



# FCC TEST REPORT (15.247)

**REPORT NO.:** RF131210E02

**MODEL NO.:** Balance One, Balance, MAX, Pismo805

**FCC ID:** U8G-P1805

**RECEIVED:** Dec. 10, 2013

**TESTED:** Dec. 18, 2013 to Feb. 06, 2014

**ISSUED:** Apr. 02, 2014

**APPLICANT:** Pismo Labs Technology Limited

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## Table of Contents

RELEASE CONTROL RECORD.....	6
1. CERTIFICATION.....	7
2. SUMMARY OF TEST RESULTS.....	8
2.1 MEASUREMENT UNCERTAINTY .....	9
3. GENERAL INFORMATION .....	10
3.1 GENERAL DESCRIPTION OF EUT.....	10
3.2 DESCRIPTION OF TEST MODES.....	13
3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL .....	14
3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS .....	17
3.4 DUTY CYCLE OF TEST SIGNAL.....	18
3.5 DESCRIPTION OF SUPPORT UNITS.....	20
3.6 CONFIGURATION OF SYSTEM UNDER TEST .....	21
4. TEST TYPES AND RESULTS (FOR 2.4GHZ, 2.400 ~ 2.4835GHZ BAND) .....	22
4.1 CONDUCTED EMISSION MEASUREMENT .....	22
4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT.....	22
4.1.2 TEST INSTRUMENTS .....	22
4.1.3 TEST PROCEDURES.....	23
4.1.4 DEVIATION FROM TEST STANDARD .....	23
4.1.5 TEST SETUP .....	23
4.1.6 EUT OPERATING CONDITIONS.....	24
4.1.7 TEST RESULTS.....	25
4.2 RADIATED EMISSION AND BANDEDGE MEASUREMENT.....	27
4.2.1 LIMITS OF RADIATED EMISSION AND BANDEDGE MEASUREMENT .....	27
4.2.2 TEST INSTRUMENTS .....	28
4.2.3 TEST PROCEDURES.....	30
4.2.4 DEVIATION FROM TEST STANDARD .....	30
4.2.5 TEST SETUP .....	31
4.2.6 EUT OPERATING CONDITIONS.....	31
4.2.7 TEST RESULTS.....	32
4.3 6DB BANDWIDTH MEASUREMENT.....	45
4.3.1 LIMITS OF 6DB BANDWIDTH MEASUREMENT .....	45
4.3.2 TEST INSTRUMENTS .....	45
4.3.3 TEST PROCEDURE .....	45
4.3.4 DEVIATION FROM TEST STANDARD .....	45
4.3.5 TEST SETUP .....	45
4.3.6 EUT OPERATING CONDITIONS.....	45
4.3.7 TEST RESULTS.....	46



A D T

4.4	CONDUCTED OUTPUT POWER MEASUREMENT .....	48
4.4.1	LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT .....	48
4.4.2	INSTRUMENTS .....	48
4.4.3	TEST PROCEDURES.....	48
4.4.4	DEVIATION FROM TEST STANDARD .....	49
4.4.5	TEST SETUP .....	49
4.4.6	EUT OPERATING CONDITIONS.....	49
4.4.7	TEST RESULTS.....	50
4.5	AVERAGE OUTPUT POWER.....	51
4.5.1	FOR REFERENCE.....	51
4.5.2	TEST INSTRUMENTS .....	51
4.5.3	TEST PROCEDURES.....	51
4.5.4	TEST SETUP .....	51
4.5.5	EUT OPERATING CONDITIONS.....	51
4.5.6	TEST RESULTS.....	52
4.6	POWER SPECTRAL DENSITY MEASUREMENT.....	53
4.6.1	LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT .....	53
4.6.2	TEST INSTRUMENTS .....	53
4.6.3	TEST PROCEDURE .....	53
4.6.4	DEVIATION FROM TEST STANDARD .....	53
4.6.5	TEST SETUP .....	53
4.6.6	EUT OPERATING CONDITION .....	53
4.6.7	TEST RESULTS.....	54
4.7	CONDUCTED OUT-BAND EMISSION MEASUREMENT.....	57
4.7.1	LIMITS OF CONDUCTED OUT-BAND EMISSION MEASUREMENT .....	57
4.7.2	TEST INSTRUMENTS .....	57
4.7.3	TEST PROCEDURE .....	57
4.7.4	DEVIATION FROM TEST STANDARD .....	58
4.7.5	TEST SETUP .....	58
4.7.6	EUT OPERATING CONDITION .....	58
4.7.7	TEST RESULTS.....	58
5.	TEST TYPES AND RESULTS (FOR 5GHZ, 5.725~5.850GHZ BAND) .....	67
5.1	CONDUCTED EMISSION MEASUREMENT .....	67
5.1.1	LIMITS OF CONDUCTED EMISSION MEASUREMENT.....	67
5.1.2	TEST INSTRUMENTS .....	67
5.1.3	TEST PROCEDURES.....	68
5.1.4	DEVIATION FROM TEST STANDARD .....	68
5.1.5	TEST SETUP .....	68
5.1.6	EUT OPERATING CONDITIONS.....	69



A D T

5.1.7	TEST RESULTS.....	70
5.2	RADIATED AND BANDEDGE EMISSION MEASUREMENT.....	72
5.2.1	LIMITS OF RADIATED AND BANDEDGE EMISSION MEASUREMENT ...	72
5.2.2	TEST INSTRUMENTS .....	73
5.2.3	TEST PROCEDURES.....	75
5.2.4	DEVIATION FROM TEST STANDARD .....	75
5.2.5	TEST SETUP .....	76
5.2.6	EUT OPERATING CONDITIONS.....	76
5.2.7	TEST RESULTS.....	77
5.3	6DB BANDWIDTH MEASUREMENT.....	86
5.3.1	LIMITS OF 6DB BANDWIDTH MEASUREMENT .....	86
5.3.2	TEST INSTRUMENTS .....	86
5.3.3	TEST PROCEDURE .....	86
5.3.4	DEVIATION FROM TEST STANDARD .....	86
5.3.5	TEST SETUP .....	86
5.3.6	EUT OPERATING CONDITIONS.....	86
5.3.7	TEST RESULTS.....	87
5.4	CONDUCTED OUTPUT POWER MEASUREMENT .....	89
5.4.1	LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT .....	89
5.4.2	INSTRUMENTS .....	89
5.4.3	TEST PROCEDURES.....	89
5.4.4	DEVIATION FROM TEST STANDARD .....	90
5.4.5	TEST SETUP .....	90
5.4.6	EUT OPERATING CONDITIONS.....	90
5.4.7	TEST RESULTS.....	91
5.5	AVERAGE OUTPUT POWER.....	92
5.5.1	FOR REFERENCE.....	92
5.5.2	TEST INSTRUMENTS .....	92
5.5.3	TEST PROCEDURES.....	92
5.5.4	TEST SETUP .....	92
5.5.5	EUT OPERATING CONDITIONS.....	92
5.5.6	TEST RESULTS.....	93
5.6	POWER SPECTRAL DENSITY MEASUREMENT.....	94
5.6.1	LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT .....	94
5.6.2	TEST INSTRUMENTS .....	94
5.6.3	TEST PROCEDURE .....	94
5.6.4	DEVIATION FROM TEST STANDARD .....	94
5.6.5	TEST SETUP .....	94
5.6.6	EUT OPERATING CONDITION .....	94



A D T

5.6.7	TEST RESULTS.....	95
5.7	CONDUCTED OUT-BAND EMISSION MEASUREMENT.....	97
5.7.1	LIMITS OF CONDUCTED OUT-BAND EMISSION MEASUREMENT .....	97
5.7.2	TEST INSTRUMENTS .....	97
5.7.3	TEST PROCEDURE .....	97
5.7.4	DEVIATION FROM TEST STANDARD .....	98
5.7.5	TEST SETUP .....	98
5.7.6	EUT OPERATING CONDITION .....	98
5.7.7	TEST RESULTS.....	98
6.	PHOTOGRAPHS OF THE TEST CONFIGURATION.....	105
7.	INFORMATION ON THE TESTING LABORATORIES .....	106
8.	APPENDIX A - MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB.....	107



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## RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
RF131210E02	Original release	Apr. 02, 2014

## 1. CERTIFICATION

**PRODUCT:** Pepwave / Peplink / Pismo Wireless Product  
**BRAND NAME:** Pepwave/Peplink / Pismo  
**MODEL NO.:** Balance One, Balance, MAX, Pismo805  
**TEST SAMPLE:** ENGINEERING SAMPLE  
**APPLICANT:** Pismo Labs Technology Limited  
**TESTED:** Dec. 18, 2013 to Feb. 06, 2014  
**STANDARDS:** **FCC Part 15, Subpart C (Section 15.247)**  
ANSI C63.10-2009

The above equipment (Model: Balance One) 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 :** Midoli Peng , **DATE:** Apr. 02, 2014  
( Midoli Peng, Specialist )

**APPROVED BY :** May Chen , **DATE:** Apr. 02, 2014  
( May Chen, Manager )



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## 2. SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

For 2.4GHz, 2400~2483.5MHz Band

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 -6.00dB at 0.150MHz
15.247(d) 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -0.2dB at 2483.50MHz
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	Antenna connector is i-pex not a standard connector.

For 5GHz, 5725~5850MHz Band

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 -5.09dB at 0.150MHz
15.247(d) 15.209	Radiated Emissions	PASS	Meet the requirement of limit. Minimum passing margin is -0.4dB at 11650.00MHz
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	Antenna connector is i-pex not a standard connector.

**NOTE:** The EUT was operating in 2.400 ~ 2.4835GHz, 5.15~5.25GHz and 5.725~5.850GHz frequencies band. This report was recorded the RF parameters including 2.400 ~ 2.4835GHz and 5.725~5.850GHz. For the 5.15~5.25GHz RF parameters was recorded in another test report.





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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)	5.37 dB
Radiated emissions (1GHz -6GHz)	3.72 dB
Radiated emissions (6GHz -18GHz)	4.00 dB
Radiated emissions (18GHz -40GHz)	4.11 dB



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### 3. GENERAL INFORMATION

#### 3.1 GENERAL DESCRIPTION OF EUT

<b>PRODUCT</b>	Pepwave / Peplink / Pismo Wireless Product
<b>MODEL NO.</b>	Balance One, Balance, MAX, Pismo805
<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>	<b>For 15.407</b> <b>5GHz:</b> 5.18 ~ 5.24GHz
	<b>For 15.247</b> <b>2.4GHz:</b> 2.412 ~ 2.462GHz <b>5GHz:</b> 5.745 ~ 5.825GHz
<b>NUMBER OF CHANNEL</b>	<b>For 15.407</b> 4 for 802.11a, 802.11n (HT20) 2 for 802.11n (HT40)
	<b>For 15.247 (2.4GHz)</b> 11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40)
	<b>For 15.247 (5GHz)</b> 5 for 802.11a, 802.11n (HT20) 2 for 802.11n (HT40)
<b>MAXIMUM OUTPUT POWER</b>	<b>For 15.407</b> 802.11a: 45.525mW 802.11n (HT20): 45.242mW 802.11n (HT40): 48.477mW <b>For 15.247 (2.4GHz)</b> 802.11b: 960.624mW 802.11g: 953.975mW 802.11n (HT20): 968.385mW 802.11n (HT40): 954.066mW <b>For 15.247 (5GHz)</b> 802.11a: 196.869mW 802.11n (HT20): 188.844mW 802.11n (HT40): 172.842mW



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<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 has four model names, which are identical to each other in all aspects except for the following information:

Product Name	Brand	Model No.	Different
Pepwave / Peplink / Pismo Wireless Product	Pepwave / Peplink / Pismo	Balance One	For marketing requirement
		Balance	
		MAX	
		Pismo805	

From the above models, model: **Balance One** was selected as representative model for the test and its data was recorded in this report.

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

Brand	Model No.	Spec.
Ten Pao	S024EM1200200	AC I/P: 100-240V, 50/60Hz, 0.6A DC O/P: 12V, 2000mA DC output cable (unshielded, 1.9m with 1 core)

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

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



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

<b>For 2.4GHz</b>						
Transmitter Circuit	Brand	Antenna Type	Gain (dBi) (Include cable loss)	Connector Type	Cable Length (cm)	Frequency range (MHz to MHz)
Chain (0) Ant. 1	SmartAnt	PIFA	3.73	i-pex	20	2400 ~ 2483.5
Chain (1) Ant. 2	SmartAnt	PIFA	4.51	i-pex	20	2400 ~ 2483.5
<b>For 5GHz</b>						
Transmitter Circuit	Brand	Antenna Type	Gain (dBi) (Include cable loss)	Connector Type	Cable Length (cm)	Frequency range (MHz to MHz)
Chain (0) Ant. 3	SmartAnt	PIFA	2.14	i-pex	20	5150 ~ 5250
			4.22			5725 ~ 5850
Chain (1) Ant. 4	SmartAnt	PIFA	1.85	i-pex	20	5150 ~ 5250
			2.11			5725 ~ 5850

5. 2.4GHz and 5GHz technology can transmit at same time.

6. Spurious emission of the simultaneous operation (2.4GHz and 5GHz) has been evaluated and no non-compliance was found.

7. 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

#### Operated in 2400 ~ 2483.5MHz band:

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		

#### Operated in 5725 ~ 5850MHz band:

5 channels are provided for 802.11a, 802.11n (HT20):

CHANNEL	FREQUENCY	CHANNEL	FREQUENCY
149	5745 MHz	161	5805 MHz
153	5765 MHz	165	5825 MHz
157	5785 MHz		

2 channels are provided for 802.11n (HT40):

CHANNEL	FREQUENCY
151	5755 MHz
159	5795 MHz



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### 3.2.1 TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

EUT CONFIGURE MODE	APPLICABLE TO					DESCRIPTION
	PLC	RE < 1G	RE <sup>3</sup> 1G	APCM	OB	
-	√	√	√	√	√	-

Where **PLC**: Power Line Conducted Emission      **RE < 1G**: Radiated Emission below 1GHz  
**RE <sup>3</sup> 1G**: Radiated Emission above 1GHz      **APCM**: Antenna Port Conducted Measurement  
**OB**: Conducted Out-Band Emission Measurement

**NOTE:** 1. "-" means no effect.

#### **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)
For 2.4 GHz 802.11n (HT20)	1 to 11	6	OFDM	BPSK	6.5
802.11a	149 to 165	149	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)
For 2.4 GHz 802.11n (HT20)	1 to 11	6	OFDM	BPSK	6.5
802.11a	149 to 165	149	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
For 2.4 GHz 802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
For 2.4 GHz 802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5
802.11a	149 to 165	149, 157, 165	OFDM	BPSK	6
For 5 GHz 802.11n (HT20)	149 to 165	149, 157, 165	OFDM	BPSK	6.5
For 5 GHz 802.11n (HT40)	151 to 159	151, 159	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
For 2.4 GHz 802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
For 2.4 GHz 802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5
802.11a	149 to 165	149, 157, 165	OFDM	BPSK	6
For 5 GHz 802.11n (HT20)	149 to 165	149, 157, 165	OFDM	BPSK	6.5
For 5 GHz 802.11n (HT40)	151 to 159	151, 159	OFDM	BPSK	13.5



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**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
For 2.4 GHz 802.11n (HT20)	1 to 11	1, 6, 11	OFDM	BPSK	6.5
For 2.4 GHz 802.11n (HT40)	3 to 9	3, 6, 9	OFDM	BPSK	13.5
802.11a	149 to 165	149, 157, 165	OFDM	BPSK	6
For 5 GHz 802.11n (HT20)	149 to 165	149, 157, 165	OFDM	BPSK	6.5
For 5 GHz 802.11n (HT40)	151 to 159	151, 159	OFDM	BPSK	13.5

**TEST CONDITION:**

APPLICABLE TO	ENVIRONMENTAL CONDITIONS	INPUT POWER	TESTED BY
PLC	23deg. C, 59%RH	120Vac, 60Hz	Bear Lee
RE<1G	22deg. C, 67%RH	120Vac, 60Hz	Robert Cheng
RE <sup>3</sup> 1G	22deg. C, 66%RH	120Vac, 60Hz	Robert Cheng
APCM	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 v02**

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.

### 3.4 DUTY CYCLE OF TEST SIGNAL

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

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

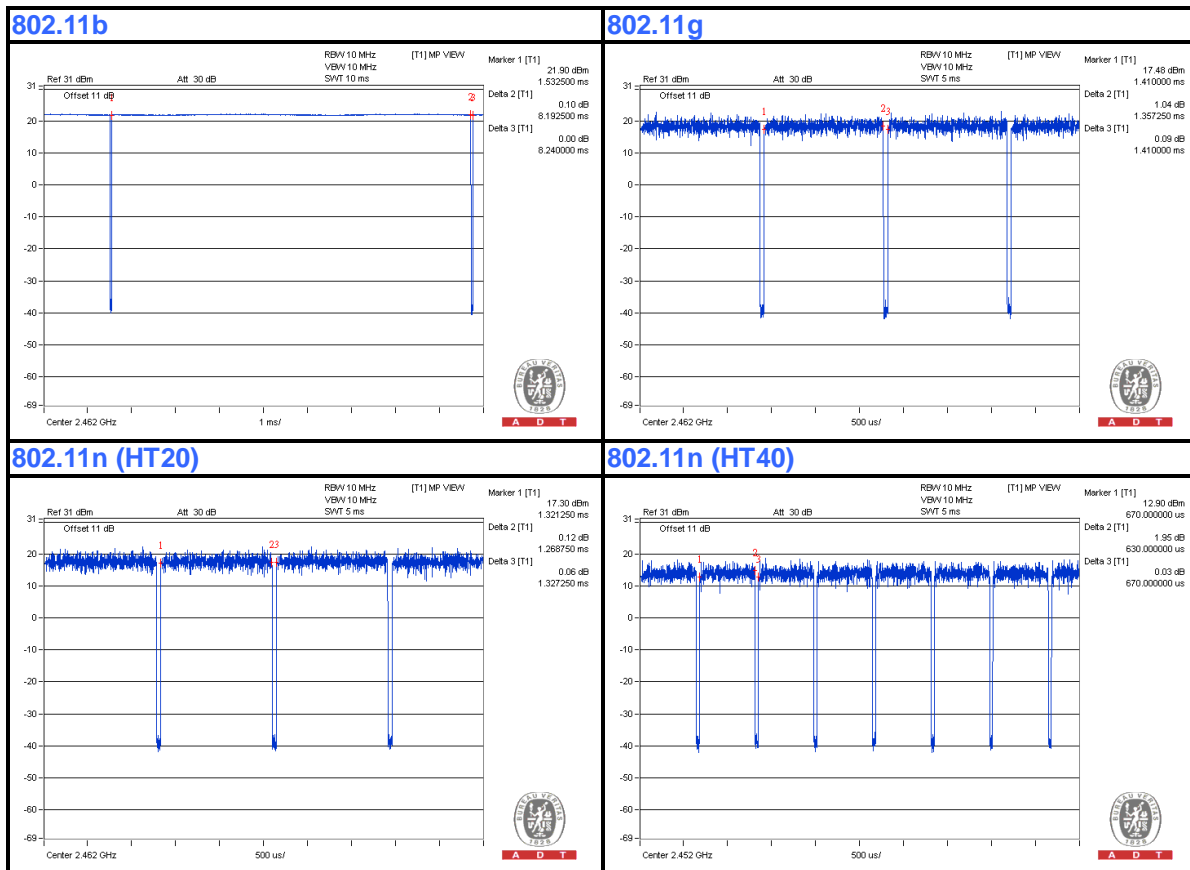
**For 2.4GHz**

**802.11b:** Duty cycle = 8.193 ms/8.24 ms = 0.994

**802.11g:** Duty cycle = 1.357 ms/1.41 ms = 0.962, Duty factor =  $10 * \log(1/0.962) = 0.2$

**802.11n (HT20):** Duty cycle = 1.269 ms/1.327 ms = 0.956, Duty factor =  $10 * \log(1/0.956) = 0.2$

**802.11n (HT40):** Duty cycle = 0.63 ms/0.67 ms = 0.94, Duty factor =  $10 * \log(1/0.94) = 0.3$



### For 5GHz

**802.11a:** Duty cycle = 1.357 ms/1.405 ms = 0.966, Duty factor =  $10 \cdot \log(1/0.966) = 0.2$

**802.11n (HT20):** Duty cycle = 1.269 ms/1.315 ms = 0.965, Duty factor =  $10 \cdot \log(1/0.965) = 0.2$

**802.11n (HT40):** Duty cycle = 0.629 ms/0.665 ms = 0.946, Duty factor =  $10 \cdot \log(1/0.946) = 0.2$





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### 3.5 DESCRIPTION OF SUPPORT UNITS

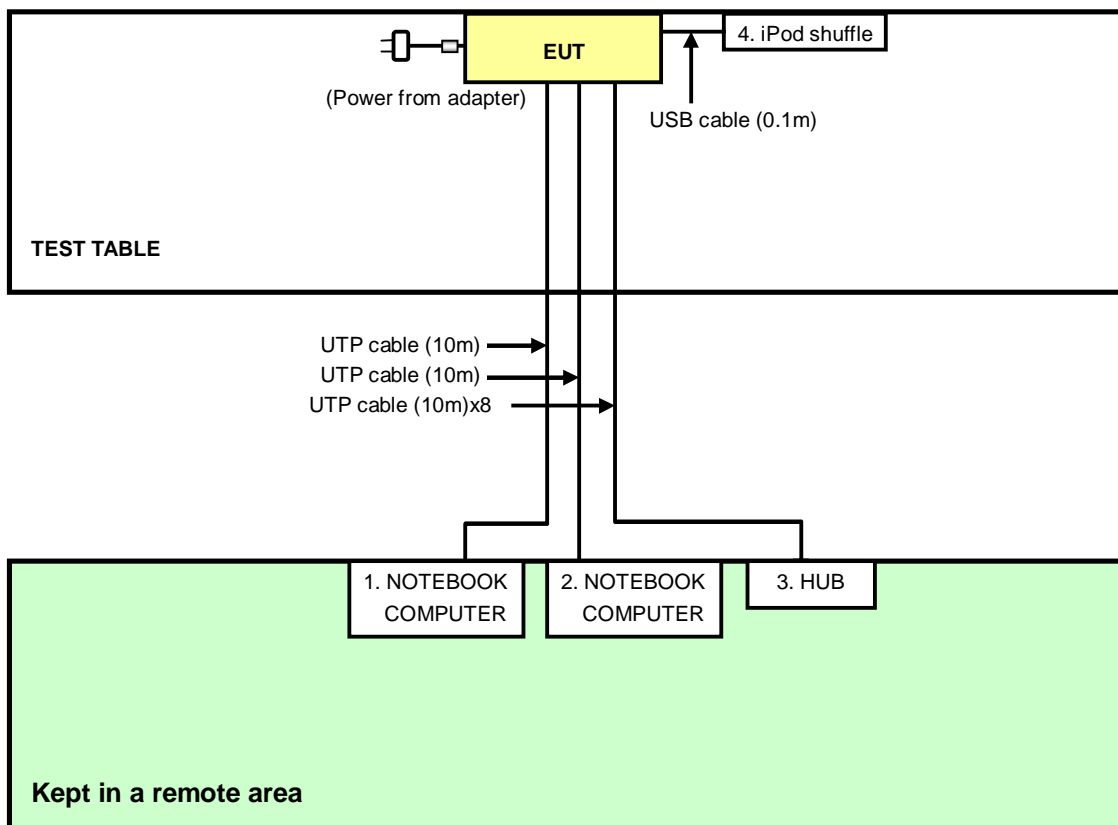
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

No.	Product	Brand	Model No.	Serial No.	FCC ID
1	NOTEBOOK COMPUTER	DELL	PP32LA	FSLB32S	FCC DoC
2	NOTEBOOK COMPUTER	DELL	PP32LA	HSLB32S	FCC DoC
3	HUB	ZyXEL	ES-116P	S060H02000215	FCC DoC
4	iPod shuffle	Apple	MD778TA/A	CC4JMH7LF4T1	NA

No.	Signal cable description
1	UTP cable(10m)
2	UTP cable(10m)
3	UTP cable(10m)
4	USB cable(0.1m)

Note: The power cords of the above support units were unshielded (1.8m).

