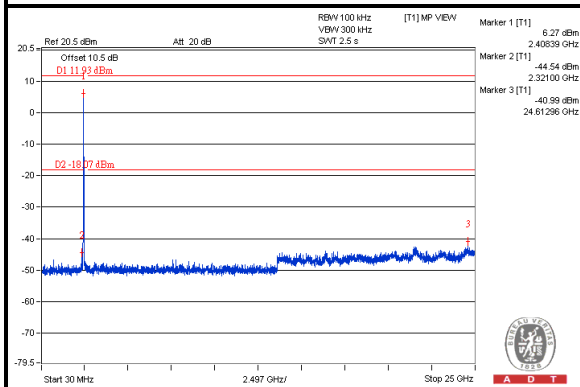
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802.11g:

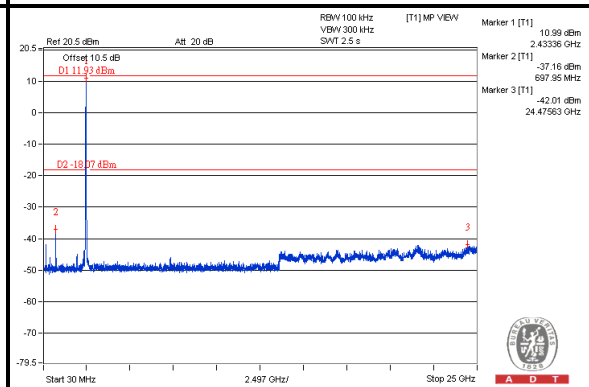


Chain(0)

