



# SPORTON International Inc.

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## FCC RADIO TEST REPORT

Applicant's company	Belkin International, Inc.
Applicant Address	12045 East Waterfront Drive, Playa Vista, CA 90094
FCC ID	K7SF9L1106V1

Product Name	AC Wi-Fi Dual-Band USB Adapter
Brand Name	Belkin
Model Name	F9L1106v1
Test Rule Part(s)	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	2400 ~ 2483.5MHz / 5725 ~ 5850MHz
Received Date	Jun. 16, 2012
Final Test Date	Sep. 05, 2012
Submission Type	Original Equipment



### Statement

Test result included is only for the IEEE 802.11n, IEEE 802.11ac, IEEE 802.11b/g part and IEEE 802.11a/ac (5725 ~ 5850MHz) of the product.

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

The measurements and test results shown in this test report were made in accordance with the procedures and found in compliance with the limit given in **ANSI C63.10-2009** and **47 CFR FCC Part 15 Subpart C**.

The test equipment used to perform the test is calibrated and traceable to NML/ROC.



## Table of Contents

<b>1. CERTIFICATE OF COMPLIANCE</b> .....	<b>1</b>
<b>2. SUMMARY OF THE TEST RESULT</b> .....	<b>2</b>
<b>3. GENERAL INFORMATION</b> .....	<b>3</b>
3.1. Product Details .....	3
3.2. Accessories .....	5
3.3. Table for Carrier Frequencies .....	7
3.4. Table for Test Modes .....	8
3.5. Table for Testing Locations.....	10
3.6. Table for Supporting Units .....	10
3.7. Table for Parameters of Test Software Setting .....	10
3.8. Test Configurations.....	12
<b>4. TEST RESULT</b> .....	<b>15</b>
4.1. AC Power Line Conducted Emissions Measurement .....	15
4.2. Conducted Output Power Measurement .....	19
4.3. Power Spectral Density Measurement.....	33
4.4. 6dB Spectrum Bandwidth Measurement .....	46
4.5. Radiated Emissions Measurement.....	58
4.6. Band Edge Emissions Measurement.....	90
4.7. Antenna Requirements .....	113
<b>5. LIST OF MEASURING EQUIPMENTS</b> .....	<b>114</b>
<b>6. TEST LOCATION</b> .....	<b>116</b>
<b>7. TAF CERTIFICATE OF ACCREDITATION</b> .....	<b>117</b>
<b>APPENDIX A. PHOTOGRAPHS OF EUT</b> .....	<b>A1 ~ A9</b>
<b>APPENDIX B. TEST PHOTOS</b> .....	<b>B1 ~ B5</b>





## 1. CERTIFICATE OF COMPLIANCE

**Product Name** : AC Wi-Fi Dual-Band USB Adapter  
**Brand Name** : Belkin  
**Model Name** : F9L1106v1  
**Applicant** : Belkin International, Inc.  
**Test Rule Part(s)** : 47 CFR FCC Part 15 Subpart C § 15.247

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Jun. 16, 2012 would like to declare that the tested sample has been evaluated and found to be in compliance with the tested rule parts. The data recorded as well as the test configuration specified is true and accurate for showing the sample's EMC nature.

A handwritten signature in blue ink that reads 'Jordan Hsiao' is written over a horizontal line.

**Jordan Hsiao**

**SPORTON INTERNATIONAL INC.**

## 2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart C				
Part	Rule Section	Description of Test	Result	Under Limit
4.1	15.207	AC Power Line Conducted Emissions	Complies	15.20 dB
4.2	15.247(b)(3)	Conducted Output Power	Complies	7.78 dB
4.3	15.247(e)	Power Spectral Density	Complies	18.86 dB
4.4	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.5	15.247(d)	Radiated Emissions	Complies	3.59 dB
4.6	15.247(d)	Band Edge Emissions	Complies	1.27 dB
4.7	15.203	Antenna Requirements	Complies	-

Test Items	Uncertainty	Remark
AC Power Line Conducted Emissions	±2.3dB	Confidence levels of 95%
Maximum Conducted Output Power	±0.8dB	Confidence levels of 95%
Power Spectral Density	±0.5dB	Confidence levels of 95%
6dB Spectrum Bandwidth	±8.5×10 <sup>-8</sup>	Confidence levels of 95%
Radiated Emissions (9kHz~30MHz)	±0.8dB	Confidence levels of 95%
Radiated Emissions (30MHz~1GHz)	±1.9dB	Confidence levels of 95%
Radiated / Band Edge Emissions (1GHz~18GHz)	±1.9dB	Confidence levels of 95%
Radiated Emissions (18GHz~40GHz)	±1.9dB	Confidence levels of 95%
Temperature	±0.7°C	Confidence levels of 95%
Humidity	±3.2%	Confidence levels of 95%
DC / AC Power Source	±1.4%	Confidence levels of 95%

### 3. GENERAL INFORMATION

#### 3.1. Product Details

##### IEEE 802.11n/ac

Items	Description
Product Type	WLAN (2TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	From Host system
Modulation	see the below table for IEEE 802.11n/ac
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM/256QAM)
Frequency Range	2400 ~ 2483.5MHz / 5725 ~ 5850MHz
Channel Number	For 2.4GHz Band: 11 for 20MHz bandwidth ; 7 for 40MHz bandwidth For 5GHz Band: 10 for 20MHz bandwidth ; 4 for 40MHz bandwidth ; 1 for 80MHz bandwidth
Channel Band Width (99%)	For 2.4GHz Band: 11n MCS0 (HT 20MHz): 17.36 dBm ; 11n MCS0 (HT 40 MHz): 37.08 dBm; For 5GHz Band: 11n MCS0 (HT 20MHz): 24.00 MHz ; 11n MCS0 (HT40 MHz): 39.72 MHz; 11ac MCS0 (VHT 80MHz): 77.00 MHz
Conducted Output Power	For 2.4GHz Band: 11n MCS0 (HT 20MHz): 20.56 dBm ; 11n MCS0 (HT 40 MHz): 19.68 dBm; For 5GHz Band: 11n MCS0 (HT 20MHz): 19.32 dBm ; 11n MCS0 (HT 40 MHz): 19.26 dBm; 11ac MCS0 (VHT 20MHz): 19.23 dBm; 11ac MCS0 (VHT 40MHz): 19.25 dBm; 11ac MCS0 (VHT 80MHz): 18.73 dBm.
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

**802.11a/b/g**

Items	Description
Product Type	802.11b (1TX, 1RX) 802.11a/g (2TX, 2RX)
Radio Type	Intentional Transceiver
Power Type	From Power Adapter
Modulation	DSSS for IEEE 802.11b ; OFDM for IEEE 802.11a/g
Data Modulation	DSSS (BPSK / QPSK / CCK) ; OFDM (BPSK / QPSK / 16QAM / 64QAM)
Frequency Range	2400 ~ 2483.5MHz / 5725 ~ 5850MHz
Channel Number	11b/g: 11 ; 11a: 5
Channel Band Width (99%)	11b: 13.20 MHz ; 11g: 16.40 MHz ; 11a: 22.16 MHz
Conducted Output Power	11b: 11.64 dBm ; 11g: 20.63 dBm ; 11a: 19.33 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

**Antenna & Band width**

Antenna	Single (TX)			Two (TX)		
	20 MHz	40 MHz	80 MHz	20 MHz	40 MHz	80MHz
Band width Mode						
IEEE 802.11a	X	X	X	V	X	X
IEEE 802.11b	V	X	X	X	X	X
IEEE 802.11g	X	X	X	V	X	X
IEEE 802.11n	X	X	X	V	V	X
IEEE 802.11ac	X	X	X	V	V	V

## IEEE 802. 11a, 11n and 11ac Spec.

Worst Modulation Used for Conformance Testing				
Power Level		1		
IEEE 802.11 Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS	Worst Data Rate / MCS	Worst Modulation Mode
a	2	6-54 Mbps	6Mbps	11A5.8G-20M
n (HT20)	2	MCS 0-15	MCS 0	11N5.8G-20M
n (HT40)	2	MCS 0-15	MCS 0	11N5.8G-40M
ac (VHT80)	2	MCS 0-9	MCS 0-Nss1	11AC5.8G-80M

Note 1: IEEE Std. 802.11-2007 modulation consists of IEEE Std. 802.11a-1999.

Note 2: IEEE Std. 802.11n-2009 modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20 and HT40. Worst modulation mode of Guard Interval (GI) is 400ns.

Note 3: draft IEEE Std. 802.11ac-2012 modulation consists of VHT20, VHT40, VHT80. Then EUT support VHT80. (VHT: Very High Throughput).

Note 4: Modulation modes consist of 11A5.8G-20M , 11N5.8G-20M , 11N5.8G-40M , 11AC5.8G-80M

11A: IEEE 802.11a, 11N: IEEE 802.11n, 11AC: IEEE 802.11ac. 5.8G: 5.47-5.725 GHz band.

20M/40M/80M: Channel Bandwidth 20MHz/40MHz/80MHz

### 3.2. Accessories

N/A

### 3.2.1. Table for Filed Antenna

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)		Remark
					2.4G	5G	
0	-	-	Printed Antenna	N/A	2.15	3.81	TX/RX
1	-	-	Printed Antenna	N/A	3.54	3.29	TX/RX

Note:

**For IEEE 802.11b mode (1TX/1RX):**

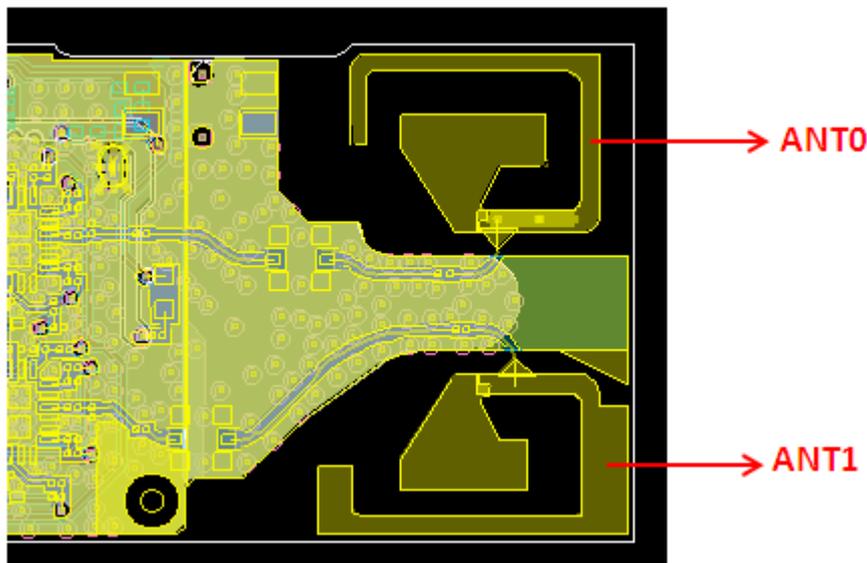
It fixed Ant. 0 as transmitting and receiving antenna.

**For IEEE 802.11g/n mode (2TX/2RX):**

Ant. 0 and Ant. 1 will transmit/receive the signal simultaneously.

**For IEEE 802.11a/ac mode (3TX/3RX):**

Ant. 1, Ant. 2 and Ant. 3 could transmit/receive simultaneously.



### 3.3. Table for Carrier Frequencies

#### For 2.4GHz Band:

For IEEE 802.11b/g, use Channel 1~Channel 11.

There are two bandwidth systems for IEEE 802.11n.

For both 20MHz bandwidth systems, use Channel 1~Channel 11.

For both 40MHz bandwidth systems, use Channel 3~Channel 9.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
2400~2483.5MHz	1	2412 MHz	7	2442 MHz
	2	2417 MHz	8	2447 MHz
	3	2422 MHz	9	2452 MHz
	4	2427 MHz	10	2457 MHz
	5	2432 MHz	11	2462 MHz
	6	2437 MHz	-	-

#### For 5GHz Band:

There are three bandwidth systems for IEEE 802.11n.

For 20MHz bandwidth systems, use Channel 149, 153, 157, 161, 165.

For 40MHz bandwidth systems, use Channel 151, 159.

For 80MHz bandwidth systems, use Channel 155.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5725~5850 MHz Band 4	149	5745 MHz	157	5785 MHz
	151	5755 MHz	159	5795 MHz
	153	5765 MHz	161	5805 MHz
	155	5775MHz	165	5825 MHz

### 3.4. Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

#### For 2.4GHz Band

Test Items	Mode	Data Rate	Channel	Antenna
AC Power Line Conducted Emissions	Normal Link	Auto	-	-
Conducted Output Power Power Spectral Density	MCS0/20MHz	7.2 Mbps	1/6/11	0/1/0+1
	MCS0/40MHz	15 Mbps	3/6/9	0/1/0+1
	11b/CCK	1 Mbps	1/6/11	0
	11g/BPSK	6 Mbps	1/6/11	0/1/0+1
6dB Spectrum Bandwidth	MCS0/20MHz	7.2 Mbps	1/6/11	0+1
	MCS0/40MHz	15 Mbps	3/6/9	0+1
	11b/CCK	1 Mbps	1/6/11	0
	11g/BPSK	6 Mbps	1/6/11	0+1
Radiated Emissions Below 1GHz	Normal Link	Auto	-	-
Radiated Emissions Above 1GHz	MCS0/20MHz	7.2 Mbps	1/6/11	0+1
	MCS0/40MHz	15 Mbps	3/6/9	0+1
	11b/CCK	1 Mbps	1/6/11	0
	11g/BPSK	6 Mbps	1/6/11	0+1
Band Edge Emissions	MCS0/20MHz	7.2 Mbps	1/11	0+1
	MCS0/40MHz	15 Mbps	3/9	0+1
	11b/CCK	1 Mbps	1/11	0
	11g/BPSK	6 Mbps	1/11	0+1

**For 5GHz Band**

Test Items	Mode	Data Rate	Channel	Antenna
AC Power Line Conducted Emissions	Normal Link	Auto	-	-
Conducted Output Power Power Spectral Density	MCS0/20MHz	7.2 Mbps	149/157/165	0/1/0+1
	MCS0/40MHz	15 Mbps	151/159	0/1/0+1
	MCS0/80MHz	MCS0NSS1	155	0/1/0+1
	11a/BPSK	6 Mbps	149/157/165	0/1/0+1
6dB Spectrum Bandwidth	MCS0/20MHz	7.2 Mbps	149/157/165	0+1
	MCS0/40MHz	15 Mbps	151/159	0+1
	MCS0/80MHz	MCS0NSS1	155	0/1/0+1
	11a/BPSK	6 Mbps	149/157/165	0+1
Radiated Emissions Below 1GHz	Normal Link	Auto	-	-
Radiated Emissions Above 1GHz	MCS0/20MHz	7.2 Mbps	149/157/165	0+1
	MCS0/40MHz	15 Mbps	151/159	0+1
	MCS0/80MHz	MCS0NSS1	155	0/1/0+1
	11a/BPSK	6 Mbps	149/157/165	0+1
Band Edge Emissions	MCS0/20MHz	7.2 Mbps	149/157/165	0+1
	MCS0/40MHz	15 Mbps	151/159	0+1
	MCS0/80MHz	MCS0NSS1	155	0/1/0+1
	11a/BPSK	6 Mbps	149/157/165	0+1

**For Radiated Emission test:**

Mode 1: EUT- Upright

Mode 2: EUT-Lying

Mode 2 generated the worst case, so it was selected to perform test and its test result was written in the report.

### 3.5. Table for Testing Locations

Test Site No.	Site Category	Location	FCC Reg. No.	IC File No.	VCCI Reg. No
03CH01-CB	SAC	Hsin Chu	262045	IC 4086D	-
CO01-CB	Conduction	Hsin Chu	262045	IC 4086D	-
TH01-CB	OVEN Room	Hsin Chu	-	-	-

Open Area Test Site (OATS); Semi Anechoic Chamber (SAC); Fully Anechoic Chamber (FAC).

Please refer section 6 for Test Site Address.

### 3.6. Table for Supporting Units

Support Unit	Brand	Model	FCC ID
Notebook	DELL	M1330	E2K4965AGNM
Mouse	iCooky	AMS0706W	DoC
Earphone	SHYARO CHI	MIC-04	N/A

### 3.7. Table for Parameters of Test Software Setting

During testing, Channel & Power Controlling Software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

#### For 2.4GHz Band

Power Parameters of IEEE 802.11n MCS0 20MHz

Test Software Version	Manual Tool 1.0.0.9		
Frequency	2412 MHz	2437 MHz	2462 MHz
MCS0 20MHz	60	70	64

Power Parameters of IEEE 802.11n MCS0 40MHz

Test Software Version	Manual Tool 1.0.0.9		
Frequency	2422 MHz	2437 MHz	2452 MHz
MCS0 40MHz	56	64	54

Power Parameters of IEEE 802.11b/g

Test Software Version	Manual Tool 1.0.0.9		
Frequency	2412 MHz	2437 MHz	2462 MHz
IEEE 802.11b	44	40	40
IEEE 802.11g	70	70	64

During the test, "Manual Tool 1.0.0.9" under WIN XP was executed the test program to control the EUT continuously transmit RF signal.

**For 5GHz Band**

Power Parameters of IEEE 802.11n MCS0 20MHz

Test Software Version	Manual Tool 1.0.0.9		
Frequency	5745 MHz	5785 MHz	5825 MHz
MCS0 20MHz	60	60	58

Power Parameters of IEEE 802.11n MCS0 40MHz

Test Software Version	Manual Tool 1.0.0.9	
Frequency	5755 MHz	5795 MHz
MCS0 40MHz	59	58

Power Parameters of IEEE 802.11ac MCS0 80MHz

Test Software Version	Manual Tool 1.0.0.9
Frequency	5775 MHz
MCS0 80MHz	60

Power Parameters of IEEE 802.11a

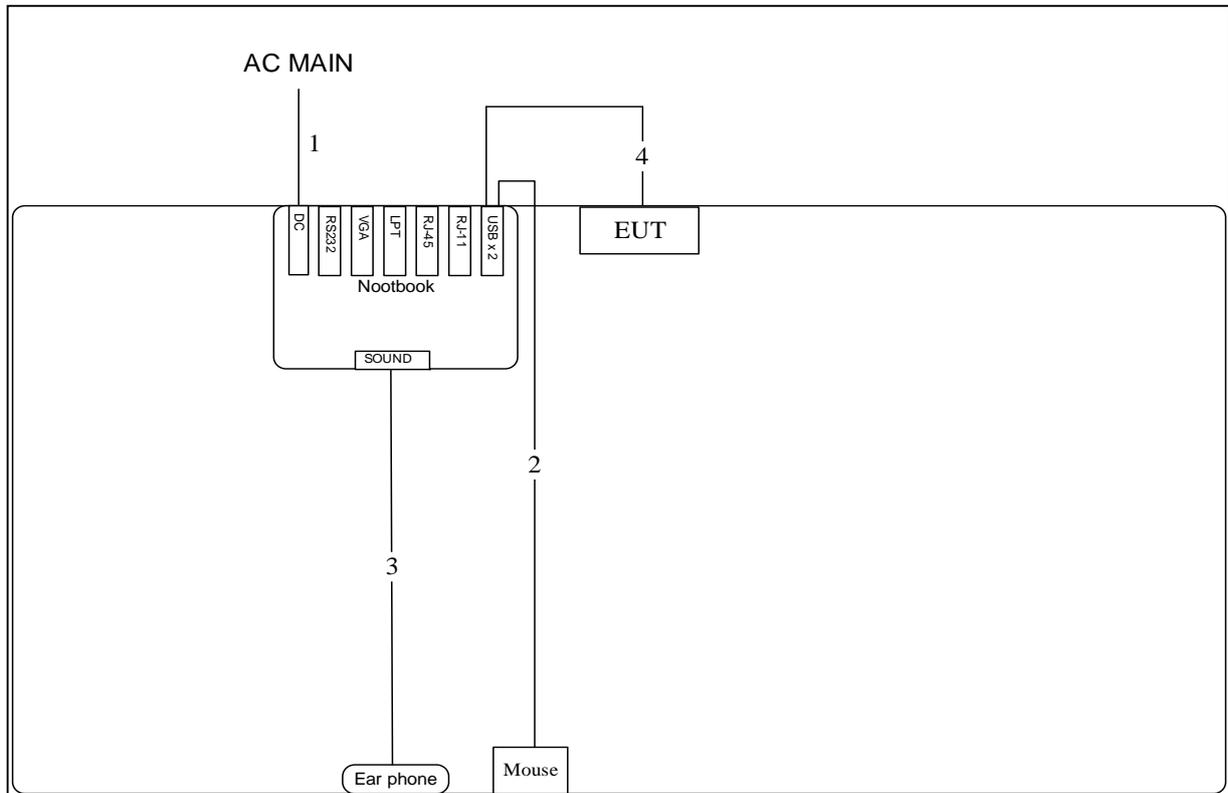
Test Software Version	Manual Tool 1.0.0.9		
Frequency	5745 MHz	5785 MHz	5825 MHz
IEEE 802.11a	60	60	58

During the test, "Manual Tool 1.0.0.9" under WIN XP was executed the test program to control the EUT continuously transmit RF signal.

### 3.8. Test Configurations

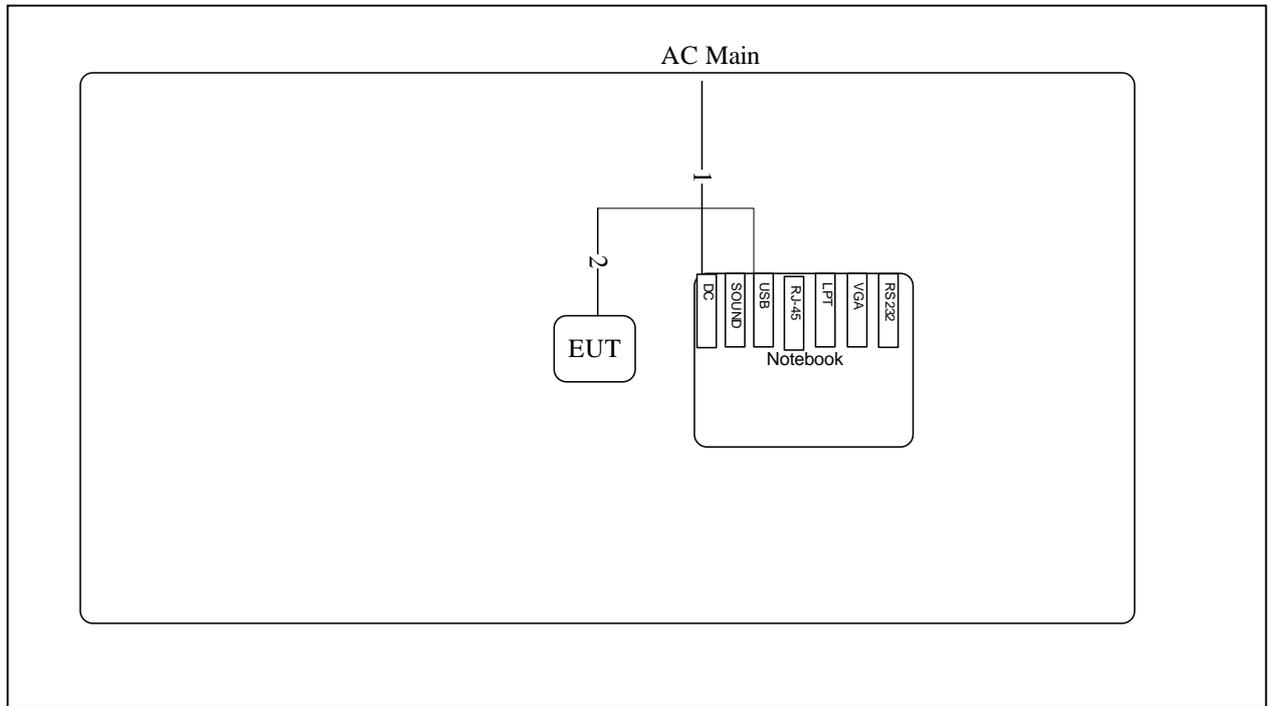
#### 3.8.1. Radiation Emissions Test Configuration

Test Configuration: 30MHz~1GHz



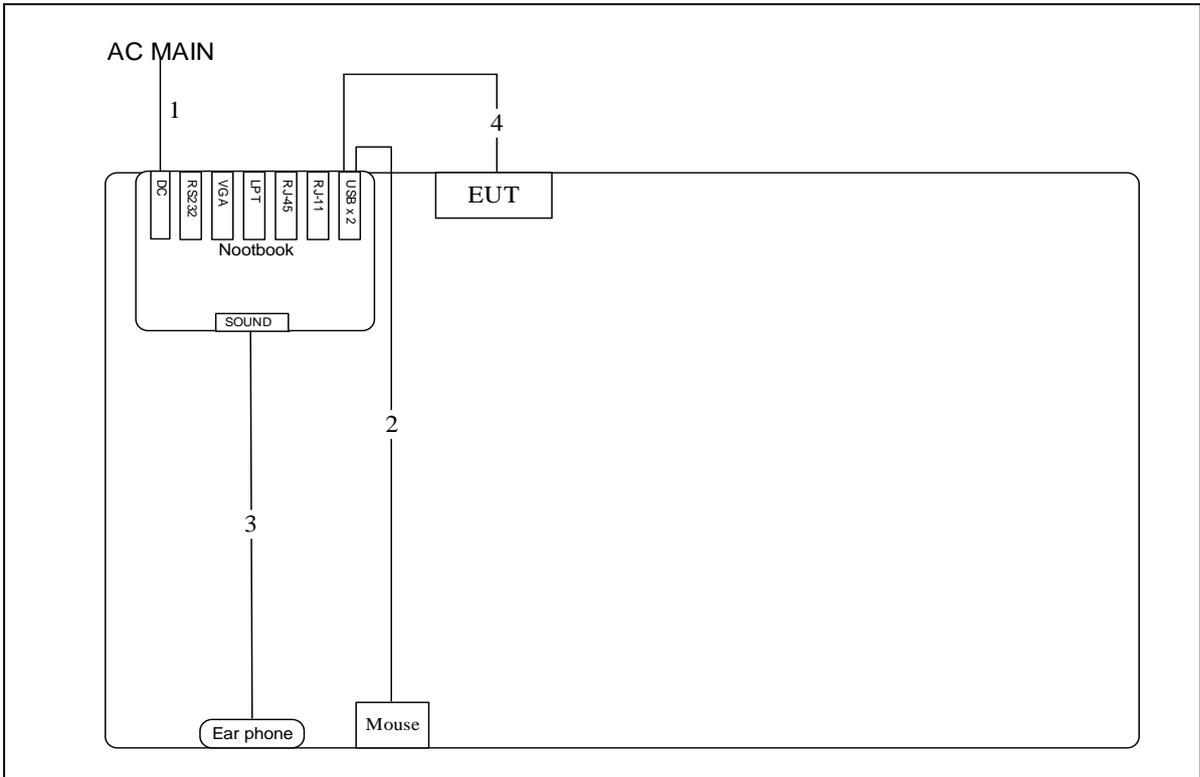
Item	Connection	Shield	Length
1	Power cable	No	2.6M
2	USB cable	No	1.8M
3	Earphone cable	No	1.1M
4	USB cable	Yes	1.8M

Test Configuration: above 1GHz



Item	Connection	Shield	Length
1	Power cable	No	1.8m
2	USB cable	Yes	0.15m

### 3.8.2. AC Power Line Conduction Emissions Test Configuration



Item	Connection	Shield	Length
1	Power cable	No	2.6M
2	USB cable	No	1.8M
3	Earphone cable	No	1.1M
4	USB cable	Yes	1.8M

## 4. TEST RESULT

### 4.1. AC Power Line Conducted Emissions Measurement

#### 4.1.1. Limit

For this product which is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

#### 4.1.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the receiver.

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

#### 4.1.3. Test Procedures

Configure the EUT according to ANSI C63.10. The EUT or host of EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.

Connect EUT or host of EUT to the power mains through a line impedance stabilization network (LISN).