### 3.6 CONFIGURATION OF SYSTEM UNDER TEST





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## 4. TEST TYPES AND RESULTS (FOR 2.4GHz, 2.400 ~ 2.4835GHz Band)

### 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	100375	Mar. 08, 2013	Mar. 07, 2014
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK8127	8127-522	Sep. 05, 2013	Sep. 04, 2014
Line-Impedance Stabilization Network (for Peripheral)	ENV216	100072	June 06, 2013	June 05, 2014
RF Cable (JYEBAO)	5DFB	COCCAB-001	Mar. 11, 2013	Mar. 10, 2014
50 ohms Terminator	50	EMC-03	Sep. 24, 2013	Sep. 23, 2014
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: Dec. 18, 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.

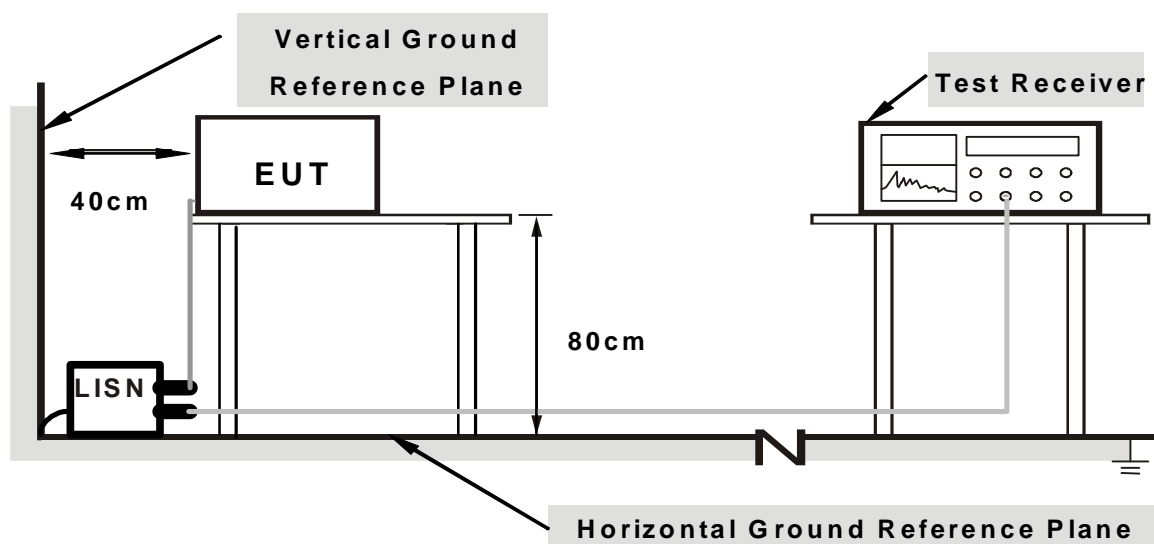
#### NOTE:

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. Placed the EUT on testing table.
2. Prepared computer systems (support unit 1 & 2) to act as communication partner.
3. The communication partner ran test program “artgui.exe (Ver.2.3)” to enable EUT under transmission/receiving condition continuously.



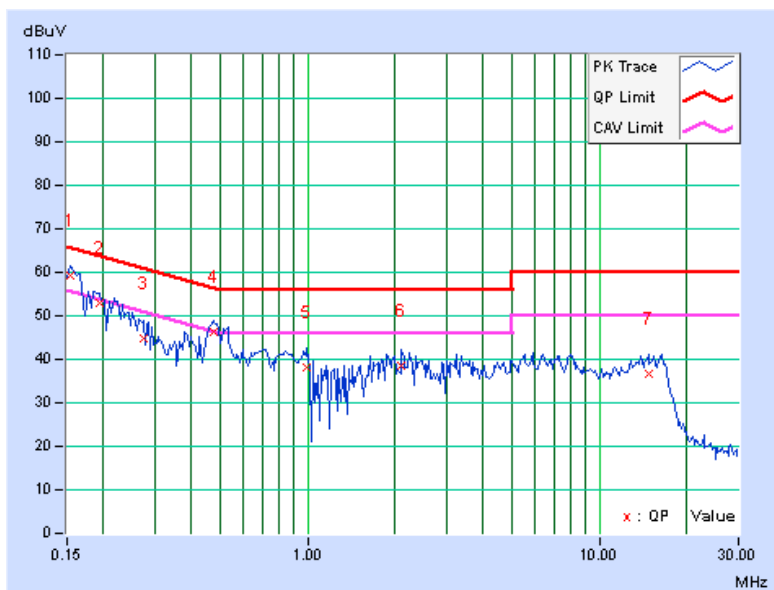
### 4.1.7 TEST RESULTS

PHASE	Line (L)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)
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No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15391	0.09	59.16	48.54	59.25	48.63	65.79	55.79	-6.53	-7.15
2	0.19297	0.11	52.73	43.81	52.84	43.92	63.91	53.91	-11.07	-9.99
3	0.27500	0.13	44.62	31.55	44.75	31.68	60.97	50.97	-16.22	-19.29
4	0.47422	0.16	46.21	39.63	46.37	39.79	56.44	46.44	-10.06	-6.64
5	0.99766	0.20	38.03	30.65	38.23	30.85	56.00	46.00	-17.77	-15.15
6	2.09766	0.28	38.28	30.64	38.56	30.92	56.00	46.00	-17.44	-15.08
7	14.78125	0.94	35.70	30.53	36.64	31.47	60.00	50.00	-23.36	-18.53

#### 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

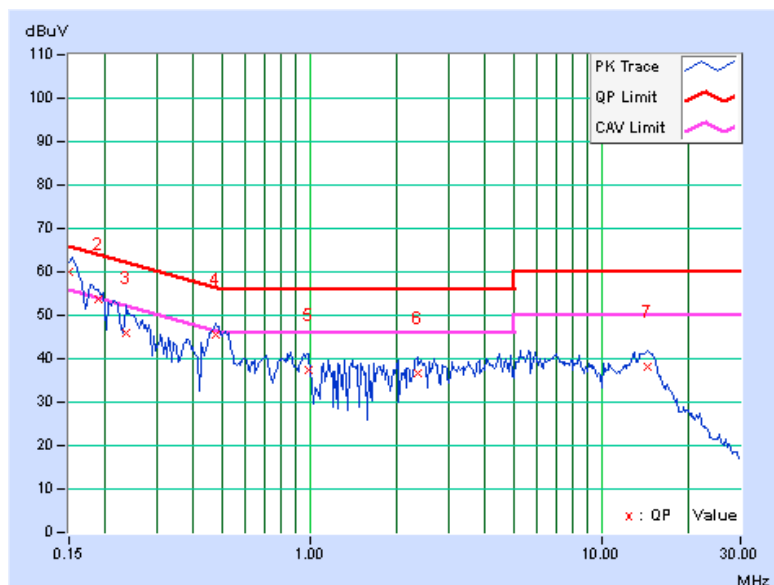


<b>PHASE</b>	Neutral (N)	<b>DETECTOR FUNCTION</b>	Quasi-Peak (QP) / Average (AV)
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No	Freq.	Corr.	Reading Value		Emission Level		Limit		Margin	
	[MHz]	(dB)	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.10	59.90	47.87	60.00	47.97	66.00	56.00	-6.00	-8.03
2	0.18906	0.11	53.71	44.91	53.82	45.02	64.08	54.08	-10.26	-9.06
3	0.23594	0.12	45.99	30.20	46.11	30.32	62.24	52.24	-16.13	-21.92
4	0.47813	0.16	45.35	37.03	45.51	37.19	56.37	46.37	-10.86	-9.18
5	0.99375	0.19	37.31	29.99	37.50	30.18	56.00	46.00	-18.50	-15.82
6	2.35547	0.28	36.52	28.46	36.80	28.74	56.00	46.00	-19.20	-17.26
7	14.34766	0.89	37.43	33.14	38.32	34.03	60.00	50.00	-21.68	-15.97

**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 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 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.



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## 4.2.2 TEST INSTRUMENTS

### For Below 1GHz test

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY51210105	Jan. 21, 2014	Jan. 20, 2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-03	Nov. 13, 2013	Nov. 12, 2014
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Mar. 19, 2013	Mar. 18, 2014
RF Cable	NA	CHGCAB_001	Oct. 05, 2013	Oct. 04, 2014
Spectrum Analyzer R&S	FSV40	100964	July 15, 2013	July 14, 2014
Horn_Antenna AISI	AIH.8018	0000320091110	Nov. 18, 2013	Nov. 17, 2014
Pre-Amplifier Agilent	8449B	3008A02578	June 25, 2013	June 24, 2014
RF Cable	NA	RF104-201 RF104-203 RF104-204	Dec. 12, 2013	Dec. 11, 2014
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 28, 2013	Aug. 27, 2014
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Nov. 13, 2013	Nov. 12, 2014
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 08, 2013	Oct. 07, 2014
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: Jan. 29, 2014



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**For Above 1GHz test**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY50010156	Jan. 15, 2014	Jan. 14, 2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-04	Nov. 13, 2013	Nov. 12, 2014
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Mar. 25, 2013	Mar. 24, 2014
RF Cable	NA	CHHCAB_001	Oct. 06, 2013	Oct. 05, 2014
Spectrum Analyzer R&S	FSV40	100964	July 15, 2013	July 14, 2014
Horn_Antenna AISI	AIH.8018	0000220091110	Dec. 06, 2013	Dec. 05, 2014
Pre-Amplifier Agilent	8449B	3008A01923	Oct. 29, 2013	Oct. 28, 2014
RF Cable	NA	RF104-205 RF104-207 RF104-202	Dec. 12, 2013	Dec. 11, 2014
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 28, 2013	Aug. 27, 2014
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Nov. 13, 2013	Nov. 12, 2014
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 08, 2013	Oct. 07, 2014
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. H.
4. The FCC Site Registration No. is 797305.
5. The CANADA Site Registration No. is IC 7450H-3.
6. Tested Date: Feb. 06, 2014

### 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:**

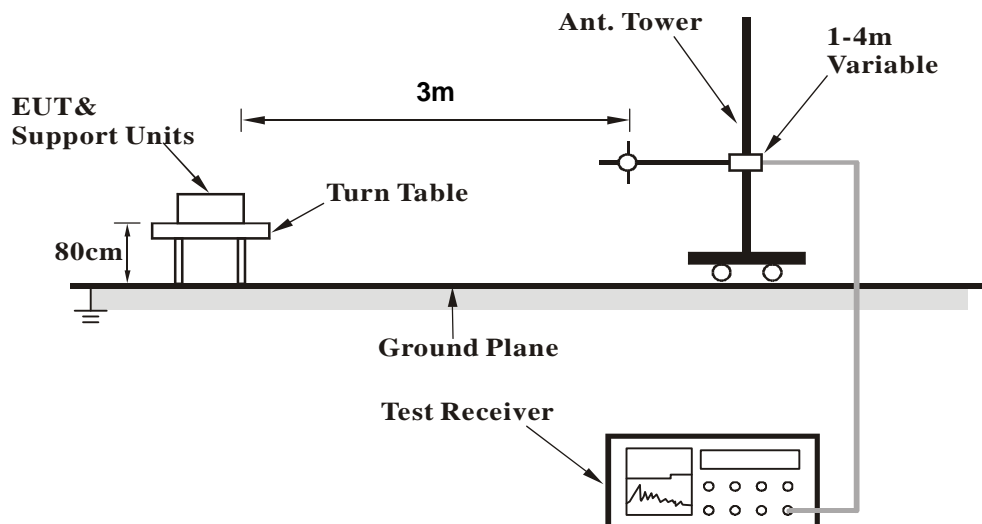
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ( $10 \log(1/\text{duty cycle})$ ).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

### 4.2.4 DEVIATION FROM TEST STANDARD

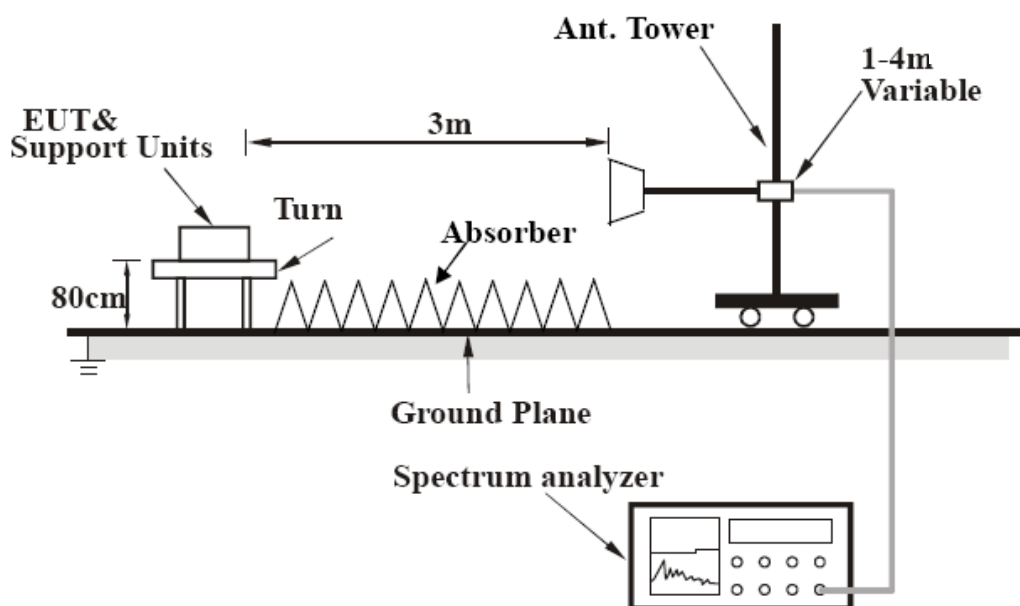
No deviation

#### 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

#### 802.11n (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	250.00	40.5 QP	46.0	-5.5	1.50 H	68	54.77	-14.31
2	375.03	38.1 QP	46.0	-7.9	1.00 H	23	48.62	-10.51
3	550.02	42.6 QP	46.0	-3.4	1.50 H	148	49.11	-6.53
4	734.07	40.4 QP	46.0	-5.6	1.00 H	321	43.15	-2.77
5	849.99	41.7 QP	46.0	-4.4	1.00 H	147	42.53	-0.88
6	950.00	40.9 QP	46.0	-5.1	1.50 H	219	39.87	1.06
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	42.11	36.4 QP	40.0	-3.6	1.47 V	110	50.28	-13.87
2	62.01	33.1 QP	40.0	-6.9	1.37 V	110	47.12	-13.98
3	77.21	34.1 QP	40.0	-5.9	1.47 V	101	51.74	-17.63
4	250.10	37.1 QP	46.0	-8.9	1.32 V	175	51.41	-14.31
5	375.11	40.2 QP	46.0	-5.8	1.42 V	98	50.71	-10.50
6	850.11	42.3 QP	46.0	-3.7	1.22 V	189	43.20	-0.88

#### 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



**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	2333.30	54.3 PK	74.0	-19.7	1.51 H	269	57.97	-3.67
2	2333.30	49.6 AV	54.0	-4.4	1.51 H	269	53.27	-3.67
3	2390.00	61.8 PK	74.0	-12.2	1.38 H	296	65.25	-3.45
4	2390.00	53.5 AV	54.0	-0.5	1.38 H	296	56.95	-3.45
5	*2412.00	112.3 PK			1.38 H	296	115.69	-3.39
6	*2412.00	110.1 AV			1.38 H	296	113.49	-3.39
7	4824.00	53.9 PK	74.0	-20.1	1.63 H	111	47.41	6.49
8	4824.00	46.8 AV	54.0	-7.2	1.63 H	111	40.31	6.49

**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	2333.30	55.2 PK	74.0	-18.8	1.27 V	37	58.87	-3.67
2	2333.30	51.8 AV	54.0	-2.2	1.27 V	37	55.47	-3.67
3	2390.00	56.7 PK	74.0	-17.3	1.17 V	242	60.15	-3.45
4	2390.00	47.8 AV	54.0	-6.2	1.17 V	242	51.25	-3.45
5	*2412.00	107.1 PK			1.17 V	242	110.49	-3.39
6	*2412.00	104.9 AV			1.17 V	242	108.29	-3.39
7	4824.00	54.9 PK	74.0	-19.1	1.47 V	43	48.41	6.49
8	4824.00	47.6 AV	54.0	-6.4	1.47 V	43	41.11	6.49

**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 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	2333.30	54.2 PK	74.0	-19.8	1.56 H	277	57.87	-3.67
2	2333.30	49.6 AV	54.0	-4.4	1.56 H	277	53.27	-3.67
3	2390.00	56.1 PK	74.0	-17.9	1.36 H	295	59.55	-3.45
4	2390.00	46.6 AV	54.0	-7.4	1.36 H	295	50.05	-3.45
5	*2437.00	116.7 PK			1.36 H	295	120.01	-3.31
6	*2437.00	114.6 AV			1.36 H	295	117.91	-3.31
7	4874.00	53.8 PK	74.0	-20.2	1.66 H	119	47.27	6.53
8	4874.00	47.4 AV	54.0	-6.6	1.66 H	119	40.87	6.53
9	7311.00	58.3 PK	74.0	-15.7	1.00 H	225	47.21	11.09
10	7311.00	46.1 AV	54.0	-7.9	1.00 H	225	35.01	11.09

**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	2333.30	55.4 PK	74.0	-18.6	1.27 V	30	59.07	-3.67
2	2333.30	51.9 AV	54.0	-2.1	1.27 V	30	55.57	-3.67
3	2390.00	55.2 PK	74.0	-18.8	1.18 V	250	58.65	-3.45
4	2390.00	45.1 AV	54.0	-8.9	1.18 V	250	48.55	-3.45
5	*2437.00	111.4 PK			1.18 V	250	114.71	-3.31
6	*2437.00	109.2 AV			1.18 V	250	112.51	-3.31
7	4874.00	58.2 PK	74.0	-15.8	1.74 V	58	51.67	6.53
8	4874.00	52.9 AV	54.0	-1.1	1.74 V	58	46.37	6.53
9	7311.00	57.7 PK	74.0	-16.3	1.00 V	64	46.61	11.09
10	7311.00	45.6 AV	54.0	-8.4	1.00 V	64	34.51	11.09

**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	2333.30	53.8 PK	74.0	-20.2	1.56 H	273	57.47	-3.67
2	2333.30	49.2 AV	54.0	-4.8	1.56 H	273	52.87	-3.67
3	*2462.00	112.1 PK			1.34 H	294	115.33	-3.23
4	*2462.00	109.5 AV			1.34 H	294	112.73	-3.23
5	2483.50	61.8 PK	74.0	-12.2	1.34 H	294	64.96	-3.16
<b>6</b>	<b>2483.50</b>	<b>53.8 AV</b>	<b>54.0</b>	<b>-0.2</b>	<b>1.34 H</b>	<b>294</b>	<b>56.96</b>	<b>-3.16</b>
7	4924.00	53.2 PK	74.0	-20.8	1.63 H	108	46.66	6.54
8	4924.00	47.0 AV	54.0	-7.0	1.63 H	108	40.46	6.54
9	7386.00	58.6 PK	74.0	-15.4	1.00 H	215	47.19	11.41
10	7386.00	46.1 AV	54.0	-7.9	1.00 H	215	34.69	11.41

**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	2333.30	55.3 PK	74.0	-18.7	1.21 V	22	58.97	-3.67
2	2333.30	52.1 AV	54.0	-1.9	1.21 V	22	55.77	-3.67
3	*2462.00	106.1 PK			1.17 V	231	109.33	-3.23
4	*2462.00	103.9 AV			1.17 V	231	107.13	-3.23
5	2483.50	56.9 PK	74.0	-17.1	1.17 V	231	60.06	-3.16
6	2483.50	48.2 AV	54.0	-5.8	1.17 V	231	51.36	-3.16
7	4924.00	55.5 PK	74.0	-18.5	1.18 V	45	48.96	6.54
8	4924.00	51.4 AV	54.0	-2.6	1.18 V	45	44.86	6.54
9	7386.00	58.1 PK	74.0	-15.9	1.00 V	65	46.69	11.41
10	7386.00	46.1 AV	54.0	-7.9	1.00 V	65	34.69	11.41

