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FCC RADIO TEST REPORT

Applicant's company	**NETGEAR, Inc.**
Applicant Address	350 East Plumeria Drive, San Jose, California 95134-1911
FCC ID	**PY311200162**
Manufacturer's company	**Ambit Microsystems (Shanghai) Ltd.**
Manufacturer Address	No. 1925, Nanle Road, Songjiang Export Processing Zone, Shanghai, China

Product Name	N900 Wireless Dual Band Gigabit Router
Brand Name	NETGEAR
Model Name	WNDR4500
Test Rule Part(s)	47 CFR FCC Part 15 Subpart C § 15.247
Test Freq. Range	5725 ~ 5850MHz
Received Date	Jul. 05, 2011
Final Test Date	Aug. 19, 2011
Submission Type	Class II Change
Class II Change	Please refer to section 3.7

Statement

Test result included is only for the IEEE 802.11n and IEEE 802.11a (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.

Testing Laboratory
1190

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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR171226-02AB	Rev. 01	Initial issue of report	Sep. 23, 2011

Certificate No.: CB10009093

1. CERTIFICATE OF COMPLIANCE

Product Name	:	N900 Wireless Dual Band Gigabit Router
Brand Name	:	NETGEAR
Model Name	:	WNDR4500
Applicant	:	NETGEAR, 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 Jul. 05, 2011 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.

Jordan Hsiao 2011.9.23

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	15.247(b)(3)	Maximum Conducted Output Power	Complies	2.05 dB
4.2	15.247(e)	Power Spectral Density	Complies	3.59 dB
4.3	15.247(a)(2)	6dB Spectrum Bandwidth	Complies	-
4.4	15.247(d)	Radiated Emissions	Complies	7.18 dB
4.5	15.247(d)	Band Edge Emissions	Complies	-
4.6	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	$\pm 8.5\times10^{-8}$	Confidence levels of 95%
Radiated Emissions (9kHz~30MHz)	±0.8dB	Confidence levels of 95%
Radiated Emissions (30MHz~1000MHz)	±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℃	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

Items	Description
Product Type	WLAN (1TX, 1RX)
Radio Type	Intentional Transceiver
Power Type	From power Adapter
Modulation	see the below table for IEEE 802.11n
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	see the below table for IEEE 802.11n
Frequency Range	5725 ~ 5850MHz
Channel Number	5 for 20MHz bandwidth ; 2 for 40MHz bandwidth
Channel Band Width (99%)	MCS0 (20MHz): 16.84 MHz ; MCS0 (40MHz): 36.32 MHz
Maximum Conducted Output Power	MCS0 (20MHz): 27.95 dBm ; MCS0 (40MHz): 27.44 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

802.11a

Items	Description
Product Type	WLAN (1TX, 1RX)
Radio Type	Intentional Transceiver
Power Type	From power Adapter
Modulation	OFDM for IEEE 802.11a
Data Modulation	OFDM (BPSK / QPSK / 16QAM / 64QAM)
Data Rate (Mbps)	OFDM (6/9/12/18/24/36/48/54)
Frequency Range	5725 ~ 5850MHz
Channel Number	5
Channel Band Width (99%)	16.76 MHz
Maximum Conducted Output Power	27.86 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Note: The test configuration, test mode and test software used in this test report are designated by the applicant.

Antenna & Band width

Antenna	Single (TX)	
Band width Mode	20 MHz	40 MHz
IEEE 802.11a	V	X
IEEE 802.11n	V	V

IEEE 802.11n spec

MCS Index	Nss	Modulation	R	NBPSC	NCBPS		NDBPS		Datarate(Mbps)			
									800nsGI		400nsGI	
					20MHz	40MHz	20MHz	40MHz	20MHz	40MHz	20MHz	40MHz
0	1	BPSK	1/2	1	52	108	26	54	6.5	13.5	7.200	15
1	1	QPSK	1/2	2	104	216	52	108	13.0	27.0	14.400	30
2	1	QPSK	3/4	2	104	216	78	162	19.5	40.5	21.700	45
3	1	16-QAM	1/2	4	208	432	104	216	26.0	54.0	28.900	60
4	1	16-QAM	3/4	4	208	432	156	324	39.0	81.0	43.300	90
5	1	64-QAM	2/3	6	312	648	208	432	52.0	108.0	57.800	120
6	1	64-QAM	3/4	6	312	648	234	486	58.5	121.5	65.000	135
7	1	64-QAM	5/6	6	312	648	260	540	65.0	135.0	72.200	150
8	2	BPSK	1/2	1	104	216	52	108	13.0	27.0	14.444	30
9	2	QPSK	1/2	2	208	432	104	216	26.0	54.0	28.889	60
10	2	QPSK	3/4	2	208	432	156	324	39.0	81.0	43.333	90
11	2	16-QAM	1/2	4	416	864	208	432	52.0	108.0	57.778	120
12	2	16-QAM	3/4	4	416	864	312	648	78.0	162.0	86.667	180
13	2	64-QAM	2/3	6	624	1296	416	864	104.0	216.0	115.556	240
14	2	64-QAM	3/4	6	624	1296	468	972	117.0	243.0	130.000	270
15	2	64-QAM	5/6	6	624	1296	520	1080	130.0	270.0	144.444	300

Symbol	Explanation
NSS	Number of spatial streams
R	Code rate
NBPSC	Number of coded bits per single carrier
NCBPS	Number of coded bits per symbol
NDBPS	Number of data bits per symbol
GI	guard interval

3.2. Accessories

Power	Brand	Model	Rating
Adapter 1	PIE	AD8180LF	Input:100V~240V, 50/60Hz 1.5A Output:12V - 5.0A
Adapter 2	LEI	NU60-H120500-I1	Input: 100V~240V, 50/60Hz 1.4A Output: 12V - 5.0A
Others			
RJ45 Cable			