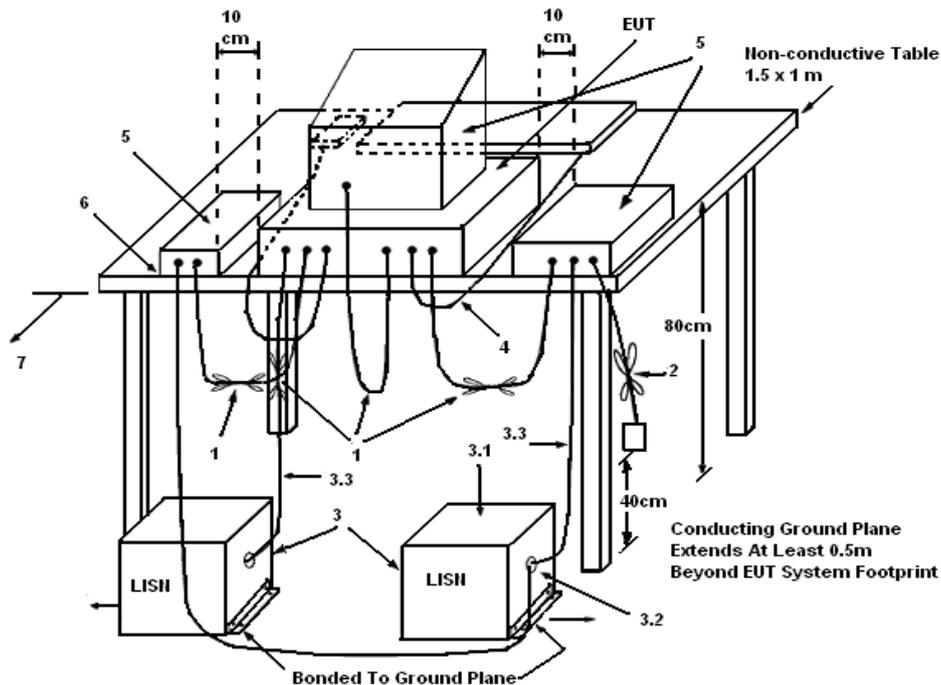
All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.

The frequency range from 150 KHz to 30 MHz was searched.

Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

The measurement has to be done between each power line and ground at the power terminal.

#### 4.1.4. Test Setup Layout



#### LEGEND:

- (1) Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
- (2) I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
- (3) EUT connected to one LISN. Unused LISN measuring port connectors shall be terminated in 50  $\Omega$ . LISN can be placed on top of, or immediately beneath, reference ground plane.
  - (3.1) All other equipment powered from additional LISN(s).
  - (3.2) Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
  - (3.3) LISN at least 80 cm from nearest part of EUT chassis.
- (4) Cables of hand-operated devices, such as keyboards, mice, etc., shall be placed as for normal use.
- (5) Non-EUT components of EUT system being tested.
- (6) Rear of EUT, including peripherals, shall all be aligned and flush with rear of tabletop.
- (7) Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the ground plane.

#### 4.1.5. Test Deviation

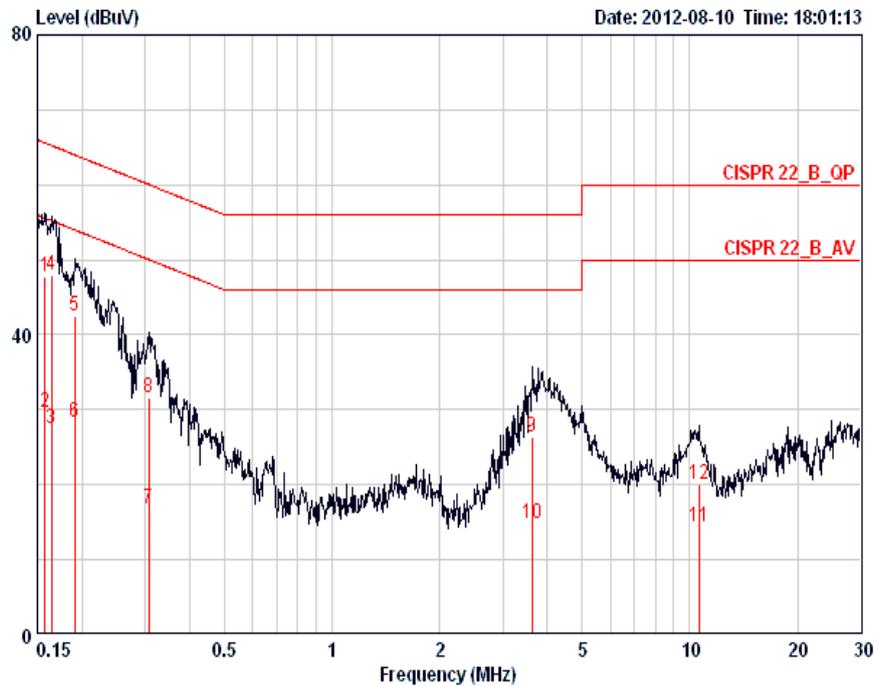
There is no deviation with the original standard.

#### 4.1.6. EUT Operation during Test

The EUT was placed on the test table and programmed in normal function.

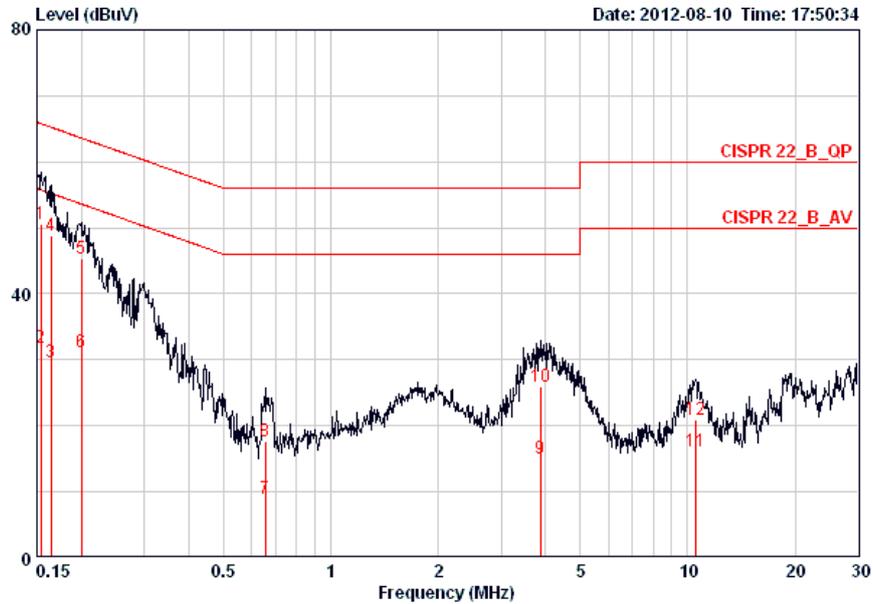
#### 4.1.7. Results of AC Power Line Conducted Emissions Measurement

Temperature	25°C	Humidity	63%
Test Engineer	Ryo Fan	Phase	Line
Configuration	Normal Link		



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.15733	47.73	-17.87	65.60	47.37	0.16	0.20	LINE	QP
2	0.15733	29.63	-25.97	55.60	29.27	0.16	0.20	LINE	AVERAGE
3	0.16414	27.46	-27.79	55.25	27.10	0.16	0.20	LINE	AVERAGE
4	0.16414	47.89	-17.36	65.25	47.53	0.16	0.20	LINE	QP
5	0.19039	42.44	-21.58	64.02	42.09	0.15	0.20	LINE	QP
6	0.19039	28.28	-25.74	54.02	27.93	0.15	0.20	LINE	AVERAGE
7	0.30671	16.79	-33.27	50.06	16.44	0.15	0.20	LINE	AVERAGE
8	0.30671	31.59	-28.47	60.06	31.24	0.15	0.20	LINE	QP
9	3.623	26.41	-29.59	56.00	25.90	0.21	0.30	LINE	QP
10	3.623	14.82	-31.18	46.00	14.31	0.21	0.30	LINE	AVERAGE
11	10.620	14.45	-35.55	50.00	13.70	0.35	0.40	LINE	AVERAGE
12	10.620	20.05	-39.95	60.00	19.30	0.35	0.40	LINE	QP

Temperature	23°C	Humidity	63%
Test Engineer	Ryo Fan	Phase	Neutral
Configuration	Normal Link		



	Freq	Level	Over	Limit	Read	LISN	Cable	Pol/Phase	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB		
1	0.15403	50.58	-15.20	65.78	50.30	0.08	0.20	NEUTRAL	QP
2	0.15403	31.79	-23.99	55.78	31.51	0.08	0.20	NEUTRAL	AVERAGE
3	0.16414	29.55	-25.70	55.25	29.27	0.08	0.20	NEUTRAL	AVERAGE
4	0.16414	48.87	-16.38	65.25	48.59	0.08	0.20	NEUTRAL	QP
5	0.19969	45.37	-18.25	63.62	45.09	0.08	0.20	NEUTRAL	QP
6	0.19969	31.09	-22.53	53.62	30.81	0.08	0.20	NEUTRAL	AVERAGE
7	0.65430	8.98	-37.02	46.00	8.70	0.08	0.20	NEUTRAL	AVERAGE
8	0.65430	17.73	-38.27	56.00	17.45	0.08	0.20	NEUTRAL	QP
9	3.860	15.15	-30.85	46.00	14.72	0.13	0.30	NEUTRAL	AVERAGE
10	3.860	25.84	-30.16	56.00	25.41	0.13	0.30	NEUTRAL	QP
11	10.564	16.21	-33.79	50.00	15.57	0.25	0.39	NEUTRAL	AVERAGE
12	10.564	20.98	-39.02	60.00	20.34	0.25	0.39	NEUTRAL	QP

Note:

Level = Read Level + LISN Factor + Cable Loss.

## 4.2. Conducted Output Power Measurement

### 4.2.1. Limit

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. The limited has to be reduced by the amount in dB that the gain of the antenna exceed 6dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

### 4.2.2. Measuring Instruments and Setting

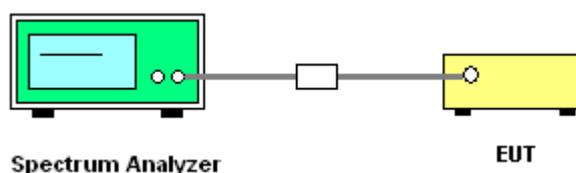
Please refer to section 5 of equipments list in this report. The following table is the setting of the peak power meter.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Encompass the entire emissions bandwidth (EBW) of the signal
RB	1MHz
VB	3MHz
Detector	RMS
Trace	Average 100
Sweep Time	Auto

### 4.2.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Test was performed in accordance with KDB 558074 Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under § 15.247 section 5.2.2.2. Multiple antenna systems was performed in accordance with KDB 662911 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
3. When measuring maximum conducted output power with multiple antenna systems, add every result of the values by mathematic formula.

### 4.2.4. Test Setup Layout



### 4.2.5. Test Deviation

There is no deviation with the original standard.

### 4.2.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 4.2.7. Test Result of Conducted Output Power

Temperature	26°C	Humidity	60%
Test Engineer	Benson Peng	Configurations	IEEE 802.11n

For 2.4GHz Band

Configuration IEEE 802.11n MCS0 20MHz

Channel	Frequency	Conducted Power (dBm)		Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Ant. 0	Ant. 1			
1	2412 MHz	15.03	14.85	17.95	30.00	Complies
6	2437 MHz	17.78	17.31	20.56	30.00	Complies
11	2462 MHz	15.93	15.71	18.83	30.00	Complies

Configuration IEEE 802.11n MCS0 40MHz

Channel	Frequency	Conducted Power (dBm)		Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Ant. 0	Ant. 1			
3	2422 MHz	14.64	14.31	17.49	30.00	Complies
6	2437 MHz	16.85	16.49	19.68	30.00	Complies
9	2452 MHz	14.55	14.19	17.38	30.00	Complies

For 5GHz Band

Configuration IEEE 802.11n MCS0 20MHz

Channel	Frequency	Conducted Power (dBm)		Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Ant. 0	Ant. 1			
149	5745 MHz	15.97	15.96	18.98	30.00	Complies
157	5785 MHz	16.39	16.23	19.32	30.00	Complies
165	5825 MHz	16.20	16.11	19.17	30.00	Complies

Configuration IEEE 802.11n MCS0 40MHz

Channel	Frequency	Conducted Power (dBm)		Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Ant. 0	Ant. 1			
151	5755 MHz	16.23	16.08	19.17	30.00	Complies
159	5795 MHz	16.27	16.23	19.26	30.00	Complies

**Configuration IEEE 802.11ac MCS0 20MHz**

Channel	Frequency	Conducted Power (dBm)		Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Ant. 0	Ant. 1			
149	5745 MHz	15.97	15.82	18.91	30.00	Complies
157	5785 MHz	16.24	16.19	19.23	30.00	Complies
165	5825 MHz	16.17	15.90	19.05	30.00	Complies

**Configuration IEEE 802.11ac MCS0 40MHz**

Channel	Frequency	Conducted Power (dBm)		Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Ant. 0	Ant. 1			
151	5755 MHz	16.28	16.10	19.20	30.00	Complies
159	5795MHz	16.27	16.21	19.25	30.00	Complies

**Configuration IEEE 802.11ac MCS0 80MHz**

Channel	Frequency	Conducted Power (dBm)		Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Ant. 0	Ant. 1			
155	5775 MHz	15.73	15.71	18.73	30.00	Complies

Temperature	26°C	Humidity	60%
Test Engineer	Benson Peng	Configurations	IEEE 802.11a/b/g

**Configuration IEEE 802.11b / Ant. 0**

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
1	2412 MHz	11.64	30.00	Complies
6	2437 MHz	11.15	30.00	Complies
11	2462 MHz	11.22	30.00	Complies

**Configuration IEEE 802.11g / Ant. 0+ Ant. 1**

Channel	Frequency	Conducted Power (dBm)		Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Ant. 0	Ant. 1			
1	2412 MHz	17.74	17.28	20.53	30.00	Complies
6	2437 MHz	17.79	17.44	20.63	30.00	Complies
11	2462 MHz	16.53	16.07	19.32	30.00	Complies

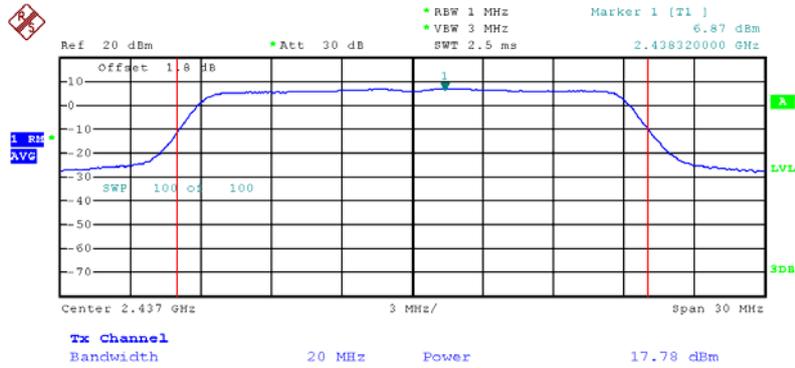
**Configuration IEEE 802.11a / Ant. 0+ Ant. 1**

Channel	Frequency	Conducted Power (dBm)		Total Conducted Power (dBm)	Max. Limit (dBm)	Result
		Ant. 0	Ant. 1			
149	5745 MHz	15.99	15.98	19.00	29.44	Complies
157	5785 MHz	16.46	16.18	19.33	29.44	Complies
165	5825 MHz	16.27	16.11	19.20	29.44	Complies

Note: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N]$  dBi

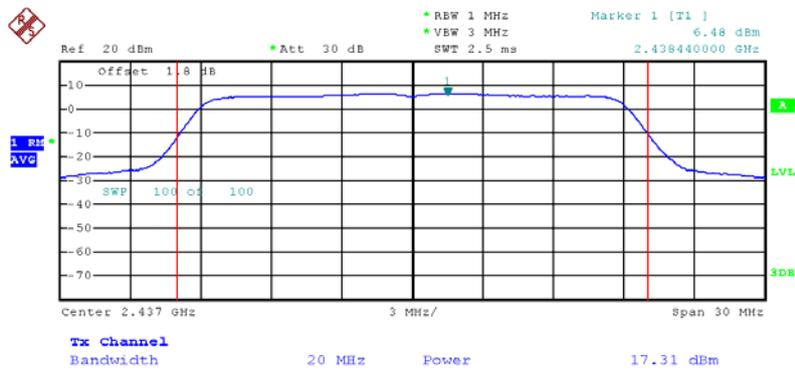
=6.56dBi > 6dBi , so the conducted power limit =30-(6.56-6)=29.44dBm.

Conducted Output Power Plot on Configuration IEEE 802.11n MCS0 20MHz / 2437 MHz / ANT. 0



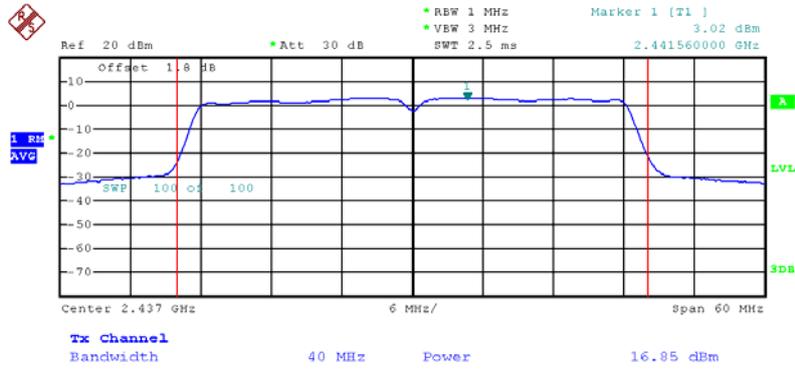
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Conducted Output Power Plot on Configuration IEEE 802.11n MCS0 20MHz / 2437 MHz / ANT. 1



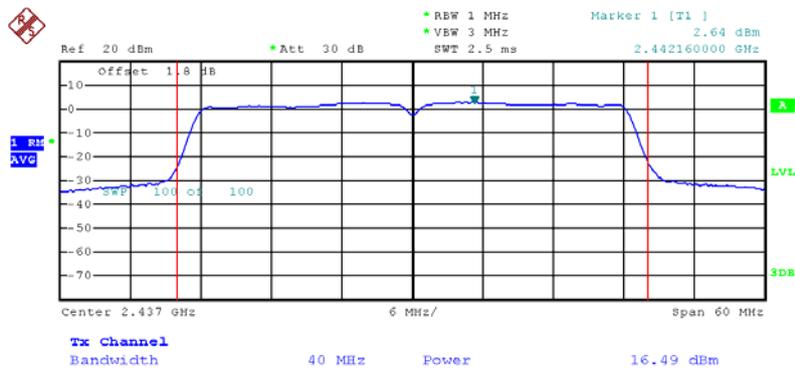
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Conducted Output Power Plot on Configuration IEEE 802.11n MCS0 40MHz / 2437 MHz/ ANT. 0



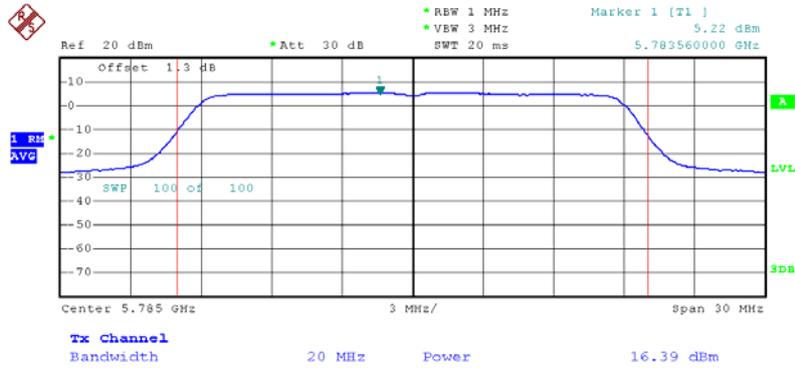
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Conducted Output Power Plot on Configuration IEEE 802.11n MCS0 40MHz / 2437 MHz/ ANT.1



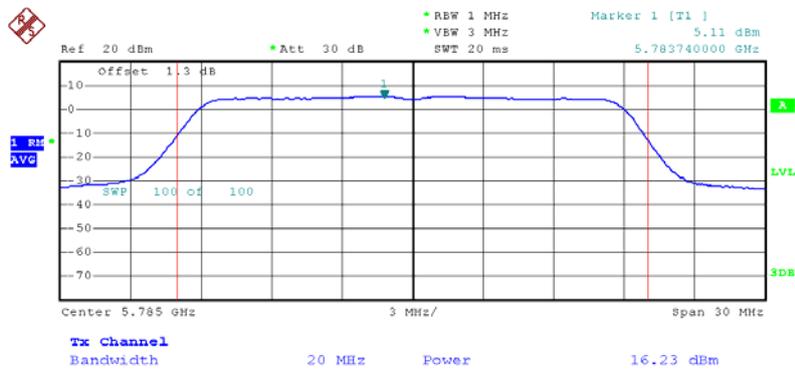
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Conducted Output Power Plot on Configuration IEEE 802.11n MCS0 20MHz / 5785 MHz / ANT. 0



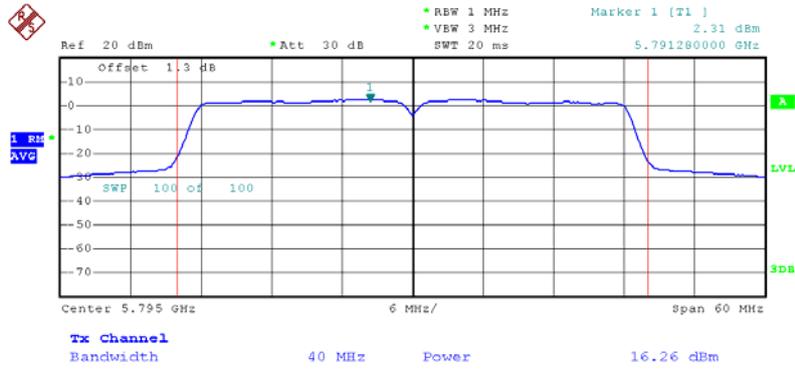
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Conducted Output Power Plot on Configuration IEEE 802.11n MCS0 20MHz / 5785 MHz/ ANT. 1



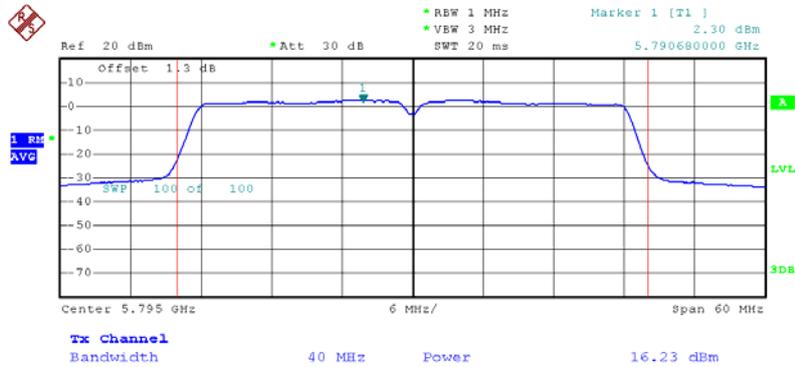
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Conducted Output Power Plot on Configuration IEEE 802.11n MCS0 40MHz / 5795 MHz/ ANT. 0



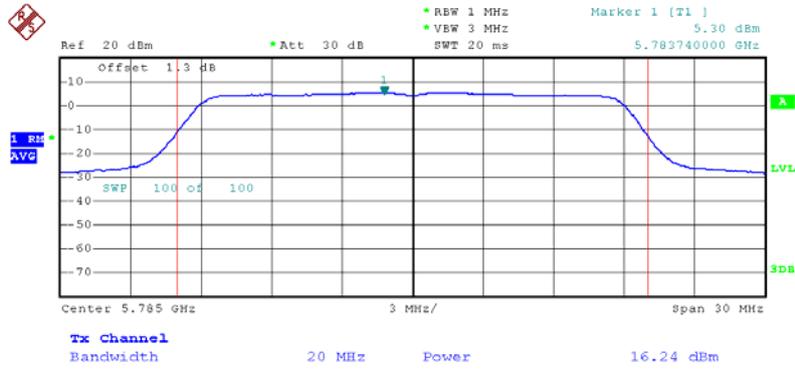
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Conducted Output Power Plot on Configuration IEEE 802.11n MCS0 40MHz / 5795 MHz/ ANT. 1



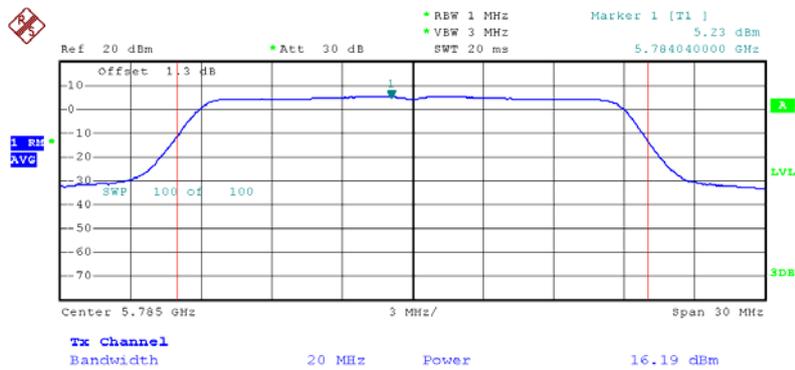
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Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0 20MHz / 5785 MHz/ ANT. 0



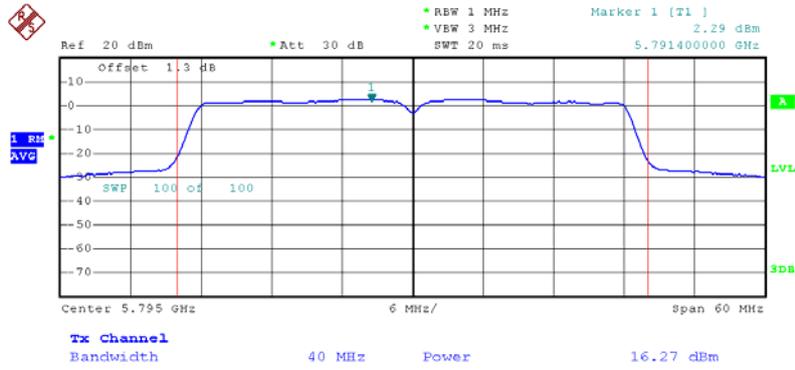
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Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0 20MHz / 5785 MHz / ANT. 1



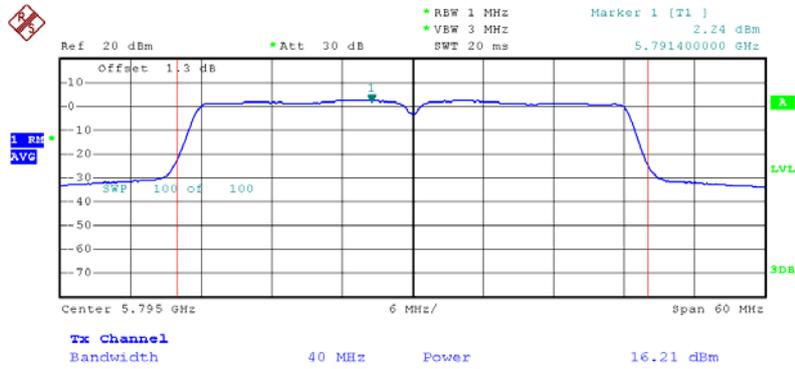
Date: 4.SEP.2012 19:13:15

Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0 40MHz / 5795 MHz / ANT. 0



Date: 4.SEP.2012 19:28:27

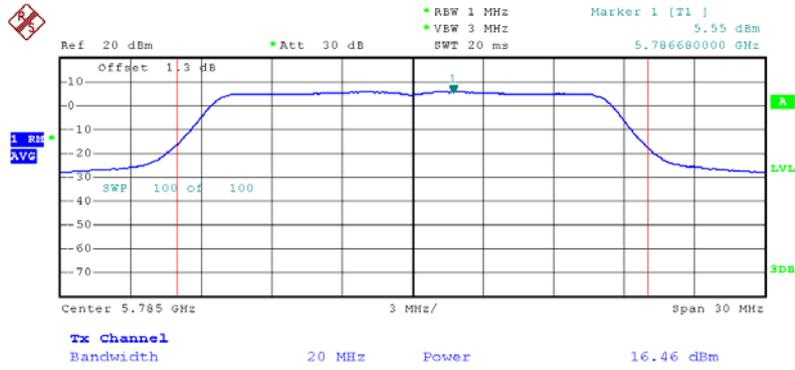
Conducted Output Power Plot on Configuration IEEE 802.11ac MCS0 40MHz / 5795 MHz / ANT. 1