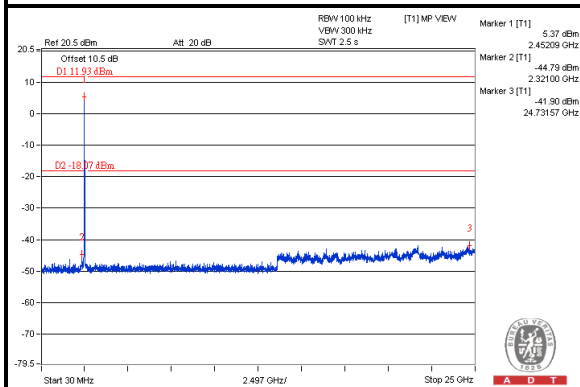
CH 1



CH 6



CH 11



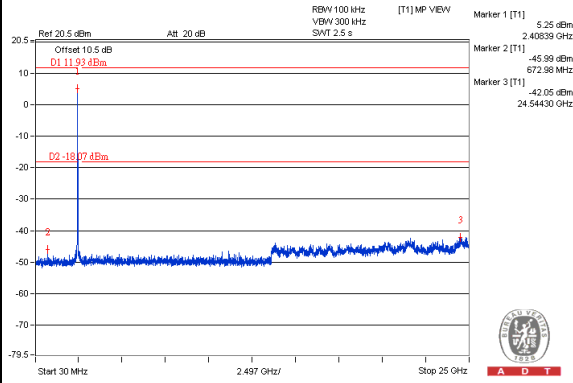




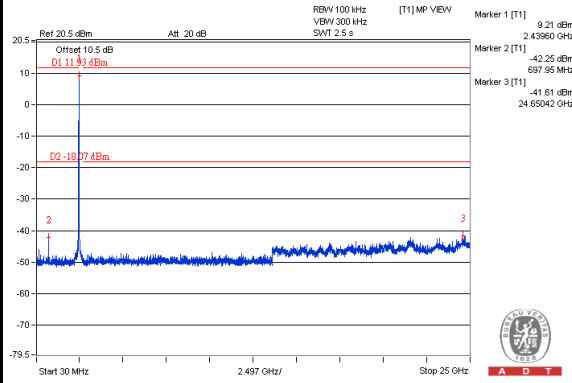
A D T

### Chain(1)

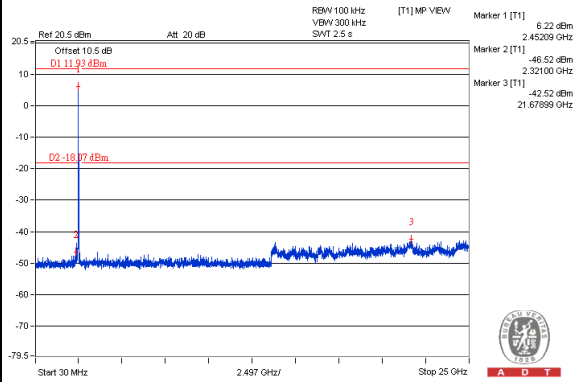
#### CH 1



#### CH 6



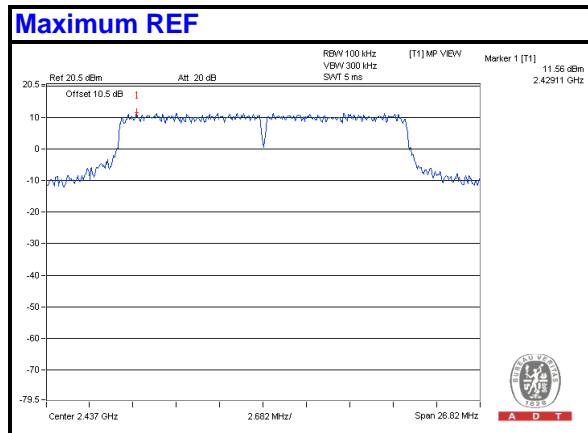
#### CH 11





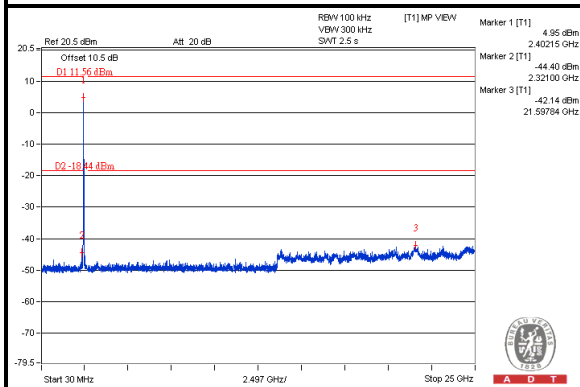
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802.11n (HT20):

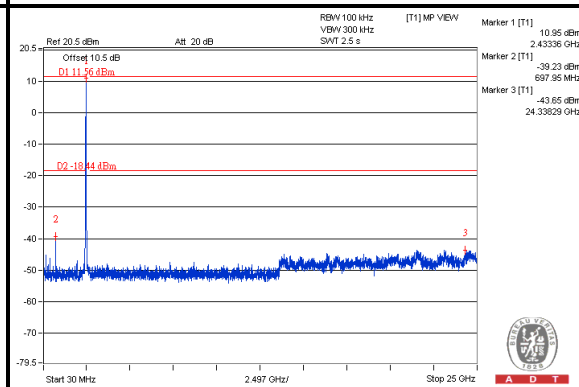


Chain(0)