3.3. Table for Filed Antenna

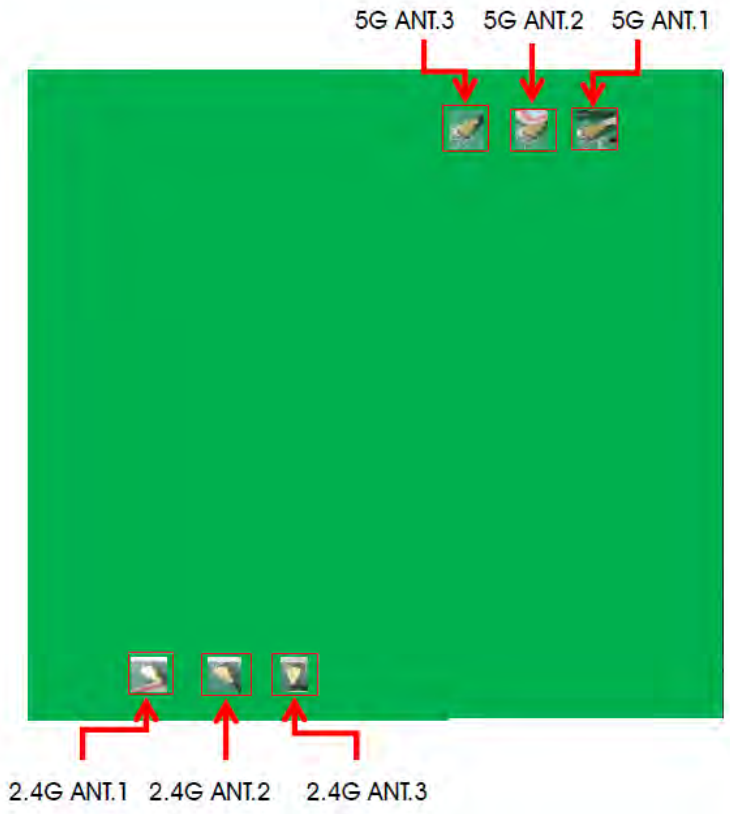
Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)	Remark
1	-	-	Printed Antenna	NA	4.21	TX/RX
2	-	-	Printed Antenna	NA	4.36	TX/RX
3	-	-	Printed Antenna	NA	4.03	TX/RX

Note: The EUT has three antennas. (1TX/1RX)

Ant. 1, Ant. 2, and Ant. 3 can be used as transmitting/receiving antennas, but only one antenna can be used as transmitting/receiving antenna at the same time.

The EUT supports the antenna with TX/RX diversity function.

Due to the "Ant. 3" generated highest output power, all the tests were base on this setting and recorded in this report.



3.4. Table for Carrier Frequencies

For IEEE 802.11a, use Channel 149, 153, 157, 161, 165.

There are two 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.

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

3.5. 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.

Test Items	Mode	Data Rate	Channel	Antenna
Maximum Conducted Output Power Average Output Power Power Spectral Density	MCS0/20MHz	7.2 Mbps	149/157/165	3
	MCS0/40MHz	14.4 Mbps	151/159	3
	11a/BPSK	6 Mbps	149/157/165	3
6dB Spectrum Bandwidth	MCS0/20MHz	7.2 Mbps	149/157/165	3
	MCS0/40MHz	14.4 Mbps	151/159	3
	11a/BPSK	6 Mbps	149/157/165	3
Radiated Emissions Above 1GHz	MCS0/20MHz	7.2 Mbps	149/157/165	3
	MCS0/40MHz	14.4 Mbps	151/159	3
	11a/BPSK	6 Mbps	149/157/165	3
Band Edge Emissions	MCS0/20MHz	7.2 Mbps	149/157/165	3
	MCS0/40MHz	14.4 Mbps	151/159	3
	11a/BPSK	6 Mbps	149/157/165	3

3.6. 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	-
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.

3.7. Table for Class II Change

This product is an extension of original one reported under Sporton project number: FR171226AB

Below is the table for the change of the product with respect to the original one.

Description	Performance Checking
The operating test configuration of EUT for 5GHz Band was changed from 3TX/3RX to 1TX/1RX, and it was controlled by software. There is no change in both hardware and existing RF relevant portion.	Maximum Conducted Output Power Average Output Power Power Spectral Density 6dB Spectrum Bandwidth Radiated Emissions above 1GHz test Band Edge Emissions

3.8. Table for Supporting Units

Support Unit	Brand	Model	FCC ID
Notebook	DELL	1200	E2K4965AGNM
Mouse	iCooky	AMS0706W	DoC
Modem	ACEEX	DM1414	IFAXDM1414
Flash Disk	Silicon	D33B01	DoC
Flash Disk	Silicon	D33B02	DoC
Notebook	DELL	M1330	E2KWM3945ABG
Notebook	DELL	PP25L	E2K4965AGNM

3.9. 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.

Power Parameters of IEEE 802.11n

Test Software Version	DOS V1.3.2.		
Frequency	5745 MHz	5785 MHz	5825 MHz
MCS0 20MHz	120	120	120

Power Parameters of IEEE 802.11n

Test Software Version	DOS V1.3.2.	
Frequency	5755 MHz	5795 MHz
MCS0 40MHz	108	120