Date: 4.SEP.2012 19:29:11

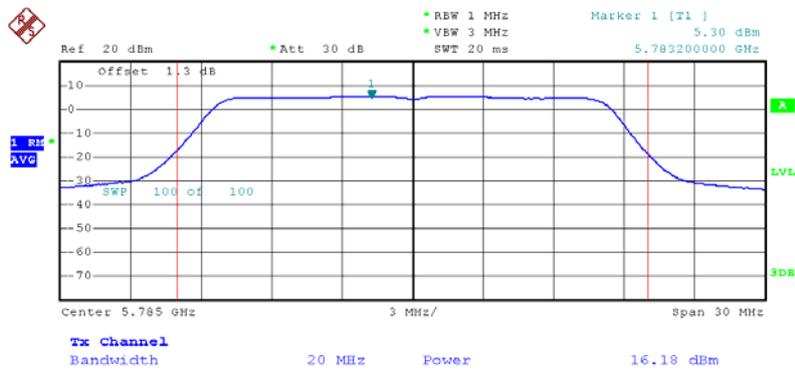


Conducted Output Power Plot on Configuration IEEE 802.11a / 5785 MHz/ ANT. 0



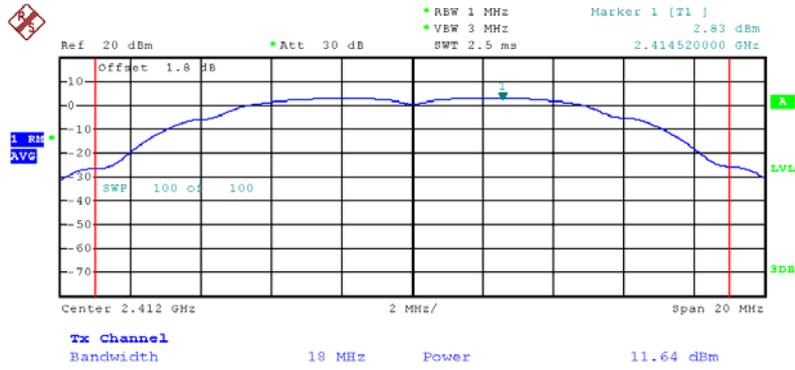
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Conducted Output Power Plot on Configuration IEEE 802.11a / 5785 MHz / ANT. 1



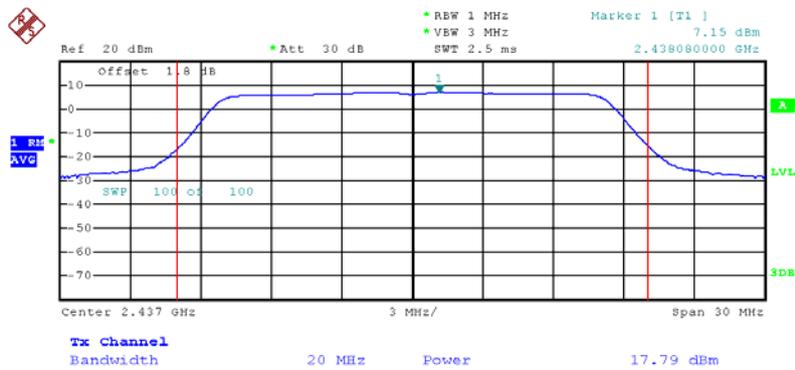
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Conducted Output Power Plot on Configuration IEEE 802.11b / 2412 MHz/ ANT. 0



Date: 23.AUG.2012 19:04:15

Conducted Output Power Plot on Configuration IEEE 802.11g / 2437 MHz/ ANT.0



Date: 23.AUG.2012 19:11:02



### 4.3. Power Spectral Density Measurement

#### 4.3.1. Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

#### 4.3.2. Measuring Instruments and Setting

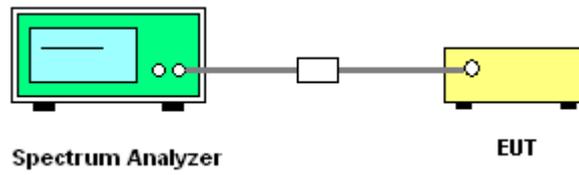
Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	Set the analyzer span to 5-30% greater than the EBW.
RB	100 kHz
VB	300 kHz
Detector	RMS
Trace	Single Sweep
Sweep Time	$\geq 10 \times (\text{number of measurement points in sweep}) \times (\text{transmission symbol period})$ .

#### 4.3.3. Test Procedures

1. Use this procedure when the maximum conducted output power in the fundamental emission is used to demonstrate compliance. The EUT must be configured to transmit continuously at full power over the measurement duration.
2. Ensure that the number of measurement points in the sweep  $\geq 2 \times \text{span}/\text{RBW}$  (use of a greater number of measurement points than this minimum requirement is recommended).
3. Use the peak marker function to determine the maximum level in any 100 kHz band segment within the fundamental EBW.
4. Scale the observed power level to an equivalent level in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where:  $\text{BWCF} = 10\log(3 \text{ kHz}/100 \text{ kHz} = -15.2 \text{ dB})$ .
5. The resulting PSD level must be  $\leq 8 \text{ dBm}$ .
6. When measuring power spectral density with multiple antenna systems, add every result of the values by mathematic formula.

#### 4.3.4. Test Setup Layout



#### 4.3.5. Test Deviation

There is no deviation with the original standard.

#### 4.3.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 4.3.7. Test Result of Power Spectral Density

Temperature	26°C	Humidity	60%
Test Engineer	Benson Peng	Configurations	IEEE 802.11n

For 2.4GHz Band

Configuration IEEE 802.11n MCS0 20MHz

Channel	Frequency	Power Density (dBm/100kHz)		BWCF factor (100KHz to 3KHz)	Power Density (dBm/3kHz)		Single Port. Limit (dBm/3kHz)	Result
		Ant. 0	Ant. 1		Ant. 0	Ant. 1		
1	2412 MHz	-5.10	-5.18	-15.23	-20.33	-20.41	4.99	Complies
6	2437 MHz	-2.56	-2.75	-15.23	-17.79	-17.98	4.99	Complies
11	2462 MHz	-3.68	-4.31	-15.23	-18.91	-19.54	4.99	Complies

Configuration IEEE 802.11n MCS0 40MHz

Channel	Frequency	Power Density (dBm/100kHz)		BWCF factor (100KHz to 3KHz)	Power Density (dBm/3kHz)		Single Port. Limit (dBm/3kHz)	Result
		Ant. 0	Ant. 1		Ant. 0	Ant. 1		
3	2422 MHz	-8.03	-8.60	-15.23	-23.26	-23.83	4.99	Complies
6	2437 MHz	-6.27	-6.37	-15.23	-21.50	-21.60	4.99	Complies
9	2452 MHz	-8.50	-9.14	-15.23	-23.73	-24.37	4.99	Complies

For 5GHz Band

Configuration IEEE 802.11n MCS0 20MHz

Channel	Frequency	Power Density (dBm/100kHz)		BWCF factor (100KHz to 3KHz)	Power Density (dBm/3kHz)		Single Port. Limit (dBm/3kHz)	Result
		Ant. 0	Ant. 1		Ant. 0	Ant. 1		
149	5745 MHz	0.17	0.32	-15.23	-15.06	-14.91	4.99	Complies
157	5785 MHz	-0.23	0.83	-15.23	-15.46	-14.40	4.99	Complies
165	5825 MHz	-0.85	0.51	-15.23	-16.08	-14.72	4.99	Complies

**Configuration IEEE 802.11n MCS0 40MHz**

Channel	Frequency	Power Density (dBm/100kHz)		BWCF factor (100KHz to 3KHz)	Power Density (dBm/3kHz)		Single Port. Limit (dBm/3kHz)	Result
		Ant. 0	Ant. 1		Ant. 0	Ant. 1		
151	5755 MHz	-3.19	-2.74	-15.23	-18.42	-17.97	4.99	Complies
159	5795 MHz	-3.50	-2.30	-15.23	-18.73	-17.53	4.99	Complies

**Configuration IEEE 802.11ac MCS0 80MHz**

Channel	Frequency	Power Density (dBm/100kHz)		BWCF factor (100KHz to 3KHz)	Power Density (dBm/3kHz)		Single Port. Limit (dBm/3kHz)	Result
		Ant. 0	Ant. 1		Ant. 0	Ant. 1		
155	5775 MHz	-6.69	-6.00	-15.23	-21.92	-21.23	4.99	Complies

Temperature	23°C	Humidity	60%
Test Engineer	Benson Peng	Configurations	IEEE 802.11a/b/g

**Configuration IEEE 802.11b / Ant. 0**

Channel	Frequency	Power Density (dBm/100kHz)	BWCF factor (100KHz to 3KHz)	Power Density (dBm/3kHz)	Single Port. Limit (dBm/3kHz)	Result
1	2412 MHz	-6.53	-15.23	-21.76	8.00	Complies
6	2437 MHz	-7.33	-15.23	-22.56	8.00	Complies
11	2462 MHz	-7.49	-15.23	-22.72	8.00	Complies

**Configuration IEEE 802.11g / Ant. 0+ Ant. 1**

Channel	Frequency	Power Density (dBm/100kHz)		BWCF factor (100KHz to 3KHz)	Power Density (dBm/3kHz)		Single Port. Limit (dBm/3kHz)	Result
		Ant. 0	Ant. 1		Ant. 0	Ant. 1		
1	2412 MHz	-2.13	-2.93	-15.23	-17.36	-18.16	4.43	Complies
6	2437 MHz	-2.00	-2.45	-15.23	-17.23	-17.68	4.43	Complies
11	2462 MHz	-3.62	-4.16	-15.23	-18.85	-19.39	4.43	Complies

Note: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N]$  dBi

=5.88dBi < 6dBi, so the power density limit =8dBm.

**Configuration IEEE 802.11a / Ant. 0+ Ant. 1**

Channel	Frequency	Power Density (dBm/100kHz)		BWCF factor (100KHz to 3KHz)	Power Density (dBm/3kHz)		Single Port. Limit (dBm/3kHz)	Result
		Ant. 0	Ant. 1		Ant. 0	Ant. 1		
149	5745 MHz	1.09	1.04	-15.23	-14.14	-14.19	4.99	Complies
157	5785 MHz	0.83	1.36	-15.23	-14.40	-13.87	4.99	Complies
165	5825 MHz	-0.10	1.30	-15.23	-15.33	-13.93	4.99	Complies

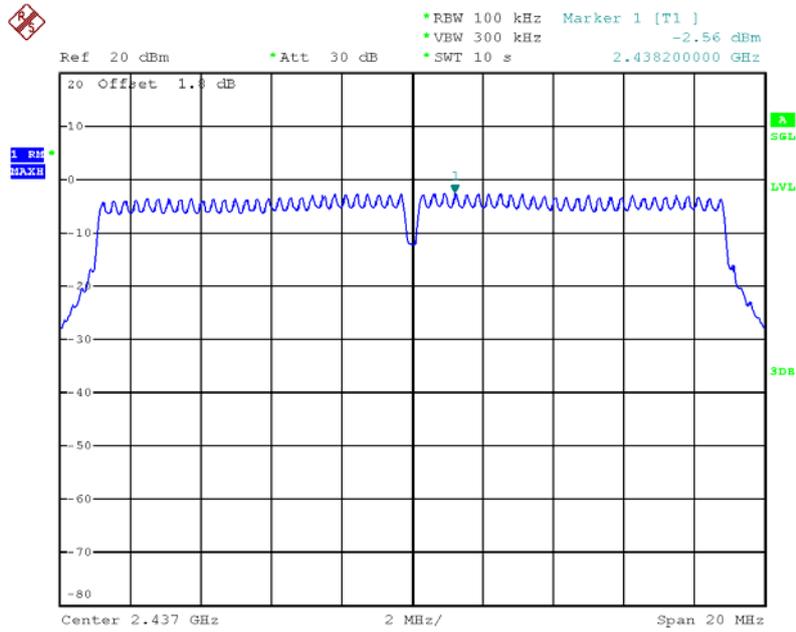
Note: Directional gain =  $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / N]$  dBi

=6.56dBi > 6dBi, so the power density limit =8-(6.56-6)-3.01=4.43

All the test values were listed in the report.

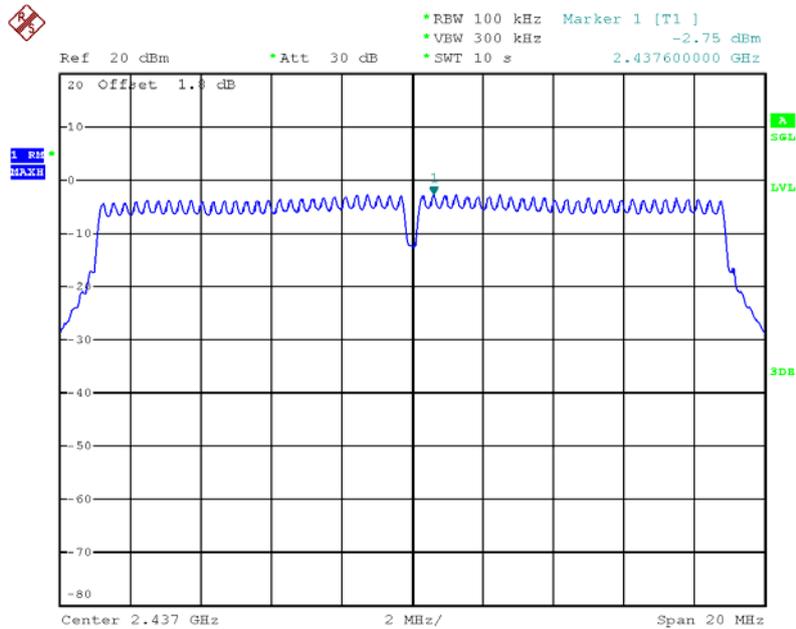
For plots, only the channel with maximum results was shown.

Power Density Plot on Configuration IEEE 802.11n MCS0 20MHz / Ant. 0 / 2437 MHz



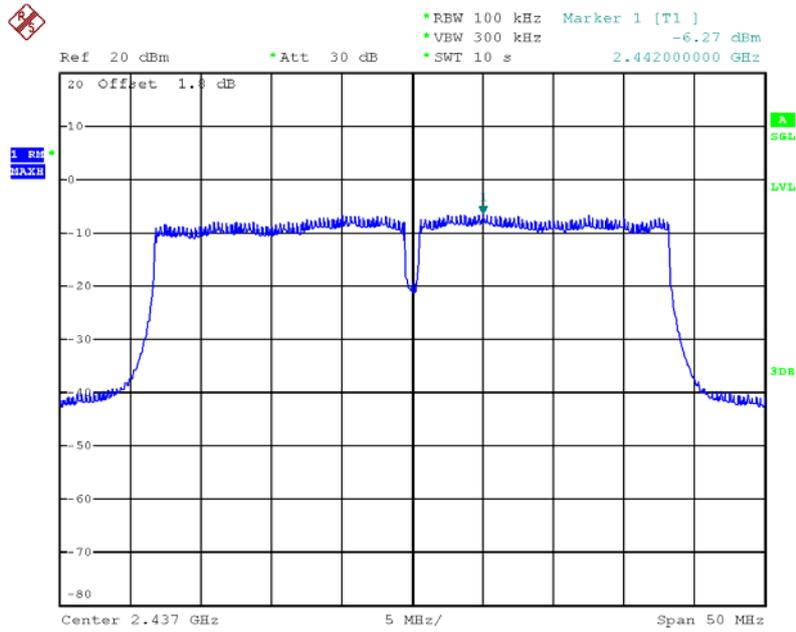
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Power Density Plot on Configuration IEEE 802.11n MCS0 20MHz / Ant. 1 / 2437 MHz



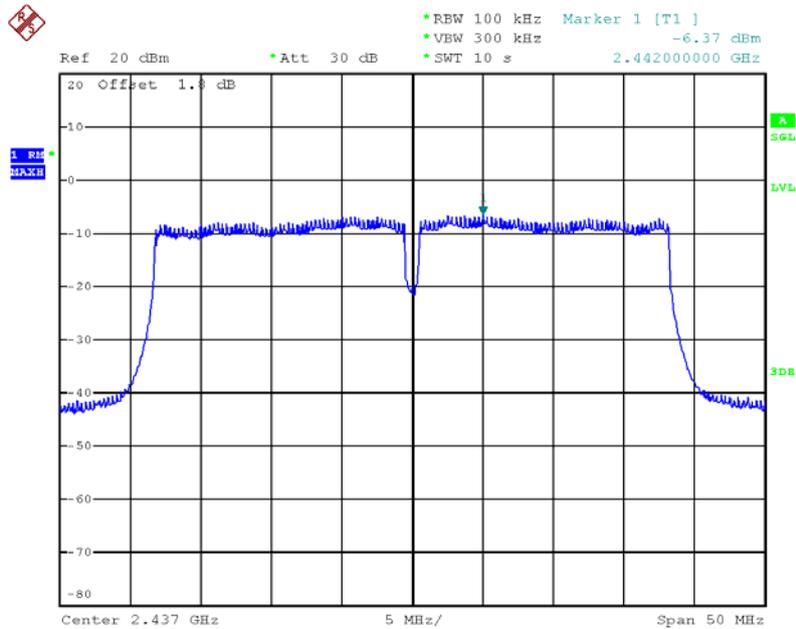
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Power Density Plot on Configuration IEEE 802.11n MCS0 40MHz / Ant. 0 / 2437 MHz



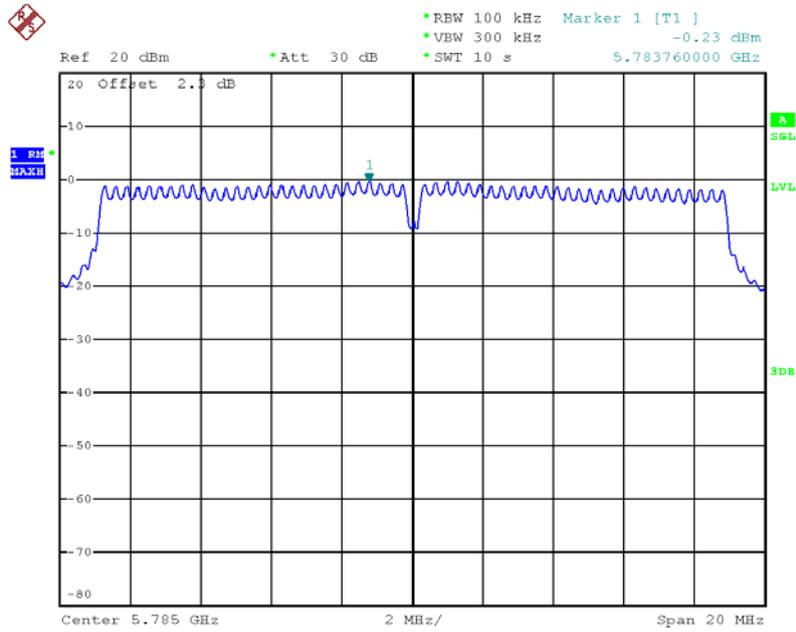
Date: 23.AUG.2012 21:39:35

Power Density Plot on Configuration IEEE 802.11n MCS0 40MHz / Ant. 1 / 2437 MHz



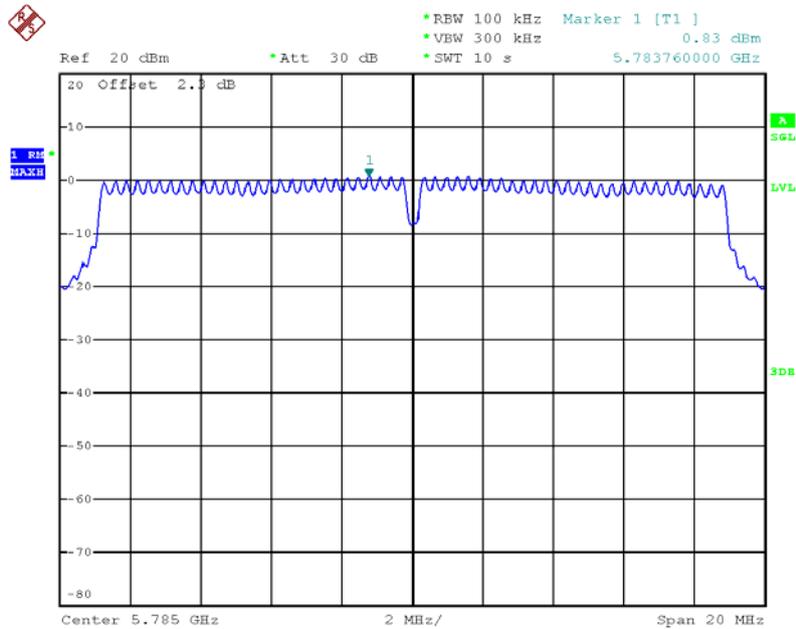
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### Power Density Plot on Configuration IEEE 802.11n MCS0 20MHz / Ant. 0 / 5785 MHz



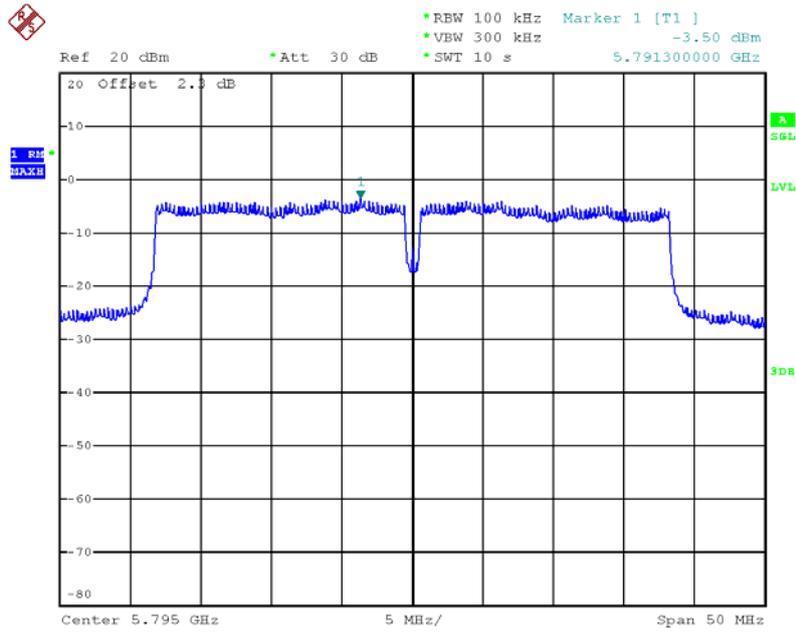
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### Power Density Plot on Configuration IEEE 802.11n MCS0 20MHz / Ant. 1 / 5785 MHz



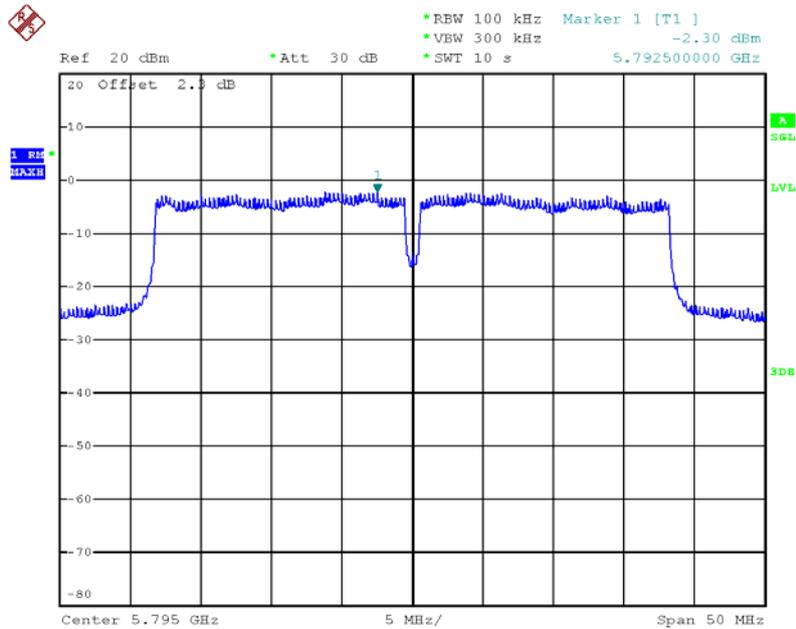
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Power Density Plot on Configuration IEEE 802.11n MCS0 40MHz / Ant. 0 / 5795 MHz



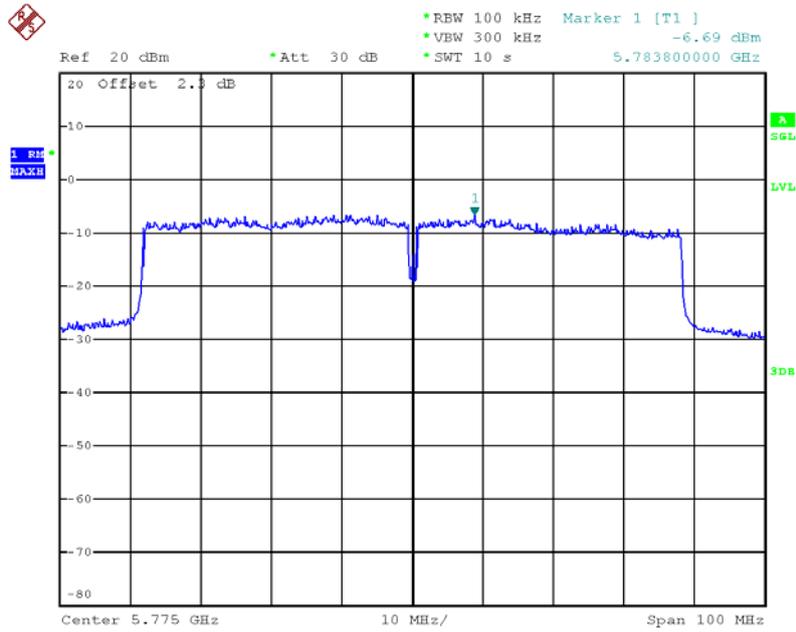
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Power Density Plot on Configuration IEEE 802.11n MCS0 40MHz / Ant. 1 / 5795 MHz



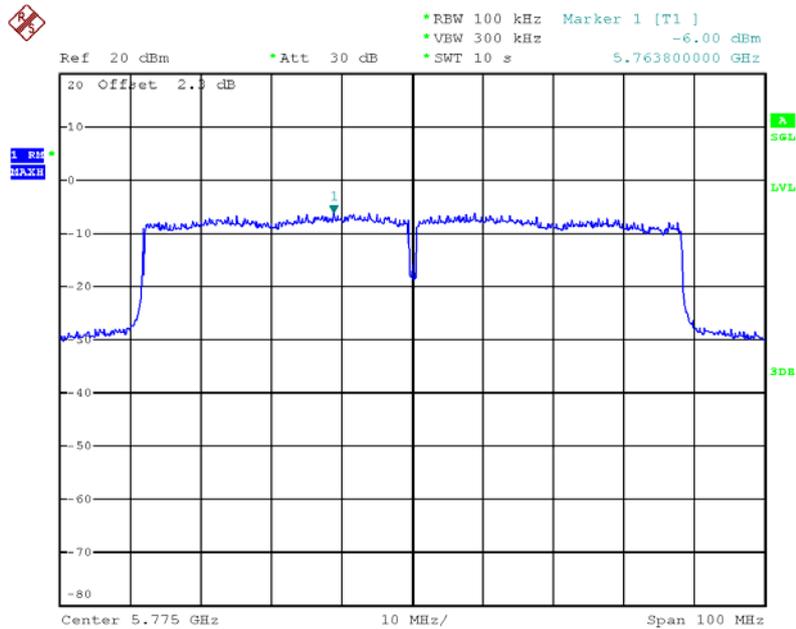
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Power Density Plot on Configuration IEEE 802.11n MCS0 8MHz / Ant. 0 / 5775 MHz