**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 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	72.3 PK	74.0	-1.7	1.35 H	294	75.75	-3.45
2	2390.00	53.1 AV	54.0	-0.9	1.35 H	294	56.55	-3.45
3	*2412.00	113.5 PK			1.35 H	294	116.89	-3.39
4	*2412.00	103.0 AV			1.35 H	294	106.39	-3.39
5	4824.00	55.4 PK	74.0	-18.6	1.63 H	129	48.91	6.49
6	4824.00	44.9 AV	54.0	-9.1	1.63 H	129	38.41	6.49

**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	2390.00	66.4 PK	74.0	-7.6	1.15 V	232	69.85	-3.45
2	2390.00	48.5 AV	54.0	-5.5	1.15 V	232	51.95	-3.45
3	*2412.00	107.4 PK			1.15 V	232	110.79	-3.39
4	*2412.00	96.2 AV			1.15 V	232	99.59	-3.39
5	4824.00	57.8 PK	74.0	-16.2	1.03 V	78	51.31	6.49
6	4824.00	45.8 AV	54.0	-8.2	1.03 V	78	39.31	6.49

**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 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	69.1 PK	74.0	-4.9	1.40 H	300	72.55	-3.45
2	2390.00	53.2 AV	54.0	-0.8	1.40 H	300	56.65	-3.45
3	*2437.00	121.2 PK			1.40 H	300	124.51	-3.31
4	*2437.00	111.2 AV			1.40 H	300	114.51	-3.31
5	2483.50	64.1 PK	74.0	-9.9	1.40 H	300	67.26	-3.16
6	2483.50	49.6 AV	54.0	-4.4	1.40 H	300	52.76	-3.16
7	4874.00	55.5 PK	74.0	-18.5	1.66 H	115	48.97	6.53
8	4874.00	44.7 AV	54.0	-9.3	1.66 H	115	38.17	6.53
9	7311.00	59.2 PK	74.0	-14.8	1.04 H	225	48.11	11.09
10	7311.00	46.5 AV	54.0	-7.5	1.04 H	225	35.41	11.09

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	2390.00	57.9 PK	74.0	-16.1	1.11 V	232	61.35	-3.45
2	2390.00	45.8 AV	54.0	-8.2	1.11 V	232	49.25	-3.45
3	*2437.00	115.4 PK			1.11 V	232	118.71	-3.31
4	*2437.00	105.6 AV			1.11 V	232	108.91	-3.31
5	2483.50	56.9 PK	74.0	-17.1	1.11 V	232	60.06	-3.16
6	2483.50	48.1 AV	54.0	-5.9	1.11 V	232	51.26	-3.16
7	4874.00	57.9 PK	74.0	-16.1	1.00 V	63	51.37	6.53
8	4874.00	45.8 AV	54.0	-8.2	1.00 V	63	39.27	6.53
9	7311.00	58.3 PK	74.0	-15.7	1.00 V	205	47.21	11.09
10	7311.00	46.8 AV	54.0	-7.2	1.00 V	205	35.71	11.09

**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	114.1 PK			1.34 H	294	117.33	-3.23
2	*2462.00	103.5 AV			1.34 H	294	106.73	-3.23
3	2483.50	69.6 PK	74.0	-4.4	1.34 H	294	72.76	-3.16
4	2483.50	53.6 AV	54.0	-0.4	1.34 H	294	56.76	-3.16
5	4924.00	55.6 PK	74.0	-18.4	1.59 H	115	49.06	6.54
6	4924.00	45.3 AV	54.0	-8.7	1.59 H	115	38.76	6.54
7	7386.00	58.4 PK	74.0	-15.6	1.03 H	227	46.99	11.41
8	7386.00	46.0 AV	54.0	-8.0	1.03 H	227	34.59	11.41

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	106.4 PK			1.10 V	227	109.63	-3.23
2	*2462.00	95.7 AV			1.10 V	227	98.93	-3.23
3	2483.50	56.9 PK	74.0	-17.1	1.10 V	227	60.06	-3.16
4	2483.50	48.3 AV	54.0	-5.7	1.10 V	227	51.46	-3.16
5	4924.00	58.1 PK	74.0	-15.9	1.00 V	76	51.56	6.54
6	4924.00	46.1 AV	54.0	-7.9	1.00 V	76	39.56	6.54
7	7386.00	58.9 PK	74.0	-15.1	1.03 V	201	47.49	11.41
8	7386.00	47.1 AV	54.0	-6.9	1.03 V	201	35.69	11.41

**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	2390.00	71.9 PK	74.0	-2.1	1.39 H	296	75.35	-3.45
2	2390.00	53.6 AV	54.0	-0.4	1.39 H	296	57.05	-3.45
3	*2412.00	111.4 PK			1.39 H	296	114.79	-3.39
4	*2412.00	102.5 AV			1.39 H	296	105.89	-3.39
5	4824.00	55.6 PK	74.0	-18.4	1.62 H	138	49.11	6.49
6	4824.00	45.2 AV	54.0	-8.8	1.62 H	138	38.71	6.49

**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	2390.00	56.3 PK	74.0	-17.7	1.14 V	229	59.75	-3.45
2	2390.00	47.6 AV	54.0	-6.4	1.14 V	229	51.05	-3.45
3	*2412.00	106.9 PK			1.14 V	229	110.29	-3.39
4	*2412.00	95.4 AV			1.14 V	229	98.79	-3.39
5	4824.00	57.9 PK	74.0	-16.1	1.00 V	63	51.41	6.49
6	4824.00	45.8 AV	54.0	-8.2	1.00 V	63	39.31	6.49

**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 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	69.8 PK	74.0	-4.2	1.31 H	291	73.25	-3.45
2	2390.00	53.5 AV	54.0	-0.5	1.31 H	291	56.95	-3.45
3	*2437.00	120.2 PK			1.31 H	291	123.51	-3.31
4	*2437.00	110.7 AV			1.31 H	291	114.01	-3.31
5	2483.50	68.5 PK	74.0	-5.5	1.31 H	291	71.66	-3.16
6	2483.50	52.6 AV	54.0	-1.4	1.31 H	291	55.76	-3.16
7	4874.00	54.8 PK	74.0	-19.2	1.65 H	123	48.27	6.53
8	4874.00	44.4 AV	54.0	-9.6	1.65 H	123	37.87	6.53
9	7311.00	59.0 PK	74.0	-15.0	1.00 H	240	47.91	11.09
10	7311.00	46.3 AV	54.0	-7.7	1.00 H	240	35.21	11.09

**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	56.0 PK	74.0	-18.0	1.14 V	215	59.45	-3.45
2	2390.00	47.6 AV	54.0	-6.4	1.14 V	215	51.05	-3.45
3	*2437.00	113.2 PK			1.14 V	215	116.51	-3.31
4	*2437.00	103.4 AV			1.14 V	215	106.71	-3.31
5	2483.50	57.1 PK	74.0	-16.9	4.00 V	215	60.26	-3.16
6	2483.50	48.3 AV	54.0	-5.7	4.00 V	215	51.46	-3.16
7	4874.00	57.9 PK	74.0	-16.1	1.00 V	69	51.37	6.53
8	4874.00	45.6 AV	54.0	-8.4	1.00 V	69	39.07	6.53
9	7311.00	58.0 PK	74.0	-16.0	1.02 V	193	46.91	11.09
10	7311.00	46.4 AV	54.0	-7.6	1.02 V	193	35.31	11.09

**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	111.0 PK			1.32 H	290	114.23	-3.23
2	*2462.00	102.0 AV			1.32 H	290	105.23	-3.23
3	2483.50	67.2 PK	74.0	-6.8	1.32 H	290	70.36	-3.16
4	2483.50	53.2 AV	54.0	-0.8	1.32 H	290	56.36	-3.16
5	4924.00	55.5 PK	74.0	-18.5	1.65 H	136	48.96	6.54
6	4924.00	45.0 AV	54.0	-9.0	1.65 H	136	38.46	6.54
7	7386.00	58.8 PK	74.0	-15.2	1.05 H	241	47.39	11.41
8	7386.00	46.2 AV	54.0	-7.8	1.05 H	241	34.79	11.41

**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	103.5 PK			1.21 V	212	106.73	-3.23
2	*2462.00	94.8 AV			1.21 V	212	98.03	-3.23
3	2483.50	56.8 PK	74.0	-17.2	1.21 V	212	59.96	-3.16
4	2483.50	48.0 AV	54.0	-6.0	1.21 V	212	51.16	-3.16
5	4924.00	58.0 PK	74.0	-16.0	1.00 V	71	51.46	6.54
6	4924.00	46.0 AV	54.0	-8.0	1.00 V	71	39.46	6.54
7	7386.00	58.4 PK	74.0	-15.6	1.00 V	217	46.99	11.41
8	7386.00	47.1 AV	54.0	-6.9	1.00 V	217	35.69	11.41

**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)

<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	69.1 PK	74.0	-4.9	1.37 H	293	72.55	-3.45
2	2390.00	53.7 AV	54.0	-0.3	1.37 H	293	57.15	-3.45
3	*2422.00	105.9 PK			1.37 H	293	109.26	-3.36
4	*2422.00	96.4 AV			1.37 H	293	99.76	-3.36
5	4844.00	55.0 PK	74.0	-19.0	1.60 H	143	48.50	6.50
6	4844.00	44.7 AV	54.0	-9.3	1.60 H	143	38.20	6.50
7	7266.00	58.0 PK	74.0	-16.0	1.05 H	227	47.02	10.98
8	7266.00	45.9 AV	54.0	-8.1	1.05 H	227	34.92	10.98

**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	56.6 PK	74.0	-17.4	1.19 V	244	60.05	-3.45
2	2390.00	48.0 AV	54.0	-6.0	1.19 V	244	51.45	-3.45
3	*2422.00	98.2 PK			1.19 V	244	101.56	-3.36
4	*2422.00	89.4 AV			1.19 V	244	92.76	-3.36
5	4844.00	57.5 PK	74.0	-16.5	1.00 V	71	51.00	6.50
6	4844.00	45.3 AV	54.0	-8.7	1.00 V	71	38.80	6.50
7	7266.00	58.3 PK	74.0	-15.7	1.00 V	194	47.32	10.98
8	7266.00	46.6 AV	54.0	-7.4	1.00 V	194	35.62	10.98

**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	2390.00	68.8 PK	74.0	-5.2	1.37 H	295	72.25	-3.45
2	2390.00	53.4 AV	54.0	-0.6	1.37 H	295	56.85	-3.45
3	*2437.00	110.8 PK			1.37 H	295	114.11	-3.31
4	*2437.00	101.3 AV			1.37 H	295	104.61	-3.31
5	2483.50	64.5 PK	74.0	-9.5	1.37 H	295	67.66	-3.16
6	2483.50	48.9 AV	54.0	-5.1	1.37 H	295	52.06	-3.16
7	4874.00	55.5 PK	74.0	-18.5	1.68 H	138	48.97	6.53
8	4874.00	45.1 AV	54.0	-8.9	1.68 H	138	38.57	6.53
9	7311.00	58.9 PK	74.0	-15.1	1.06 H	231	47.81	11.09
10	7311.00	46.5 AV	54.0	-7.5	1.06 H	231	35.41	11.09

**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	55.6 PK	74.0	-18.4	1.25 V	224	59.05	-3.45
2	2390.00	47.3 AV	54.0	-6.7	1.25 V	224	50.75	-3.45
3	*2437.00	103.3 PK			1.25 V	224	106.61	-3.31
4	*2437.00	94.2 AV			1.25 V	224	97.51	-3.31
5	2483.50	56.3 PK	74.0	-17.7	1.25 V	224	59.46	-3.16
6	2483.50	47.8 AV	54.0	-6.2	1.25 V	224	50.96	-3.16
7	4874.00	58.0 PK	74.0	-16.0	1.00 V	60	51.47	6.53
8	4874.00	46.2 AV	54.0	-7.8	1.00 V	60	39.67	6.53
9	7311.00	57.8 PK	74.0	-16.2	1.03 V	210	46.71	11.09
10	7311.00	46.5 AV	54.0	-7.5	1.03 V	210	35.41	11.09

**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	110.7 PK			1.32 H	293	113.96	-3.26
2	*2452.00	101.5 AV			1.32 H	293	104.76	-3.26
3	2483.50	69.4 PK	74.0	-4.6	1.32 H	293	72.56	-3.16
4	2483.50	53.6 AV	54.0	-0.4	1.32 H	293	56.76	-3.16
5	4904.00	55.7 PK	74.0	-18.3	1.58 H	113	49.15	6.55
6	4904.00	45.0 AV	54.0	-9.0	1.58 H	113	38.45	6.55
7	7356.00	58.8 PK	74.0	-15.2	1.00 H	223	47.51	11.29
8	7356.00	46.3 AV	54.0	-7.7	1.00 H	223	35.01	11.29

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

NO.	FREQ. (MHz)	EMISSION LEVEL (dBuV/m)	LIMIT (dBuV/m)	MARGIN (dB)	ANTENNA HEIGHT (m)	TABLE ANGLE (Degree)	RAW VALUE (dBuV)	CORRECTION FACTOR (dB/m)
1	*2452.00	103.9 PK			1.62 V	234	107.16	-3.26
2	*2452.00	94.7 AV			1.62 V	234	97.96	-3.26
3	2483.50	63.5 PK	74.0	-10.5	1.62 V	234	66.66	-3.16
4	2483.50	48.2 AV	54.0	-5.8	1.62 V	234	51.36	-3.16
5	4904.00	57.8 PK	74.0	-16.2	1.00 V	66	51.25	6.55
6	4904.00	45.5 AV	54.0	-8.5	1.00 V	66	38.95	6.55
7	7356.00	57.9 PK	74.0	-16.1	1.00 V	216	46.61	11.29
8	7356.00	46.4 AV	54.0	-7.6	1.00 V	216	35.11	11.29

**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
Spectrum Analyzer R&S	FSP 40	100036	Jan. 21, 2014	Jan. 20, 2015

**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 : Feb. 06, 2014

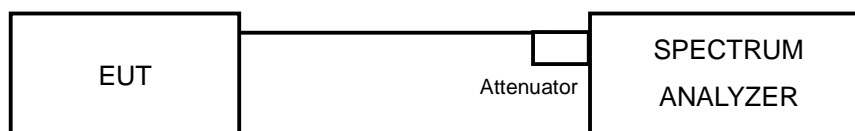
#### 4.3.3 TEST PROCEDURE

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	9.62	10.08	0.5	PASS
6	2437	11.09	9.65	0.5	PASS
11	2462	11.07	10.17	0.5	PASS

#### 802.11g

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
1	2412	15.82	15.81	0.5	PASS
6	2437	15.75	15.80	0.5	PASS
11	2462	16.47	15.83	0.5	PASS

#### 802.11n (HT20)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
1	2412	15.22	16.45	0.5	PASS
6	2437	16.38	16.43	0.5	PASS
11	2462	17.30	16.47	0.5	PASS

#### 802.11n (HT40)

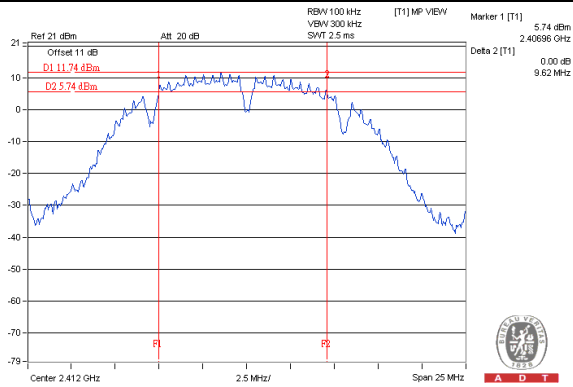
CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
3	2422	36.56	36.53	0.5	PASS
6	2437	35.20	35.23	0.5	PASS
9	2452	15.28	21.44	0.5	PASS



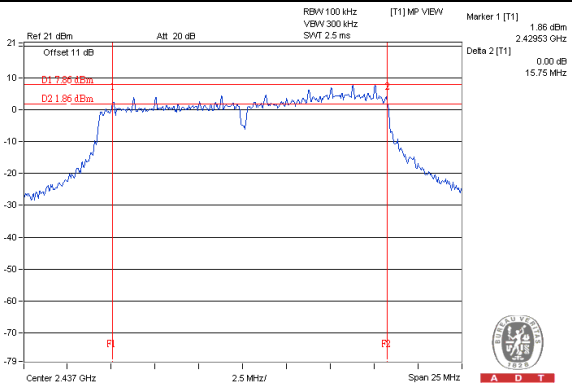
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### SPECTRUM PLOT OF WORST VALUE

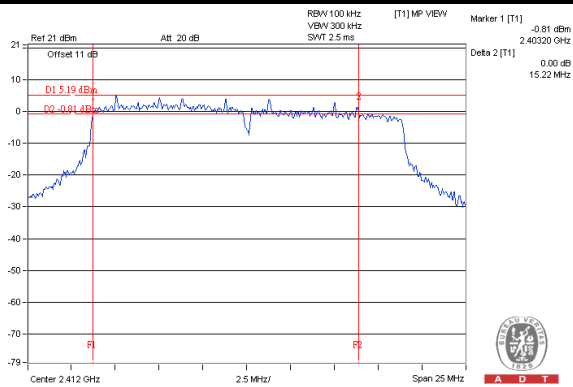
#### 802.11b / Chain(0) : CH1



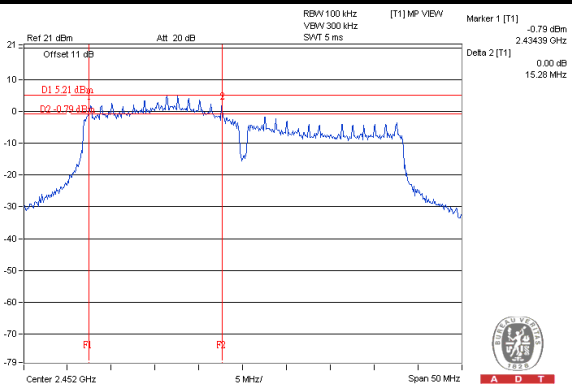
#### 802.11g / Chain(0) : CH6



#### 802.11n (HT20) / Chain(0) : CH1



#### 802.11n (HT40) / Chain(0) : CH9



## 4.4 CONDUCTED OUTPUT POWER MEASUREMENT

### 4.4.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

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

Per KDB 662911 D01 Multiple Transmitter Output 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 Anritsu	ML2495A	0824006	May 20, 2013	May 19, 2014
Power sensor Anritsu	MA2411B	0738172	May 20, 2013	May 19, 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 : Feb. 06, 2014

### 4.4.3 TEST PROCEDURES

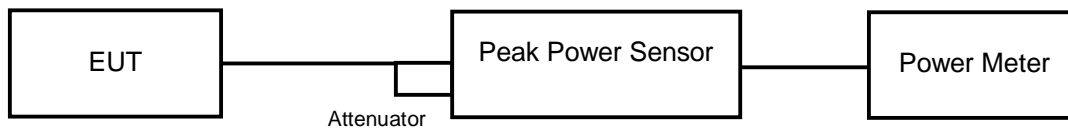
The peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the peak power level.



#### 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)	PEAK POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
1	2412	23.89	23.76	482.590	26.84	30	PASS
6	2437	26.86	26.77	960.624	29.83	30	PASS
11	2462	24.45	24.37	552.139	27.42	30	PASS

##### 802.11g

CHANNEL	FREQUENCY (MHz)	PEAK POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
1	2412	25.57	25.41	708.115	28.50	30	PASS
6	2437	26.81	26.76	953.975	29.80	30	PASS
11	2462	26.61	26.51	905.855	29.57	30	PASS

##### 802.11n (HT20)

CHANNEL	FREQUENCY (MHz)	PEAK POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
1	2412	25.73	25.46	725.671	28.61	30	PASS
6	2437	26.89	26.81	968.385	29.86	30	PASS
11	2462	26.64	26.57	915.260	29.62	30	PASS

##### 802.11n (HT40)

CHANNEL	FREQUENCY (MHz)	PEAK POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
3	2422	23.48	23.52	447.749	26.51	30	PASS
6	2437	26.85	26.72	954.066	29.80	30	PASS
9	2452	26.31	26.44	868.118	29.39	30	PASS



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## 4.5 AVERAGE OUTPUT POWER

### 4.5.1 FOR REFERENCE.

### 4.5.2 TEST 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 : Feb. 06, 2014

### 4.5.3 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.

### 4.5.4 TEST SETUP



### 4.5.5 EUT OPERATING CONDITIONS

Same as Item 4.3.6



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## 4.5.6 TEST RESULTS

### 802.11b

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		CHAIN 0	CHAIN 1		
1	2412	21.85	21.96	310.145	24.92
6	2437	24.89	24.87	615.221	27.89
11	2462	22.26	22.17	333.083	25.23

### 802.11g

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		CHAIN 0	CHAIN 1		
1	2412	17.01	16.97	100.008	20.00
6	2437	19.40	19.17	169.700	22.30
11	2462	19.11	18.57	153.415	21.86

### 802.11n (HT20)

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		CHAIN 0	CHAIN 1		
1	2412	17.25	16.89	101.953	20.08
6	2437	18.97	18.81	154.919	21.90
11	2462	18.62	18.20	138.847	21.43

### 802.11n (HT40)

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		CHAIN 0	CHAIN 1		
3	2422	14.01	13.79	49.110	16.91
6	2437	18.52	18.79	146.804	21.67
9	2452	17.43	17.59	112.747	20.52

## 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
Spectrum Analyzer R&S	FSP 40	100036	Jan. 21, 2014	Jan. 20, 2015

**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 : Feb. 06, 2014

### 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

#### 4.6.7 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	-3.62	3.01	-0.61	6.86	PASS
	6	2437	-0.85	3.01	2.16	6.86	PASS
	11	2462	-3.31	3.01	-0.30	6.86	PASS
1	1	2412	-4.23	3.01	-1.22	6.86	PASS
	6	2437	-0.91	3.01	2.10	6.86	PASS
	11	2462	-3.55	3.01	-0.54	6.86	PASS

**NOTE:** 1. Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 7.14\text{dBi} > 6\text{dBi}$  , so the power density limit shall be reduced to  $8-(7.14-6) = 6.86\text{dBm}$ .