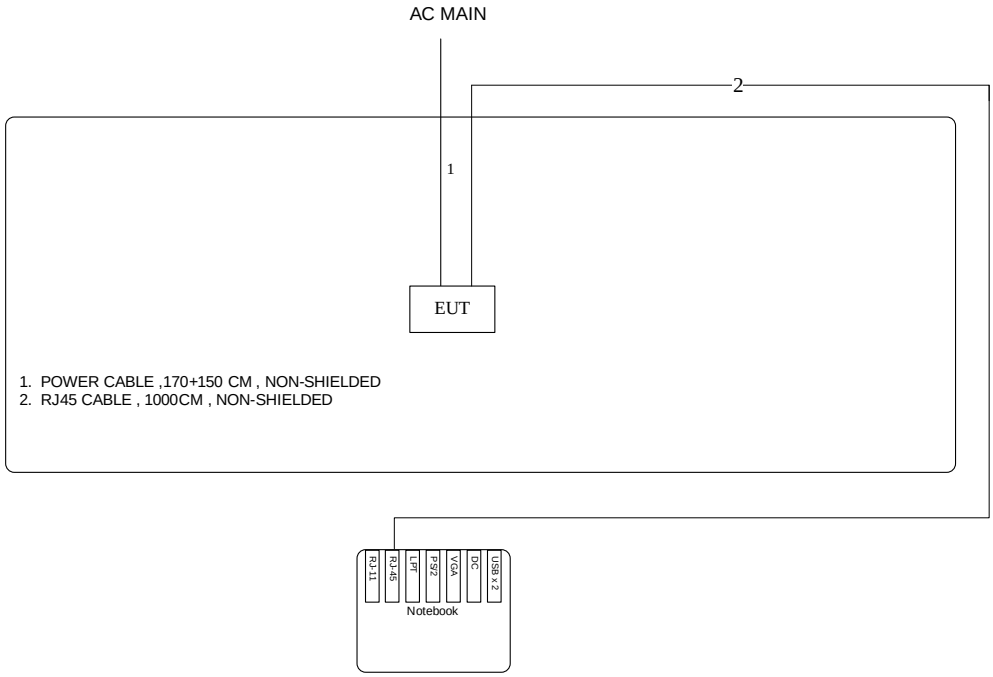
Power Parameters of IEEE 802.11a

Test Software Version	DOS V1.3.2.		
Frequency	5745 MHz	5785 MHz	5825 MHz
IEEE 802.11a	118	120	120

During the test, "DOS V1.3.2." under WIN XP was executed the test program to control the EUT continuously transmit RF signal.

3.10. Test Configurations

3.10.1. Radiation Emissions Test Configuration



4. TEST RESULT

4.1. Maximum Conducted Output Power Measurement

4.1.1. Limit

For systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

4.1.2. Measuring Instruments and Setting

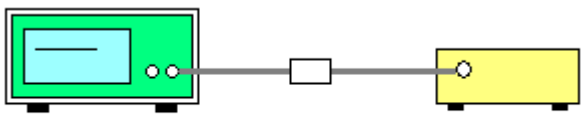
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

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

4.1.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Test was performed in accordance with Measurement of Digital Transmission Systems Operating under Section 15.247 March 23, 2005.
3. When measuring maximum conducted output power with multiple antenna systems, add every result of the values by mathematic formula.

4.1.4. Test Setup Layout



4.1.5. Test Deviation

There is no deviation with the original standard.

4.1.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.1.7. Test Result of Maximum Conducted Output Power

Temperature	25°C	Humidity	60%
Test Engineer	Allen Liu	Configurations	IEEE 802.11n
Test Date	Aug. 18, 2011		

Configuration IEEE 802.11n MCS0 20MHz / Ant. 3

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	27.95	30.00	Complies
157	5785 MHz	27.70	30.00	Complies
165	5825 MHz	27.54	30.00	Complies

Configuration IEEE 802.11n MCS0 40MHz / Ant. 3

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
151	5755 MHz	24.51	30.00	Complies
159	5795 MHz	27.44	30.00	Complies

Temperature	25°C	Humidity	60%
Test Engineer	Allen Liu	Configurations	IEEE 802.11a
Test Date	Aug. 18, 2011		

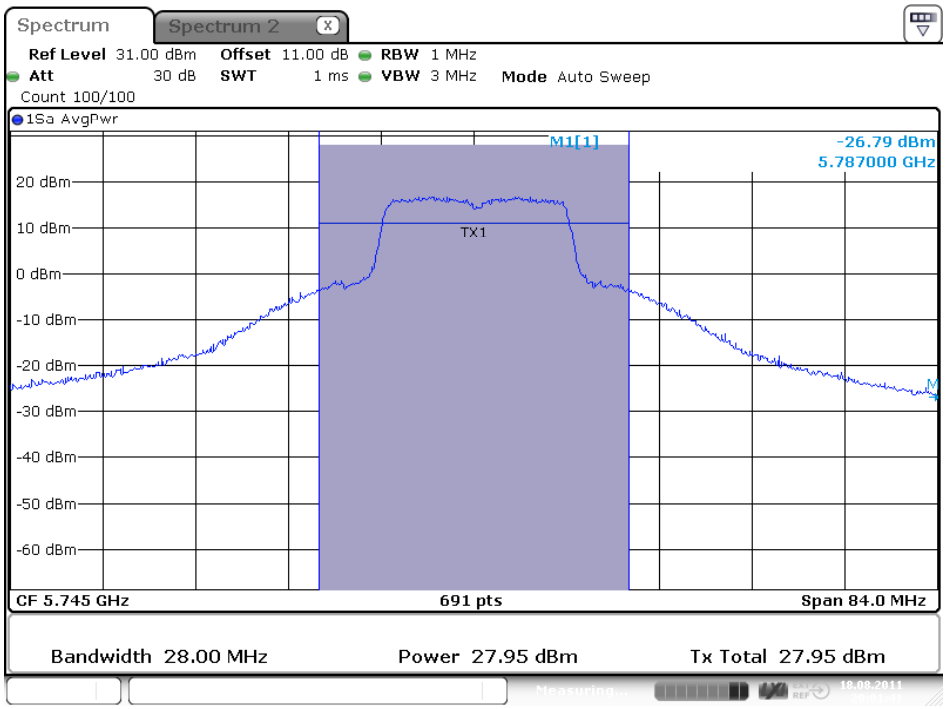
Configuration IEEE 802.11a / Ant. 3

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
149	5745 MHz	27.86	30.00	Complies
157	5785 MHz	27.60	30.00	Complies
165	5825 MHz	27.83	30.00	Complies

Note: All the test values were listed in the report.