Date: 23.AUG.2012 21:27:17

Power Density Plot on Configuration IEEE 802.11n MCS0 8MHz / Ant. 1 / 5775 MHz



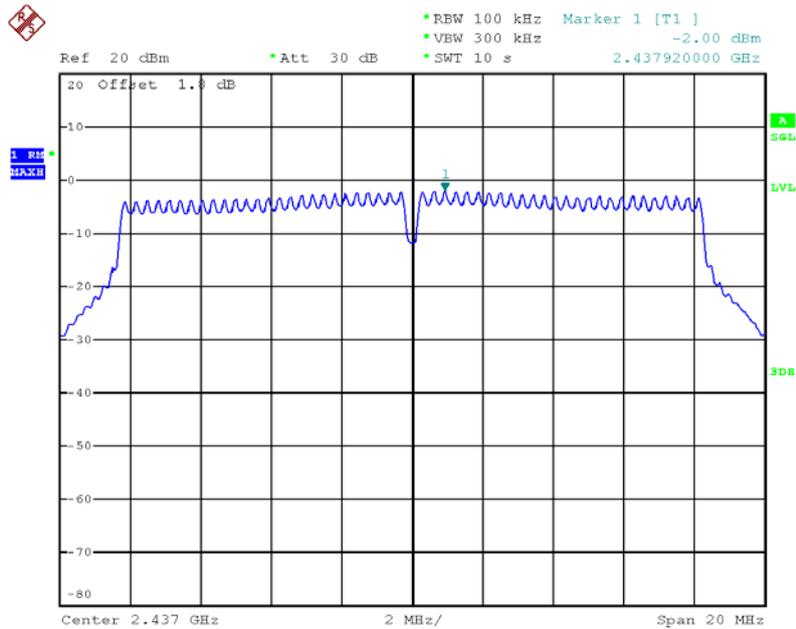
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Power Density Plot on Configuration IEEE 802.11b / Ant. 0 / 2412 MHz



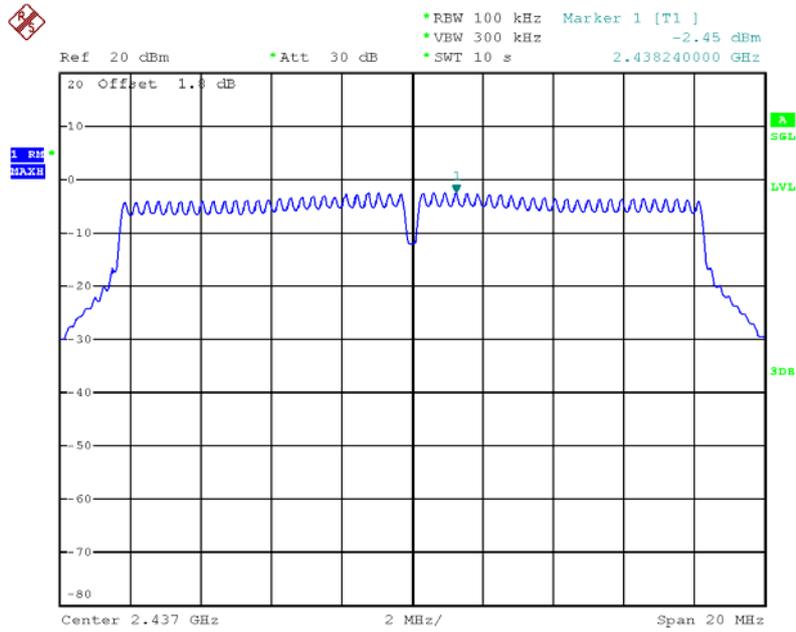
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Power Density Plot on Configuration IEEE 802.11g / Ant. 0 / 2437 MHz



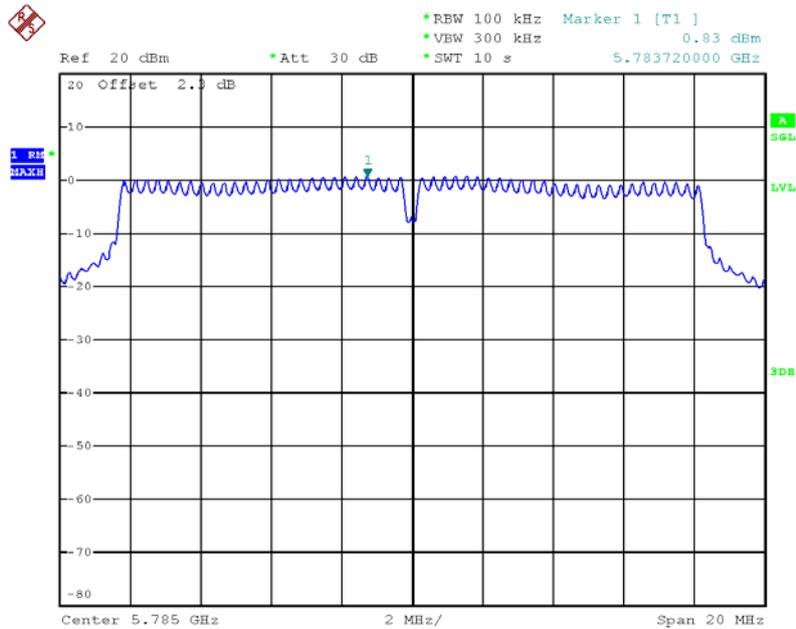
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### Power Density Plot on Configuration IEEE 802.11g / Ant. 1 / 2437 MHz



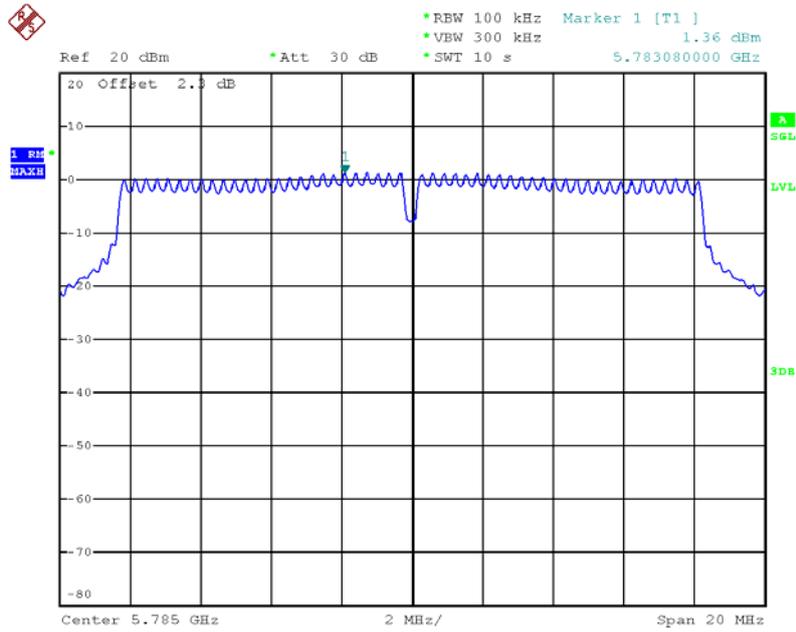
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### Power Density Plot on Configuration IEEE 802.11a / Ant. 0 / 5785 MHz



Date: 23.AUG.2012 21:17:53

### Power Density Plot on Configuration IEEE 802.11a / Ant. 1 / 5785 MHz



Date: 23.AUG.2012 21:17:22

#### 4.4. 6dB Spectrum Bandwidth Measurement

##### 4.4.1. Limit

For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz.

##### 4.4.2. Measuring Instruments and Setting

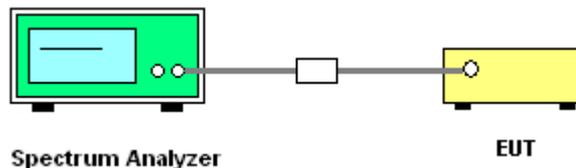
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RB	1-5 % of the emission bandwidth (EBW)
VB	$\geq 3 \times \text{RBW}$
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

##### 4.4.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. Test was performed in accordance with KDB 558074 Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247 section 5.1.1 EBW Measurement Procedure
3. Multiple antenna systems was performed in accordance with KDB 662911 Emissions Testing of Transmitters with Multiple Outputs in the Same Band.
4. Measured the spectrum width with power higher than 6dB below carrier.

##### 4.4.4. Test Setup Layout



##### 4.4.5. Test Deviation

There is no deviation with the original standard.

##### 4.4.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 4.4.7. Test Result of 6dB Spectrum Bandwidth

Temperature	26°C	Humidity	60%
Test Engineer	Benson Peng	Configurations	IEEE 802.11n

For 2.4GHz Band

Configuration IEEE 802.11n MCS0 20MHz / Ant. 0 + Ant. 1

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	16.72	17.36	500	Complies
6	2437 MHz	16.56	17.36	500	Complies
11	2462 MHz	16.56	17.36	500	Complies

Configuration IEEE 802.11n MCS0 40MHz / Ant. 0 + Ant. 1

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
3	2422 MHz	36.60	36.96	500	Complies
6	2437 MHz	36.60	37.08	500	Complies
9	2452 MHz	36.84	36.96	500	Complies

## For 5GHz Band

## Configuration IEEE 802.11n MCS0 20MHz / Ant. 0 + Ant. 1

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	16.88	24.00	500	Complies
157	5785 MHz	16.72	23.76	500	Complies
165	5825 MHz	16.64	22.48	500	Complies

## Configuration IEEE 802.11n MCS0 40MHz / Ant. 0 + Ant. 1

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
151	5755 MHz	36.48	39.72	500	Complies
159	5795 MHz	36.96	39.36	500	Complies

## Configuration IEEE 802.11ac MCS0 80MHz / Ant. 0 + Ant. 1

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
155	5775 MHz	76.80	77.00	500	Complies

Temperature	26°C	Humidity	60%
Test Engineer	Benson Peng	Configurations	IEEE 802.11a/b/g

**Configuration IEEE 802.11b / Ant. 0**

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	10.24	13.20	500	Complies
6	2437 MHz	10.32	13.20	500	Complies
11	2462 MHz	10.32	13.20	500	Complies

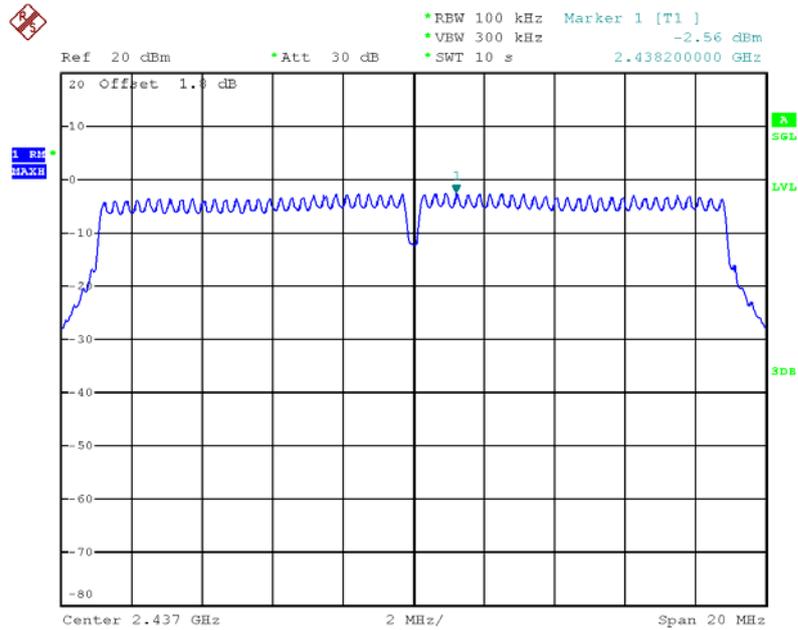
**Configuration IEEE 802.11g / Ant. 0 + Ant. 1**

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
1	2412 MHz	13.52	16.32	500	Complies
6	2437 MHz	13.44	16.40	500	Complies
11	2462 MHz	13.44	16.32	500	Complies

**Configuration IEEE 802.11a / Ant. 0 + Ant. 1**

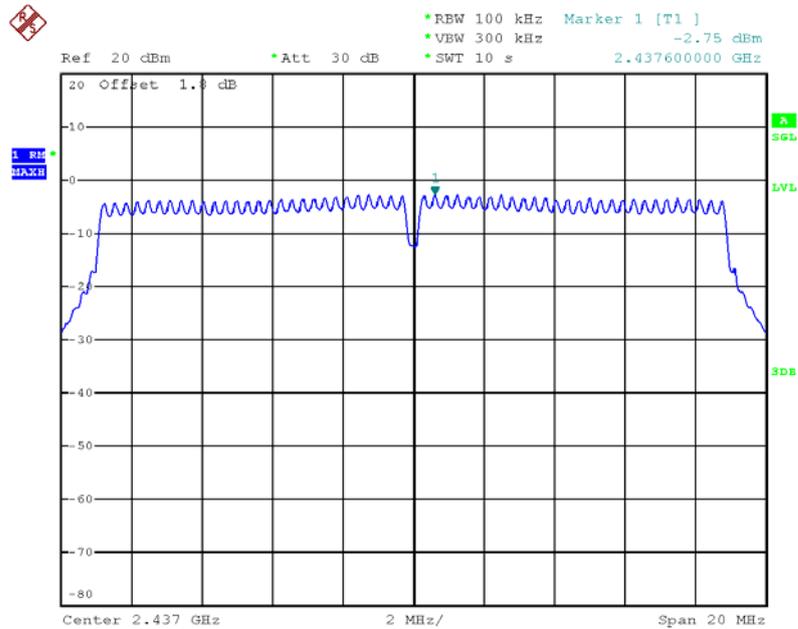
Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	13.68	21.68	500	Complies
157	5785 MHz	13.36	22.16	500	Complies
165	5825 MHz	13.84	21.60	500	Complies

6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 20MHz / Ant. 0 / 2437 MHz



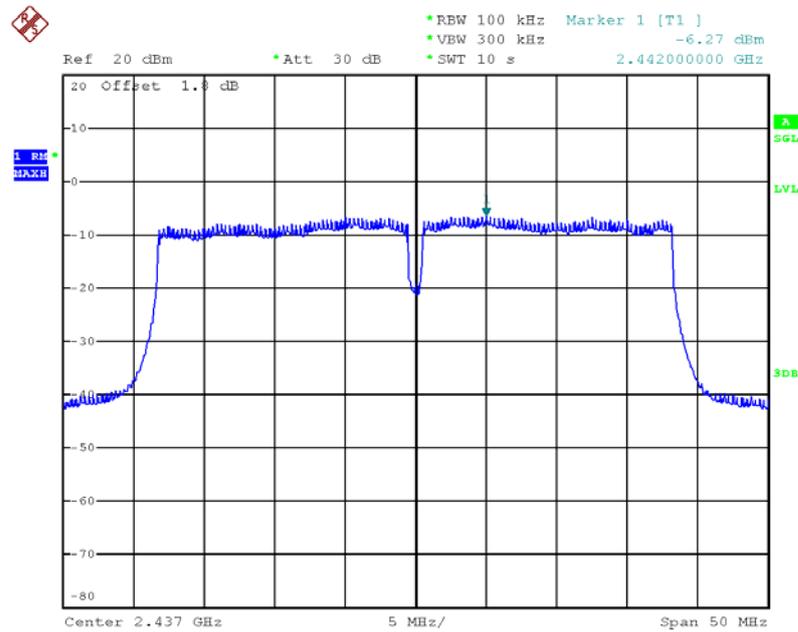
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6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 20MHz / Ant. 1 / 2437 MHz



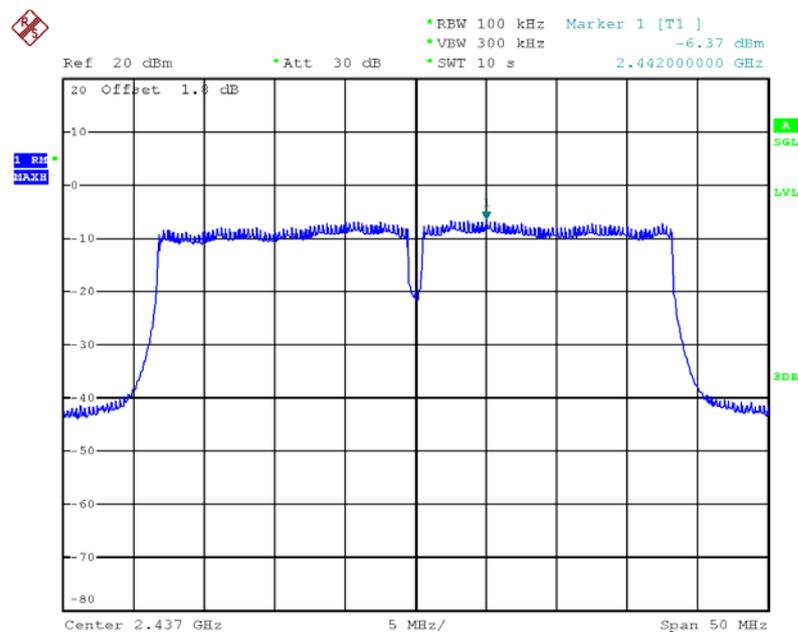
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6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 40MHz / Ant. 0 / 2437 MHz



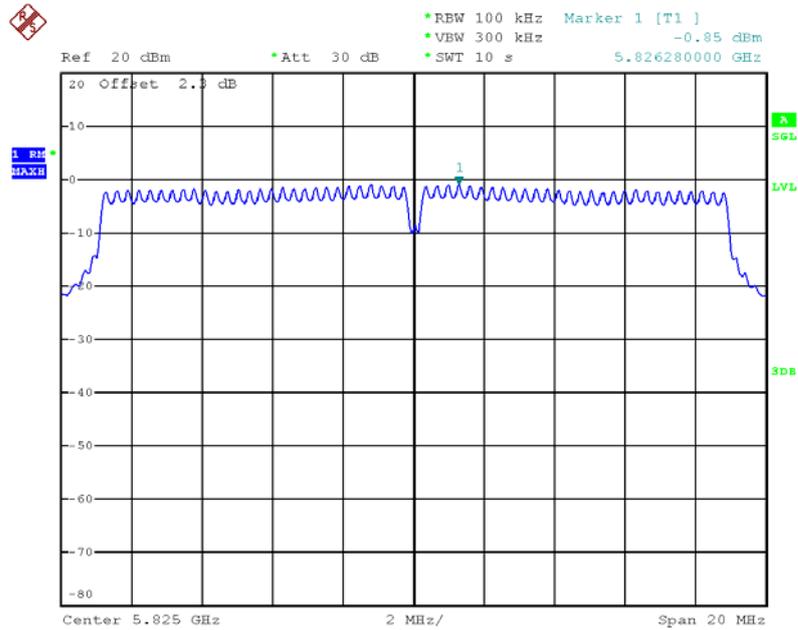
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6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 40MHz / Ant. 1 / 2437 MHz



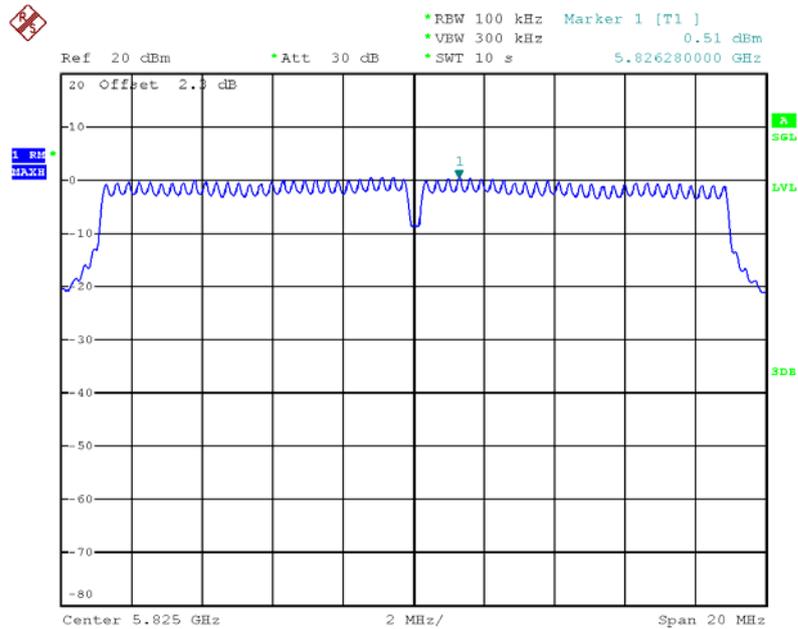
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6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 20MHz / Ant. 0 / 5745 MHz



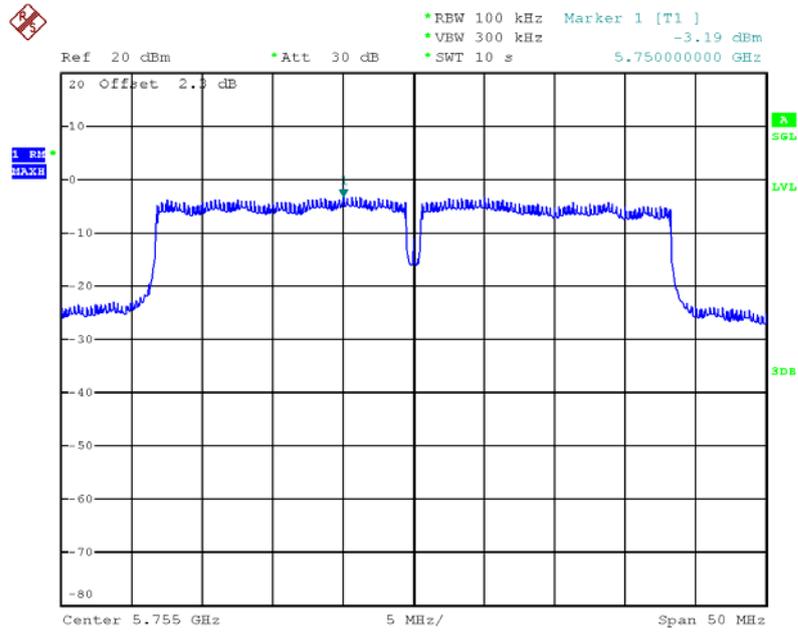
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6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 20MHz / Ant. 1 / 5745 MHz



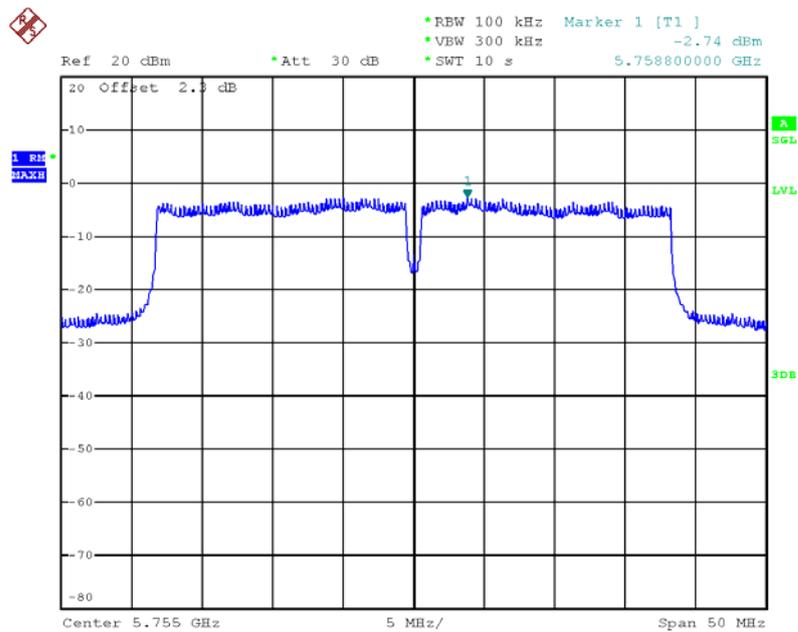
Date: 23.AUG.2012 21:23:23

6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 40MHz / Ant.0/ 5755 MHz



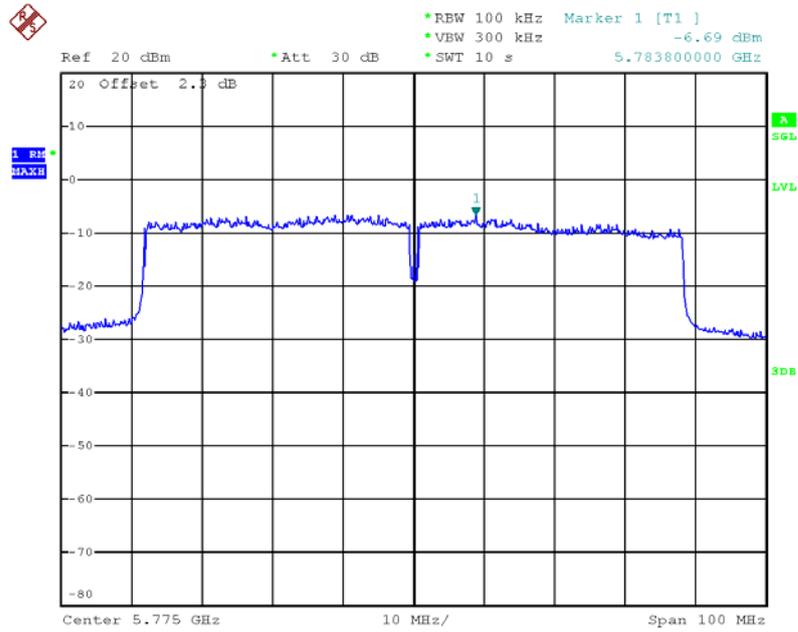
Date: 23.AUG.2012 21:25:01

6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 40MHz / Ant.1/ 5755 MHz



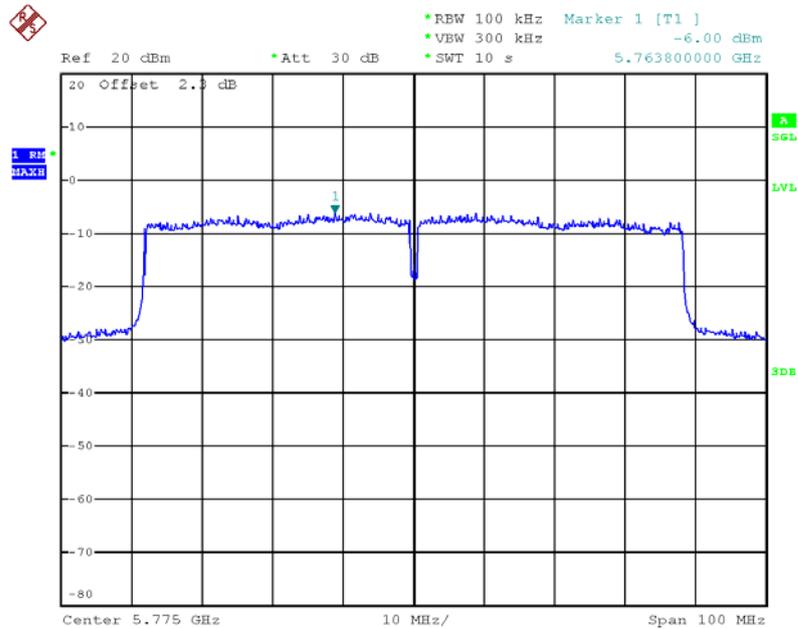
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6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0 80MHz / Ant. 0/ 5775 MHz