##### 802.11g

TX CHAIN	CHANNEL	FREQUENCY (MHz)	PSD (dBm)	10 log (N=2) dB	Total PSD (dBm)	Limit (dBm)	PASS /FAIL
0	1	2412	-9.60	3.01	-6.59	6.86	PASS
	6	2437	-6.31	3.01	-3.30	6.86	PASS
	11	2462	-6.87	3.01	-3.86	6.86	PASS
1	1	2412	-8.74	3.01	-5.73	6.86	PASS
	6	2437	-5.86	3.01	-2.85	6.86	PASS
	11	2462	-8.59	3.01	-5.58	6.86	PASS

**NOTE:** 1. Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 7.14\text{dBi} > 6\text{dBi}$  , so the power density limit shall be reduced to  $8-(7.14-6) = 6.86\text{dBm}$ .

### 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	-9.51	3.01	-6.50	6.86	PASS
	6	2437	-7.61	3.01	-4.60	6.86	PASS
	11	2462	-8.96	3.01	-5.95	6.86	PASS
1	1	2412	-10.28	3.01	-7.27	6.86	PASS
	6	2437	-6.84	3.01	-3.83	6.86	PASS
	11	2462	-5.49	3.01	-2.48	6.86	PASS

**NOTE:** 1. Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 7.14\text{dBi} > 6\text{dBi}$  , so the power density limit shall be reduced to  $8-(7.14-6) = 6.86\text{dBm}$ .

### 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	-14.15	3.01	-11.14	6.86	PASS
	6	2437	-9.38	3.01	-6.37	6.86	PASS
	9	2452	-9.65	3.01	-6.64	6.86	PASS
1	3	2422	-14.92	3.01	-11.91	6.86	PASS
	6	2437	-10.67	3.01	-7.66	6.86	PASS
	9	2452	-10.71	3.01	-7.70	6.86	PASS

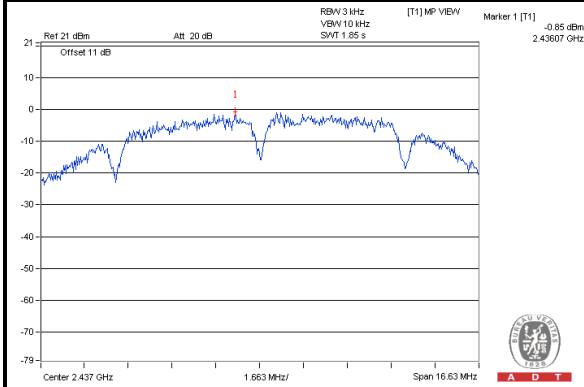
**NOTE:** 1. Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 7.14\text{dBi} > 6\text{dBi}$  , so the power density limit shall be reduced to  $8-(7.14-6) = 6.86\text{dBm}$ .



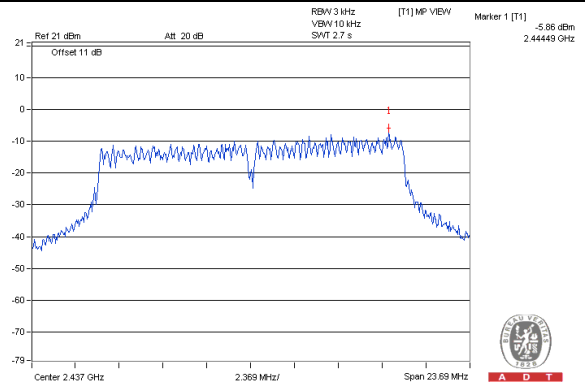
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### SPECTRUM PLOT OF WORST VALUE

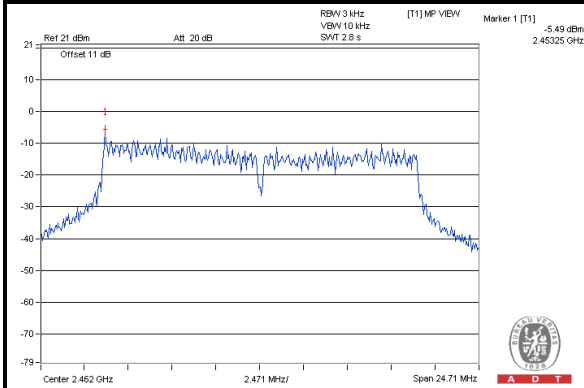
#### 802.11b / Chain(0) : CH6



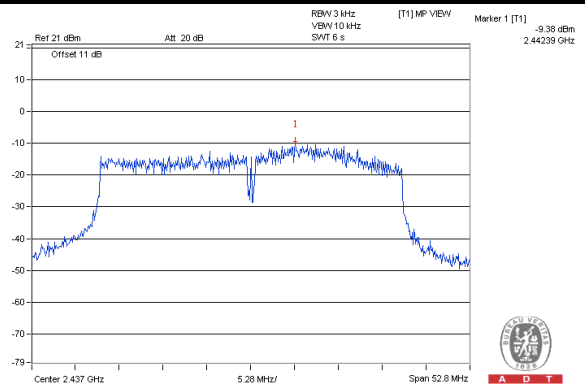
#### 802.11g / Chain(1) : CH6



#### 802.11n (HT20) / Chain(1) : CH11



#### 802.11n (HT40) / Chain(0) : CH6







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## 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
Spectrum Analyzer R&S	FSP 40	100036	Jan. 21, 2014	Jan. 20, 2015

**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 : Feb. 06, 2014

### 4.7.3 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.

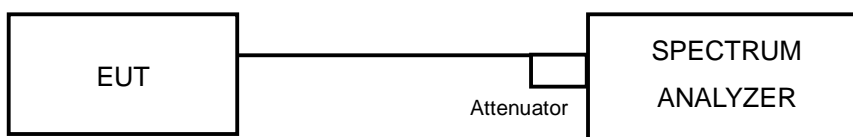
#### Measurement Procedure –Unwanted Emission Level

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.

#### 4.7.4 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

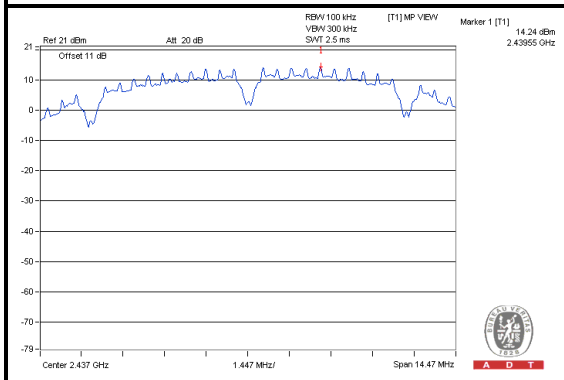
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.



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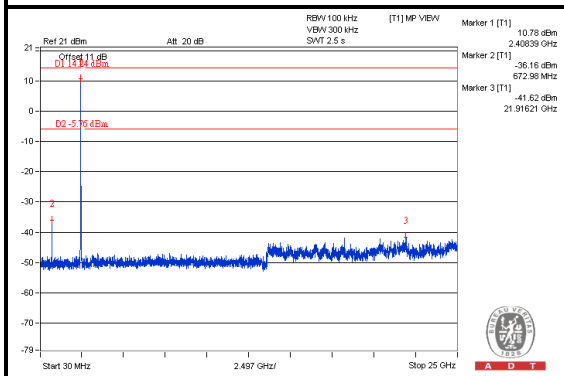
For 802.11b

### Maximum REF

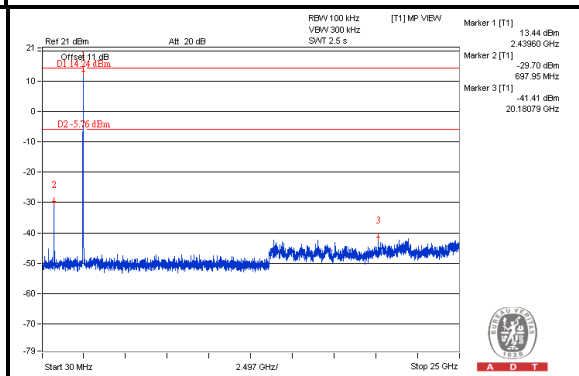


For Chain (0): 802.11b

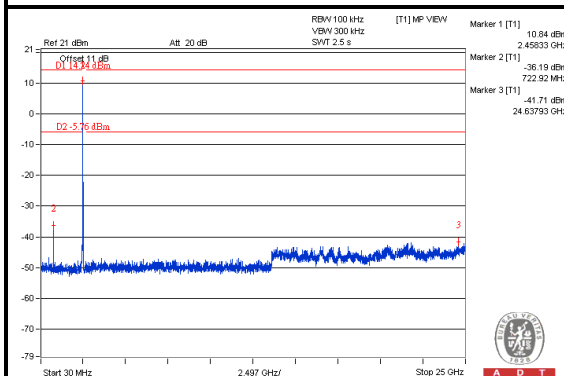
### CH 1



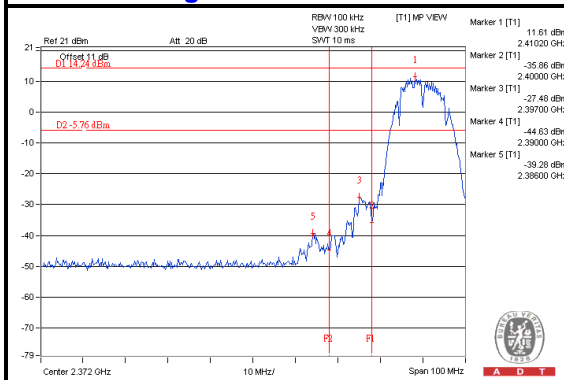
### CH 6



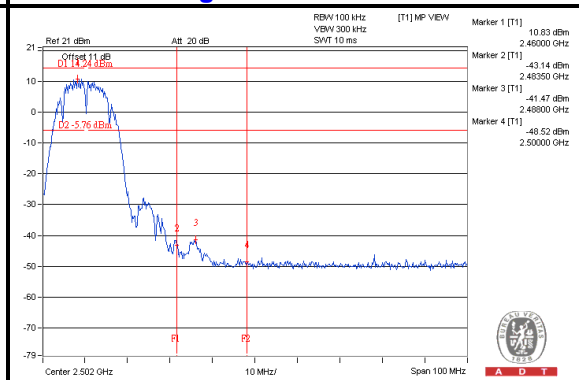
### CH 11



### CH 1 Band edge



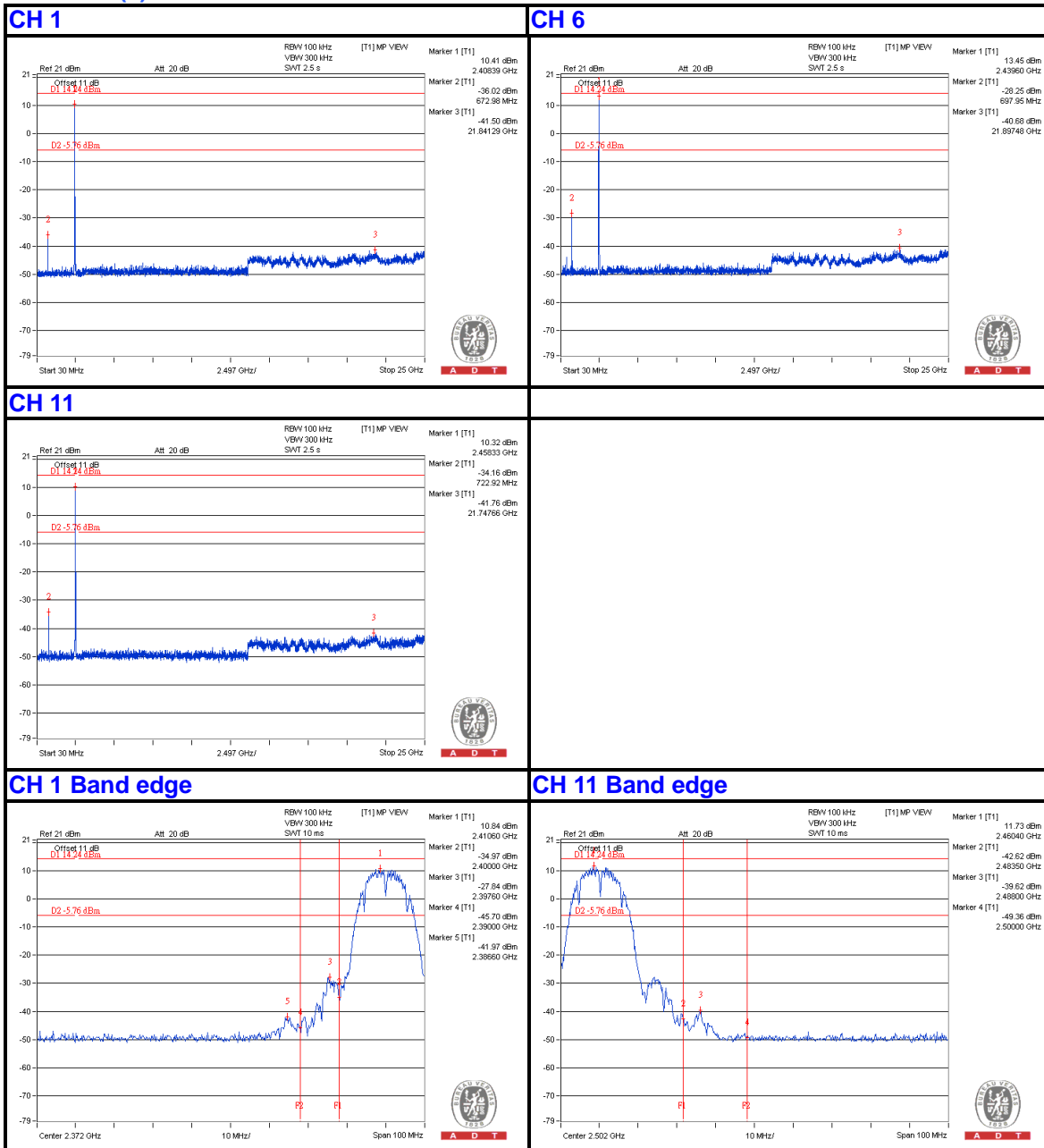
### CH 11 Band edge





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### For Chain (1): 802.11b

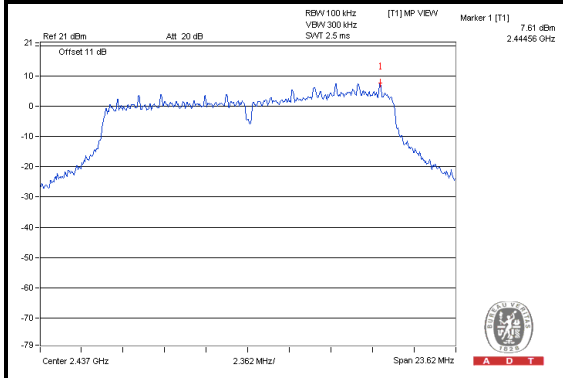




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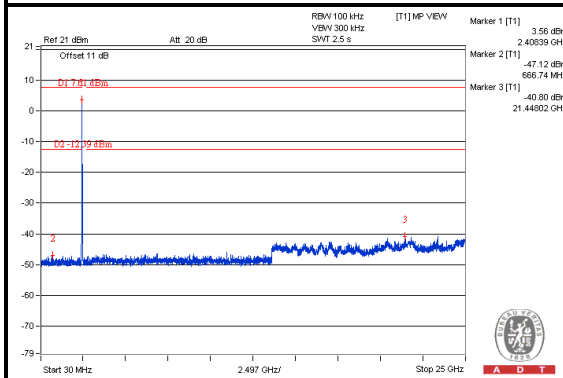
For 802.11g

### Maximum REF

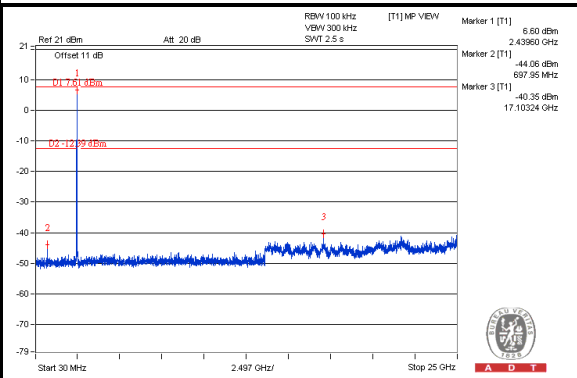


For Chain (0): 802.11g

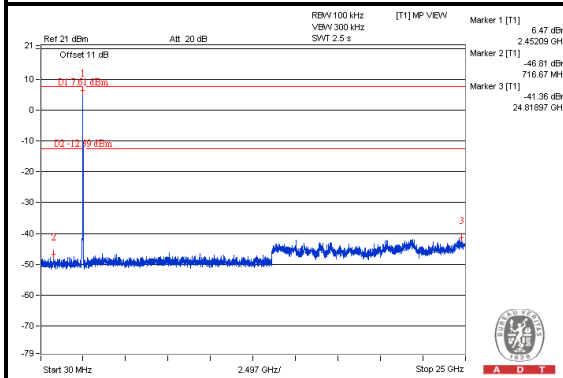
### CH 1



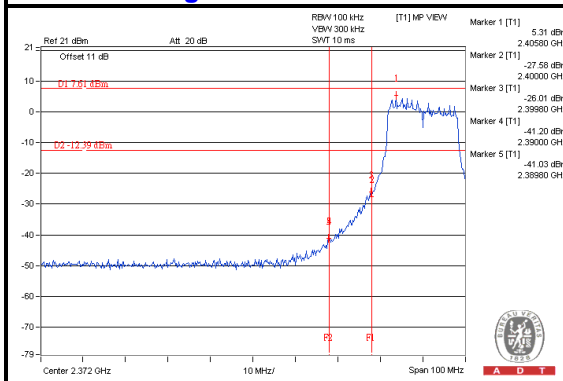
### CH 6



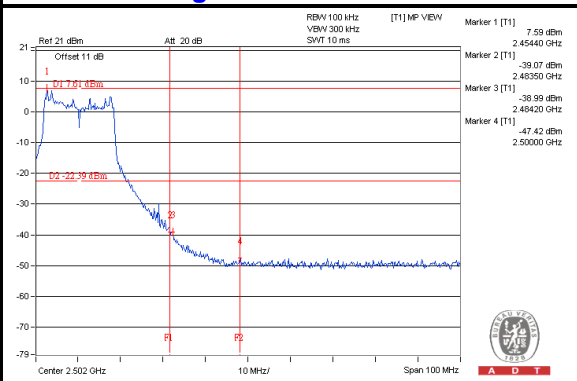
### CH 11



### CH 1 Band edge



### CH 11 Band edge

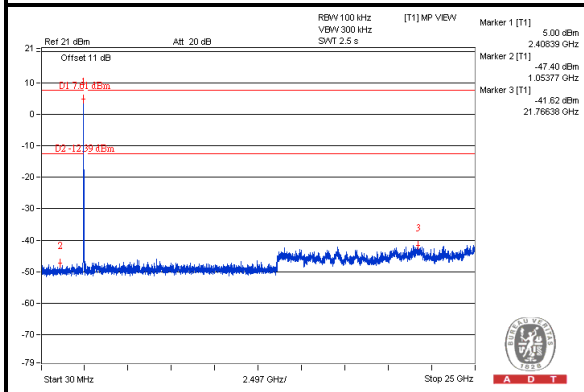




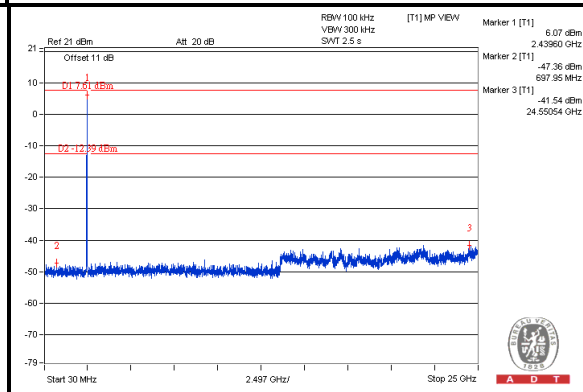
A D T

### For Chain (1): 802.11g

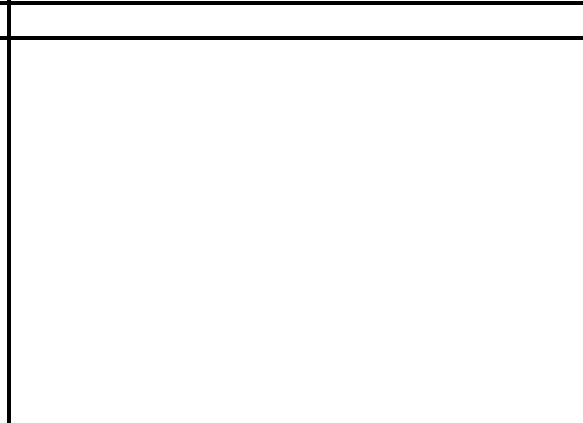
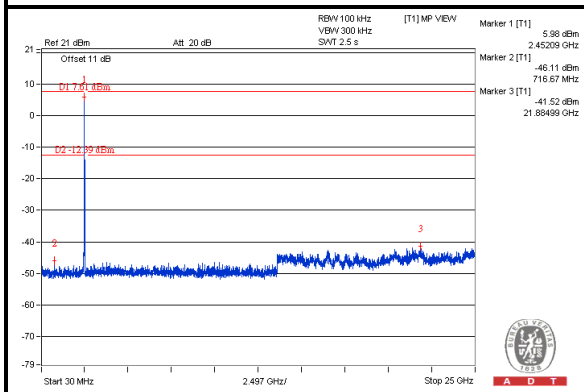
#### CH 1