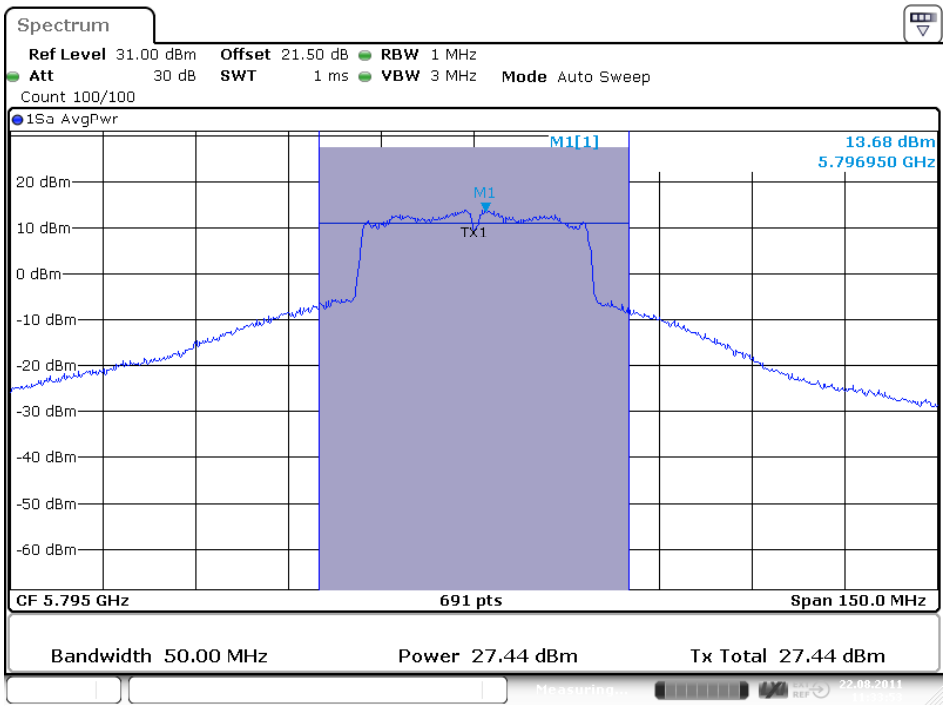
For plots, only the channel with maximum results was shown.

Conducted Output Power Plot on Configuration IEEE 802.11n MCS0 20MHz Ant. 3 / 5745 MHz



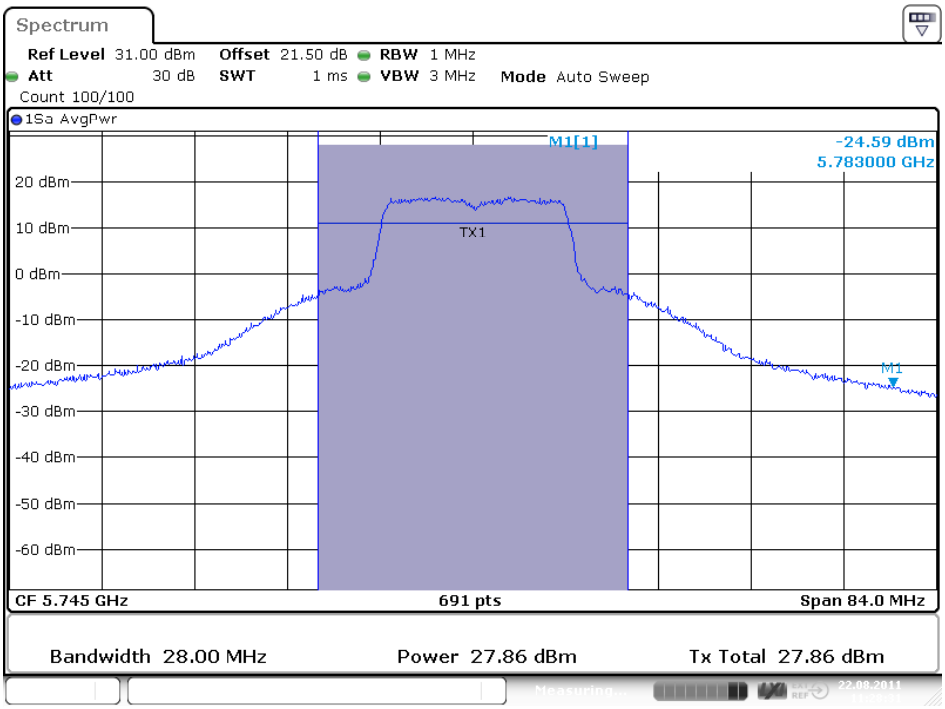
Date: 18.AUG.2011 20:01:41

Conducted Output Power Plot on Configuration IEEE 802.11n MCS0 40MHz Ant. 3 / 5795 MHz



Date: 22.AUG.2011 11:33:54

Conducted Output Power Plot on Configuration IEEE 802.11a Ant. 3 / 5745 MHz



Date: 22.AUG.2011 11:28:32

4.2. Power Spectral Density Measurement

4.2.1. 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.

4.2.2. Measuring Instruments and Setting

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

Spectrum Parameter	Setting
Attenuation	Auto
Span Frequency	30 kHz
RB	3 kHz
VB	30 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	10s

4.2.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer.
2. Set RBW of spectrum analyzer to 3kHz and VBW to 30kHz. Set Detector to Peak, Trace to Max Hold.
3. Mark the frequency with maximum peak power as the center of the display of the spectrum.
4. Set the span to 30kHz and the sweep time to 10s and record the maximum peak value.
5. When measuring power spectral density 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 Power Spectral Density

Temperature	25°C	Humidity	60%
Test Engineer	Allen Liu	Configurations	IEEE 802.11n

Configuration IEEE 802.11n MCS0 20MHz / Ant. 3

Channel	Frequency	Power Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
149	5745 MHz	4.41	8.00	Complies
157	5785 MHz	4.03	8.00	Complies
165	5825 MHz	1.98	8.00	Complies

Configuration IEEE 802.11n MCS0 40MHz / Ant. 3

Channel	Frequency	Power Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
151	5755 MHz	2.84	8.00	Complies
159	5795 MHz	3.25	8.00	Complies

Temperature	25°C	Humidity	60%
Test Engineer	Allen Liu	Configurations	IEEE 802.11a