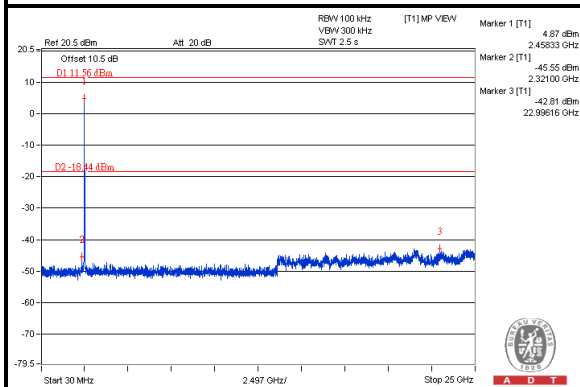
CH 1



CH 6



CH 11

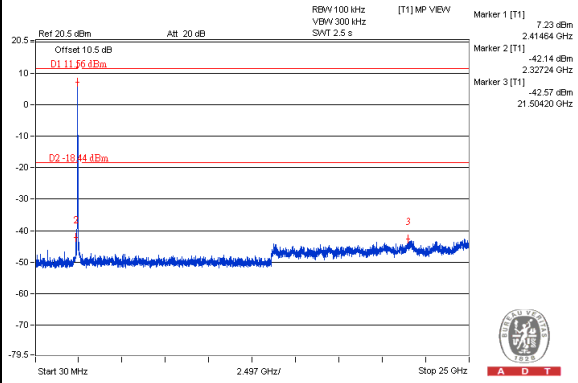




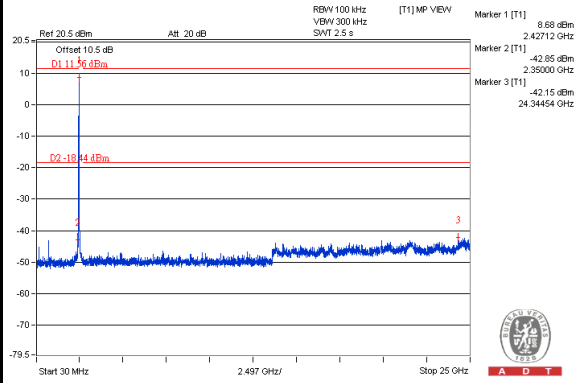
A D T

### Chain(1)

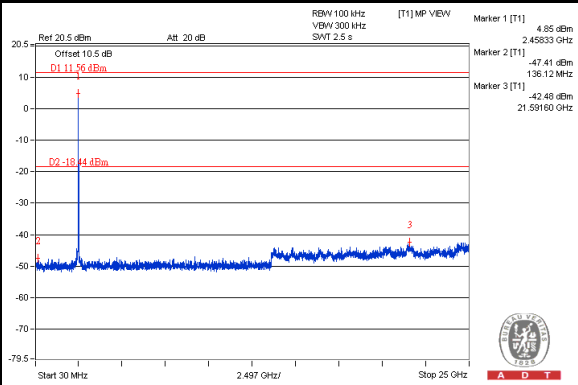
#### CH 1



#### CH 6



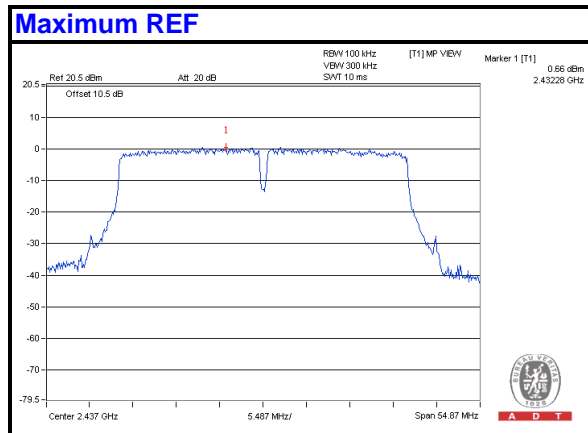
#### CH 11





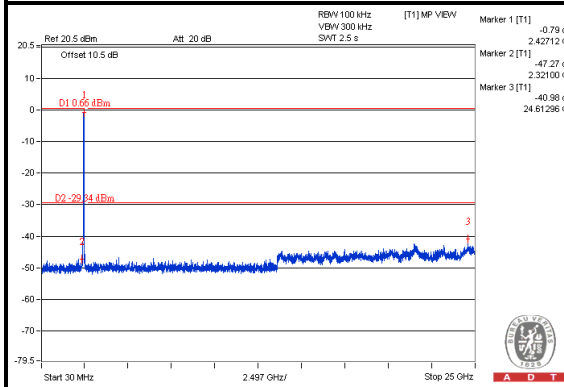
A D T

802.11n (HT40):