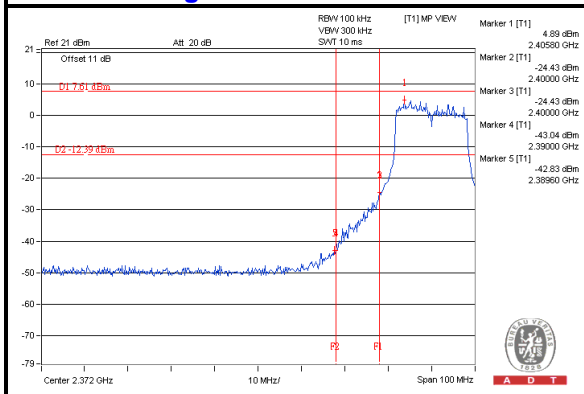
#### CH 6



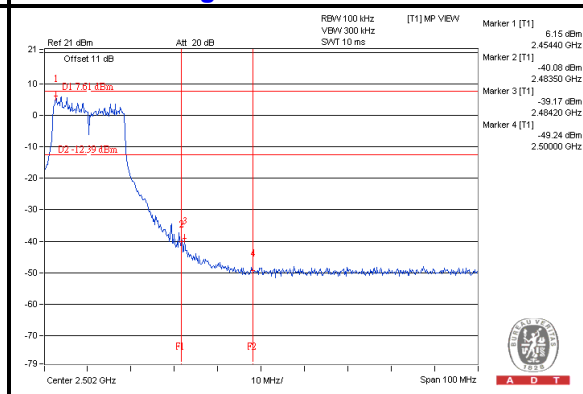
#### CH 11



#### CH 1 Band edge



#### CH 11 Band edge

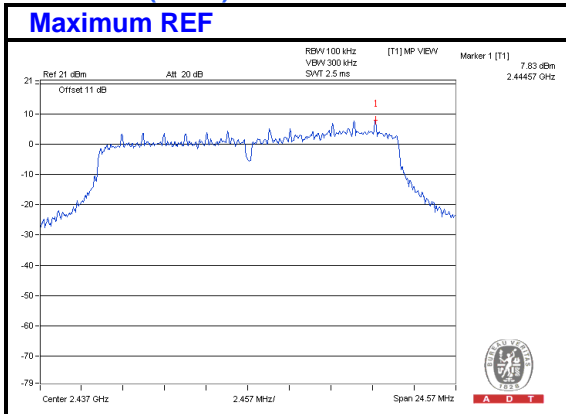




A D T

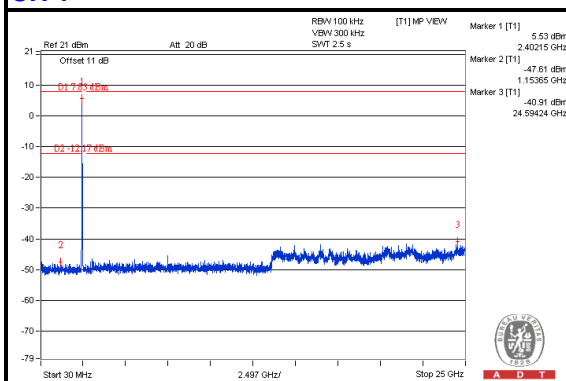
### For 802.11n(HT20)

#### Maximum REF

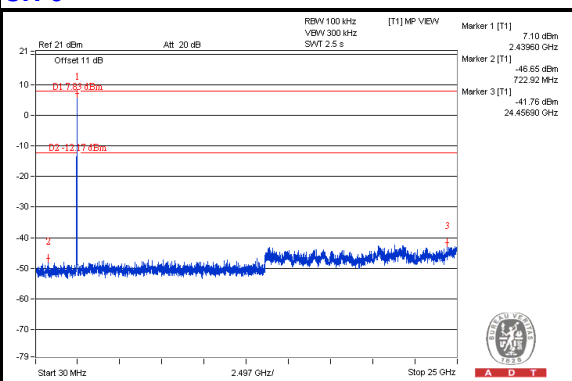


### For Chain (0): 802.11n(HT20)

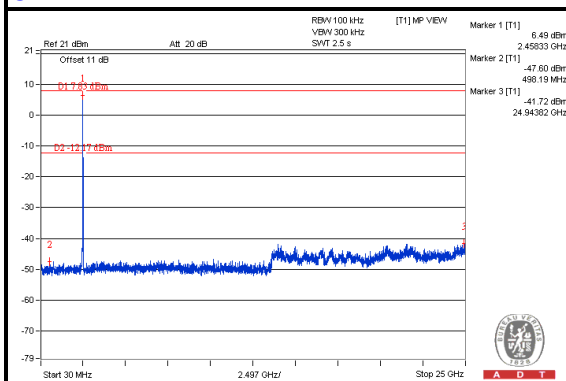
#### CH 1



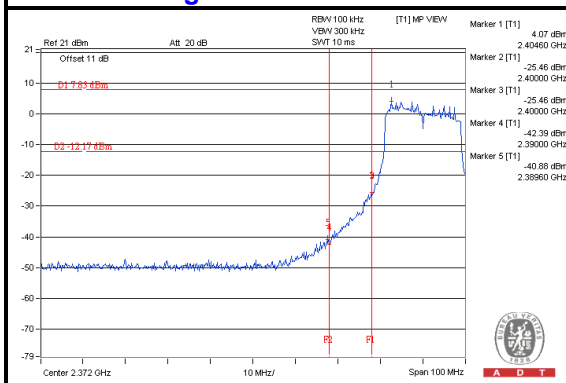
#### CH 6



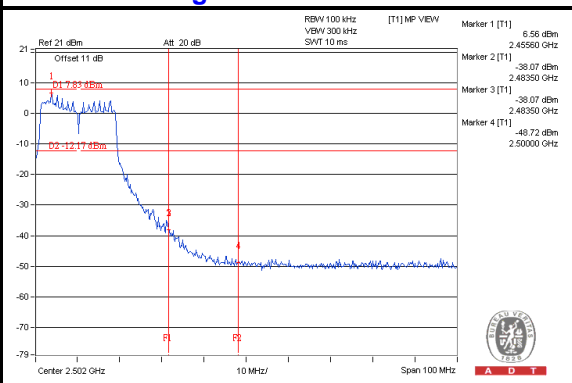
#### CH 11



#### CH 1 Band edge



#### CH 11 Band edge

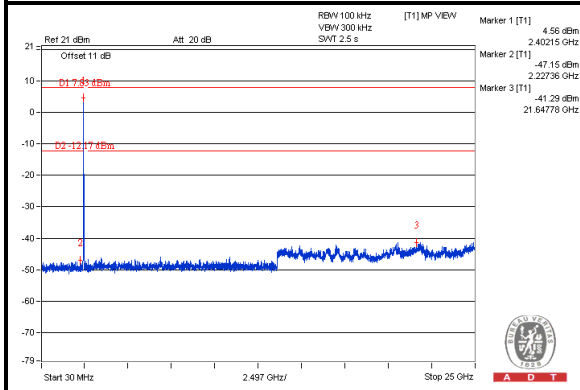




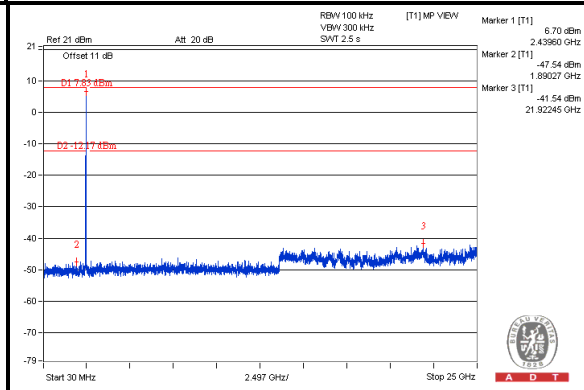
A D T

### For Chain (1): 802.11n(HT20)

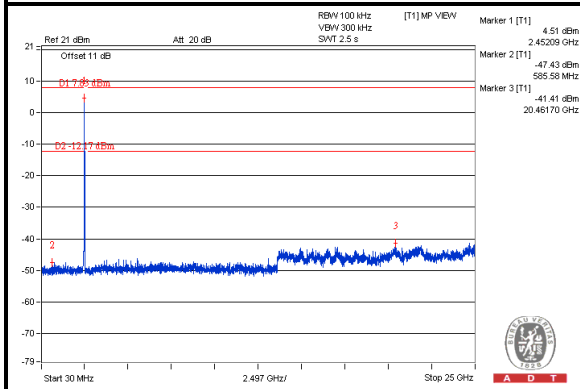
#### CH 1



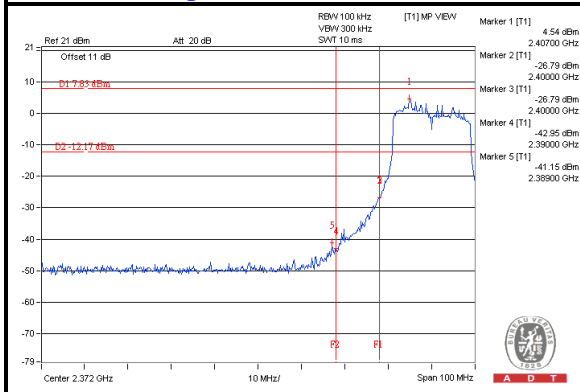
#### CH 6



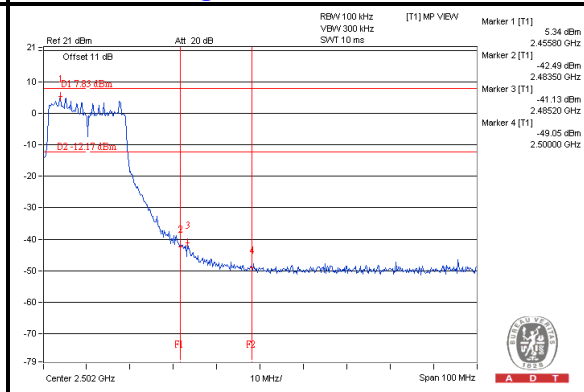
#### CH 11



#### CH 1 Band edge



#### CH 11 Band edge



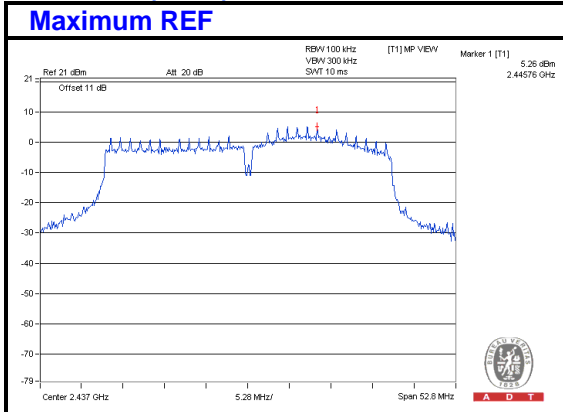




A D T

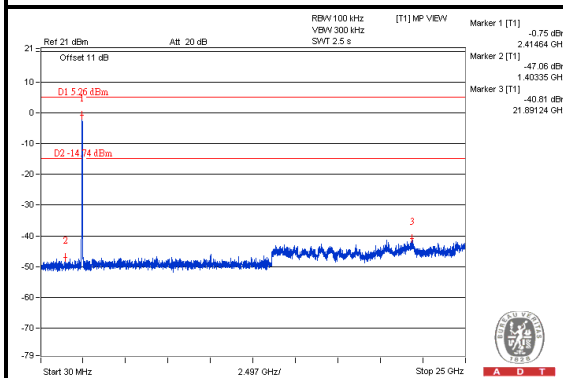
### For 802.11n(HT40)

#### Maximum REF

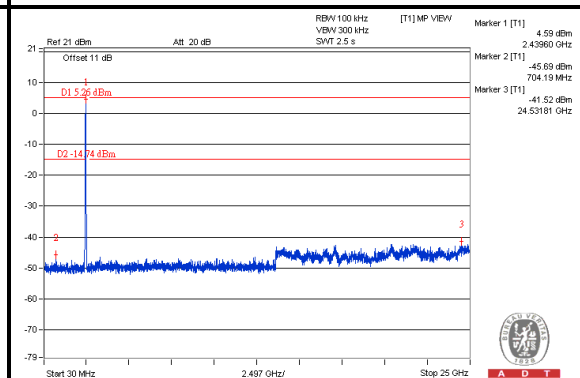


### For Chain (0): 802.11n(HT40)

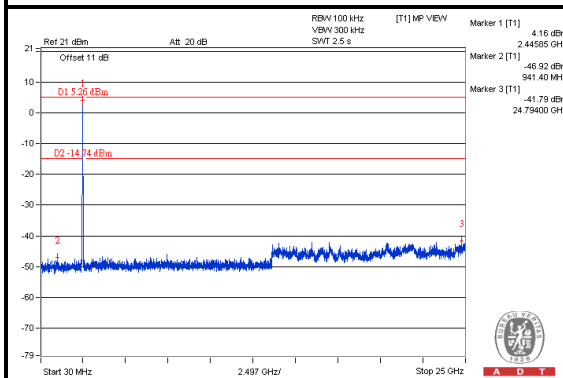
#### CH 3



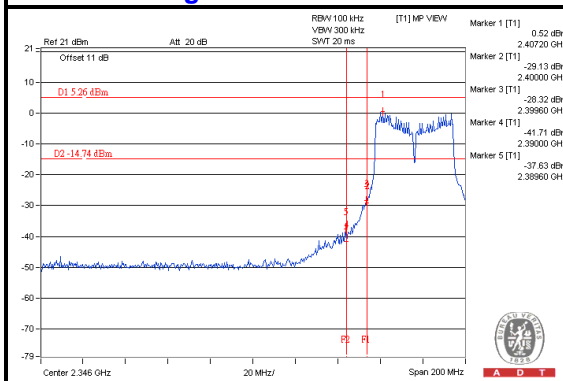
#### CH 6



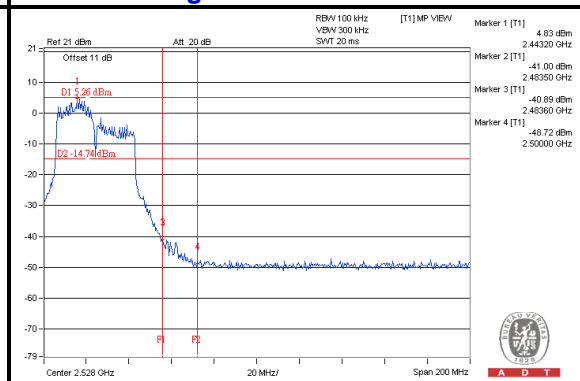
#### CH 9



#### CH 3 Band edge



#### CH 9 Band edge

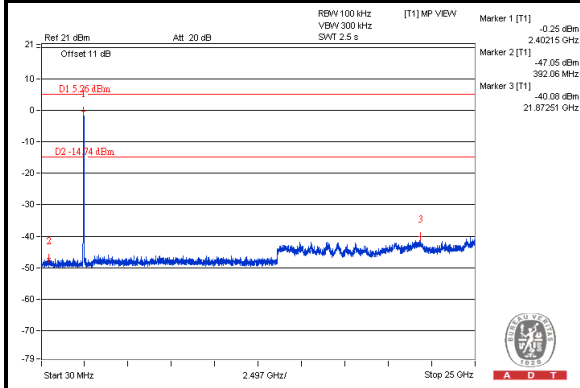




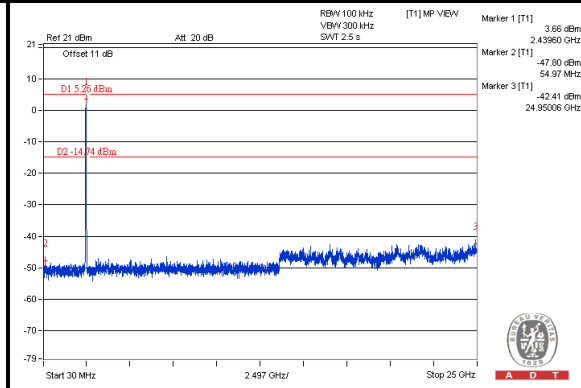
A D T

### For Chain (1): 802.11n(HT40)

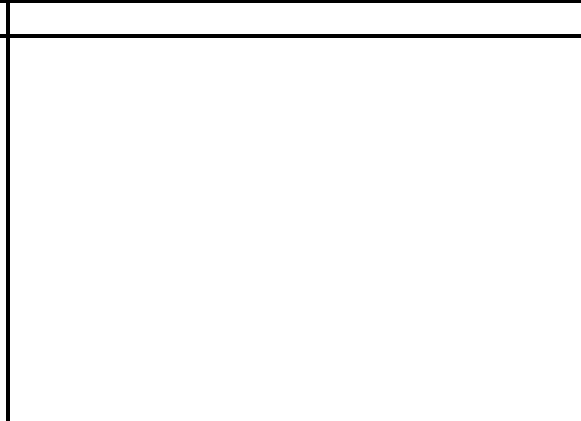
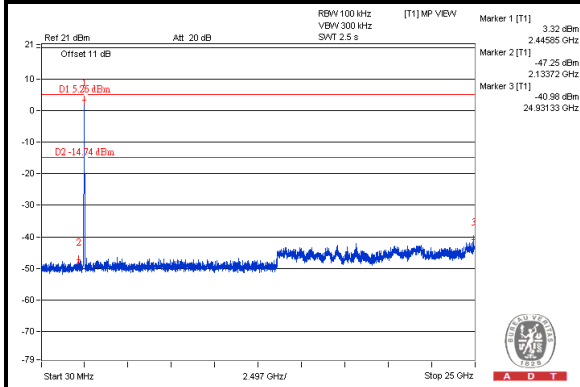
#### CH 3



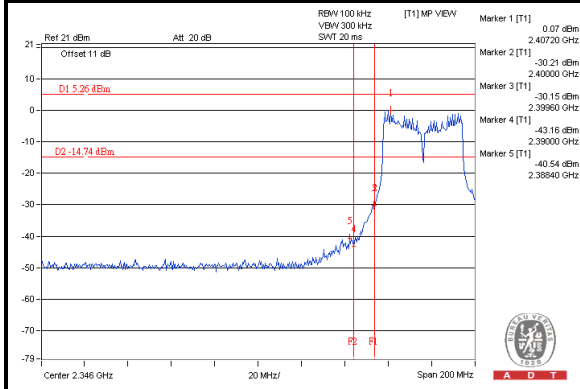
#### CH 6



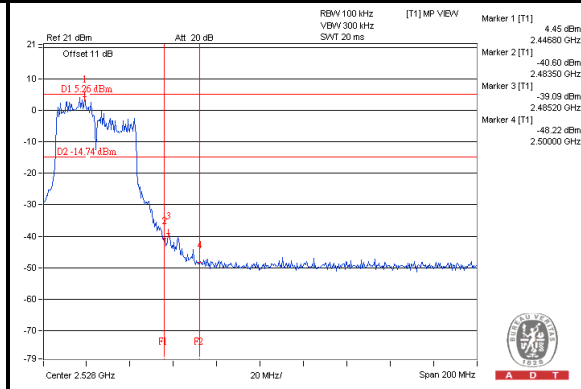
#### CH 9



#### CH 3 Band edge



#### CH 9 Band edge



## 5. TEST TYPES AND RESULTS (FOR 5GHz, 5.725~5.850GHz Band)

### 5.1 CONDUCTED EMISSION MEASUREMENT

#### 5.1.1 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.

#### 5.1.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Test Receiver ROHDE & SCHWARZ	ESCS 30	100375	Mar. 08, 2013	Mar. 07, 2014
Line-Impedance Stabilization Network (for EUT) SCHWARZBECK	NSLK8127	8127-522	Sep. 05, 2013	Sep. 04, 2014
Line-Impedance Stabilization Network (for Peripheral)	ENV216	100072	June 06, 2013	June 05, 2014
RF Cable (JYEBAO)	5DFB	COCCAB-001	Mar. 11, 2013	Mar. 10, 2014
50 ohms Terminator	50	EMC-03	Sep. 24, 2013	Sep. 23, 2014
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: Dec. 18, 2013

### 5.1.3 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.

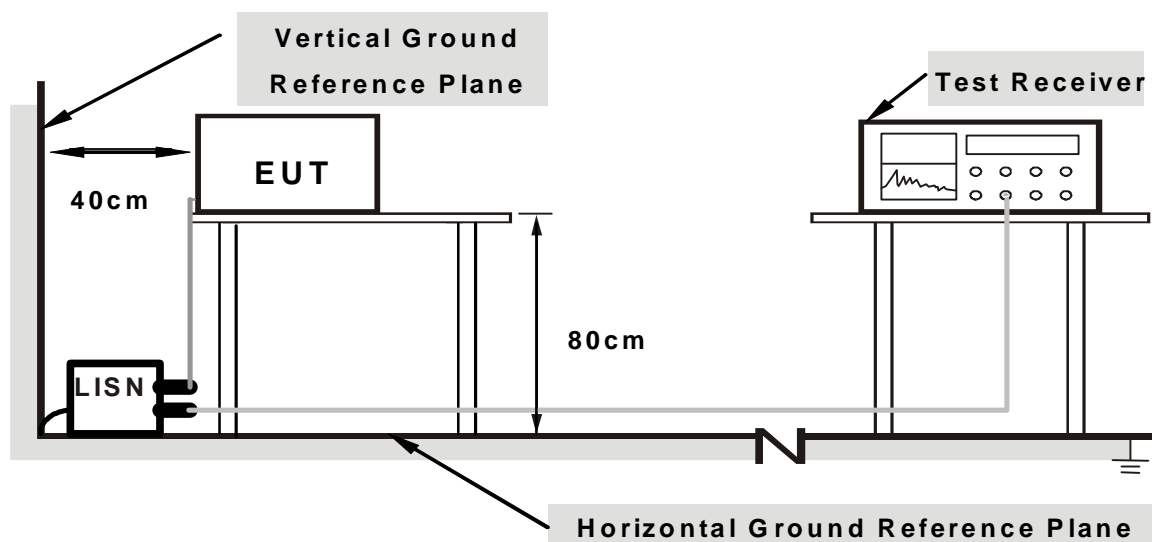
#### NOTE:

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

### 5.1.4 DEVIATION FROM TEST STANDARD

No deviation

### 5.1.5 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.



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## 5.1.6 EUT OPERATING CONDITIONS