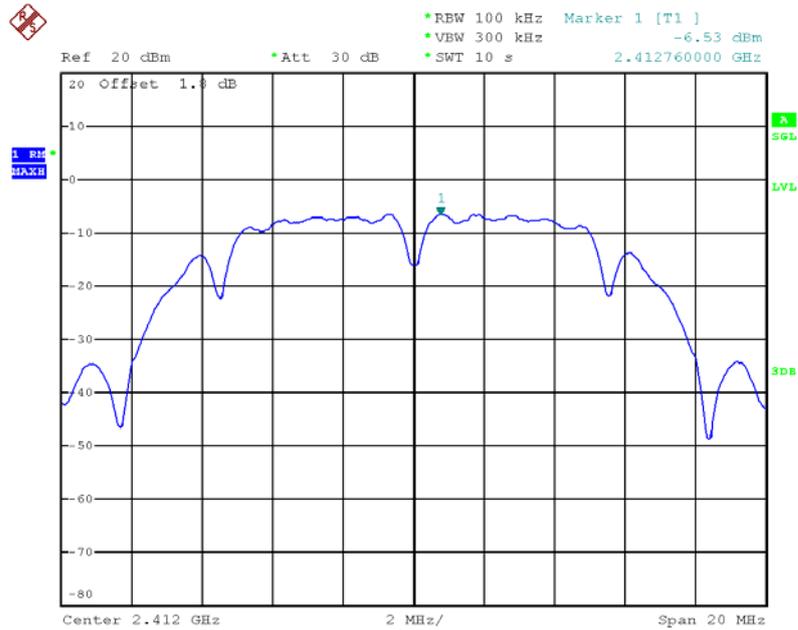
Date: 23.AUG.2012 21:27:17

6 dB Bandwidth Plot on Configuration IEEE 802.11ac MCS0 80MHz / Ant. 1/ 5775 MHz



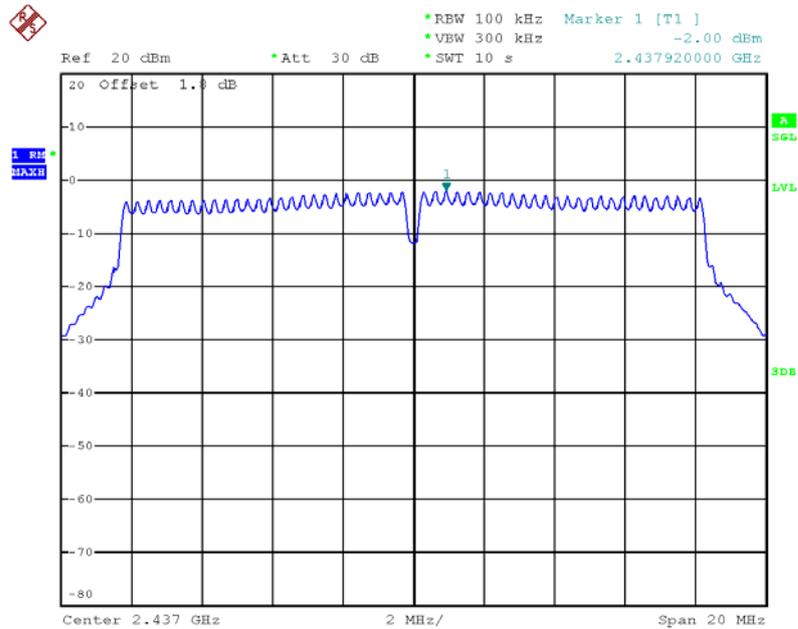
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6 dB Bandwidth Plot on Configuration IEEE 802.11b / Ant. 0 / 2412 MHz



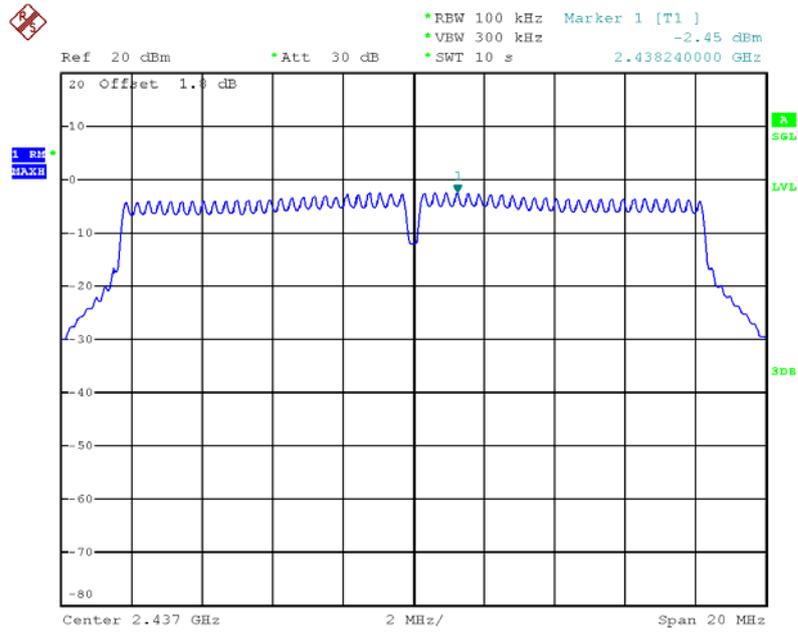
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6 dB Bandwidth Plot on Configuration IEEE 802.11g / Ant. 0/ 2437 MHz



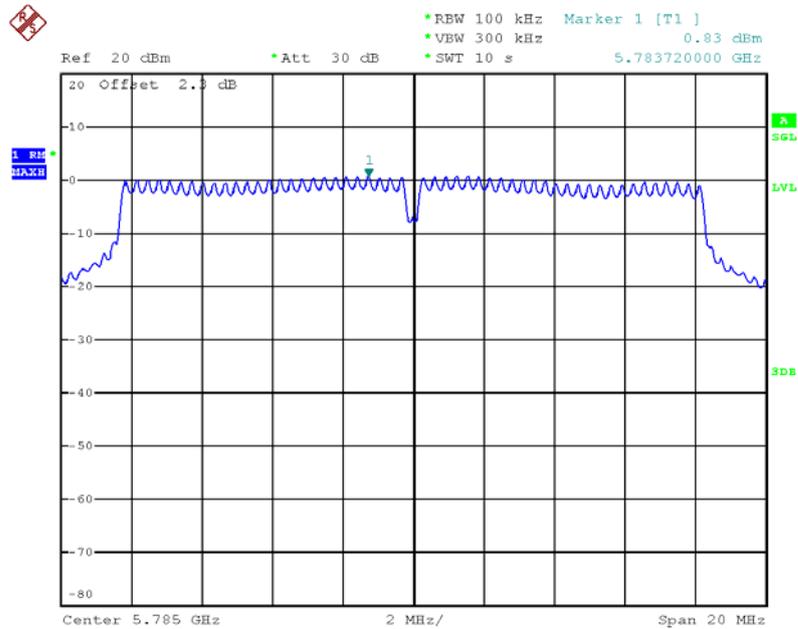
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6 dB Bandwidth Plot on Configuration IEEE 802.11g / Ant. 1/ 2437 MHz



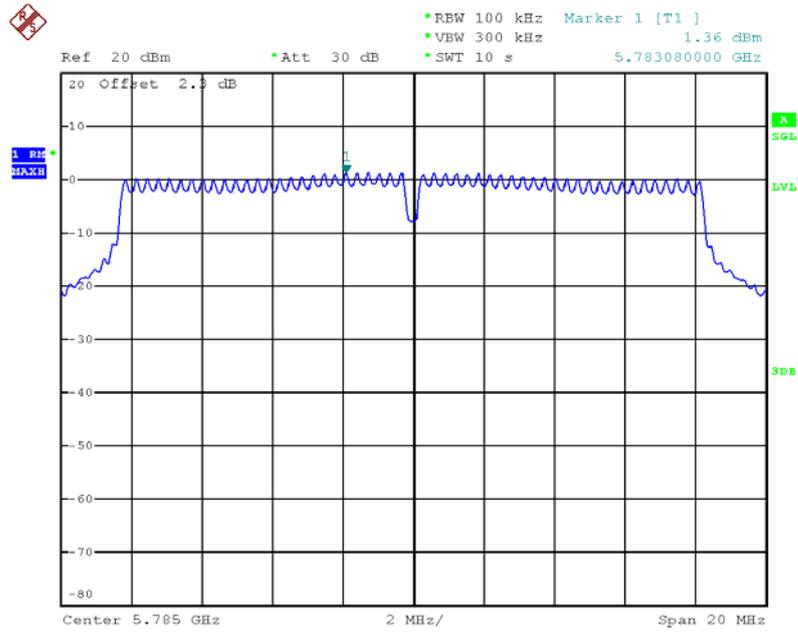
Date: 23.AUG.2012 21:32:35

6 dB Bandwidth Plot on Configuration IEEE 802.11a / Ant. 0 / 5785 MHz



Date: 23.AUG.2012 21:17:53

### 6 dB Bandwidth Plot on Configuration IEEE 802.11a / Ant. 1 / 5785 MHz



Date: 23.AUG.2012 21:17:22

## 4.5. Radiated Emissions Measurement

### 4.5.1. Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

### 4.5.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1GHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	1MHz / 3MHz for peak

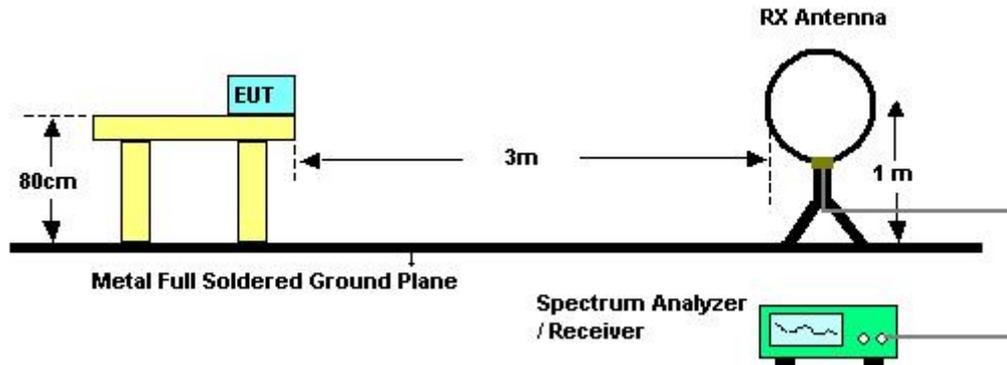
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RB 9kHz for QP
Start ~ Stop Frequency	30MHz~1GHz / RB 120kHz for QP

### 4.5.3. Test Procedures

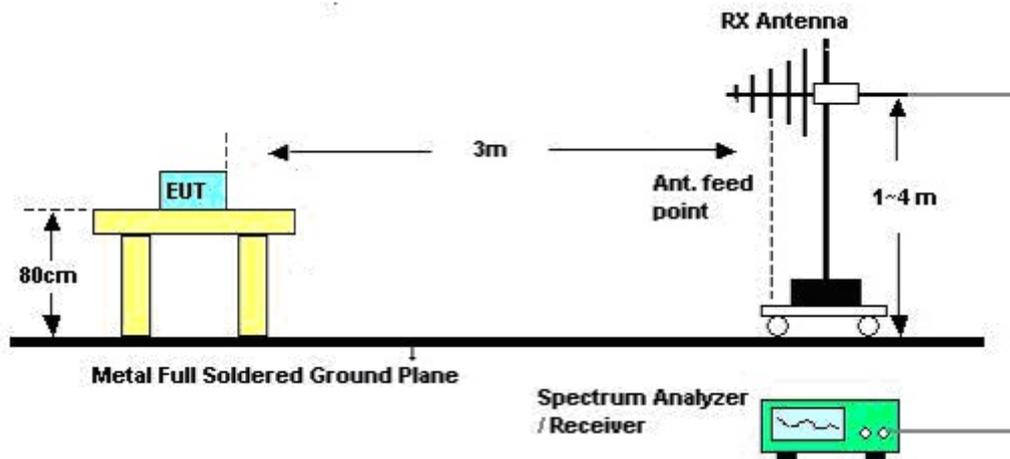
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and 3MHz RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

#### 4.5.4. Test Setup Layout

For radiated emissions below 1GHz



For radiated emissions above 1GHz



#### 4.5.5. Test Deviation

There is no deviation with the original standard.

#### 4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 4.5.7. Results of Radiated Emissions (9kHz~30MHz)

Temperature	26°C	Humidity	60%
Test Engineer	Serway Lee	Configurations	Normal
Test Date	Sep. 05, 2012		

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.

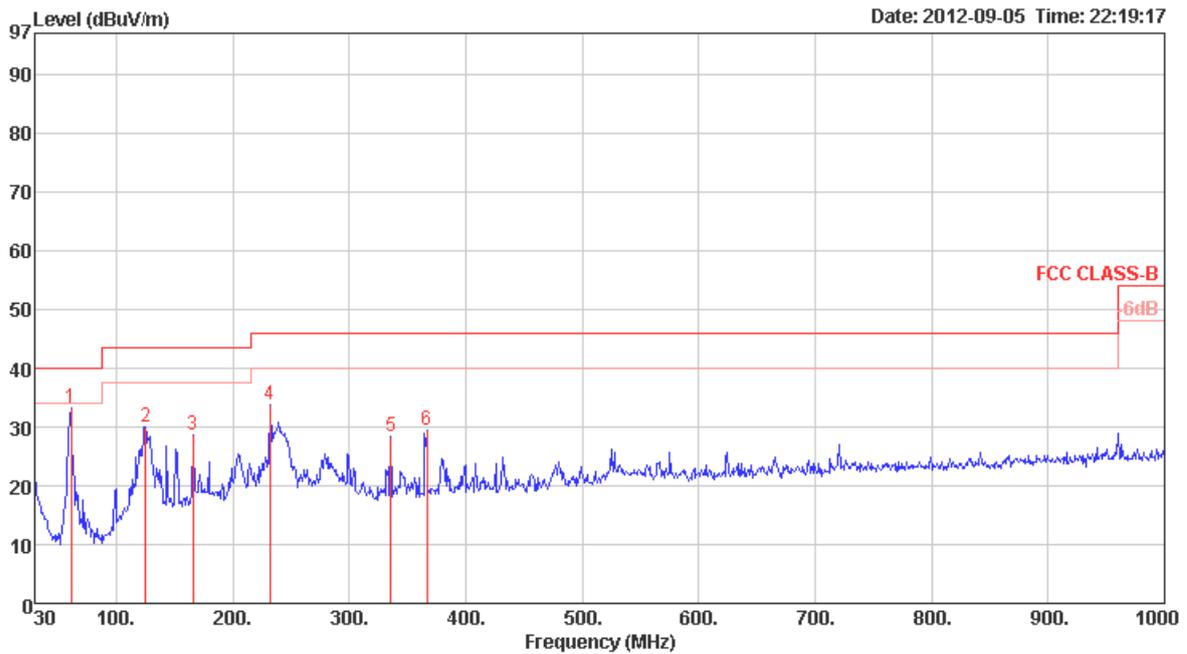
Distance extrapolation factor =  $40 \log (\text{specific distance} / \text{test distance})$  (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.

4.5.8. Results of Radiated Emissions (30MHz~1GHz)

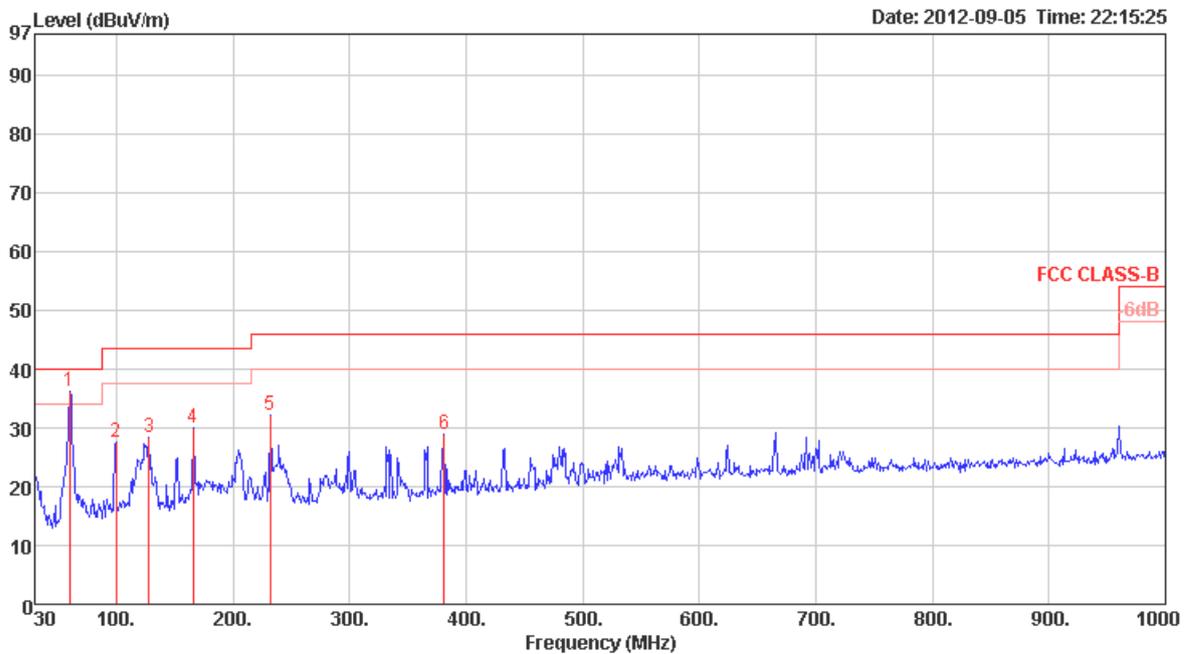
Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	Normal Link / Mode 2

Horizontal



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase	Aux Factor
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg		dB
1	61.04	33.18	40.00	-6.82	53.36	0.82	6.76	27.76	Peak	100	0	HORIZONTAL	0.00
2	125.06	30.06	43.50	-13.44	44.08	1.25	12.21	27.48	Peak	100	0	HORIZONTAL	0.00
3	165.80	28.59	43.50	-14.91	41.86	1.53	12.47	27.27	Peak	100	0	HORIZONTAL	0.00
4	231.76	33.79	46.00	-12.21	47.59	1.83	11.41	27.04	Peak	100	0	HORIZONTAL	0.00
5	335.55	28.46	46.00	-17.54	39.11	2.17	14.33	27.15	Peak	100	0	HORIZONTAL	0.00
6	366.59	29.42	46.00	-16.58	39.39	2.23	15.17	27.37	Peak	100	0	HORIZONTAL	0.00

*Vertical*



	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Aux Factor
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	dB
1	60.07	36.31	40.00	-3.69	56.50	0.80	6.77	27.76	Peak	400	0 VERTICAL	0.00
2	99.84	27.49	43.50	-16.01	42.90	1.20	10.99	27.60	Peak	400	0 VERTICAL	0.00
3	127.97	28.31	43.50	-15.19	42.25	1.28	12.24	27.46	Peak	400	0 VERTICAL	0.00
4	165.80	30.12	43.50	-13.38	43.39	1.53	12.47	27.27	Peak	400	0 VERTICAL	0.00
5	231.76	32.28	46.00	-13.72	46.08	1.83	11.41	27.04	Peak	400	0 VERTICAL	0.00
6	381.14	29.04	46.00	-16.96	38.69	2.26	15.56	27.47	Peak	400	0 VERTICAL	0.00

Note:

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

#### 4.5.9. Results for Radiated Emissions (1GHz~10<sup>th</sup> Harmonic)

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11n MCS0 HT20MHz Ch 1 / Ant. 0 + Ant. 1
Test Date	Aug. 23, 2012		

##### *Horizontal*

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4823.88	37.18	54.00	-16.82	35.84	3.31	33.06	35.03	Average	100	238	HORIZONTAL
2	4826.10	49.99	74.00	-24.01	48.65	3.31	33.06	35.03	Peak	100	238	HORIZONTAL

##### *Vertical*

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4824.30	44.20	54.00	-9.80	42.86	3.31	33.06	35.03	Average	100	62	VERTICAL
2	4824.90	57.41	74.00	-16.59	56.07	3.31	33.06	35.03	Peak	100	62	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11n MCS0 HT20MHz Ch 6 / Ant. 0 + Ant. 1
Test Date	Aug. 23, 2012		

### Horizontal

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp		A/Pos	T/Pos	
	MHz	dBuV/m	Line	Limit	Level	Loss	Factor	Factor	cm	deg	Pol/Phase
			dBuV/m	dB	dBuV	dB	dB/m	dB			
1	4875.44	41.98	54.00	-12.02	40.52	3.33	33.16	35.03	100	297	HORIZONTAL
2	4877.72	54.75	74.00	-19.25	53.29	3.33	33.16	35.03	100	297	HORIZONTAL
3	7309.86	43.56	54.00	-10.44	38.94	4.06	35.96	35.40	100	122	HORIZONTAL
4	7309.92	58.91	74.00	-15.09	54.29	4.06	35.96	35.40	100	122	HORIZONTAL

### Vertical

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp		A/Pos	T/Pos	
	MHz	dBuV/m	Line	Limit	Level	Loss	Factor	Factor	cm	deg	Pol/Phase
			dBuV/m	dB	dBuV	dB	dB/m	dB			
1	4874.24	48.42	54.00	-5.58	46.96	3.33	33.16	35.03	109	62	VERTICAL
2	4880.84	63.03	74.00	-10.97	61.57	3.33	33.16	35.03	109	62	VERTICAL
3	7310.70	54.68	74.00	-19.32	50.06	4.06	35.96	35.40	100	270	VERTICAL
4	7311.18	41.76	54.00	-12.24	37.14	4.06	35.96	35.40	100	270	VERTICAL

<b>Temperature</b>	26°C	<b>Humidity</b>	60%
<b>Test Engineer</b>	Wen Chao	<b>Configurations</b>	IEEE 802.11n MCS0 HT20MHz Ch 11 / Ant. 0 + Ant. 1
<b>Test Date</b>	Aug. 23, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4925.20	53.90	74.00	-20.10	52.30	3.35	33.26	35.01	Peak	100	326	HORIZONTAL
2	4925.32	40.86	54.00	-13.14	39.26	3.35	33.26	35.01	Average	100	326	HORIZONTAL
3	7390.14	41.03	54.00	-12.97	36.28	4.06	36.09	35.40	Average	100	148	HORIZONTAL
4	7390.14	54.87	74.00	-19.13	50.12	4.06	36.09	35.40	Peak	100	148	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4921.90	62.27	74.00	-11.73	60.67	3.35	33.26	35.01	Peak	115	246	VERTICAL
2	4924.72	47.84	54.00	-6.16	46.24	3.35	33.26	35.01	Average	115	246	VERTICAL
3	7385.40	52.83	74.00	-21.17	48.08	4.06	36.09	35.40	Peak	100	24	VERTICAL
4	7385.88	38.78	54.00	-15.22	34.03	4.06	36.09	35.40	Average	100	24	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11n MCS0 HT40MHz Ch 3 / Ant. 0 + Ant. 1
Test Date	Aug. 23, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4844.36	47.96	74.00	-26.04	46.58	3.32	33.09	35.03	Peak	100	298	HORIZONTAL
2	4844.78	34.82	54.00	-19.18	33.44	3.32	33.09	35.03	Average	100	298	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4842.14	54.19	74.00	-19.81	52.81	3.32	33.09	35.03	Peak	100	253	VERTICAL
2	4844.42	40.91	54.00	-13.09	39.53	3.32	33.09	35.03	Average	100	253	VERTICAL

<b>Temperature</b>	26°C	<b>Humidity</b>	60%
<b>Test Engineer</b>	Wen Chao	<b>Configurations</b>	IEEE 802.11n MCS0 HT40MHz Ch 6 / Ant. 0 + Ant. 1
<b>Test Date</b>	Aug. 23, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4877.54	38.48	54.00	-15.52	37.02	3.33	33.16	35.03	Average	100	296	HORIZONTAL
2	4880.00	52.06	74.00	-21.94	50.60	3.33	33.16	35.03	Peak	100	296	HORIZONTAL
3	7311.06	38.76	54.00	-15.24	34.14	4.06	35.96	35.40	Average	100	265	HORIZONTAL
4	7322.22	50.93	74.00	-23.07	46.31	4.06	35.96	35.40	Peak	100	265	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4873.94	45.08	54.00	-8.92	43.62	3.33	33.16	35.03	Average	110	56	VERTICAL
2	4873.94	59.11	74.00	-14.89	57.65	3.33	33.16	35.03	Peak	110	56	VERTICAL
3	7311.00	38.51	54.00	-15.49	33.89	4.06	35.96	35.40	Average	100	248	VERTICAL
4	7326.00	50.22	74.00	-23.78	45.57	4.06	35.99	35.40	Peak	100	248	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11n MCS0 HT40MHz Ch 9 / Ant. 0 + Ant. 1
Test Date	Aug. 23, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4902.92	47.86	74.00	-26.14	46.35	3.34	33.19	35.02	Peak	100	213	HORIZONTAL
2	4913.54	35.28	54.00	-18.72	33.73	3.34	33.23	35.02	Average	100	213	HORIZONTAL
3	7355.82	49.26	74.00	-24.74	44.58	4.06	36.02	35.40	Peak	100	277	HORIZONTAL
4	7356.06	40.29	54.00	-13.71	35.61	4.06	36.02	35.40	Average	100	277	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4903.94	55.61	74.00	-18.39	54.10	3.34	33.19	35.02	Peak	114	245	VERTICAL
2	4909.52	42.39	54.00	-11.61	40.84	3.34	33.23	35.02	Average	114	245	VERTICAL
3	7356.18	36.90	54.00	-17.10	32.22	4.06	36.02	35.40	Average	100	10	VERTICAL
4	7358.22	46.75	74.00	-27.25	42.07	4.06	36.02	35.40	Peak	100	10	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11b Ch 1 / Ant. 0 + Ant. 1
Test Date	Aug. 20, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4823.97	44.75	54.00	-9.25	43.41	3.31	33.06	35.03	Average	100	7	HORIZONTAL
2	4824.01	49.53	74.00	-24.47	48.19	3.31	33.06	35.03	Peak	100	7	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4823.89	53.61	74.00	-20.39	52.27	3.31	33.06	35.03	Peak	100	343	VERTICAL
2	4823.96	50.14	54.00	-3.86	48.80	3.31	33.06	35.03	Average	100	343	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11b Ch 6 / Ant. 0 + Ant. 1
Test Date	Aug. 20, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4873.97	43.32	54.00	-10.68	41.86	3.33	33.16	35.03	Average	100	11	HORIZONTAL
2	4874.03	48.35	74.00	-25.65	46.89	3.33	33.16	35.03	Peak	100	11	HORIZONTAL
3	7310.18	35.63	54.00	-18.37	31.01	4.06	35.96	35.40	Average	102	214	HORIZONTAL
4	7311.18	47.30	74.00	-26.70	42.68	4.06	35.96	35.40	Peak	102	214	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4873.90	53.52	74.00	-20.48	52.06	3.33	33.16	35.03	Peak	102	197	VERTICAL
2	4873.97	50.41	54.00	-3.59	48.95	3.33	33.16	35.03	Average	102	197	VERTICAL
3	7308.18	47.19	74.00	-26.81	42.57	4.06	35.96	35.40	Peak	173	277	VERTICAL
4	7310.22	36.11	54.00	-17.89	31.49	4.06	35.96	35.40	Average	173	277	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11b Ch 11 / Ant. 0 + Ant. 1
Test Date	Aug. 20, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4923.86	47.48	74.00	-26.52	45.88	3.35	33.26	35.01	Peak	100	335	HORIZONTAL
2	4923.96	42.05	54.00	-11.95	40.45	3.35	33.26	35.01	Average	100	335	HORIZONTAL
3	7385.90	47.34	74.00	-26.66	42.59	4.06	36.09	35.40	Peak	100	234	HORIZONTAL
4	7385.92	36.92	54.00	-17.08	32.17	4.06	36.09	35.40	Average	100	234	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4923.85	53.09	74.00	-20.91	51.49	3.35	33.26	35.01	Peak	100	238	VERTICAL
2	4923.96	49.79	54.00	-4.21	48.19	3.35	33.26	35.01	Average	100	238	VERTICAL
3	7386.74	37.92	54.00	-16.08	33.17	4.06	36.09	35.40	Average	131	280	VERTICAL
4	7387.28	47.79	74.00	-26.21	43.04	4.06	36.09	35.40	Peak	131	280	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11g Ch 1 / Ant. 0 + Ant. 1
Test Date	Aug. 23, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4824.00	54.19	74.00	-19.81	52.85	3.31	33.06	35.03	Peak	100	20	HORIZONTAL
2	4824.50	40.66	54.00	-13.34	39.32	3.31	33.06	35.03	Average	100	20	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4824.60	47.39	54.00	-6.61	46.05	3.31	33.06	35.03	Average	100	63	VERTICAL
2	4825.40	61.24	74.00	-12.76	59.90	3.31	33.06	35.03	Peak	100	63	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11g Ch 6 / Ant. 0 + Ant. 1
Test Date	Aug. 23, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4876.00	40.91	54.00	-13.09	39.45	3.33	33.16	35.03	Average	100	304	HORIZONTAL
2	4881.10	55.43	74.00	-18.57	53.97	3.33	33.16	35.03	Peak	100	304	HORIZONTAL
3	7308.44	60.27	74.00	-13.73	55.65	4.06	35.96	35.40	Peak	100	136	HORIZONTAL
4	7308.80	44.59	54.00	-9.41	39.97	4.06	35.96	35.40	Average	100	136	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4875.20	46.00	54.00	-8.00	44.54	3.33	33.16	35.03	Average	100	81	VERTICAL
2	4876.80	59.53	74.00	-14.47	58.07	3.33	33.16	35.03	Peak	100	81	VERTICAL
3	7310.12	58.66	74.00	-15.34	54.04	4.06	35.96	35.40	Peak	100	244	VERTICAL
4	7311.08	44.00	54.00	-10.00	39.38	4.06	35.96	35.40	Average	100	244	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11g Ch 11 / Ant. 0 + Ant. 1
Test Date	Aug. 23, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4921.78	54.93	74.00	-19.07	53.36	3.35	33.23	35.01	Peak	100	331	HORIZONTAL
2	4926.58	41.14	54.00	-12.86	39.54	3.35	33.26	35.01	Average	100	331	HORIZONTAL
3	7389.06	41.91	54.00	-12.09	37.16	4.06	36.09	35.40	Average	100	164	HORIZONTAL
4	7389.60	56.01	74.00	-17.99	51.26	4.06	36.09	35.40	Peak	100	164	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	4924.78	63.02	74.00	-10.98	61.42	3.35	33.26	35.01	Peak	114	251	VERTICAL
2	4925.44	48.44	54.00	-5.56	46.84	3.35	33.26	35.01	Average	114	251	VERTICAL
3	7390.14	52.92	74.00	-21.08	48.17	4.06	36.09	35.40	Peak	100	33	VERTICAL
4	7390.56	39.26	54.00	-14.74	34.51	4.06	36.09	35.40	Average	100	33	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11n MCS0 HT20MHz Ch 149 / Ant. 0 + Ant. 1
Test Date	Jul. 06, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11485.56	54.20	74.00	-19.80	45.59	5.11	38.78	35.28	Peak	100	190	HORIZONTAL
2	11490.54	41.62	54.00	-12.38	33.01	5.11	38.78	35.28	Average	100	190	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11490.84	41.24	54.00	-12.76	32.63	5.11	38.78	35.28	Average	100	295	VERTICAL
2	11493.42	52.48	74.00	-21.52	43.86	5.12	38.78	35.28	Peak	100	295	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11n MCS0 HT20MHz Ch 157 / Ant. 0 + Ant. 1
Test Date	Jul. 05, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11560.58	53.36	74.00	-20.64	44.71	5.13	38.82	35.30	Peak	100	171	HORIZONTAL
2	11570.84	40.61	54.00	-13.39	31.94	5.14	38.83	35.30	Average	100	171	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11568.44	41.80	54.00	-12.20	33.14	5.13	38.83	35.30	Average	129	249	VERTICAL
2	11573.72	54.19	74.00	-19.81	45.52	5.14	38.83	35.30	Peak	129	249	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11n MCS0 HT20MHz Ch 165 / Ant. 0 + Ant. 1
Test Date	Jul. 05, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11640.94	50.80	74.00	-23.20	42.08	5.16	38.86	35.30	Peak	100	206	HORIZONTAL
2	11648.20	39.68	54.00	-14.32	30.96	5.16	38.86	35.30	Average	100	206	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11640.34	54.69	74.00	-19.31	45.97	5.16	38.86	35.30	Peak	116	227	VERTICAL
2	11650.96	41.67	54.00	-12.33	32.95	5.16	38.86	35.30	Average	116	227	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11n MCS0 HT40MHz Ch 151 / Ant. 0 + Ant. 1
Test Date	Jul. 06, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11504.60	37.82	54.00	-16.18	29.19	5.12	38.79	35.28	Average	100	350	HORIZONTAL
2	11518.22	50.46	74.00	-23.54	41.83	5.12	38.80	35.29	Peak	100	350	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11510.66	38.39	54.00	-15.61	29.76	5.12	38.79	35.28	Average	100	215	VERTICAL
2	11519.30	50.95	74.00	-23.05	42.31	5.13	38.80	35.29	Peak	100	215	VERTICAL