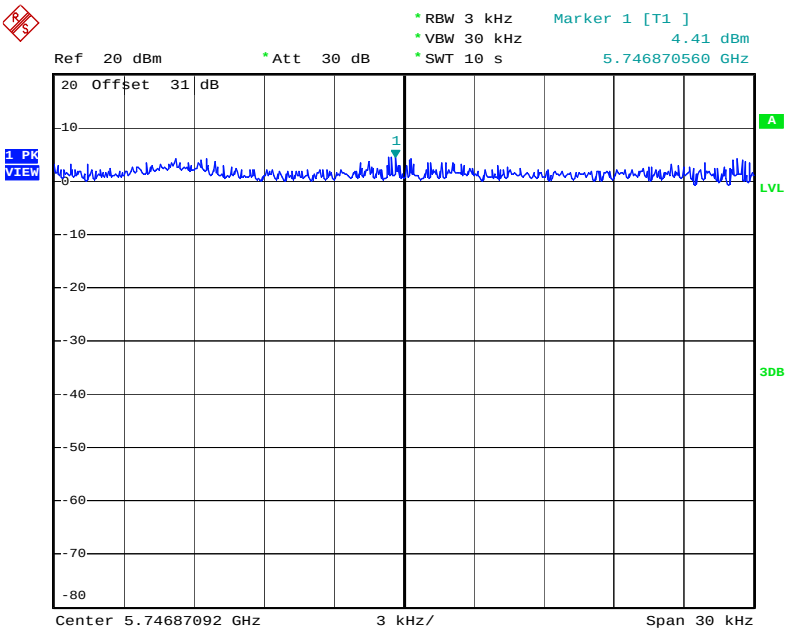
Configuration IEEE 802.11a / Ant. 3

Channel	Frequency	Power Density (dBm/3kHz)	Max. Limit (dBm/3kHz)	Result
149	5745 MHz	2.61	8.00	Complies
157	5785 MHz	4.38	8.00	Complies
165	5825 MHz	1.62	8.00	Complies

Note: All the test values were listed in the report.

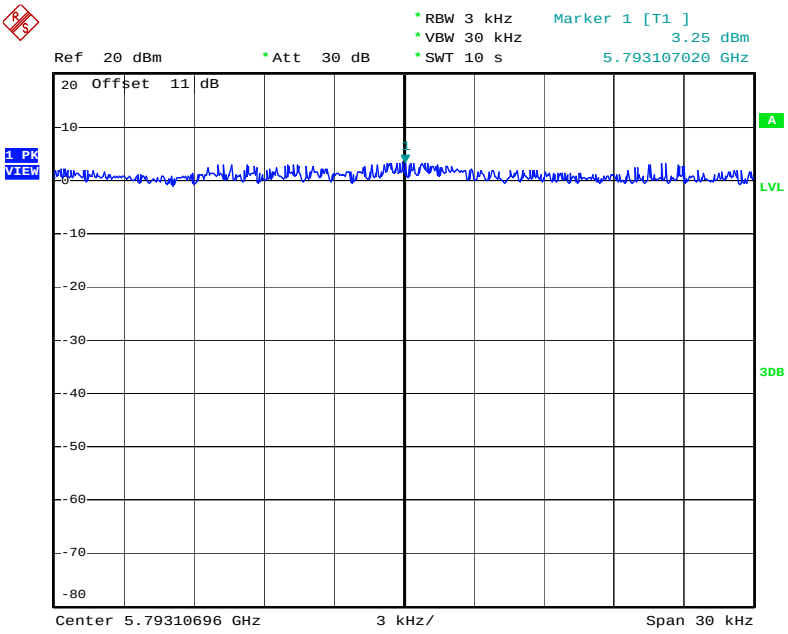
For plots, only the channel with maximum results was shown.

Power Density Plot on Configuration IEEE 802.11n MCS0 20MHz / Ant. 3 / 5745 MHz



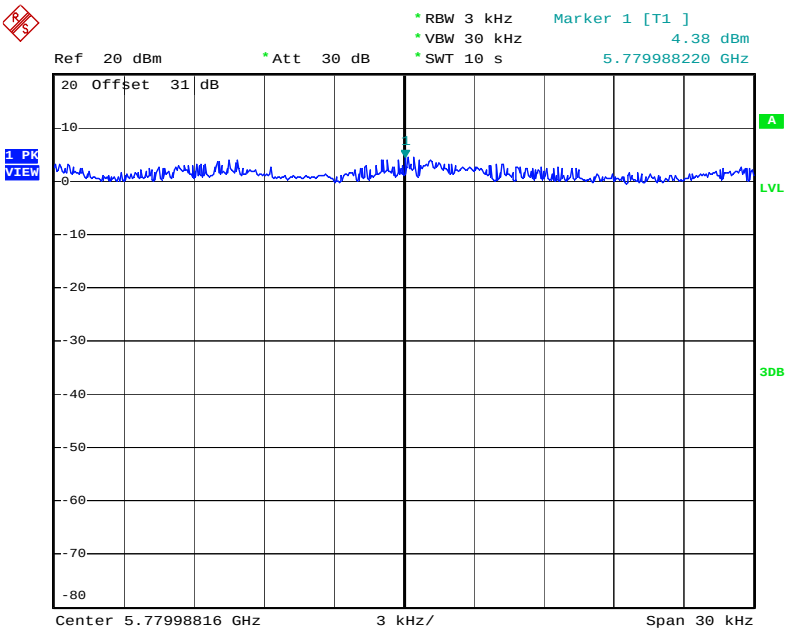
Date: 18.AUG.2011 03:39:08

Power Density Plot on Configuration IEEE 802.11n MCS0 40MHz / Ant. 3 / 5795 MHz



Date: 18.AUG.2011 02:15:19

Power Density Plot on Configuration IEEE 802.11a / Ant. 3 / 5785 MHz



Date: 18.AUG.2011 03:45:15

4.3. 6dB Spectrum Bandwidth Measurement

4.3.1. Limit

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

4.3.2. Measuring Instruments and Setting

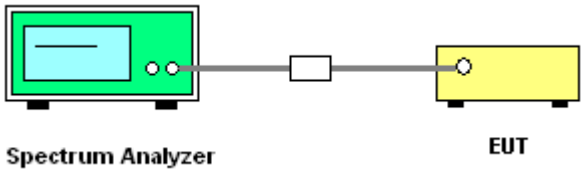
Please refer to section 5 of equipments list in this report. The following table is the setting of the spectrum analyzer.

Spectrum Parameters	Setting
Attenuation	Auto
Span Frequency	> 6dB Bandwidth
RB	100 kHz
VB	100 kHz
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

4.3.3. Test Procedures

1. The transmitter output (antenna port) was connected to the spectrum analyzer in peak hold mode.
2. The resolution bandwidth of 100 kHz and the video bandwidth of 100 kHz were used.
3. Measured the spectrum width with power higher than 6dB below carrier.