Same as the 4.1.6

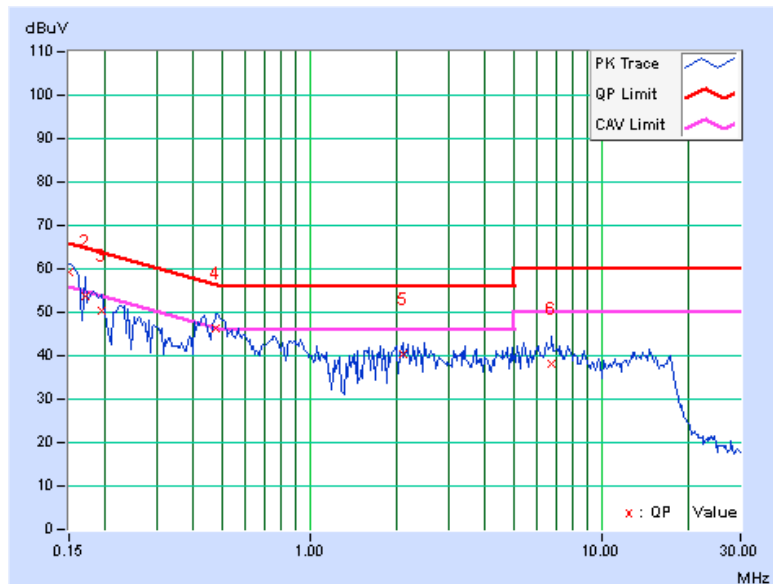
### 5.1.7 TEST RESULTS

<b>PHASE</b>	Line (L)	<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	0.15000	0.09	59.14	50.82	59.23	50.91	66.00	56.00	-6.77	-5.09
2	0.16953	0.10	53.56	32.08	53.66	32.18	64.98	54.98	-11.33	-22.81
3	0.19297	0.11	50.27	38.70	50.38	38.81	63.91	53.91	-13.53	-15.10
4	0.47813	0.17	46.27	39.10	46.44	39.27	56.37	46.37	-9.94	-7.11
5	2.08984	0.28	40.11	32.00	40.39	32.28	56.00	46.00	-15.61	-13.72
6	6.75000	0.54	37.45	31.53	37.99	32.07	60.00	50.00	-22.01	-17.93

#### 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





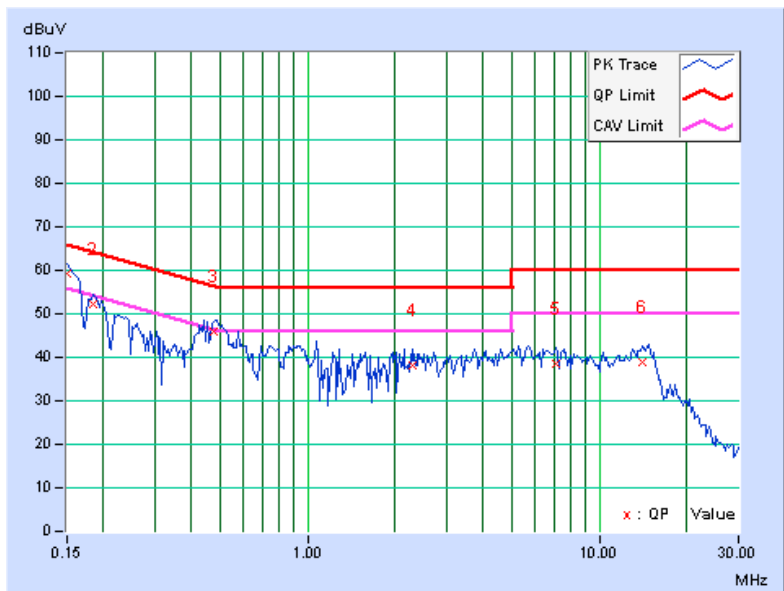
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PHASE	Neutral (N)	DETECTOR FUNCTION	Quasi-Peak (QP) / Average (AV)
-------	-------------	-------------------	--------------------------------

No	Freq. [MHz]	Corr. Factor (dB)	Reading Value [dB (uV)]		Emission Level [dB (uV)]		Limit [dB (uV)]		Margin (dB)	
			Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
1	0.15000	0.10	59.04	50.46	59.14	50.56	66.00	56.00	-6.86	-5.44
2	0.18516	0.11	52.12	42.21	52.23	42.32	64.25	54.25	-12.02	-11.93
3	0.47813	0.16	45.64	38.12	45.80	38.28	56.37	46.37	-10.57	-8.09
4	2.30078	0.28	37.84	29.86	38.12	30.14	56.00	46.00	-17.88	-15.86
5	7.12500	0.54	38.01	32.18	38.55	32.72	60.00	50.00	-21.45	-17.28
6	14.08984	0.88	37.96	33.41	38.84	34.29	60.00	50.00	-21.16	-15.71

**REMARKS:**

6. Q.P. and AV. are abbreviations of quasi-peak and average individually.
1. The emission levels of other frequencies were very low against the limit.
2. Margin value = Emission Level – Limit value
3. Correction Factor = Insertion loss + Cable loss
4. Emission Level = Correction Factor + Reading Value





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## 5.2 RADIATED AND BANDEDGE EMISSION MEASUREMENT

### 5.2.1 LIMITS OF RADIATED AND BANDEDGE EMISSION 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.





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## 5.2.2 TEST INSTRUMENTS

### For Below 1GHz test

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY51210105	Jan. 21, 2014	Jan. 20, 2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-03	Nov. 13, 2013	Nov. 12, 2014
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-360	Mar. 19, 2013	Mar. 18, 2014
RF Cable	NA	CHGCAB_001	Oct. 05, 2013	Oct. 04, 2014
Spectrum Analyzer R&S	FSV40	100964	July 15, 2013	July 14, 2014
Horn_Antenna AISI	AIH.8018	0000320091110	Nov. 18, 2013	Nov. 17, 2014
Pre-Amplifier Agilent	8449B	3008A02578	June 25, 2013	June 24, 2014
RF Cable	NA	RF104-201 RF104-203 RF104-204	Dec. 12, 2013	Dec. 11, 2014
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 28, 2013	Aug. 27, 2014
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Nov. 13, 2013	Nov. 12, 2014
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 08, 2013	Oct. 07, 2014
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: Jan. 29, 2014



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**For Above 1GHz test**

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
MXE EMI Receiver Agilent	N9038A	MY50010156	Jan. 15, 2014	Jan. 14, 2015
Pre-Amplifier Mini-Circuits	ZFL-1000VH2 B	AMP-ZFL-04	Nov. 13, 2013	Nov. 12, 2014
Trilog Broadband Antenna SCHWARZBECK	VULB 9168	9168-361	Mar. 25, 2013	Mar. 24, 2014
RF Cable	NA	CHHCAB_001	Oct. 06, 2013	Oct. 05, 2014
Spectrum Analyzer R&S	FSV40	100964	July 15, 2013	July 14, 2014
Horn_Antenna AISI	AIH.8018	0000220091110	Dec. 06, 2013	Dec. 05, 2014
Pre-Amplifier Agilent	8449B	3008A01923	Oct. 29, 2013	Oct. 28, 2014
RF Cable	NA	RF104-205 RF104-207 RF104-202	Dec. 12, 2013	Dec. 11, 2014
Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 28, 2013	Aug. 27, 2014
Pre-Amplifier SPACEK LABS	SLKKa-48-6	9K16	Nov. 13, 2013	Nov. 12, 2014
Horn_Antenna SCHWARZBECK	BBHA 9170	9170-424	Oct. 08, 2013	Oct. 07, 2014
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. H.
4. The FCC Site Registration No. is 797305.
5. The CANADA Site Registration No. is IC 7450H-3.
6. Tested Date: Feb. 06, 2014

### 5.2.3 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:**

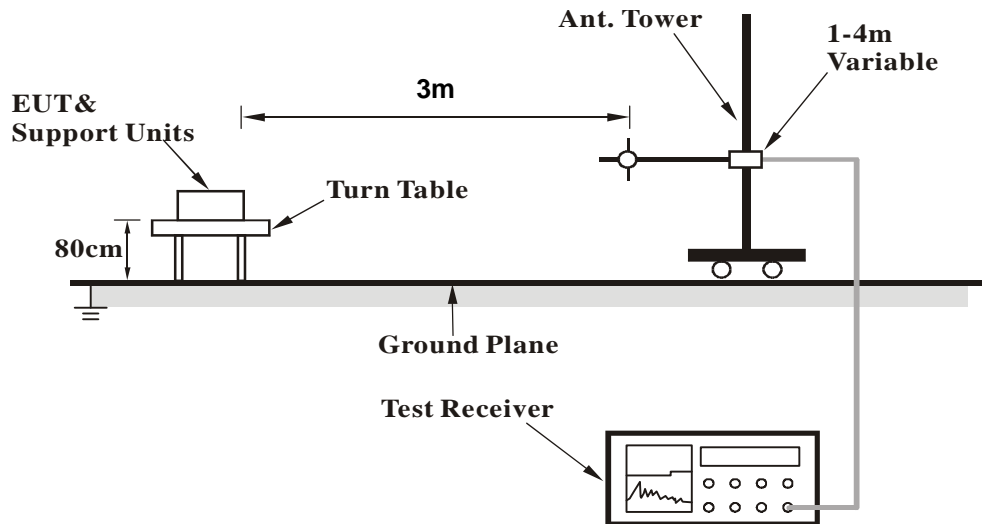
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ( $10 \log(1/\text{duty cycle})$ ).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle  $\geq 98\%$ ) for Average detection (AV) at frequency above 1GHz.
5. All modes of operation were investigated and the worst-case emissions are reported.

### 5.2.4 DEVIATION FROM TEST STANDARD

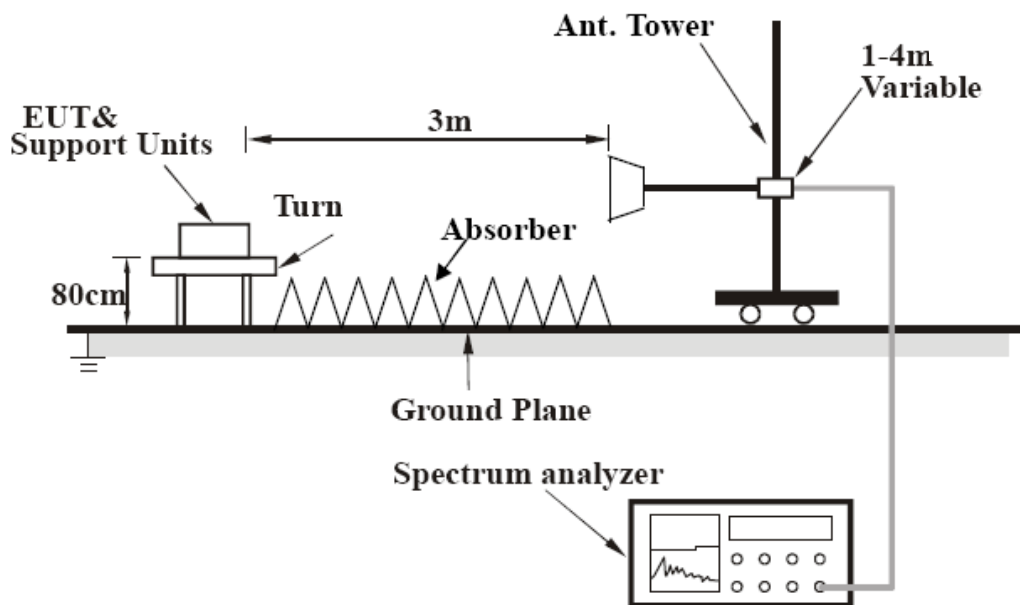
No deviation

### 5.2.5 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.

### 5.2.6 EUT OPERATING CONDITIONS

Same as the 4.1.6

## 5.2.7 TEST RESULTS

### BELOW 1GHz WORST-CASE DATA

#### 802.11a

<b>CHANNEL</b>	TX Channel 149	<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	125.01	33.7 QP	43.5	-9.8	1.50 H	55	48.49	-14.83
2	250.00	40.9 QP	46.0	-5.1	1.00 H	81	55.22	-14.31
3	550.02	41.2 QP	46.0	-4.8	1.50 H	149	47.75	-6.53
4	738.25	42.0 QP	46.0	-4.0	1.00 H	333	44.67	-2.63
5	849.99	40.8 QP	46.0	-5.2	1.00 H	145	41.69	-0.88
6	950.00	40.0 QP	46.0	-6.0	1.50 H	213	38.96	1.06

#### 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	40.75	36.3 QP	40.0	-3.7	1.10 V	85	50.38	-14.07
2	62.10	33.0 QP	40.0	-7.0	1.24 V	65	47.01	-14.00
3	76.21	34.3 QP	40.0	-5.7	1.34 V	98	51.85	-17.51
4	250.21	37.2 QP	46.0	-8.8	1.42 V	221	51.55	-14.31
5	375.02	40.4 QP	46.0	-5.6	1.75 V	342	50.93	-10.51
6	850.01	42.4 QP	46.0	-3.6	1.47 V	244	43.30	-0.88

#### 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



A D T

ABOVE 1GHz DATA

802.11a

<b>CHANNEL</b>	TX Channel 149	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 40GHz		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	2333.30	53.8 PK	74.0	-20.2	1.47 H	255	57.47	-3.67
2	2333.30	49.3 AV	54.0	-4.7	1.47 H	255	52.97	-3.67
3	5000.00	59.0 PK	74.0	-15.0	1.43 H	227	52.48	6.52
4	5000.00	52.7 AV	54.0	-1.3	1.43 H	227	46.18	6.52
5	5400.00	60.4 PK	74.0	-13.6	1.00 H	2	52.97	7.43
6	5400.00	52.3 AV	54.0	-1.7	1.00 H	2	44.87	7.43
7	*5745.00	113.5 PK			1.14 H	352	105.64	7.86
8	*5745.00	104.3 AV			1.14 H	352	96.44	7.86
9	11490.00	56.3 PK	74.0	-17.7	1.15 H	282	41.55	14.75
10	11490.00	44.9 AV	54.0	-9.1	1.15 H	282	30.15	14.75

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	2333.30	55.1 PK	74.0	-18.9	1.22 V	29	58.77	-3.67
2	2333.30	51.6 AV	54.0	-2.4	1.22 V	29	55.27	-3.67
3	5000.00	56.7 PK	74.0	-17.3	1.41 V	262	50.18	6.52
4	5000.00	47.8 AV	54.0	-6.2	1.41 V	262	41.28	6.52
5	5400.00	60.5 PK	74.0	-13.5	1.23 V	134	53.07	7.43
6	5400.00	51.2 AV	54.0	-2.8	1.23 V	134	43.77	7.43
7	*5745.00	111.7 PK			1.62 V	314	103.84	7.86
8	*5745.00	102.4 AV			1.62 V	314	94.54	7.86
9	11490.00	57.8 PK	74.0	-16.2	1.23 V	247	43.05	14.75
10	11490.00	47.1 AV	54.0	-6.9	1.23 V	247	32.35	14.75

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.
6. The limit value is defined as per 15.247.



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<b>CHANNEL</b>	TX Channel 157	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 40GHz		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	2333.30	54.4 PK	74.0	-19.6	1.48 H	271	58.07	-3.67
2	2333.30	49.9 AV	54.0	-4.1	1.48 H	271	53.57	-3.67
3	5000.00	58.4 PK	74.0	-15.6	1.44 H	231	51.88	6.52
4	5000.00	51.9 AV	54.0	-2.1	1.44 H	231	45.38	6.52
5	5400.00	60.8 PK	74.0	-13.2	1.00 H	23	53.37	7.43
6	5400.00	52.6 AV	54.0	-1.4	1.00 H	23	45.17	7.43
7	*5785.00	113.8 PK			1.10 H	351	105.87	7.93
8	*5785.00	104.5 AV			1.10 H	351	96.57	7.93
9	11570.00	56.3 PK	74.0	-17.7	1.14 H	272	41.41	14.89
10	11570.00	44.7 AV	54.0	-9.3	1.14 H	272	29.81	14.89

**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	2333.30	55.3 PK	74.0	-18.7	1.30 V	32	58.97	-3.67
2	2333.30	52.2 AV	54.0	-1.8	1.30 V	32	55.87	-3.67
3	5000.00	57.7 PK	74.0	-16.3	1.44 V	287	51.18	6.52
4	5000.00	48.4 AV	54.0	-5.6	1.44 V	287	41.88	6.52
5	5400.00	60.4 PK	74.0	-13.6	1.13 V	135	52.97	7.43
6	5400.00	51.7 AV	54.0	-2.3	1.13 V	135	44.27	7.43
7	*5785.00	111.1 PK			1.66 V	311	103.17	7.93
8	*5785.00	102.1 AV			1.66 V	311	94.17	7.93
9	11570.00	60.9 PK	74.0	-13.1	1.23 V	248	46.01	14.89
10	11570.00	49.1 AV	54.0	-4.9	1.23 V	248	34.21	14.89

**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.
6. The limit value is defined as per 15.247.



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<b>CHANNEL</b>	TX Channel 165	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 40GHz		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	2333.30	54.7 PK	74.0	-19.3	1.51 H	255	58.37	-3.67
2	2333.30	49.7 AV	54.0	-4.3	1.51 H	255	53.37	-3.67
3	5000.00	58.9 PK	74.0	-15.1	1.40 H	219	52.38	6.52
4	5000.00	52.5 AV	54.0	-1.5	1.40 H	219	45.98	6.52
5	5400.00	60.9 PK	74.0	-13.1	1.02 H	30	53.47	7.43
6	5400.00	52.8 AV	54.0	-1.2	1.02 H	30	45.37	7.43
7	*5825.00	113.1 PK			1.11 H	360	105.08	8.02
8	*5825.00	104.1 AV			1.11 H	360	96.08	8.02
9	11650.00	61.1 PK	74.0	-12.9	1.12 H	285	46.29	14.81
10	11650.00	51.2 AV	54.0	-2.8	1.12 H	285	36.39	14.81

**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	2333.30	55.5 PK	74.0	-18.5	1.22 V	50	59.17	-3.67
2	2333.30	52.1 AV	54.0	-1.9	1.22 V	50	55.77	-3.67
3	5000.00	56.9 PK	74.0	-17.1	1.42 V	259	50.38	6.52
4	5000.00	47.8 AV	54.0	-6.2	1.42 V	259	41.28	6.52
5	5400.00	60.0 PK	74.0	-14.0	1.18 V	136	52.57	7.43
6	5400.00	51.3 AV	54.0	-2.7	1.18 V	136	43.87	7.43
7	*5825.00	110.7 PK			1.69 V	300	102.68	8.02
8	*5825.00	101.8 AV			1.69 V	300	93.78	8.02
9	11650.00	64.4 PK	74.0	-9.6	1.11 V	95	49.59	14.81
10	11650.00	53.6 AV	54.0	-0.4	1.11 V	95	38.79	14.81

**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.
6. The limit value is defined as per 15.247.





### 802.11n (HT20)

<b>CHANNEL</b>	TX Channel 149	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 40GHz		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	2333.30	54.0 PK	74.0	-20.0	1.49 H	281	57.67	-3.67
2	2333.30	49.2 AV	54.0	-4.8	1.49 H	281	52.87	-3.67
3	5000.00	58.8 PK	74.0	-15.2	1.46 H	233	52.28	6.52
4	5000.00	52.6 AV	54.0	-1.4	1.46 H	233	46.08	6.52
5	5400.00	60.7 PK	74.0	-13.3	1.06 H	7	53.27	7.43
6	5400.00	52.5 AV	54.0	-1.5	1.06 H	7	45.07	7.43
7	*5745.00	112.8 PK			1.10 H	360	104.94	7.86
8	*5745.00	103.8 AV			1.10 H	360	95.94	7.86
9	11490.00	56.2 PK	74.0	-17.8	1.17 H	289	41.45	14.75
10	11490.00	45.0 AV	54.0	-9.0	1.17 H	289	30.25	14.75

#### 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	2333.30	54.4 PK	74.0	-19.6	1.32 V	36	58.07	-3.67
2	2333.30	51.3 AV	54.0	-2.7	1.32 V	36	54.97	-3.67
3	5000.00	57.2 PK	74.0	-16.8	1.46 V	272	50.68	6.52
4	5000.00	48.4 AV	54.0	-5.6	1.46 V	272	41.88	6.52
5	5400.00	59.7 PK	74.0	-14.3	1.16 V	159	52.27	7.43
6	5400.00	51.0 AV	54.0	-3.0	1.16 V	159	43.57	7.43
7	*5745.00	110.8 PK			1.70 V	299	102.94	7.86
8	*5745.00	101.9 AV			1.70 V	299	94.04	7.86
9	11490.00	57.2 PK	74.0	-16.8	1.20 V	245	42.45	14.75
10	11490.00	46.7 AV	54.0	-7.3	1.20 V	245	31.95	14.75

#### 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.
6. The limit value is defined as per 15.247.



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<b>CHANNEL</b>	TX Channel 157	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 40GHz		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	2333.30	54.7 PK	74.0	-19.3	1.46 H	256	58.37	-3.67
2	2333.30	49.8 AV	54.0	-4.2	1.46 H	256	53.47	-3.67
3	5000.00	58.0 PK	74.0	-16.0	1.48 H	241	51.48	6.52
4	5000.00	51.9 AV	54.0	-2.1	1.48 H	241	45.38	6.52
5	5400.00	60.2 PK	74.0	-13.8	1.03 H	6	52.77	7.43
6	5400.00	52.1 AV	54.0	-1.9	1.03 H	6	44.67	7.43
7	*5785.00	114.1 PK			1.12 H	344	106.17	7.93
8	*5785.00	104.8 AV			1.12 H	344	96.87	7.93
9	11570.00	56.2 PK	74.0	-17.8	1.16 H	271	41.31	14.89
10	11570.00	45.0 AV	54.0	-9.0	1.16 H	271	30.11	14.89

**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	2333.30	55.0 PK	74.0	-19.0	1.29 V	25	58.67	-3.67
2	2333.30	51.7 AV	54.0	-2.3	1.29 V	25	55.37	-3.67
3	5000.00	56.9 PK	74.0	-17.1	1.43 V	274	50.38	6.52
4	5000.00	47.6 AV	54.0	-6.4	1.43 V	274	41.08	6.52
5	5400.00	60.5 PK	74.0	-13.5	1.13 V	133	53.07	7.43
6	5400.00	51.8 AV	54.0	-2.2	1.13 V	133	44.37	7.43
7	*5785.00	110.6 PK			1.66 V	316	102.67	7.93
8	*5785.00	101.7 AV			1.66 V	316	93.77	7.93
9	11570.00	57.6 PK	74.0	-16.4	1.22 V	235	42.71	14.89
10	11570.00	47.1 AV	54.0	-6.9	1.22 V	235	32.21	14.89