<b>Temperature</b>	26°C	<b>Humidity</b>	60%
<b>Test Engineer</b>	Wen Chao	<b>Configurations</b>	IEEE 802.11n MCS0 HT40MHz Ch 159 / Ant. 0 + Ant. 1
<b>Test Date</b>	Jul. 06, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11583.16	38.85	54.00	-15.15	30.18	5.14	38.83	35.30	Average	100	225	HORIZONTAL
2	11600.56	50.76	74.00	-23.24	42.08	5.15	38.83	35.30	Peak	100	225	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11591.08	39.05	54.00	-14.95	30.38	5.14	38.83	35.30	Average	100	92	VERTICAL
2	11591.80	51.08	74.00	-22.92	42.41	5.14	38.83	35.30	Peak	100	92	VERTICAL

Temperature	26°C	Humidity	60 %
Test Engineer	Wen Chao	Configurations	IEEE 802. 11a CH 149 / Ant. 0 + Ant. 1
Test Date	Jul. 05, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11490.08	56.40	74.00	-17.60	47.79	5.11	38.78	35.28	Peak	100	190	HORIZONTAL
2	11490.12	42.70	54.00	-11.30	34.09	5.11	38.78	35.28	Average	100	190	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11490.72	44.14	54.00	-9.86	35.53	5.11	38.78	35.28	Average	116	258	VERTICAL
2	11495.84	57.74	74.00	-16.26	49.12	5.12	38.78	35.28	Peak	116	258	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802. 11a CH 157 / Ant. 0 + Ant. 1
Test Date	Jul. 05, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11570.48	41.45	54.00	-12.55	32.78	5.14	38.83	35.30	Average	100	191	HORIZONTAL
2	11571.08	53.25	74.00	-20.75	44.58	5.14	38.83	35.30	Peak	100	191	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11566.08	53.28	74.00	-20.72	44.63	5.13	38.82	35.30	Peak	100	97	VERTICAL
2	11566.60	41.75	54.00	-12.25	33.10	5.13	38.82	35.30	Average	100	97	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802. 11a CH 165 / Ant. 0 + Ant. 1
Test Date	Jul. 05, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11651.28	40.31	54.00	-13.69	31.59	5.16	38.86	35.30	Average	100	177	HORIZONTAL
2	11652.12	53.35	74.00	-20.65	44.63	5.16	38.86	35.30	Peak	100	177	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11646.28	42.70	54.00	-11.30	33.98	5.16	38.86	35.30	Average	109	235	VERTICAL
2	11647.16	55.40	74.00	-18.60	46.68	5.16	38.86	35.30	Peak	109	235	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11ac MCS0 VHT 20MHz CH 149 / Ant. 0 + Ant. 1
Test Date	Jul. 05, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11488.56	50.75	74.00	-23.25	42.14	5.11	38.78	35.28	Peak	100	323	HORIZONTAL
2	11489.64	38.65	54.00	-15.35	30.04	5.11	38.78	35.28	Average	100	323	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11490.72	41.80	54.00	-12.20	33.19	5.11	38.78	35.28	Average	114	250	VERTICAL
2	11496.18	55.96	74.00	-18.04	47.34	5.12	38.78	35.28	Peak	114	250	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11ac MCS0 VHT 20MHz CH 157 / Ant. 0 + Ant. 1
Test Date	Jul. 06, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11568.08	40.37	54.00	-13.63	31.71	5.13	38.83	35.30	Average	100	199	HORIZONTAL
2	11572.10	52.43	74.00	-21.57	43.76	5.14	38.83	35.30	Peak	100	199	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11568.56	52.75	74.00	-21.25	44.09	5.13	38.83	35.30	Peak	100	134	VERTICAL
2	11570.96	41.28	54.00	-12.72	32.61	5.14	38.83	35.30	Average	100	134	VERTICAL

Temperature	26°C	Humidity	60 %
Test Engineer	Wen Chao	Configurations	IEEE 802. 11ac MCS0 VHT 20MHz CH 165 / Ant. 0 + Ant. 1
Test Date	Jul. 06, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11650.66	39.44	54.00	-14.56	30.72	5.16	38.86	35.30	Average	100	241	HORIZONTAL
2	11653.96	50.75	74.00	-23.25	42.03	5.16	38.86	35.30	Peak	100	241	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11648.38	53.67	74.00	-20.33	44.95	5.16	38.86	35.30	Peak	115	226	VERTICAL
2	11650.90	41.64	54.00	-12.36	32.92	5.16	38.86	35.30	Average	115	226	VERTICAL

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802. 11ac MCS0 VHT 40MHz CH 151 / Ant. 0 + Ant. 1 +
Test Date	Jul. 06, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11514.50	50.02	74.00	-23.98	41.39	5.12	38.79	35.28	Peak	100	255	HORIZONTAL
2	11516.96	37.28	54.00	-16.72	28.65	5.12	38.80	35.29	Average	100	255	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11503.34	38.28	54.00	-15.72	29.65	5.12	38.79	35.28	Average	100	133	VERTICAL
2	11519.30	50.40	74.00	-23.60	41.76	5.13	38.80	35.29	Peak	100	133	VERTICAL

<b>Temperature</b>	26°C	<b>Humidity</b>	60 %
<b>Test Engineer</b>	Wen Chao	<b>Configurations</b>	IEEE 802. 11ac MCS0 VHT 40MHz CH 159 / Ant. 0 + Ant. 1
<b>Test Date</b>	Jul. 06, 2012		

### Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11577.22	50.75	74.00	-23.25	42.08	5.14	38.83	35.30	Peak	100	280	HORIZONTAL
2	11582.98	38.50	54.00	-15.50	29.83	5.14	38.83	35.30	Average	100	280	HORIZONTAL

### Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	11580.58	38.78	54.00	-15.22	30.11	5.14	38.83	35.30	Average	100	110	VERTICAL
2	11592.40	50.92	74.00	-23.08	42.25	5.14	38.83	35.30	Peak	100	110	VERTICAL

<b>Temperature</b>	26°C	<b>Humidity</b>	60 %
<b>Test Engineer</b>	Wen Chao	<b>Configurations</b>	IEEE 802. 11ac MCS0 VHT 80MHz CH 155 / Ant. 0 + Ant. 1
<b>Test Date</b>	Jul. 06, 2012		

### Horizontal

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	11549.52	49.97	74.00	-24.03	41.33	5.13	38.81	35.30	Peak	100	130 HORIZONTAL
2	11551.50	37.31	54.00	-16.69	28.66	5.13	38.82	35.30	Average	100	130 HORIZONTAL

### Vertical

	Freq	Level	Limit	Over	Read	CableAntenna	Preamp	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	cm	deg	
1	11549.04	50.10	74.00	-23.90	41.46	5.13	38.81	35.30	Peak	100	36 VERTICAL
2	11560.62	38.02	54.00	-15.98	29.37	5.13	38.82	35.30	Average	100	36 VERTICAL

### Note:

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

## 4.6. Band Edge Emissions Measurement

### 4.6.1. Limit

20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (micorvolts/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

### 4.6.2. Measuring Instruments and Setting

Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RB / VB (Emission in restricted band)	1MHz / 3MHz for Peak, 1 MHz / 10Hz for Average
RB / VB (Emission in non-restricted band)	100 KHz / 300 KHz for Peak

### 4.6.3. Test Procedures

11. The test procedure is the same as section 4.5.3, only the frequency range investigated is limited to 100MHz around bandedges.

### 4.6.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.5.4.

### 4.6.5. Test Deviation

There is no deviation with the original standard.

### 4.6.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

#### 4.6.7. Test Result of Band Edge and Fundamental Emissions

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11n MCS0 20MHz Ch 1, 6, 11 / Ant. 0 + Ant. 1

##### Channel 1

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2390.00	51.69	54.00	-2.31	21.30	2.22	28.17	0.00	Average	100	103	VERTICAL
2	2390.00	68.01	74.00	-5.99	37.62	2.22	28.17	0.00	Peak	100	103	VERTICAL
3	2404.63	109.51				2.22	28.21	0.00	Peak	100	103	VERTICAL
4	2404.79	98.64				2.22	28.21	0.00	Average	100	103	VERTICAL

Item 3, 4 are the fundamental frequency at 2412 MHz.

##### Channel 6

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2364.68	41.65	54.00	-12.35	11.34	2.21	28.10	0.00	Average	100	145	VERTICAL
2	2365.32	52.91	74.00	-21.09	22.60	2.21	28.10	0.00	Peak	100	145	VERTICAL
3	2445.01	101.56				2.24	28.29	0.00	Average	100	145	VERTICAL
4	2445.33	112.61				2.24	28.29	0.00	Peak	100	145	VERTICAL
5	2483.50	39.57	54.00	-14.43	8.94	2.26	28.37	0.00	Average	100	145	VERTICAL
6	2484.14	56.24	74.00	-17.76	25.61	2.26	28.37	0.00	Peak	100	145	VERTICAL

Item 3, 4 are the fundamental frequency at 2437MHz.

##### Channel 11

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2459.60	110.80				2.24	28.33	0.00	Peak	100	146	VERTICAL
2	2459.76	100.56				2.24	28.33	0.00	Average	100	146	VERTICAL
3	2484.62	52.46	54.00	-1.54	21.83	2.26	28.37	0.00	Average	100	146	VERTICAL
4	2484.94	72.37	74.00	-1.63	41.74	2.26	28.37	0.00	Peak	100	146	VERTICAL

Item 1, 2 are the fundamental frequency at 2462 MHz.

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11n MCS0 40MHz Ch 3, 6, 9 / Ant. 0 + Ant. 1

### Channel 3

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2389.68	66.95	74.00	-7.05	36.57	2.21	28.17	0.00	Peak	100	82	VERTICAL
2	2390.00	51.77	54.00	-2.23	21.38	2.22	28.17	0.00	Average	100	82	VERTICAL
3	2427.45	94.75				2.23	28.25	0.00	Average	100	82	VERTICAL
4	2427.77	106.41				2.23	28.25	0.00	Peak	100	82	VERTICAL

Item 3, 4 are the fundamental frequency at 2422 MHz.

### Channel 6

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2387.76	62.69	74.00	-11.31	32.31	2.21	28.17	0.00	Peak	100	139	VERTICAL
2	2390.00	47.87	54.00	-6.13	17.48	2.22	28.17	0.00	Average	100	139	VERTICAL
3	2442.13	97.22				2.24	28.29	0.00	Average	100	139	VERTICAL
4	2443.09	109.07				2.24	28.29	0.00	Peak	100	139	VERTICAL
5	2484.78	51.57	54.00	-2.43	20.94	2.26	28.37	0.00	Average	100	139	VERTICAL
6	2485.10	70.81	74.00	-3.19	40.14	2.26	28.41	0.00	Peak	100	139	VERTICAL

Item 3, 4 are the fundamental frequency at 2437MHz.

### Channel 9

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2447.19	95.50				2.24	28.29	0.00	Average	100	142	VERTICAL
2	2458.09	106.70				2.24	28.33	0.00	Peak	100	142	VERTICAL
3	2484.78	52.73	54.00	-1.27	22.10	2.26	28.37	0.00	Average	100	142	VERTICAL
4	2487.67	69.02	74.00	-4.98	38.35	2.26	28.41	0.00	Peak	100	142	VERTICAL

Item 1, 2 are the fundamental frequency at 2452 MHz.

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m).

Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level.

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11b CH 1, 6, 11 / Ant. 0

**Channel 1**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2388.60	54.25	74.00	-19.75	23.87	2.21	28.17	0.00	Peak	126	267	VERTICAL
2	2390.00	41.82	54.00	-12.18	11.43	2.22	28.17	0.00	Average	126	267	VERTICAL
3	2409.40	100.74				2.22	28.21	0.00	Peak	126	267	VERTICAL
4	2410.20	96.95				2.22	28.21	0.00	Average	126	267	VERTICAL

Item 3, 4 are the fundamental frequency at 2412 MHz.

**Channel 6**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2389.80	53.21	74.00	-20.79	22.82	2.22	28.17	0.00	Peak	128	264	VERTICAL
2	2390.00	41.79	54.00	-12.21	11.40	2.22	28.17	0.00	Average	128	264	VERTICAL
3	2435.20	96.23				2.23	28.29	0.00	Average	128	264	VERTICAL
4	2436.00	100.07				2.23	28.29	0.00	Peak	128	264	VERTICAL
5	2483.50	42.06	54.00	-11.94	11.43	2.26	28.37	0.00	Average	128	264	VERTICAL
6	2484.30	53.74	74.00	-20.26	23.11	2.26	28.37	0.00	Peak	128	264	VERTICAL

Item 3, 4 are the fundamental frequency at 2437 MHz.

**Channel 11**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2464.60	100.25				2.24	28.33	0.00	Peak	123	264	VERTICAL
2	2464.80	96.39				2.24	28.33	0.00	Average	123	264	VERTICAL
3	2493.00	44.12	54.00	-9.88	13.44	2.27	28.41	0.00	Average	123	264	VERTICAL
4	2493.10	55.04	74.00	-18.96	24.36	2.27	28.41	0.00	Peak	123	264	VERTICAL

Item 1, 2 are the fundamental frequency at 2462 MHz.

Temperature	26°C	Humidity	60%
Test Engineer	Wen Chao	Configurations	IEEE 802.11g CH 1, 6, 11 / Ant. 0 + Ant. 1

**Channel 1**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2389.20	49.16	54.00	-4.84	18.78	2.21	28.17	0.00	Average	102	359	VERTICAL
2	2389.20	68.62	74.00	-5.38	38.24	2.21	28.17	0.00	Peak	102	359	VERTICAL
3	2412.80	113.03				2.22	28.21	0.00	Peak	102	359	VERTICAL
4	2412.96	102.47				2.22	28.21	0.00	Average	102	359	VERTICAL

Item 3, 4 are the fundamental frequency at 2412 MHz.

**Channel 6**

	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2362.76	41.28	54.00	-12.72	10.99	2.19	28.10	0.00	Average	100	148	VERTICAL
2	2363.40	52.08	74.00	-21.92	21.79	2.19	28.10	0.00	Peak	100	148	VERTICAL
3	2437.96	102.55				2.23	28.29	0.00	Average	100	148	VERTICAL
4	2437.96	112.92				2.23	28.29	0.00	Peak	100	148	VERTICAL
5	2483.50	39.22	54.00	-14.78	8.59	2.26	28.37	0.00	Average	100	148	VERTICAL
6	2483.50	47.78	74.00	-26.22	17.15	2.26	28.37	0.00	Peak	100	148	VERTICAL

Item 3, 4 are the fundamental frequency at 2437 MHz.

**Channel 11**

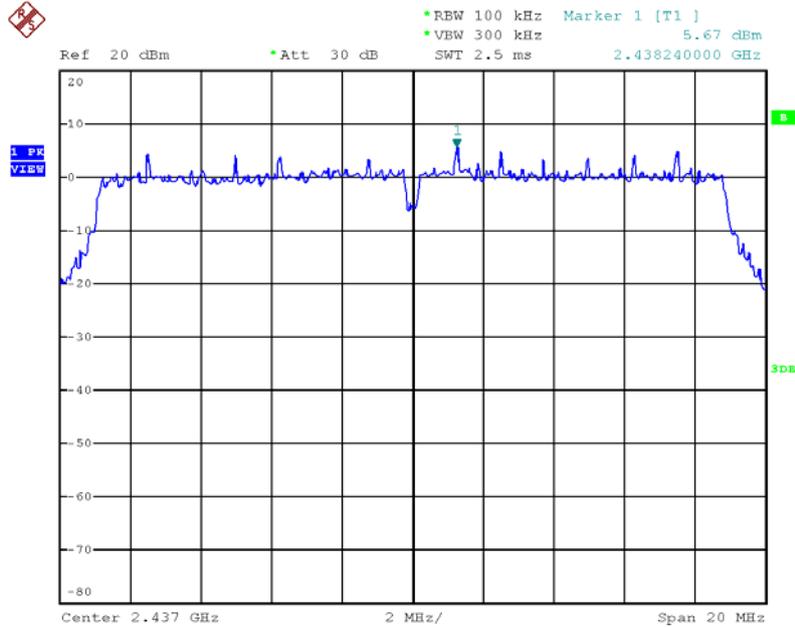
	Freq	Level	Limit Line	Over Limit	Read Level	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	A/Pos	T/Pos	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB		cm	deg	
1	2462.64	101.88				2.24	28.33	0.00	Average	100	148	VERTICAL
2	2463.28	112.42				2.24	28.33	0.00	Peak	100	148	VERTICAL
3	2483.50	50.85	54.00	-3.15	20.22	2.26	28.37	0.00	Average	100	148	VERTICAL
4	2483.66	68.96	74.00	-5.04	38.33	2.26	28.37	0.00	Peak	100	148	VERTICAL

Item 1, 2 are the fundamental frequency at 2462 MHz.

**For Emission not in Restricted Band**

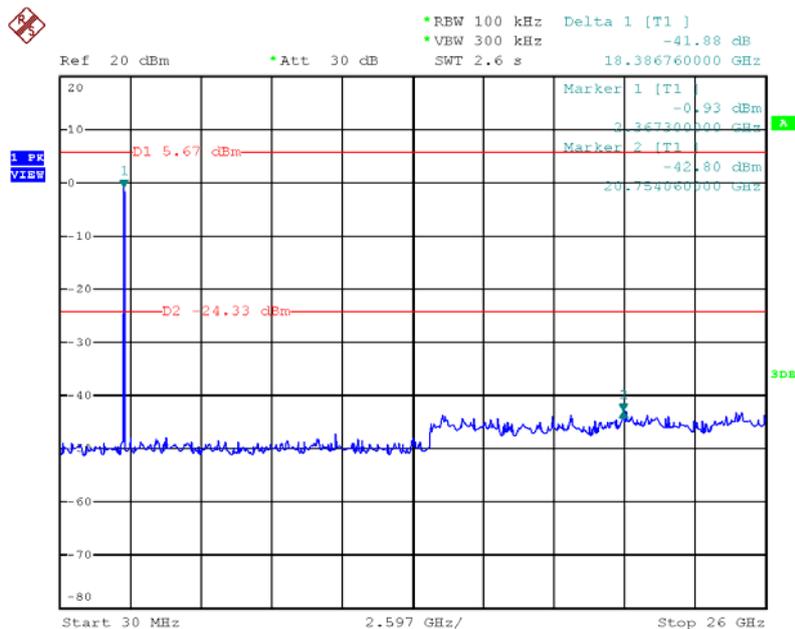
Note: The conducted emission test is performed on each TX port of operating mode without summing or adding  $10\log(N)$  since the limit is relative emission limit. Only worst data of each operating mode is presented.

**Plot on Configuration IEEE 802.11n MCS0 20MHz (Reference Level)**



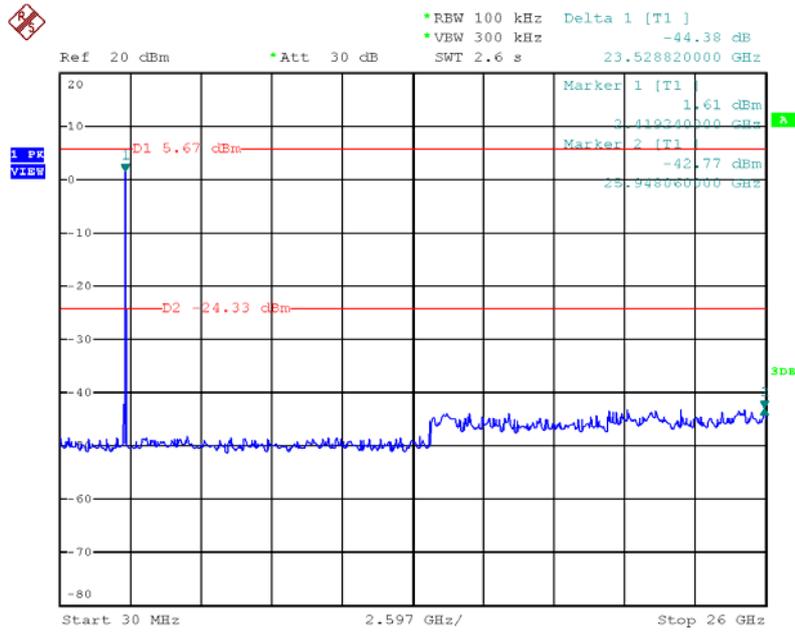
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**Plot on Configuration IEEE 802.11n MCS0 20MHz / Ant. 0 / 2412 MHz (down 20dBc)**



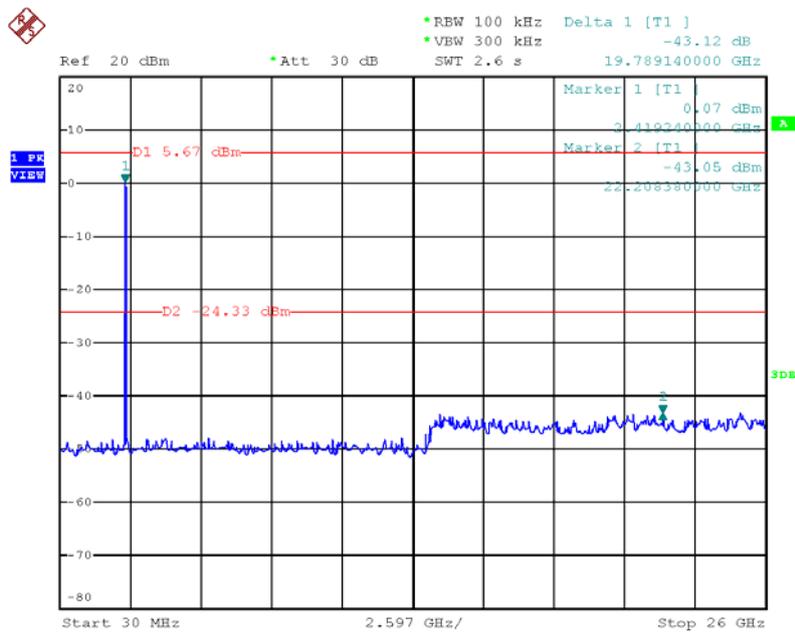
Date: 23.AUG.2012 23:28:16

Plot on Configuration IEEE 802.11n MCS0 20MHz / Ant. 0 / 2437 MHz (down 20dBc)



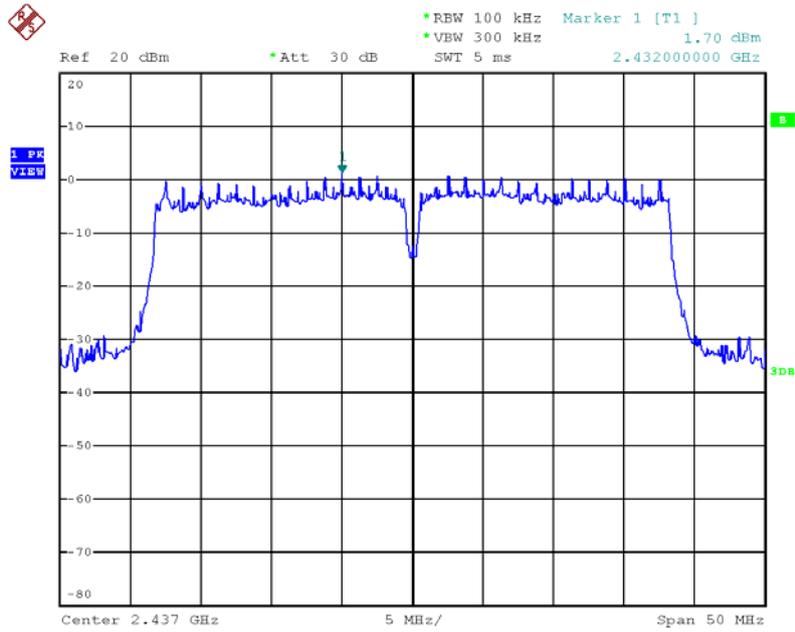
Date: 23.AUG.2012 23:27:45

Plot on Configuration IEEE 802.11n MCS0 20MHz / Ant. 0 / 2462 MHz (down 20dBc)