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 6dB Spectrum Bandwidth

Temperature	25°C	Humidity	60%
Test Engineer	Allen Liu	Configurations	IEEE 802.11n
Test Date	Jul. 09, 2011		

Configuration IEEE 802.11n MCS0 20MHz / Ant. 3

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	16.40	16.84	500	Complies
157	5785 MHz	16.36	16.84	500	Complies
165	5825 MHz	16.48	16.60	500	Complies

Configuration IEEE 802.11n MCS0 40MHz / Ant. 3

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
151	5755 MHz	36.32	36.32	500	Complies
159	5795 MHz	36.32	36.32	500	Complies

Temperature	25°C	Humidity	60%
Test Engineer	Allen Liu	Configurations	IEEE 802.11a
Test Date	Jul. 09, 2011		

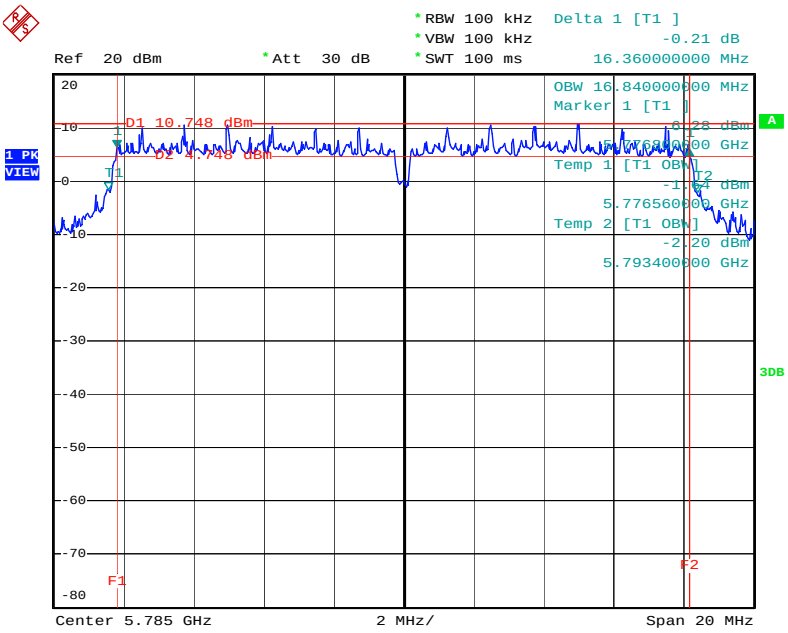
Configuration IEEE 802.11a / Ant. 3

Channel	Frequency	6dB Bandwidth (MHz)	99% Occupied Bandwidth (MHz)	Min. Limit (kHz)	Test Result
149	5745 MHz	16.44	16.60	500	Complies
157	5785 MHz	16.36	16.76	500	Complies
165	5825 MHz	16.44	16.60	500	Complies

Note: All the test values were listed in the report.

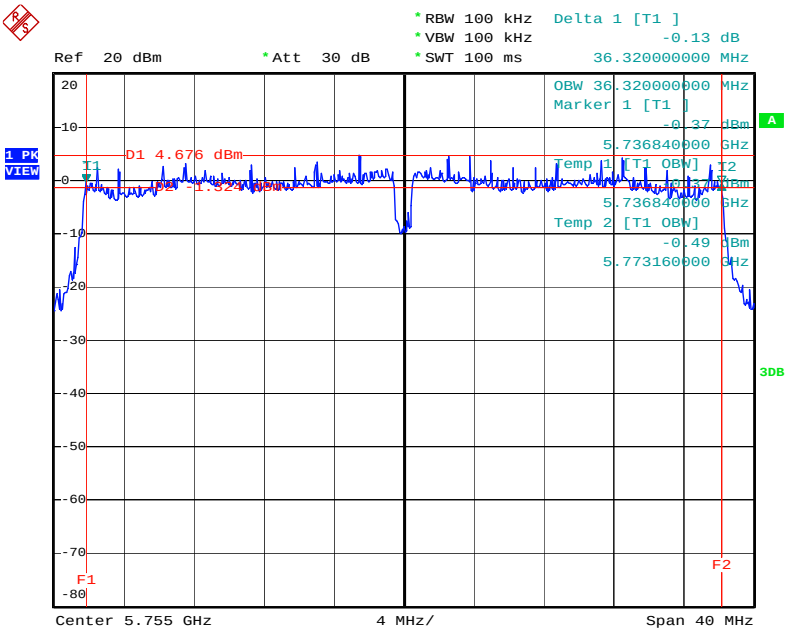
For plots, only the channel with maximum results was shown.