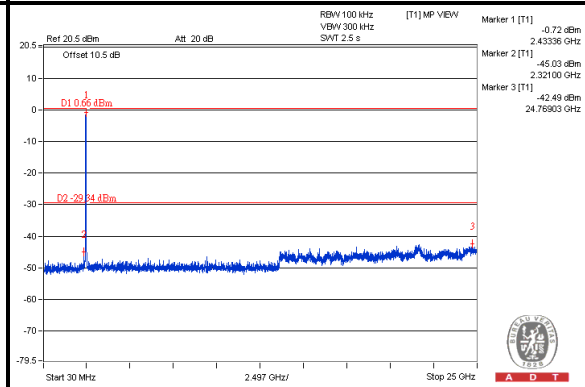


Chain(0)

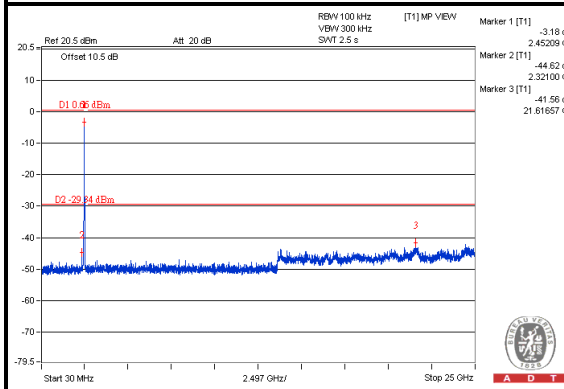
CH 3



CH 6



CH 9

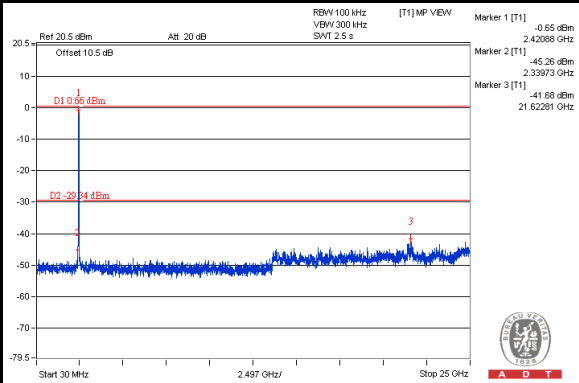




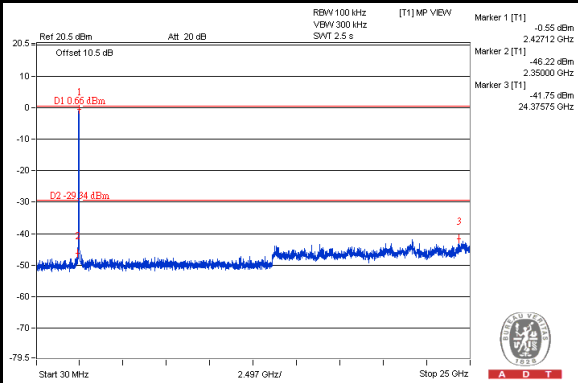
A D T

### Chain(1)

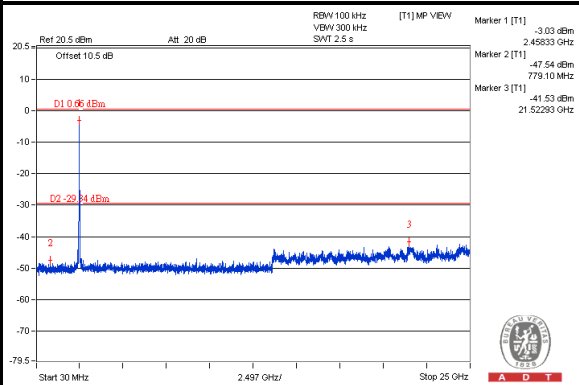
#### CH 3



#### CH 6



#### CH 9



## 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:

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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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## **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 ---**