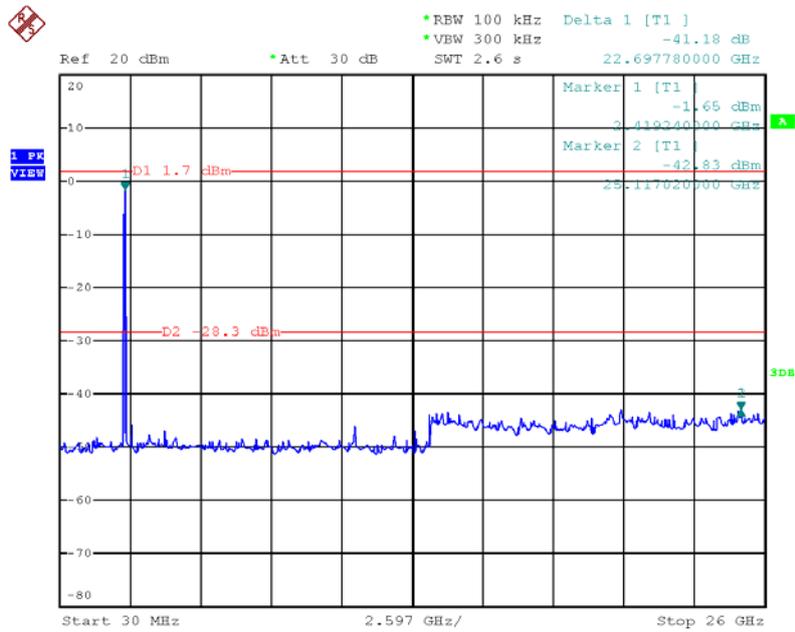
Date: 23.AUG.2012 23:28:47

Plot on Configuration IEEE 802.11n MCS0 40MHz (Reference Level)



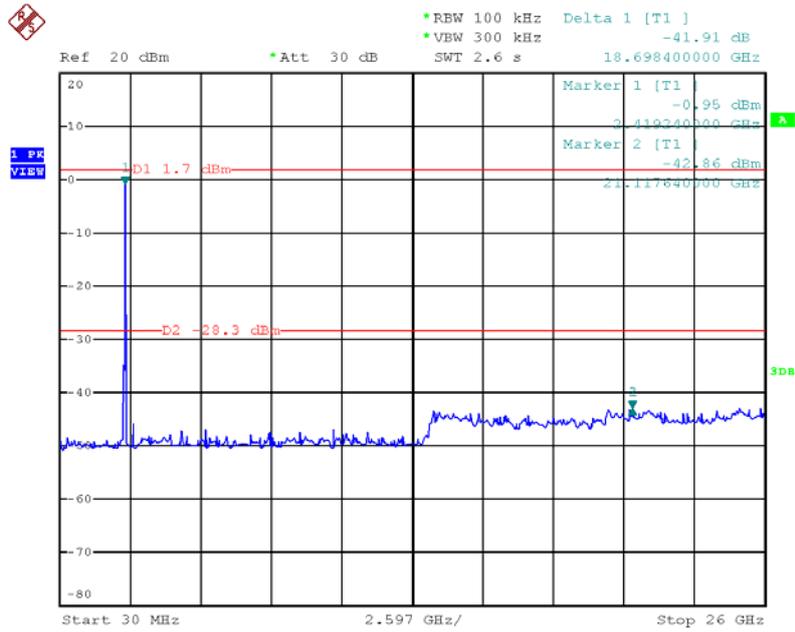
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Plot on Configuration IEEE 802.11n MCS0 40MHz / Ant. 0 / 2412 MHz (down 20dBc)



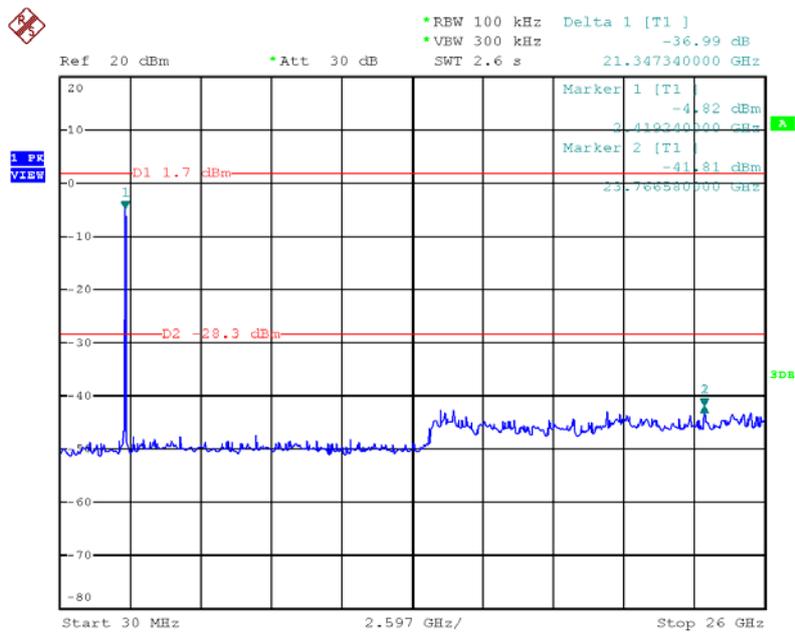
Date: 23.AUG.2012 23:31:00

Plot on Configuration IEEE 802.11n MCS0 40MHz / Ant. 0 / 2437 MHz (down 20dBc)



Date: 23.AUG.2012 23:30:25

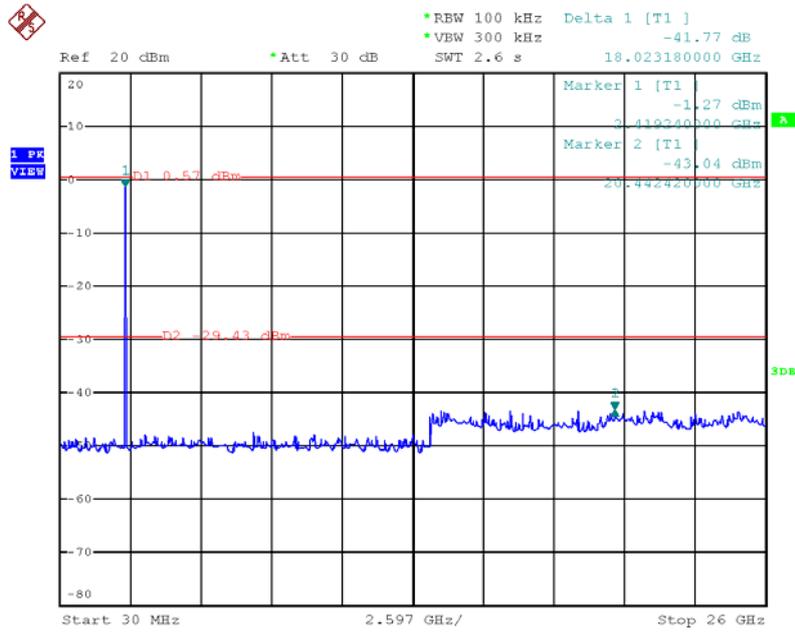
Plot on Configuration IEEE 802.11n MCS0 40MHz / Ant. 0 / 2437 MHz (down 20dBc)



Date: 23.AUG.2012 23:31:42

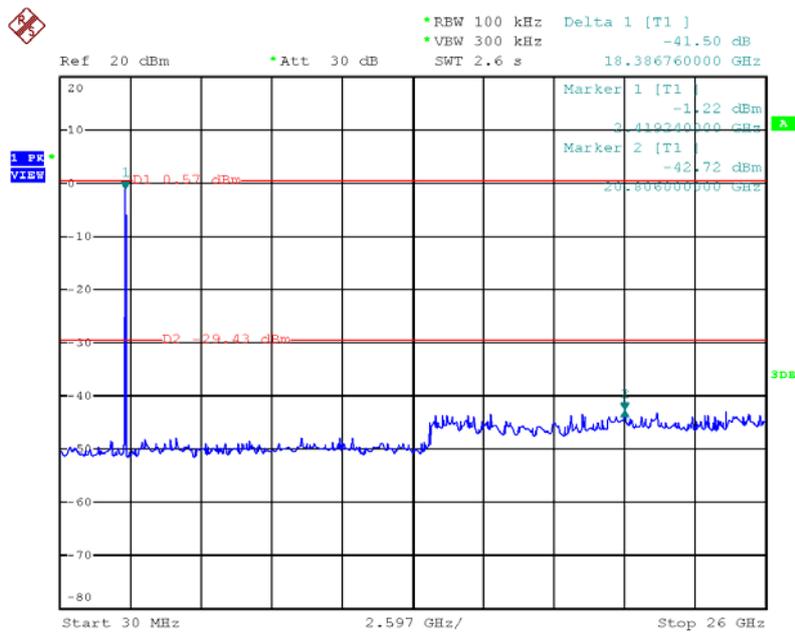


Plot on Configuration IEEE 802.11b / Ant. 0 / 2437 MHz (down 20dBc)



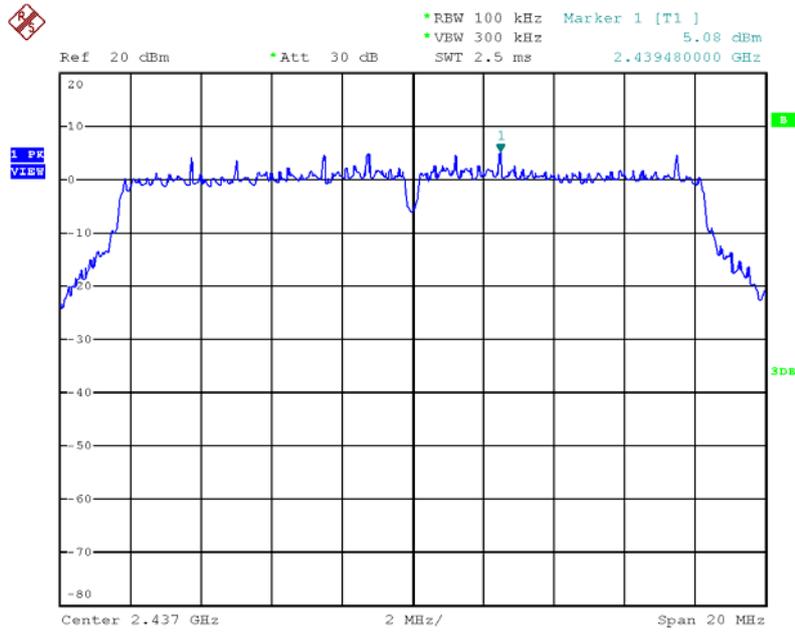
Date: 23.AUG.2012 23:19:10

Plot on Configuration IEEE 802.11b / Ant. 0 / 2462 MHz (down 20dBc)



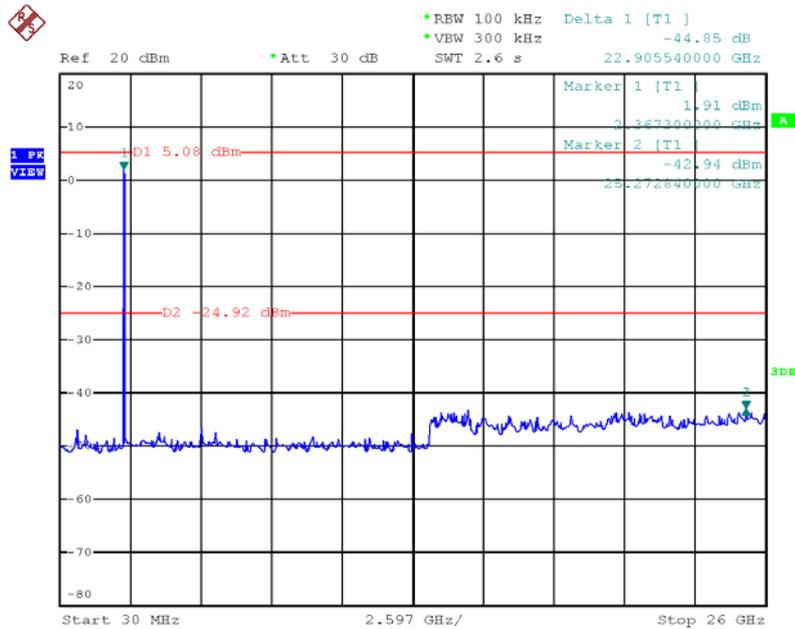
Date: 23.AUG.2012 23:21:42

Plot on Configuration IEEE 802.11g (Reference Level)



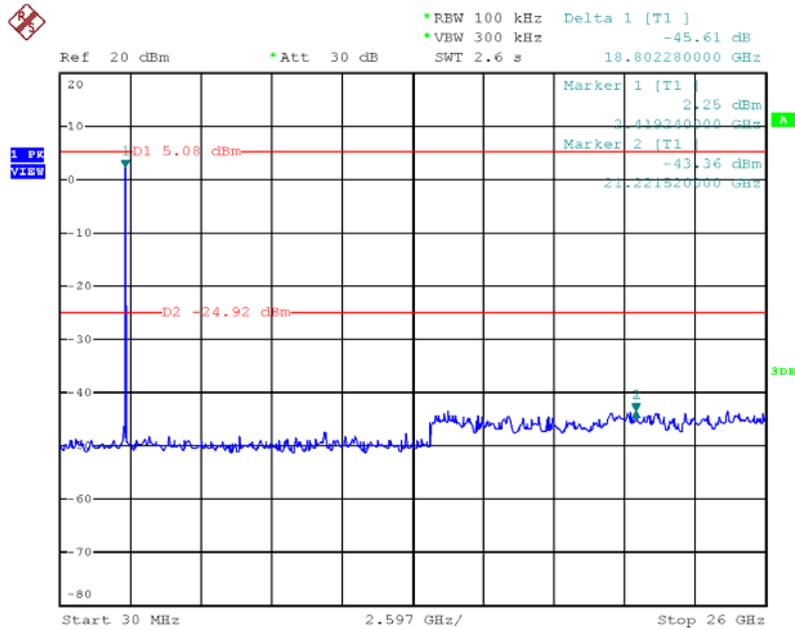
Date: 23.AUG.2012 23:23:22

Plot on Configuration IEEE 802.11g / Ant. 0 / 2412 MHz (down 20dBc)



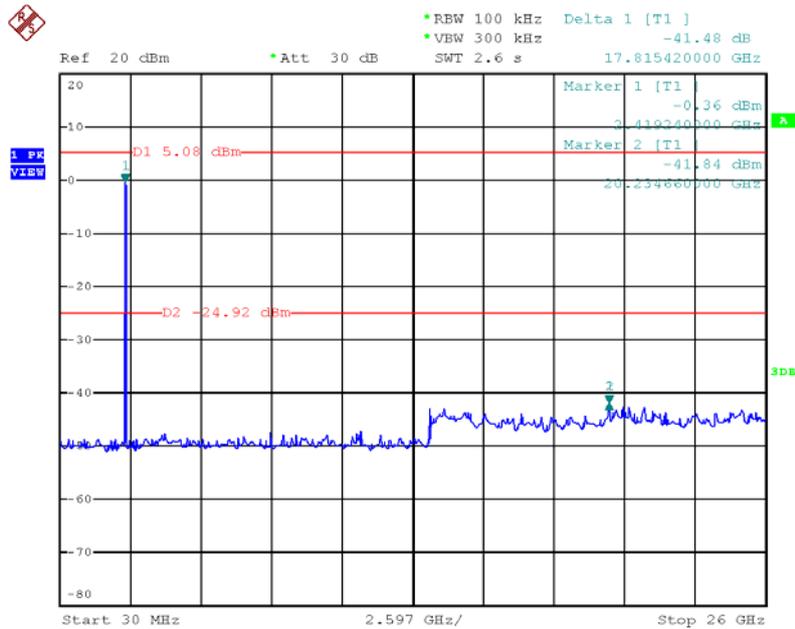
Date: 23.AUG.2012 23:25:01

Plot on Configuration IEEE 802.11g / Ant. 0 / 2437 MHz (down 20dBc)



Date: 23.AUG.2012 23:24:27

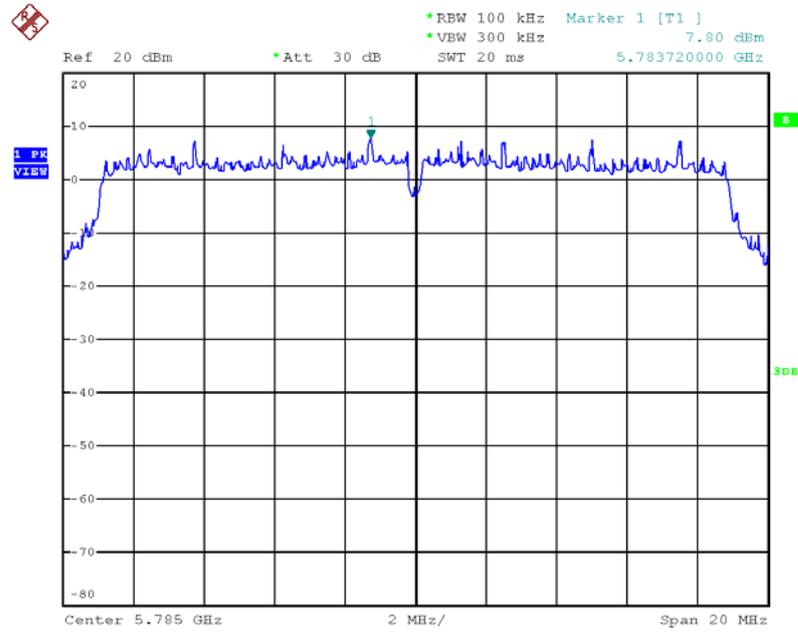
Plot on Configuration IEEE 802.11g / Ant. 0 / 2462 MHz (down 20dBc)



Date: 23.AUG.2012 23:25:41

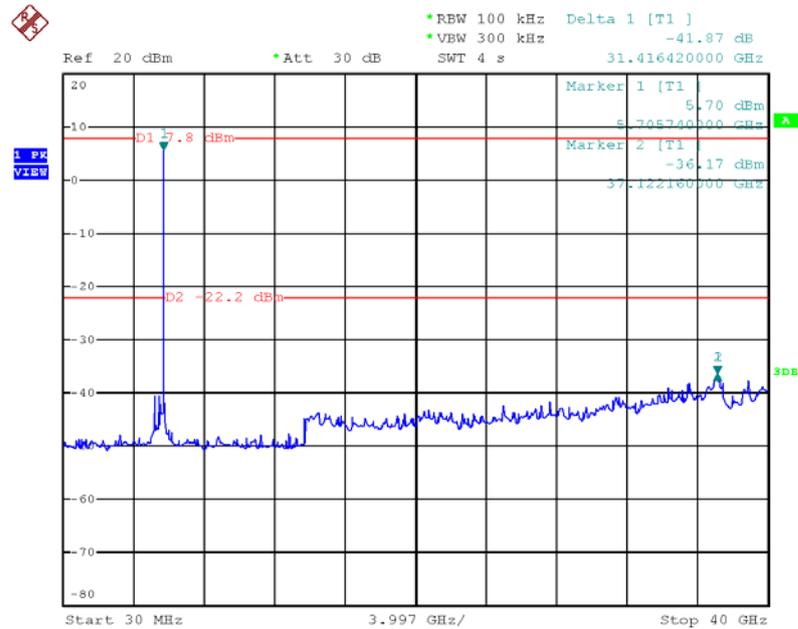
For Emission not in Restricted Band

Plot on Configuration IEEE 802.11n MCS0 HT20MHz (Reference Level)



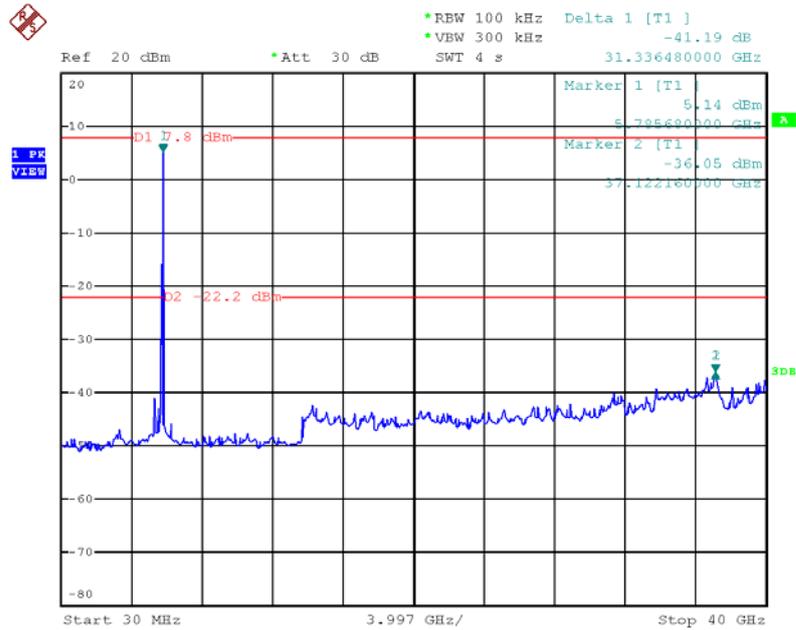
Date: 23.AUG.2012 23:39:13

Plot on Configuration IEEE 802.11n MCS0 HT20MHz / Ant. 0 / 5745 MHz (down 20dBc)



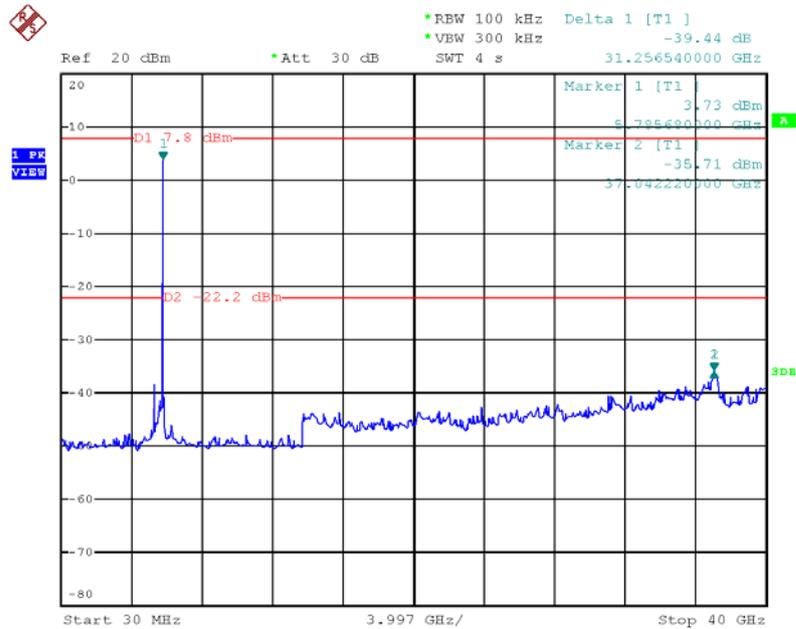
Date: 23.AUG.2012 23:40:42

Plot on Configuration IEEE 802.11n MCS0 HT20MHz / Ant. 0 / 5785 MHz (down 20dBc)



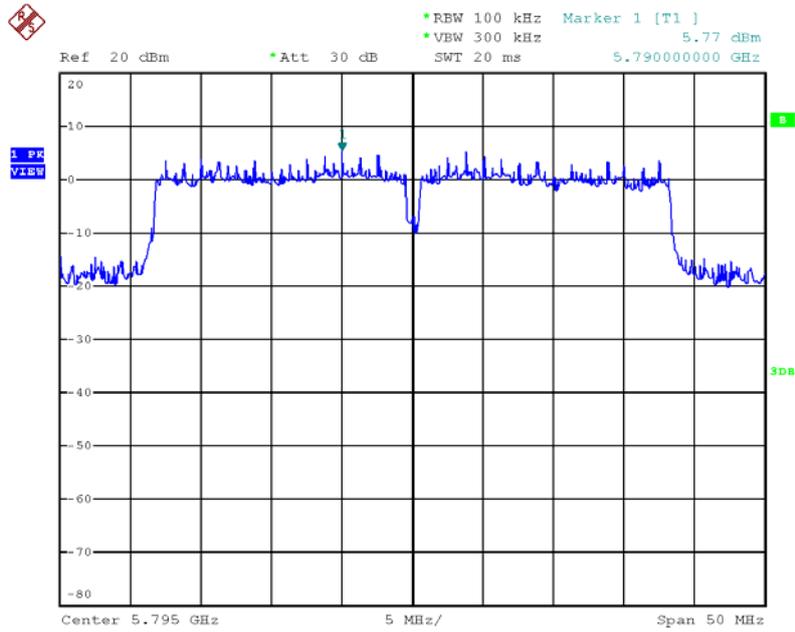
Date: 23.AUG.2012 23:40:07

Plot on Configuration IEEE 80211n MCS0 HT20MHz / Ant. 0 / 5825 MHz(down 20dBc)



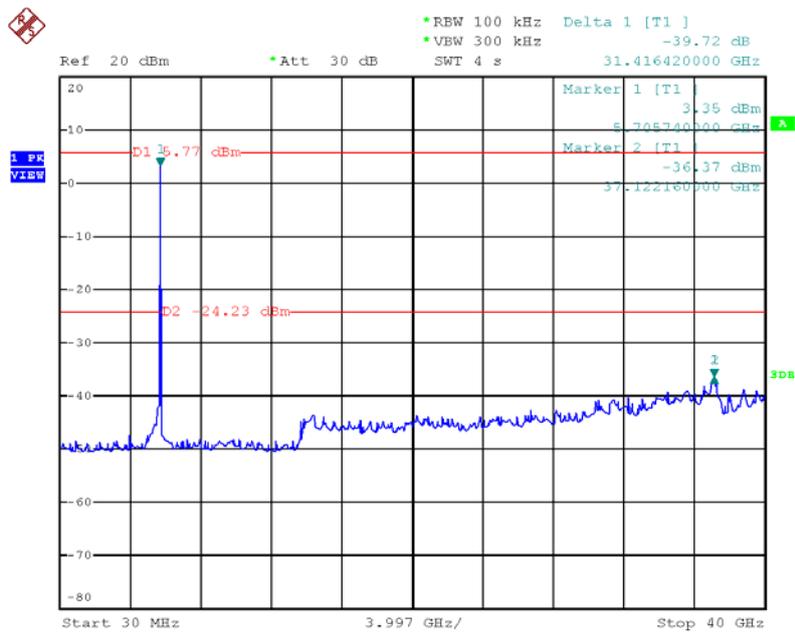
Date: 23.AUG.2012 23:41:16

Plot on Configuration IEEE 802.11n MCS0 HT40MHz (Reference Level)