6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 20MHz / Ant. 3 / 5785 MHz



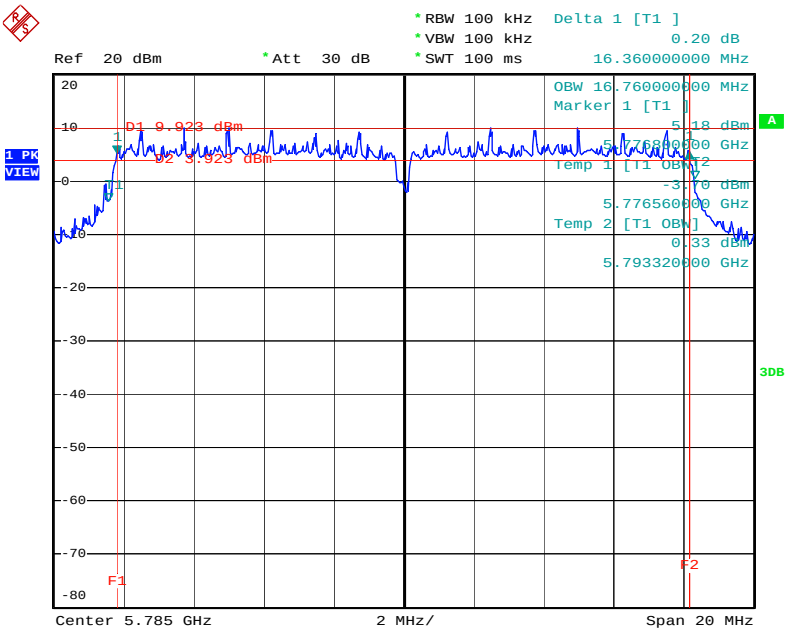
Date: 18.AUG.2011 02:03:45

6 dB Bandwidth Plot on Configuration IEEE 802.11n MCS0 40MHz / Ant. 3 / 5755MHz



Date: 18.AUG.2011 02:11:39

6 dB Bandwidth Plot on Configuration IEEE 802.11a / Ant. 3 / 5785 MHz



Date: 18.AUG.2011 01:54:44

4.4. Radiated Emissions Measurement

4.4.1. 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

4.4.2. Measuring Instruments and Setting

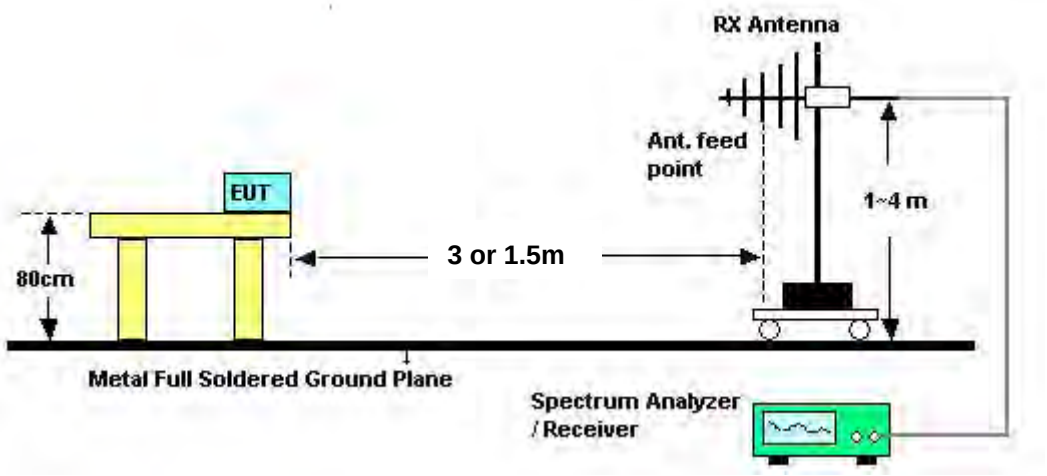
Please refer to section 5 of equipments list in this report. The following table is the setting of spectrum analyzer and receiver.

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~1000MHz / RB 120kHz for QP

4.4.3. 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 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.

4.4.4. Test Setup Layout



Above 5GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade from 3m to 1.5m.

Distance extrapolation factor = 20 log (specific distance [3m] / test distance [1.5m]) (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor [6 dB].

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. Results for Radiated Emissions (1GHz~10th Harmonic)

Temperature	25.6℃	Humidity	56%
Test Engineer	Robert Chang	Configurations	IEEE 802.11n MCS0 20MHz CH 149 / Ant. 3
Test Date	Aug. 19, 2011		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11487.72	63.90	80.00	-16.10	55.29	5.11	38.78	35.28	282	100	Peak	HORIZONTAL
2	11489.84	48.38	60.00	-11.62	39.77	5.11	38.78	35.28	282	100	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11489.52	69.57	80.00	-10.43	60.96	5.11	38.78	35.28	79	100	Peak	VERTICAL
2	11490.74	52.62	60.00	-7.38	44.01	5.11	38.78	35.28	79	100	Average	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	Robert Chang	Configurations	IEEE 802.11n MCS0 20MHz CH 157 / Ant. 3
Test Date	Aug. 19, 2011		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11569.90	48.28	60.00	-11.72	39.61	5.14	38.83	35.30	310	100	Average	HORIZONTAL
2	11570.10	63.93	80.00	-16.07	55.26	5.14	38.83	35.30	310	100	Peak	HORIZONTAL

Vertical

	Freq	Level	.imit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11568.94	51.10	60.00	-8.90	42.44	5.13	38.83	35.30	79	113	Average	VERTICAL
2	11570.16	66.71	80.00	-13.29	58.04	5.14	38.83	35.30	79	113	Peak	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	Robert Chang	Configurations	IEEE 802.11n MCS0 20MHz CH 165 / Ant. 3
Test Date	Aug. 19, 2011		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11649.04	61.74	80.00	-18.26	53.02	5.16	38.86	35.30	313	117	Peak	HORIZONTAL
2	11649.97	47.02	60.00	-12.98	38.30	5.16	38.86	35.30	313	117	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11649.39	64.18	80.00	-15.82	55.46	5.16	38.86	35.30	126	114	Peak	VERTICAL
2	11649.46	48.17	60.00	-11.83	39.45	5.16	38.86	35.30	126	114	Average	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	Robert Chang	Configurations	IEEE 802.11n MCS0 40MHz CH 151 / Ant. 3
Test Date	Aug. 19, 2011		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11507.02	55.60	80.00	-24.40	46.97	5.12	38.79	35.28	315	100	Peak	HORIZONTAL
2	11509.94	42.72	60.00	-17.28	34.09	5.12	38.79	35.28	315	100	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11505.91	47.29	60.00	-12.71	38.66	5.12	38.79	35.28	79	115	Average	VERTICAL
2	11506.55	63.90	80.00	-16.10	55.27	5.12	38.79	35.28	79	115	Peak	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	Robert Chang	Configurations	IEEE 802.11n MCS0 40MHz CH 159 / Ant. 3
Test Date	Aug. 19, 2011		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11584.84	60.36	80.00	-19.64	51.69	5.14	38.83	35.30	312	100	Peak	HORIZONTAL
2	11589.94	45.39	60.00	-14.61	36.72	5.14	38.83	35.30	312	100	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11582.12	47.26	60.00	-12.74	38.59	5.14	38.83	35.30	80	103	Average	VERTICAL
2	11588.59	63.57	80.00	-16.43	54.90	5.14	38.83	35.30	80	103	Peak	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	Robert Chang	Configurations	IEEE 802.11a CH 149 / Ant. 3
Test Date	Aug. 19, 2011		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11489.97	48.30	60.00	-11.70	39.69	5.11	38.78	35.28	310	100	Average	HORIZONTAL
2	11490.19	64.70	80.00	-15.30	56.09	5.11	38.78	35.28	310	100	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11485.19	69.93	80.00	-10.07	61.32	5.11	38.78	35.28	72	100	Peak	VERTICAL
2	11488.75	52.82	60.00	-7.18	44.21	5.11	38.78	35.28	72	100	Average	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	Robert Chang	Configurations	IEEE 802.11a CH 157 / Ant. 3
Test Date	Aug. 19, 2011		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11569.97	48.46	60.00	-11.54	39.79	5.14	38.83	35.30	311	100	Average	HORIZONTAL
2	11571.54	64.68	80.00	-15.32	56.01	5.14	38.83	35.30	311	100	Peak	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11568.88	49.58	60.00	-10.42	40.92	5.13	38.83	35.30	74	110	Average	VERTICAL
2	11570.99	66.08	80.00	-13.92	57.41	5.14	38.83	35.30	74	110	Peak	VERTICAL