**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.
6. The limit value is defined as per 15.247.



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<b>CHANNEL</b>	TX Channel 165	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 40GHz		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	2333.30	54.2 PK	74.0	-19.8	1.54 H	271	57.87	-3.67
2	2333.30	49.7 AV	54.0	-4.3	1.54 H	271	53.37	-3.67
3	5000.00	58.5 PK	74.0	-15.5	1.48 H	227	51.98	6.52
4	5000.00	52.2 AV	54.0	-1.8	1.48 H	227	45.68	6.52
5	5400.00	60.9 PK	74.0	-13.1	1.00 H	9	53.47	7.43
6	5400.00	52.9 AV	54.0	-1.1	1.00 H	9	45.47	7.43
7	*5825.00	113.6 PK			1.18 H	347	105.58	8.02
8	*5825.00	104.7 AV			1.18 H	347	96.68	8.02
9	11650.00	56.1 PK	74.0	-17.9	1.16 H	289	41.29	14.81
10	11650.00	44.7 AV	54.0	-9.3	1.16 H	289	29.89	14.81

**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	2333.30	54.8 PK	74.0	-19.2	1.31 V	40	58.47	-3.67
2	2333.30	51.4 AV	54.0	-2.6	1.31 V	40	55.07	-3.67
3	5000.00	57.0 PK	74.0	-17.0	1.41 V	270	50.48	6.52
4	5000.00	47.7 AV	54.0	-6.3	1.41 V	270	41.18	6.52
5	5400.00	60.8 PK	74.0	-13.2	1.23 V	136	53.37	7.43
6	5400.00	51.7 AV	54.0	-2.3	1.23 V	136	44.27	7.43
7	*5825.00	111.0 PK			1.62 V	308	102.98	8.02
8	*5825.00	102.2 AV			1.62 V	308	94.18	8.02
9	11650.00	64.4 PK	74.0	-9.6	1.35 V	149	49.59	14.81
10	11650.00	53.3 AV	54.0	-0.7	1.35 V	149	38.49	14.81

**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.
6. The limit value is defined as per 15.247.

802.11n (HT40)

<b>CHANNEL</b>	TX Channel 151	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 40GHz		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	2333.30	54.4 PK	74.0	-19.6	1.48 H	265	58.07	-3.67
2	2333.30	49.8 AV	54.0	-4.2	1.48 H	265	53.47	-3.67
3	5000.00	58.3 PK	74.0	-15.7	1.44 H	222	51.78	6.52
4	5000.00	52.1 AV	54.0	-1.9	1.44 H	222	45.58	6.52
5	5400.00	60.5 PK	74.0	-13.5	1.00 H	18	53.07	7.43
6	5400.00	52.4 AV	54.0	-1.6	1.00 H	18	44.97	7.43
7	*5755.00	109.5 PK			1.10 H	357	101.62	7.88
8	*5755.00	100.6 AV			1.10 H	357	92.72	7.88
9	11510.00	56.1 PK	74.0	-17.9	1.17 H	295	41.34	14.76
10	11510.00	44.4 AV	54.0	-9.6	1.17 H	295	29.64	14.76

**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	2333.30	55.3 PK	74.0	-18.7	1.32 V	28	58.97	-3.67
2	2333.30	51.9 AV	54.0	-2.1	1.32 V	28	55.57	-3.67
3	5000.00	56.5 PK	74.0	-17.5	1.38 V	271	49.98	6.52
4	5000.00	47.5 AV	54.0	-6.5	1.38 V	271	40.98	6.52
5	5400.00	60.3 PK	74.0	-13.7	1.23 V	154	52.87	7.43
6	5400.00	51.3 AV	54.0	-2.7	1.23 V	154	43.87	7.43
7	*5755.00	107.3 PK			1.60 V	254	99.42	7.88
8	*5755.00	98.4 AV			1.60 V	254	90.52	7.88
9	11510.00	57.4 PK	74.0	-16.6	1.17 V	236	42.64	14.76
10	11510.00	46.7 AV	54.0	-7.3	1.17 V	236	31.94	14.76

**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
5. " \* ": Fundamental frequency.
6. The limit value is defined as per 15.247.



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<b>CHANNEL</b>	TX Channel 159	<b>DETECTOR FUNCTION</b>	Peak (PK)
<b>FREQUENCY RANGE</b>	1GHz ~ 40GHz		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	2333.30	54.7 PK	74.0	-19.3	1.48 H	270	58.37	-3.67
2	2333.30	49.8 AV	54.0	-4.2	1.48 H	270	53.47	-3.67
3	5000.00	58.9 PK	74.0	-15.1	1.48 H	238	52.38	6.52
4	5000.00	52.4 AV	54.0	-1.6	1.48 H	238	45.88	6.52
5	5400.00	61.1 PK	74.0	-12.9	1.00 H	6	53.67	7.43
6	5400.00	52.9 AV	54.0	-1.1	1.00 H	6	45.47	7.43
7	*5795.00	109.5 PK			1.05 H	352	101.53	7.97
8	*5795.00	100.8 AV			1.05 H	352	92.83	7.97
9	11590.00	55.8 PK	74.0	-18.2	1.18 H	285	40.88	14.92
10	11590.00	44.5 AV	54.0	-9.5	1.18 H	285	29.58	14.92

**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	2333.30	54.7 PK	74.0	-19.3	1.27 V	34	58.37	-3.67
2	2333.30	51.1 AV	54.0	-2.9	1.27 V	34	54.77	-3.67
3	5000.00	56.9 PK	74.0	-17.1	1.36 V	267	50.38	6.52
4	5000.00	47.7 AV	54.0	-6.3	1.36 V	267	41.18	6.52
5	5400.00	60.7 PK	74.0	-13.3	1.23 V	151	53.27	7.43
6	5400.00	51.8 AV	54.0	-2.2	1.23 V	151	44.37	7.43
7	*5795.00	107.8 PK			1.58 V	263	99.83	7.97
8	*5795.00	98.9 AV			1.58 V	263	90.93	7.97
9	11590.00	57.5 PK	74.0	-16.5	1.26 V	236	42.58	14.92
10	11590.00	46.9 AV	54.0	-7.1	1.26 V	236	31.98	14.92

**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.
6. The limit value is defined as per 15.247.

### 5.3 6dB BANDWIDTH MEASUREMENT

#### 5.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is 0.5 MHz.

#### 5.3.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSP 40	100036	Jan. 21, 2014	Jan. 20, 2015

**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 : Feb. 06, 2014

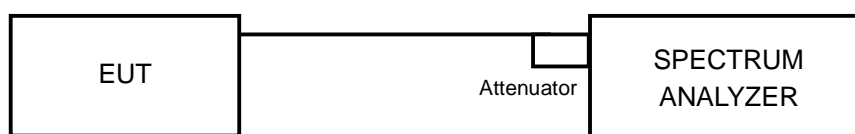
#### 5.3.3 TEST PROCEDURE

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

#### 5.3.4 DEVIATION FROM TEST STANDARD

No deviation

#### 5.3.5 TEST SETUP



#### 5.3.6 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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### 5.3.7 TEST RESULTS

#### 802.11a

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
149	5745	16.12	15.72	0.5	PASS
157	5785	16.38	15.38	0.5	PASS
165	5825	16.13	16.39	0.5	PASS

#### 802.11n (HT20)

CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
149	5745	16.38	17.29	0.5	PASS
157	5785	16.98	15.37	0.5	PASS
165	5825	16.91	15.72	0.5	PASS

#### 802.11n (HT40)

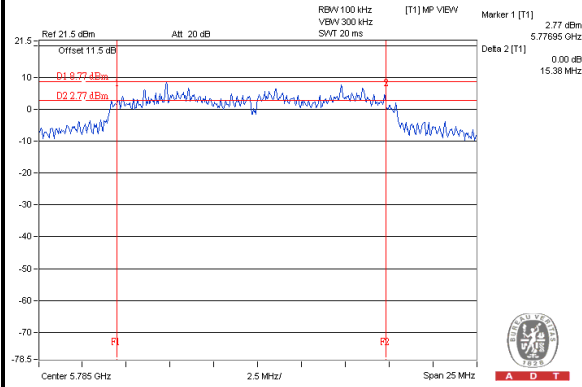
CHANNEL	CHANNEL FREQUENCY (MHz)	6dB BANDWIDTH (MHz)		MINIMUM LIMIT (MHz)	PASS / FAIL
		CHAIN 0	CHAIN 1		
151	5755	35.85	35.60	0.5	PASS
159	5795	35.77	35.19	0.5	PASS



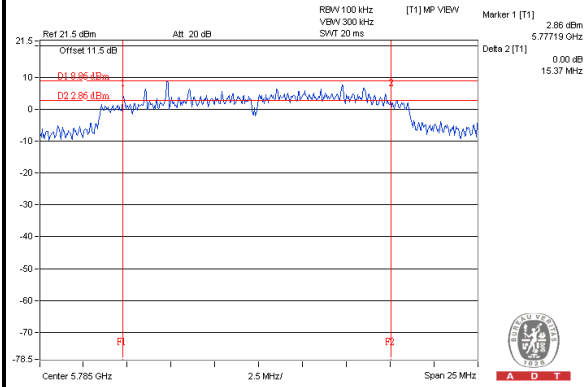
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### SPECTRUM PLOT OF WORST VALUE

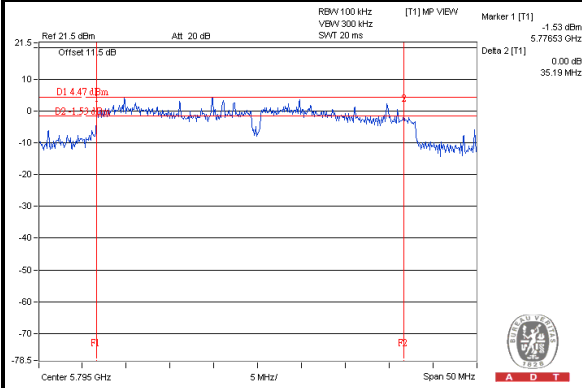
#### 802.11a / Chain(1) : CH157



#### 802.11n (HT20) / Chain(1) : CH157



#### 802.11n (HT40) / Chain(1) : CH159





## 5.4 CONDUCTED OUTPUT POWER MEASUREMENT

### 5.4.1 LIMITS OF CONDUCTED OUTPUT POWER MEASUREMENT

For systems using digital modulation in the 5725 –5850 MHz band: 1 Watt (30dBm)

Per KDB 662911 D01 Multiple Transmitter Output 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.

### 5.4.2 INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Power meter Anritsu	ML2495A	0824006	May 20, 2013	May 19, 2014
Power sensor Anritsu	MA2411B	0738172	May 20, 2013	May 19, 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 : Feb. 06, 2014

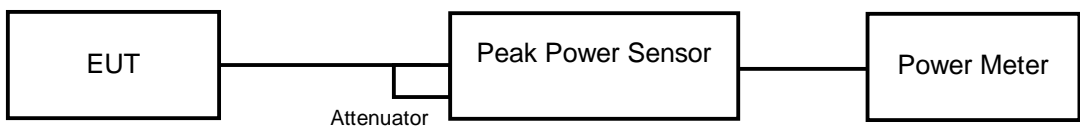
### 5.4.3 TEST PROCEDURES

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

#### 5.4.4 DEVIATION FROM TEST STANDARD

No deviation.

#### 5.4.5 TEST SETUP



#### 5.4.6 EUT OPERATING CONDITIONS

Same as Item 5.3.6



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## 5.4.7 TEST RESULTS

### 802.11a

CHANNEL	FREQUENCY (MHz)	PEAK POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
149	5745	20.65	19.07	196.869	22.94	30	PASS
157	5785	20.11	18.71	176.867	22.48	30	PASS
165	5825	20.47	18.61	184.040	22.65	30	PASS

### 802.11n(HT20)

CHANNEL	FREQUENCY (MHz)	PEAK POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
149	5745	20.51	18.83	188.844	22.76	30	PASS
157	5785	20.55	18.75	188.490	22.75	30	PASS
165	5825	20.14	18.82	179.484	22.54	30	PASS

### 802.11n(HT40)

CHANNEL	FREQUENCY (MHz)	PEAK POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)	LIMIT (dBm)	PASS / FAIL
		CHAIN 0	CHAIN 1				
151	5755	20.02	18.42	169.964	22.30	30	PASS
159	5795	20.01	18.61	172.842	22.38	30	PASS



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## 5.5 AVERAGE OUTPUT POWER

### 5.5.1 FOR REFERENCE.

### 5.5.2 TEST 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

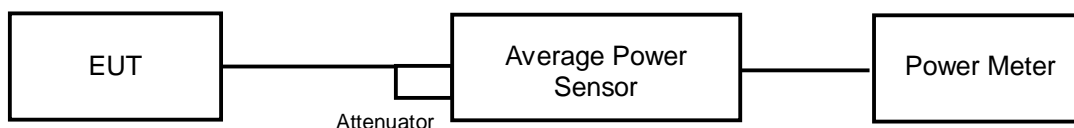
**Note:**

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 : Feb. 06, 2014

### 5.5.3 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.

### 5.5.4 TEST SETUP



### 5.5.5 EUT OPERATING CONDITIONS

Same as Item 4.3.6



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## 5.5.6 TEST RESULTS

### 802.11a

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		CHAIN 0	CHAIN 1		
149	5745	19.78	18.22	161.434	22.08
157	5785	19.58	18.03	154.315	21.88
165	5825	19.01	17.94	141.846	21.52

### 802.11n(HT20)

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		CHAIN 0	CHAIN 1		
149	5745	19.47	18.08	152.781	21.84
157	5785	19.91	18.09	162.366	22.10
165	5825	19.41	17.95	149.670	21.75

### 802.11n(HT40)

CHANNEL	FREQUENCY (MHz)	AVERAGE POWER (dBm)		TOTAL POWER (mW)	TOTAL POWER (dBm)
		CHAIN 0	CHAIN 1		
151	5755	17.14	16.05	92.033	19.64
159	5795	19.47	17.94	150.742	21.78

## 5.6 POWER SPECTRAL DENSITY MEASUREMENT

### 5.6.1 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum of Power Spectral Density Measurement is 8dBm.

### 5.6.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSP 40	100036	Jan. 21, 2014	Jan. 20, 2015

**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 : Feb. 06, 2014

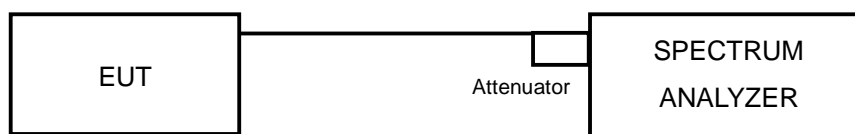
### 5.6.3 TEST PROCEDURE

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.

### 5.6.4 DEVIATION FROM TEST STANDARD

No deviation

### 5.6.5 TEST SETUP



### 5.6.6 EUT OPERATING CONDITION

Same as Item 4.3.6

## 5.6.7 TEST RESULTS

### 802.11a

TX CHAIN	CHANNEL	FREQUENCY (MHz)	PSD (dBm)	10 log (N=2) dB	Total PSD (dBm)	Limit (dBm)	PASS /FAIL
0	149	5745	-6.87	3.01	-3.86	7.76	PASS
	157	5785	-6.23	3.01	-3.22	7.76	PASS
	165	5825	-5.60	3.01	-2.59	7.76	PASS
1	149	5745	-8.04	3.01	-5.03	7.76	PASS
	157	5785	-8.16	3.01	-5.15	7.76	PASS
	165	5825	-8.29	3.01	-5.28	7.76	PASS

**NOTE:** Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 6.24\text{dBi} > 6\text{dBi}$  , so the power density limit shall be reduced to  $8-(6.24-6) = 7.76\text{dBm}$ .

### 802.11n(HT20)

TX CHAIN	CHANNEL	FREQUENCY (MHz)	PSD (dBm)	10 log (N=2) dB	Total PSD (dBm)	Limit (dBm)	PASS /FAIL
0	149	5745	-6.47	3.01	-3.46	7.76	PASS
	157	5785	-5.97	3.01	-2.96	7.76	PASS
	165	5825	-7.36	3.01	-4.35	7.76	PASS
1	149	5745	-8.35	3.01	-5.34	7.76	PASS
	157	5785	-8.58	3.01	-5.57	7.76	PASS
	165	5825	-9.06	3.01	-6.05	7.76	PASS

**NOTE:** Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 6.24\text{dBi} > 6\text{dBi}$  , so the power density limit shall be reduced to  $8-(6.24-6) = 7.76\text{dBm}$ .

### 802.11n(HT40)

TX CHAIN	CHANNEL	FREQUENCY (MHz)	PSD (dBm)	10 log (N=2) dB	Total PSD (dBm)	Limit (dBm)	PASS /FAIL
0	151	5755	-8.46	3.01	-5.45	7.76	PASS
	159	5795	-9.33	3.01	-6.32	7.76	PASS
1	151	5755	-12.40	3.01	-9.39	7.76	PASS
	159	5795	-11.22	3.01	-8.21	7.76	PASS

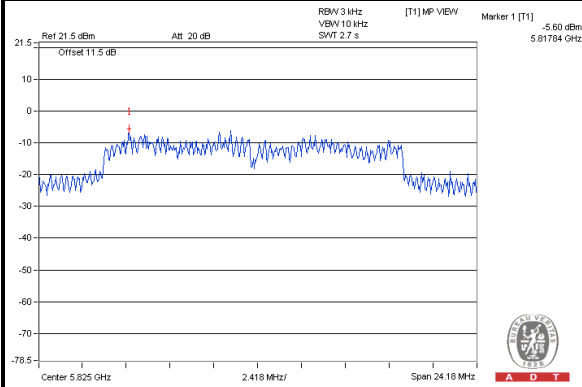
**NOTE:** Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20})^2 / 2] = 6.24\text{dBi} > 6\text{dBi}$  , so the power density limit shall be reduced to  $8-(6.24-6) = 7.76\text{dBm}$ .



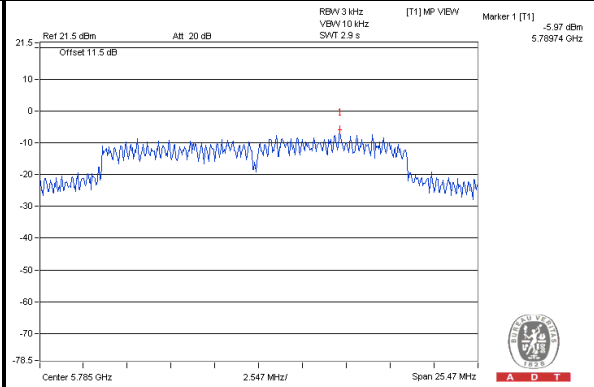
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### SPECTRUM PLOT OF WORST VALUE

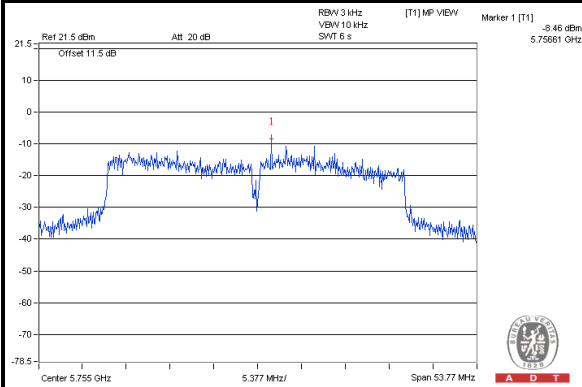
#### 802.11a / Chain(0) : CH165



#### 802.11n(HT20) / Chain(0) : CH157



#### 802.11n(HT40) / Chain(0) : CH151







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## 5.7 CONDUCTED OUT-BAND EMISSION MEASUREMENT

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

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

### 5.7.2 TEST INSTRUMENTS

DESCRIPTION & MANUFACTURER	MODEL NO.	SERIAL NO.	CALIBRATED DATE	CALIBRATED UNTIL
Spectrum Analyzer R&S	FSP 40	100036	Jan. 21, 2014	Jan. 20, 2015

**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 : Feb. 06, 2014

### 5.7.3 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.

#### 5.7.4 DEVIATION FROM TEST STANDARD

No deviation

#### 5.7.5 TEST SETUP



#### 5.7.6 EUT OPERATING CONDITION

Same as Item 4.3.6

#### 5.7.7 TEST RESULTS

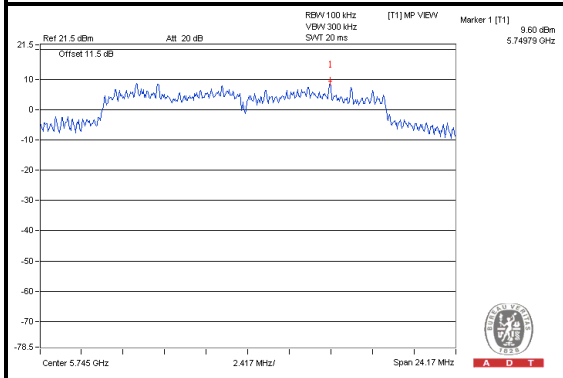
The spectrum plots are attached on the following pages. D1 line indicates the highest level, and D2 line indicates the 20dB offset below D1. It shows compliance with the requirement.