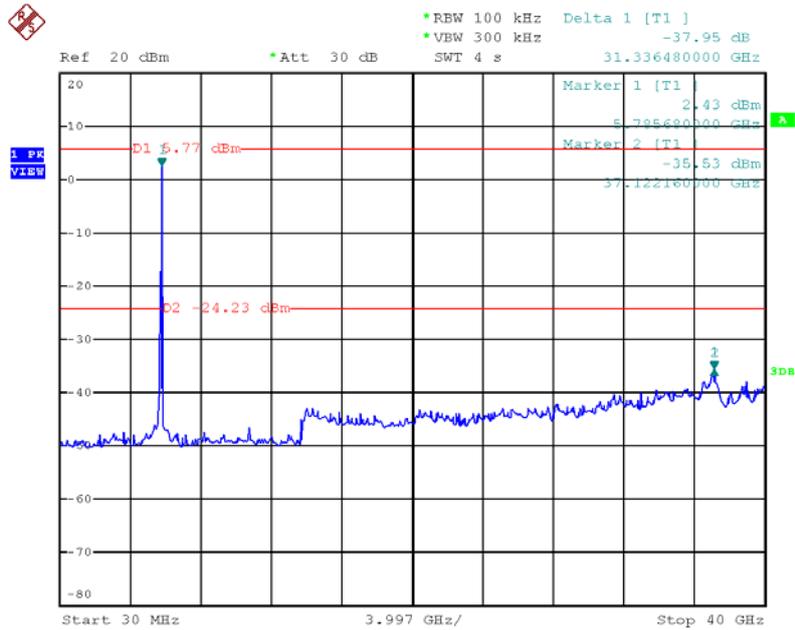
Date: 23.AUG.2012 23:44:59

Plot on Configuration IEEE 802.11n MCS0 HT40MHz / Ant. 0 / 5755 MHz



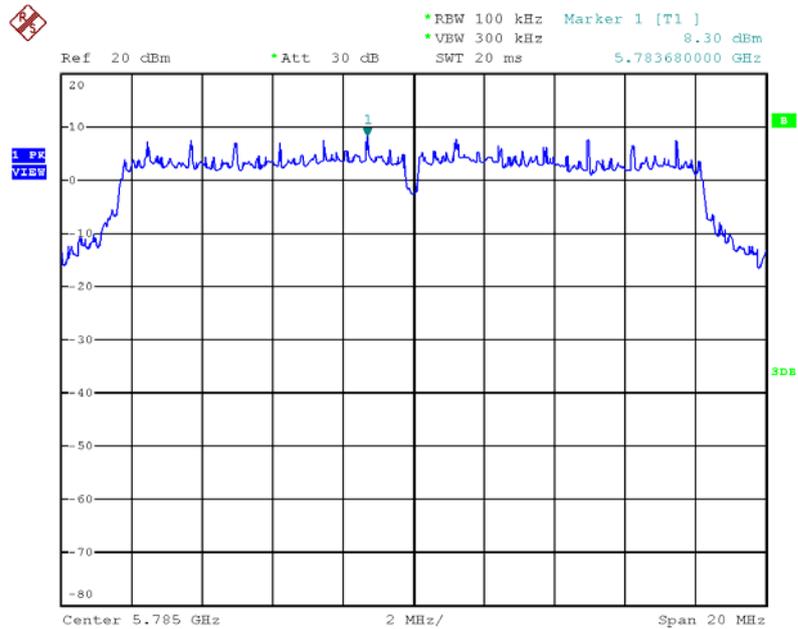
Date: 23.AUG.2012 23:44:00

Plot on Configuration IEEE 80211n MCS0 HT40MHz / Ant. 0 / 5795 MHz



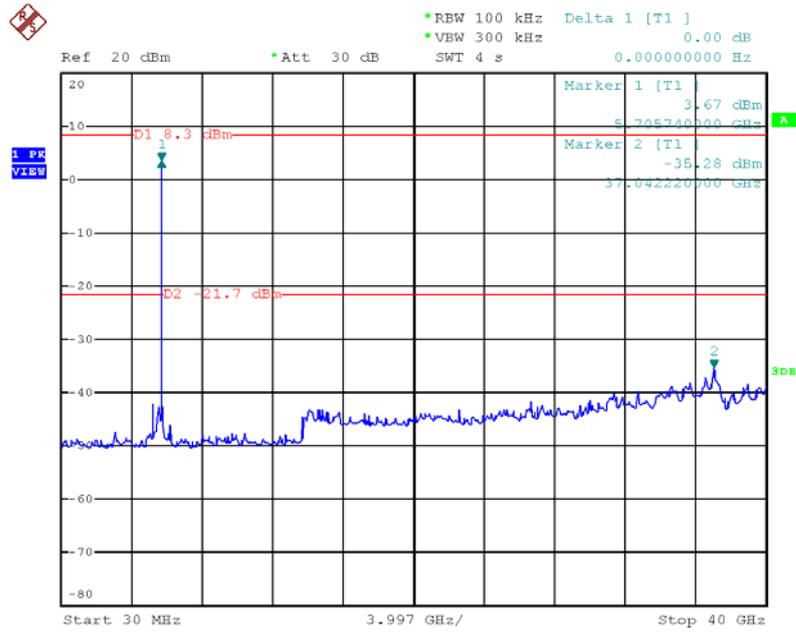
Date: 23.AUG.2012 23:43:28

Plot on Configuration IEEE 802.11a / Ant. 0 / 5745 MHz (Reference Level)



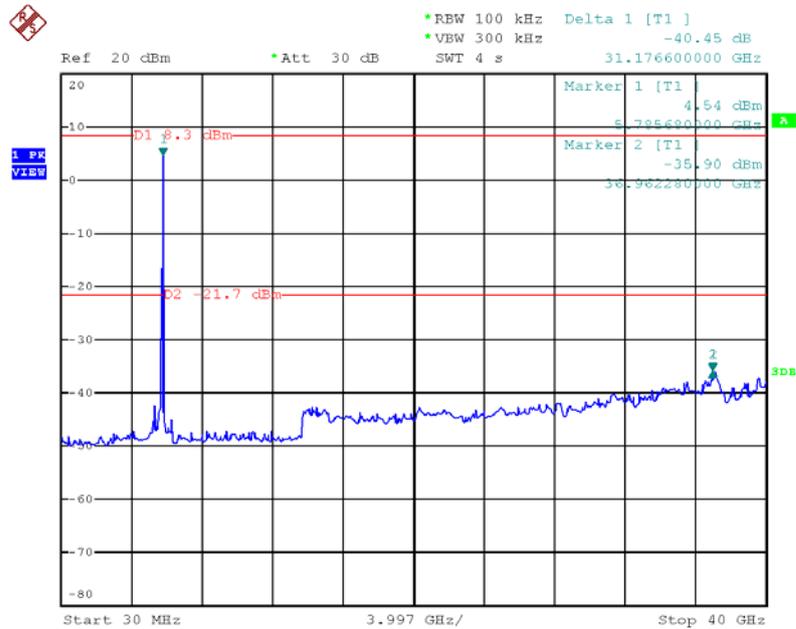
Date: 23.AUG.2012 23:35:15

Plot on Configuration IEEE 802.11a / Ant. 0 / 5745 MHz (down 20dBc)



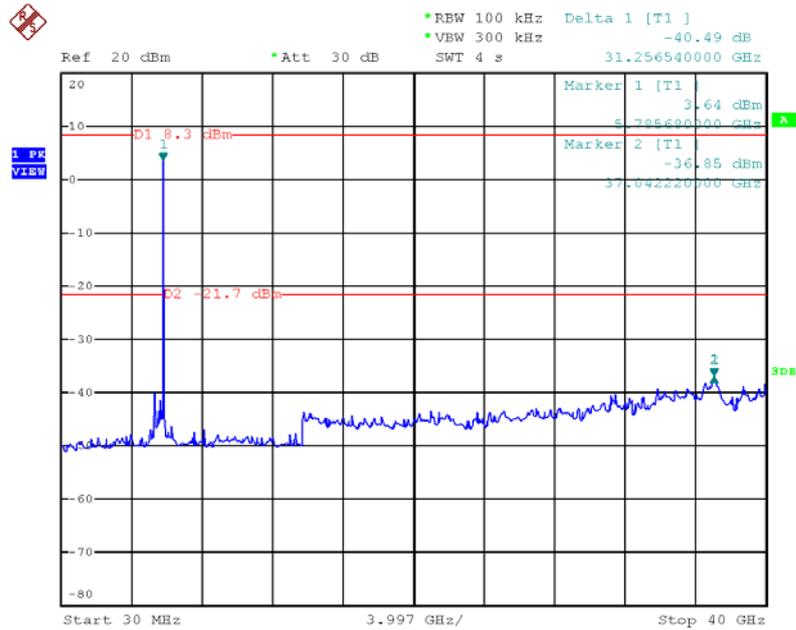
Date: 23.AUG.2012 23:37:33

Plot on Configuration IEEE 802.11a / Ant. 0 / 5785 MHz (down 20dBc)



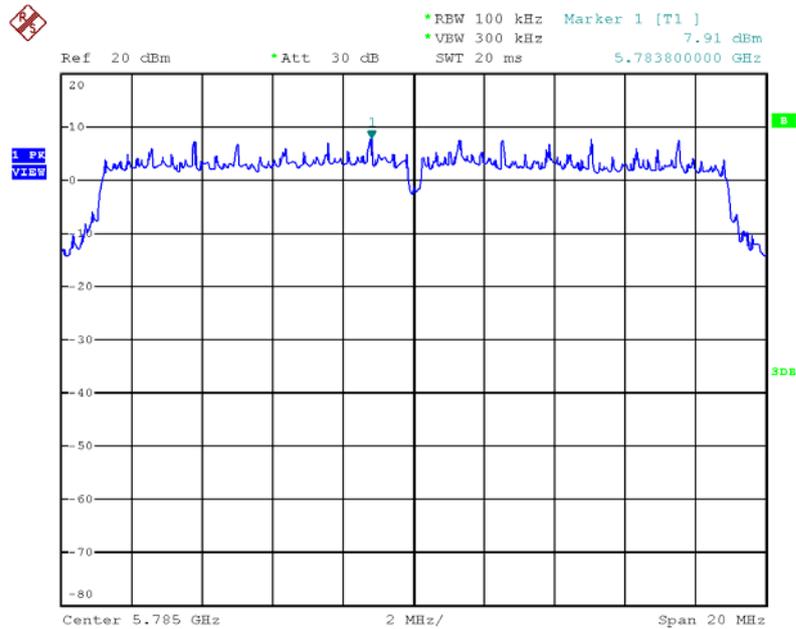
Date: 23.AUG.2012 23:36:51

Plot on Configuration IEEE 802.11a / Ant. 0 / 5825 MHz (down 20dBc)



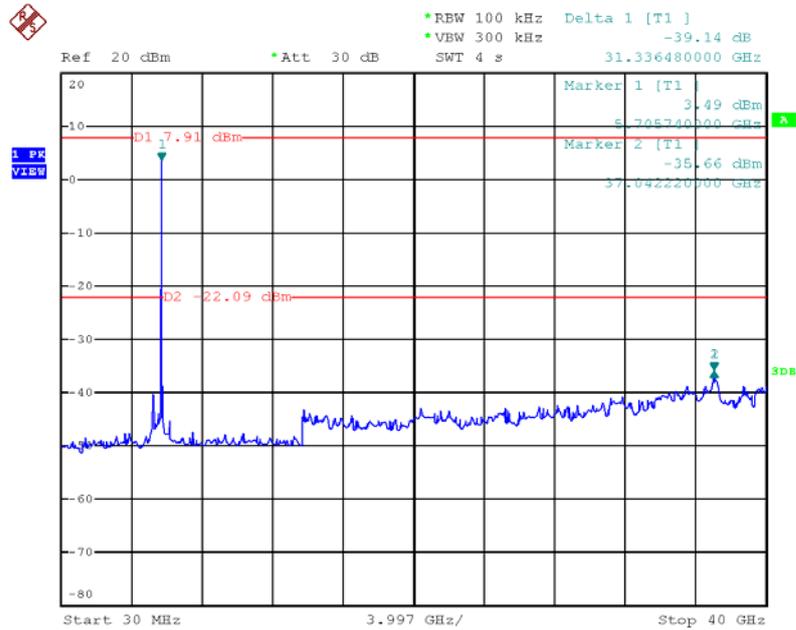
Date: 23.AUG.2012 23:38:08

Plot on Configuration IEEE 802.11ac MCS0 VHT 20MHz (Reference Level)



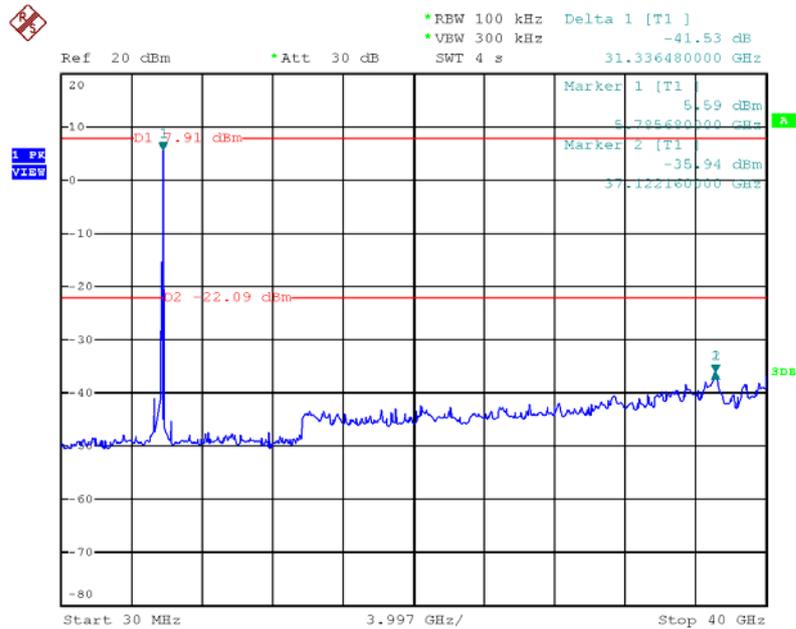
Date: 24.AUG.2012 00:01:14

Plot on Configuration IEEE 802.11ac MCS0 VHT 20MHz / Ant. 0 / 5745 MHz (down 20dBc)



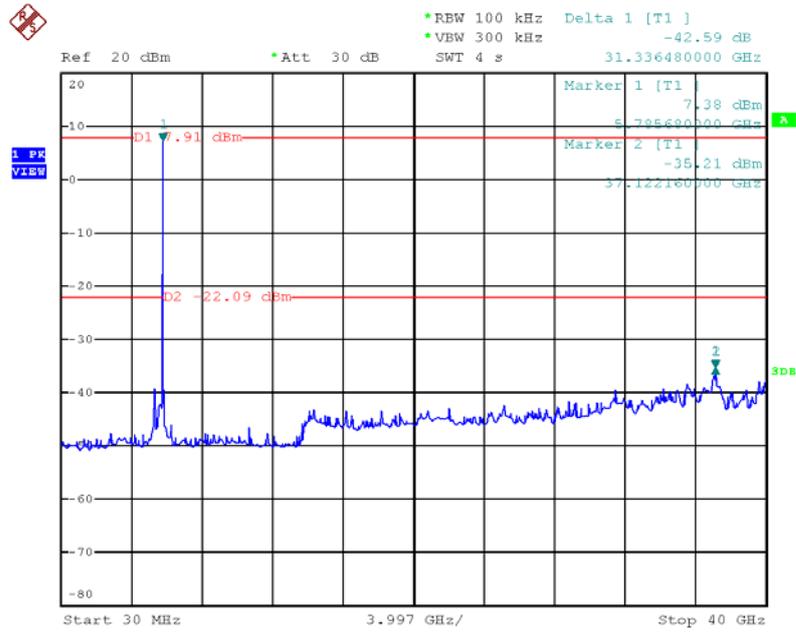
Date: 24.AUG.2012 00:02:40

Plot on Configuration IEEE 802.11ac MCS0 VHT 20MHz / Ant. 0 / 5785 MHz (down 20dBc)



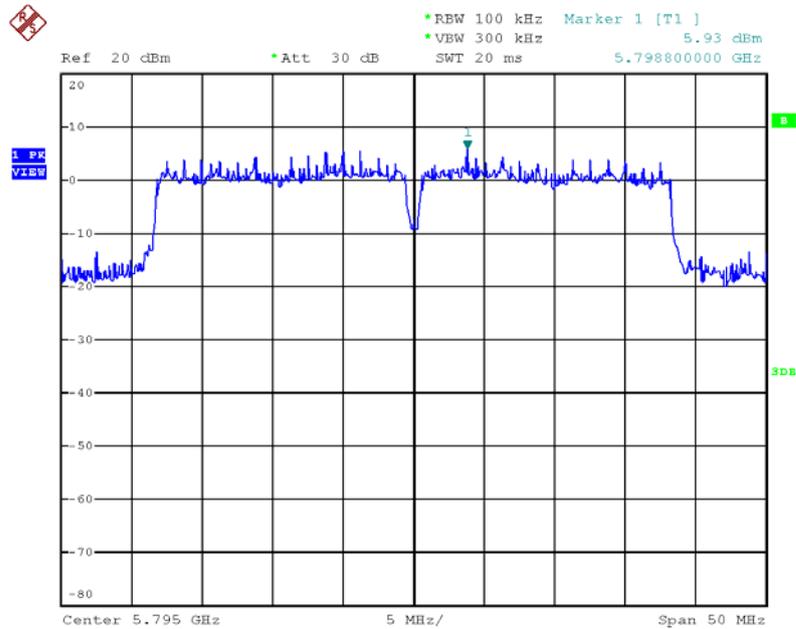
Date: 24.AUG.2012 00:02:06

Plot on Configuration IEEE 802.11ac MCS0 VHT 20MHz / Ant. 0 / 5825 MHz (down 20dBc)



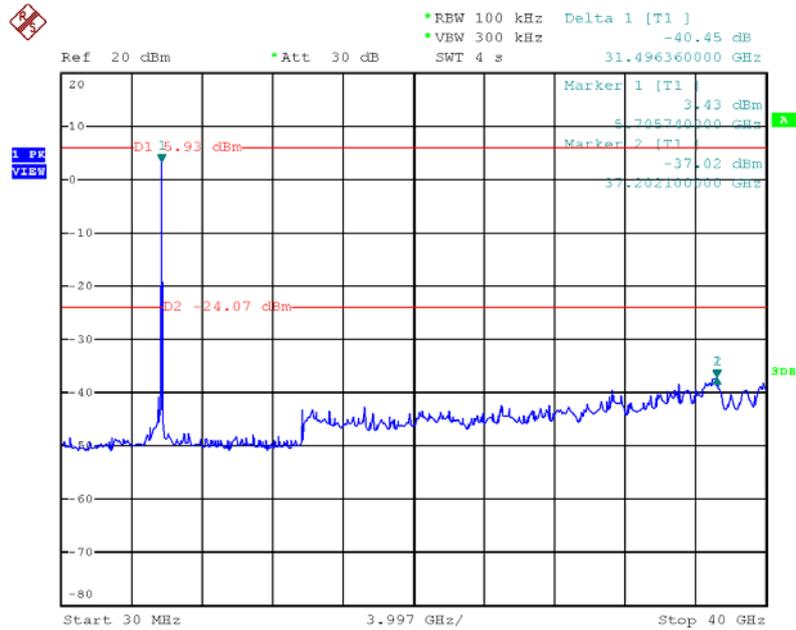
Date: 24.AUG.2012 00:03:09

Plot on Configuration IEEE 802.11ac MCS0 VHT 40MHz (Reference Level)



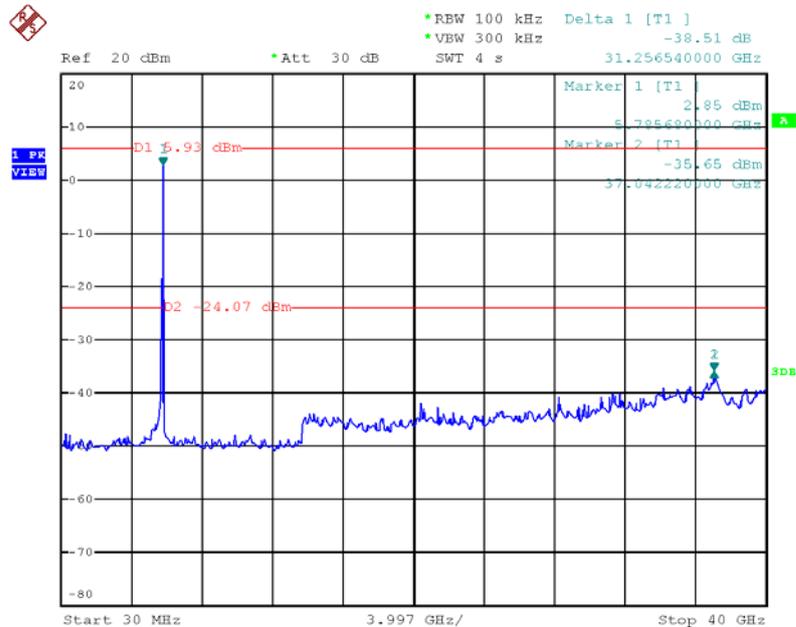
Date: 23.AUG.2012 23:58:21

Plot on Configuration IEEE 802.11ac MCS0 VHT 40MHz / Ant. 0 / 5755 MHz (down 20dBc)



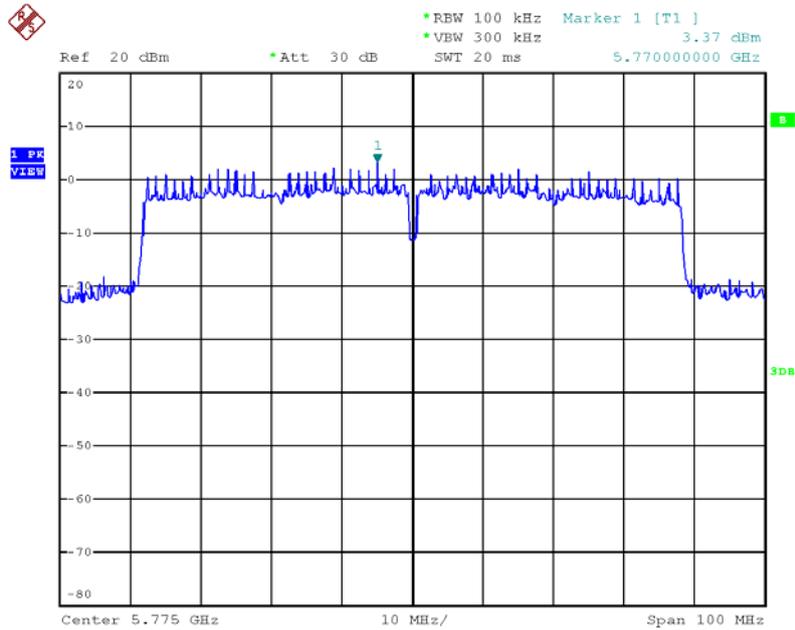
Date: 24.AUG.2012 00:00:18

Plot on Configuration IEEE 802.11ac MCS0 VHT 40MHz / Ant. 0+ Ant. 1 / 5795 MHz (down 20dBc)



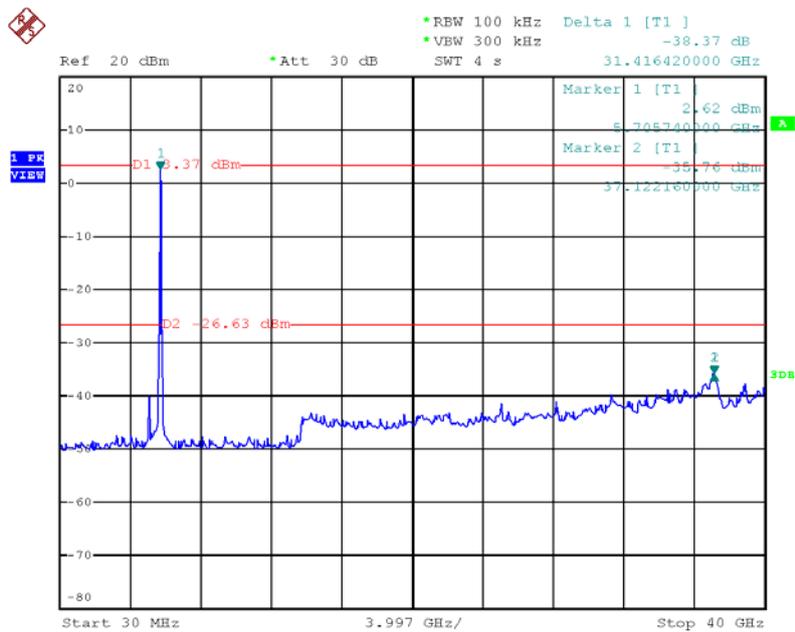
Date: 23.AUG.2012 23:59:41

Plot on Configuration IEEE 802.11ac MCS0 VHT 80MHz (Reference Level)



Date: 23.AUG.2012 23:53:44

Plot on Configuration IEEE 802.11ac MCS0 VHT 80MHz / Ant. 0 / 5775 MHz (down 20dBc)



Date: 23.AUG.2012 23:55:01

## 4.7. Antenna Requirements

### 4.7.1. Limit

Except for special regulations, the Low-power Radio-frequency Devices must not be equipped with any jacket for installing an antenna with extension cable. An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

### 4.7.2. Antenna Connector Construction

Please refer to section 3.3 in this test report; antenna connector complied with the requirements.

## 5. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMI Test Receiver	R&S	ESCS 30	100377	9kHz ~ 2.75GHz	Sep. 14, 2011	Conduction (CO01-CB)
LISN	F.C.C.	FCC-LISN-50-16-2	04083	150kHz ~ 100MHz	Nov. 14, 2011	Conduction (CO01-CB)
V- LISN	Schwarzbeck	NSLK 8127	8127-478	9K ~ 30MHz	Nov. 30, 2011	Conduction (CO01-CB)
PULSE LIMITER	R&S	ESH3-Z2	100430	9K-30MHz	Feb. 03, 2012	Conduction (CO01-CB)
COND Cable	Woken	Cable	01	0.15MHz~30MHz	Dec. 4, 2011	Conduction (CO01-CB)
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	Jan. 11, 2012	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 25, 2011	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Nov. 22, 2011	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 17, 2011	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Nov. 29, 2011	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26.5GHz ~ 40GHz	Nov. 29, 2011	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100056	9KHz~40GHz	Nov. 03, 2011	Radiation (03CH01-CB)
EMI Test Receiver	R&S	ESCS 30	100355	9KHz ~ 2.75GHz	Mar. 20, 2012	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9 kHz - 30 MHz	Sep. 09, 2011	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N/A	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO2000	N/A	1 m - 4 m	N/A	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz - 1 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 17, 2011	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	100979	9KHz~40GHz	Sep. 26, 2011	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	May 20, 2012	Conducted (TH01-CB)
Thermo-Hygro Meter	N/A	HC 520	#1	15~70 degree	Nov. 02, 2011	Conducted (TH01-CB)
Signal Generator	R&S	SMR40	100302	10MHz-40GHz	Nov. 22, 2011	Conducted (TH01-CB)
RF Power Divider	HP	11636A	00306	2GHz ~ 18GHz	N/A	Conducted (TH01-CB)
RF Power Splitter	Anaren	44100	1839	2GHz ~ 18GHz	N/A	Conducted (TH01-CB)
RF Power Splitter	Anaren	42100	17930	2GHz ~ 18GHz	N/A	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-12	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-13	-	1 GHz – 26.5 GHz	Nov. 17, 2011	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	0917223	300MHz~40GHz	Nov. 01, 2011	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Nov. 01, 2011	Conducted (TH01-CB)

Note: Calibration Interval of instruments listed above is one year.

Note: "\*" Calibration Interval of instruments listed above is two years.

## 6. TEST LOCATION

SHIJR	ADD : 6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C. TEL : 886-2-2696-2468 FAX : 886-2-2696-2255
HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-318-0055
LINKOU	ADD : No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C TEL : 886-2-2601-1640 FAX : 886-2-2601-1695
DUNGHU	ADD : No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C. TEL : 886-2-2631-4739 FAX : 886-2-2631-9740
JUNGHE	ADD : 7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C. TEL : 886-2-8227-2020 FAX : 886-2-8227-2626
NEIHU	ADD : 4Fl., No. 339, Hsin Hu 2 <sup>nd</sup> Rd., Taipei 114, Taiwan, R.O.C. TEL : 886-2-2794-8886 FAX : 886-2-2794-9777
JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C. TEL : 886-3-656-9065 FAX : 886-3-656-9085

## 7. TAF CERTIFICATE OF ACCREDITATION



Certificate No. : L1190-110702

財團法人全國認證基金會  
Taiwan Accreditation Foundation

### Certificate of Accreditation

This is to certify that

**Sporton International Inc.**  
**EMC & Wireless Communications Laboratory**  
No.52, Hwa Ya 1st Road, Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien,  
Taiwan, R.O.C.

**is accredited in respect of laboratory**

<b>Accreditation Criteria</b>	: ISO/IEC 17025:2005
<b>Accreditation Number</b>	: 1190
<b>Originally Accredited</b>	: December 15, 2003
<b>Effective Period</b>	: January 10, 2010 to January 09, 2013
<b>Accredited Scope</b>	: Testing Field, see described in the Appendix
<b>Specific Accreditation Program</b>	: Accreditation Program for Designated Testing Laboratory for Commodities Inspection Accreditation Program for Telecommunication Equipment Testing Laboratory Accreditation Program for BSMI Mutual Recognition Arrangement with Foreign Authorities

  
Jay-San Chen  
President, Taiwan Accreditation Foundation  
Date : July 02, 2011

P1, total 22 pages

The Appendix forms an integral part of this Certificate, which shall be invalid when use without the Appendix