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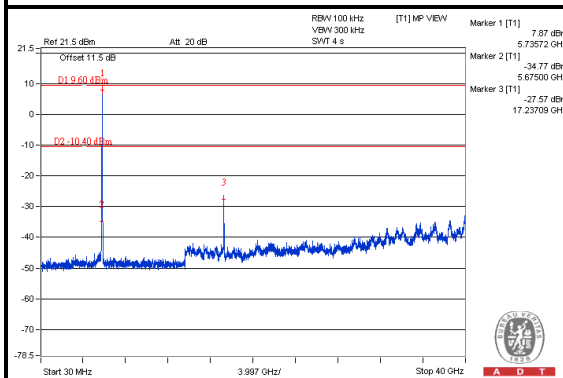
For 802.11a

### Maximum REF

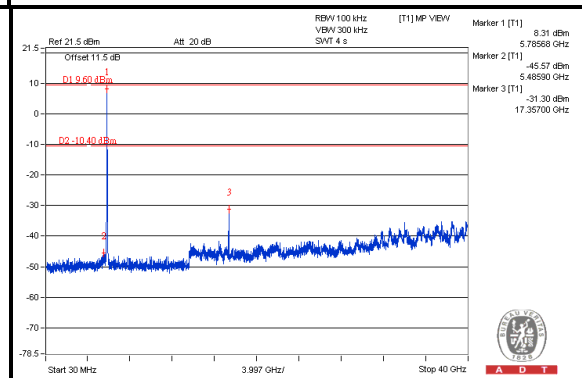


For Chain (0): 802.11a

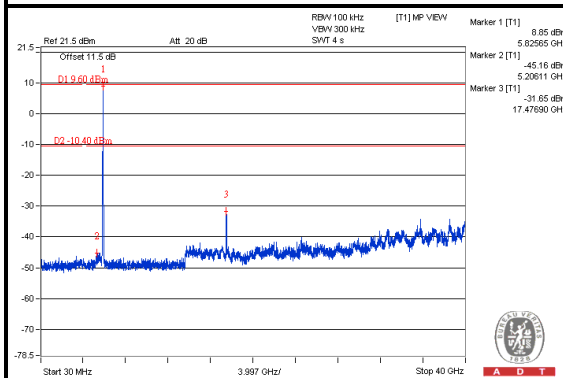
### CH 149



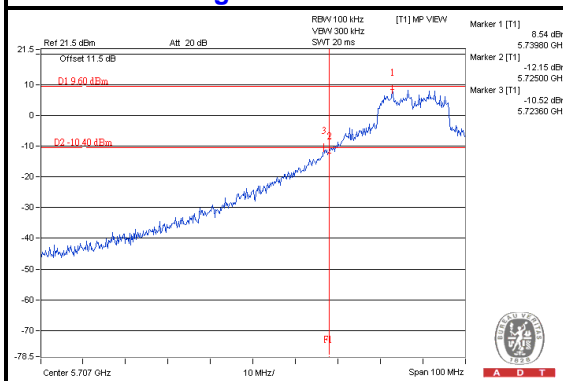
### CH 157



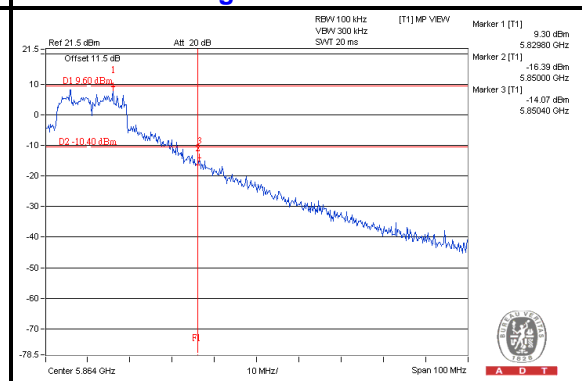
### CH 165



### CH 149 Band edge



### CH 165 Band edge

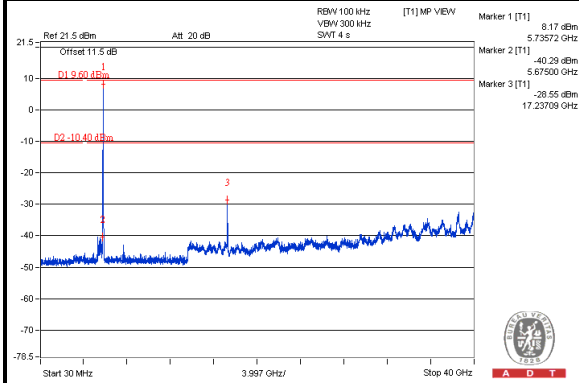




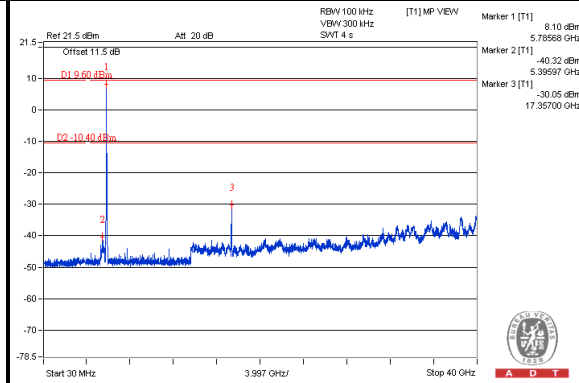
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### For Chain (1): 802.11a

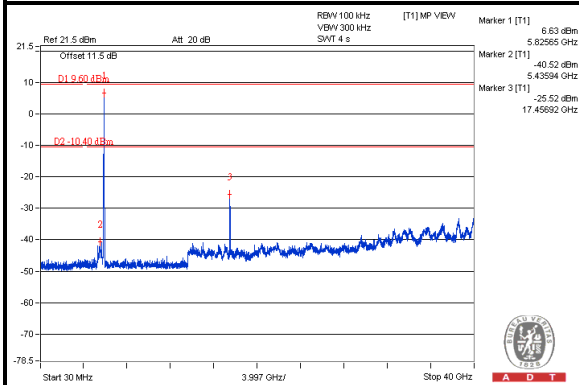
#### CH 149



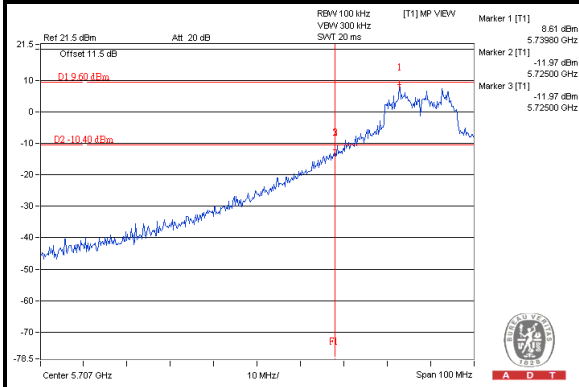
#### CH 157



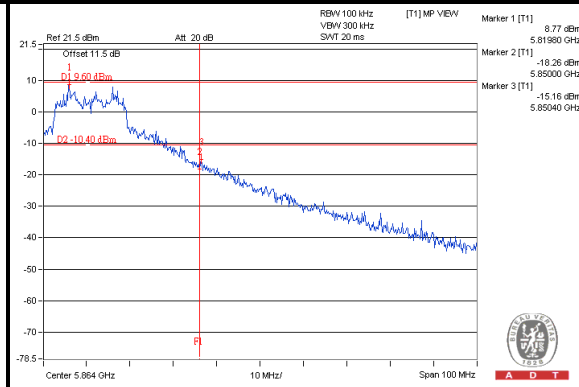
#### CH 165



#### CH 149 Band edge



#### CH 165 Band edge

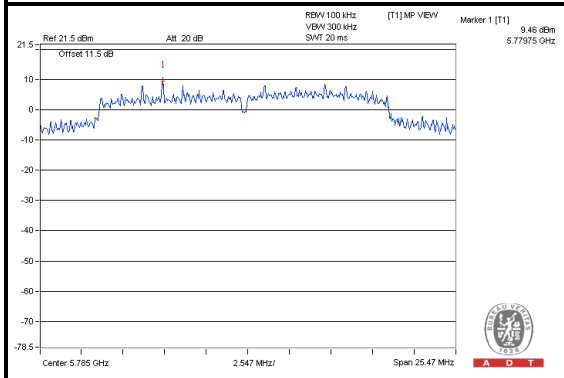




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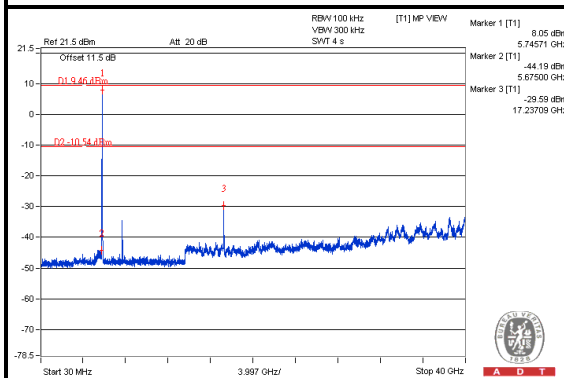
### For 802.11n(HT20)

#### Maximum REF

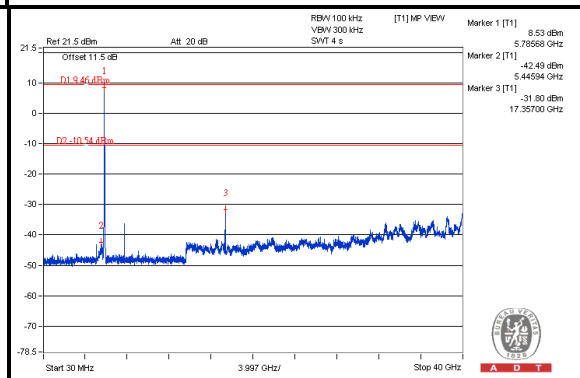


### For Chain (0): 802.11n(HT20)

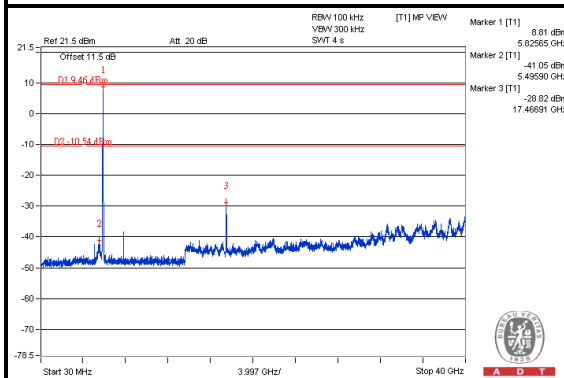
#### CH 149



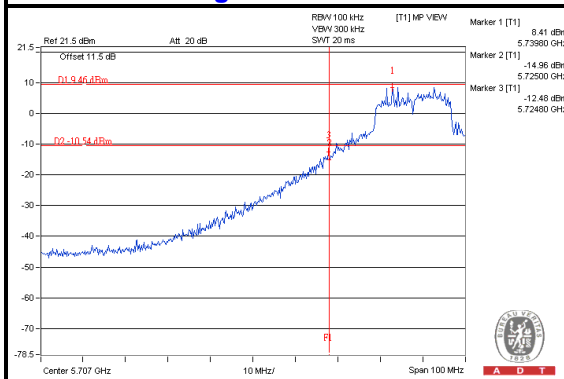
#### CH 157



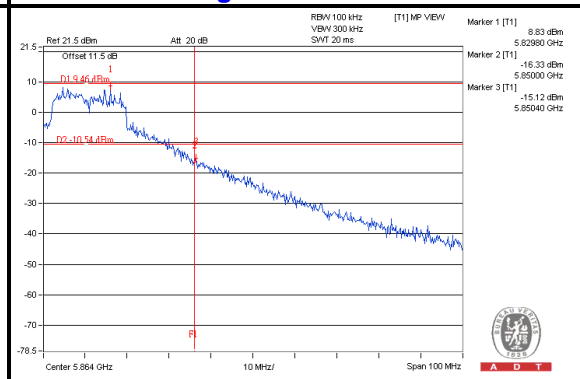
#### CH 165



#### CH 149 Band edge



#### CH 165 Band edge

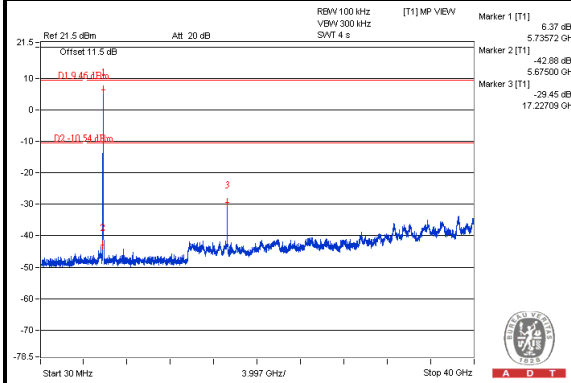




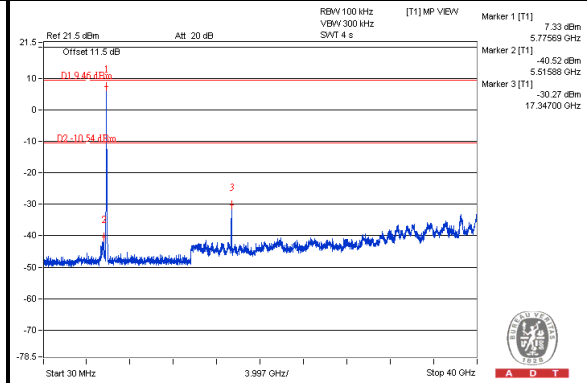
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### For Chain (1): 802.11n(HT20)

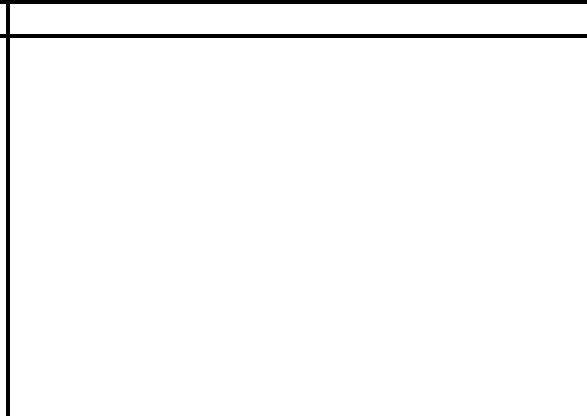
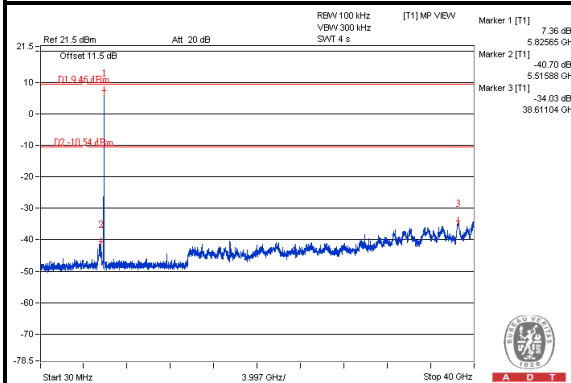
#### CH 149



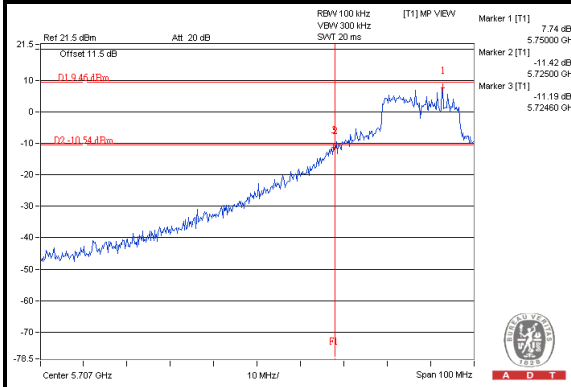
#### CH 157



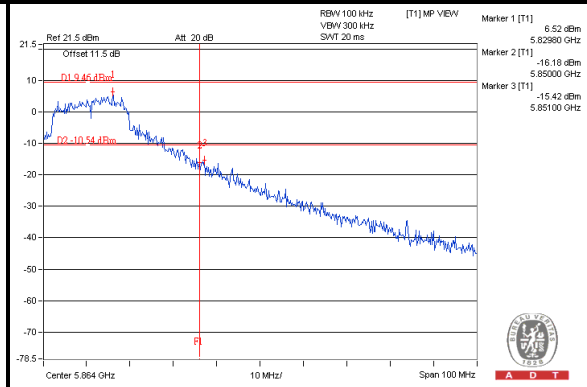
#### CH 165



#### CH 149 Band edge



#### CH 165 Band edge

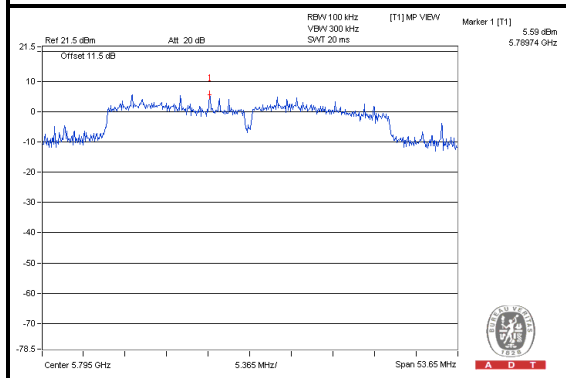




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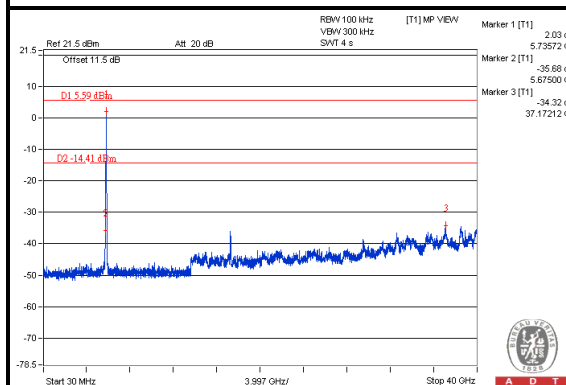
### For 802.11n(HT40)

#### Maximum REF

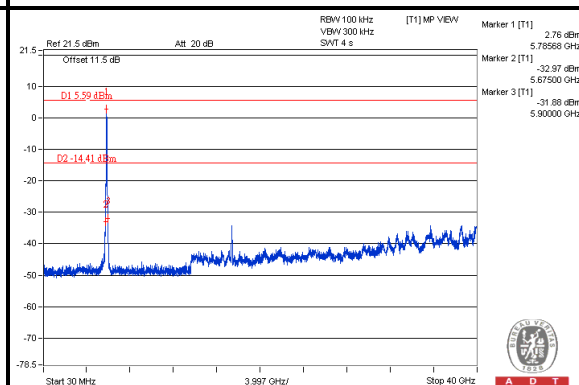


### For Chain (0): 802.11n(HT40)

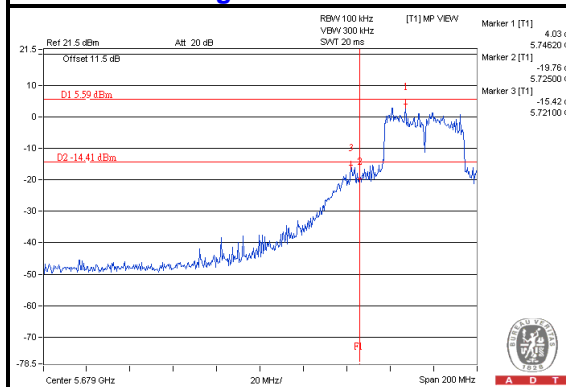
#### CH 151



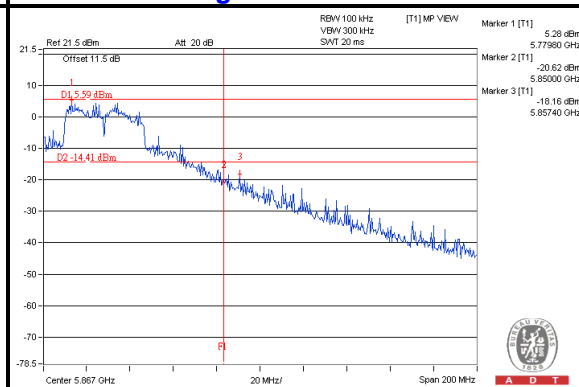
#### CH 159



#### CH 151 Band edge



#### CH 159 Band edge

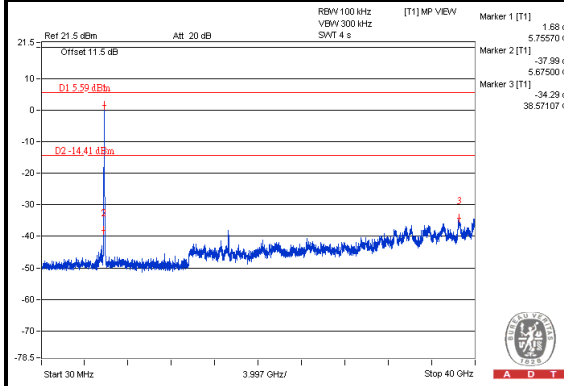




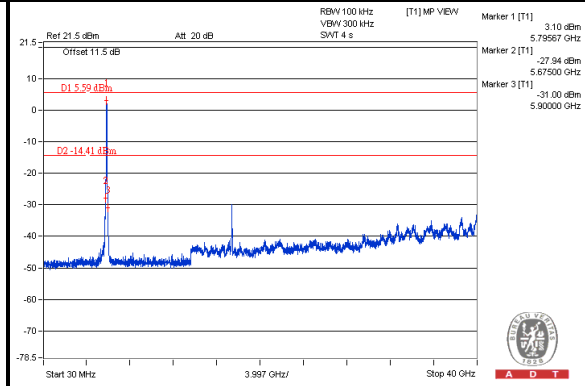
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### For Chain (1): 802.11n(HT40)

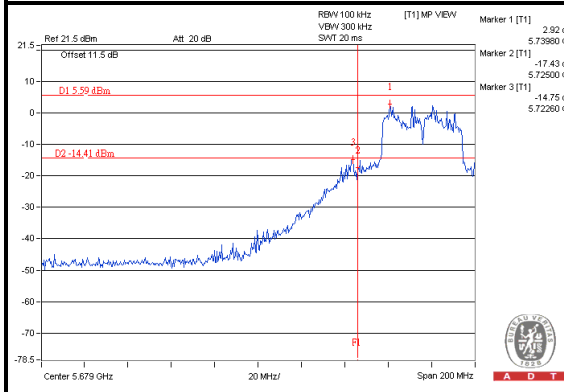
#### CH 151



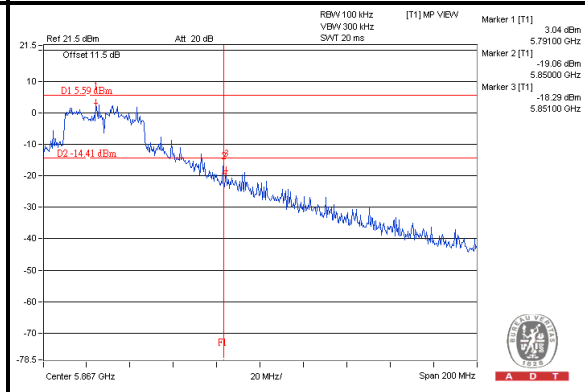
#### CH 159



#### CH 151 Band edge



#### CH 159 Band edge



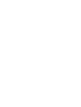




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## 6. PHOTOGRAPHS OF THE TEST CONFIGURATION

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





## 7. 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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## 8. 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 ---