Temperature	25.6°C	Humidity	56%
Test Engineer	Robert Chang	Configurations	IEEE 802.11a CH 165 / Ant. 3
Test Date	Aug. 19, 2011		

Horizontal

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11649.17	63.60	80.00	-16.40	54.88	5.16	38.86	35.30	310	117	Peak	HORIZONTAL
2	11649.94	47.53	60.00	-12.47	38.81	5.16	38.86	35.30	310	117	Average	HORIZONTAL

Vertical

	Freq	Level	Limit Line	Over Limit	Read Level	Cable Loss	Antenna Factor	Preamp Factor	T/Pos	A/Pos	Remark	Pol/Phase
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB	dB/m	dB	deg	cm		
1	11647.44	63.08	80.00	-16.92	54.36	5.16	38.86	35.30	112	120	Peak	VERTICAL
2	11649.01	47.12	60.00	-12.88	38.40	5.16	38.86	35.30	112	120	Average	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.

4.5. Band Edge 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 the spectrum analyzer.

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

4.5.3. Test Procedures

1. The test procedure is the same as section 4.5.3, only the frequency range investigated is limited to 100MHz around bandedges.
2. In case the emission is fail due to the used RB/VB is too wide, marker-delta method of FCC Public Notice DA00-705 will be followed.

4.5.4. Test Setup Layout

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

4.5.5. Test Deviation

There is no deviation with the original standard.

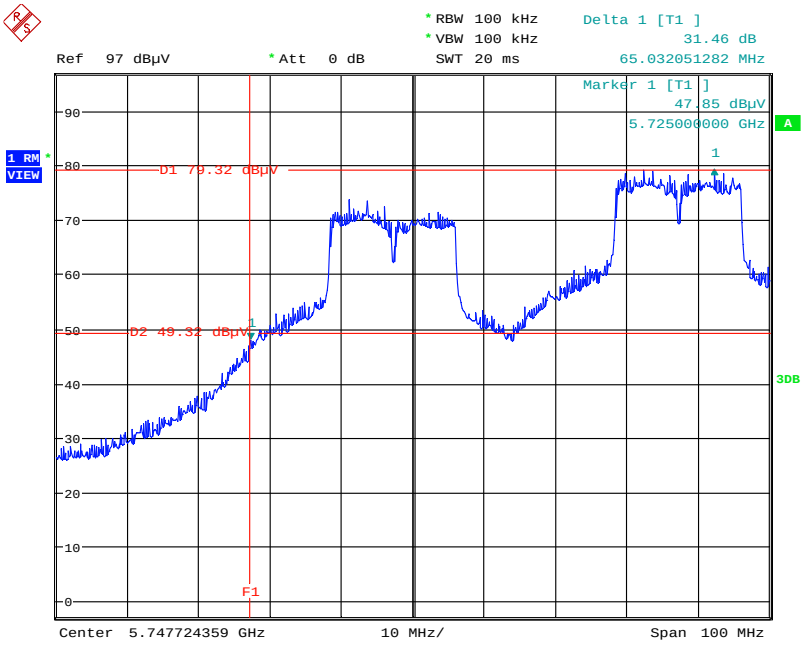
4.5.6. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

4.5.7. Test Result of Band Edge and Fundamental Emissions

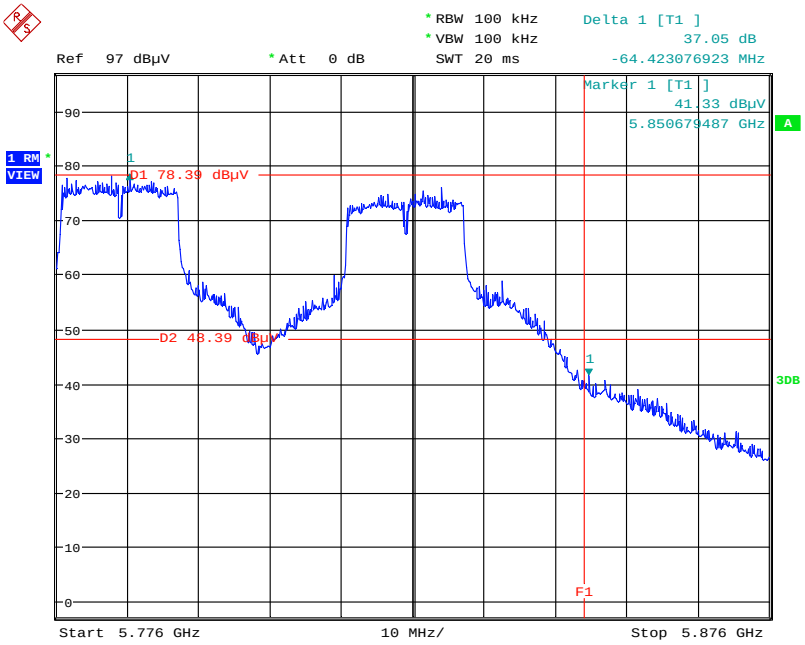
For Emission not in Restricted Band

Low Band Edge Plot on Configuration IEEE 802.11n MCS0 20MHz / Ant. 3 / 5745 MHz



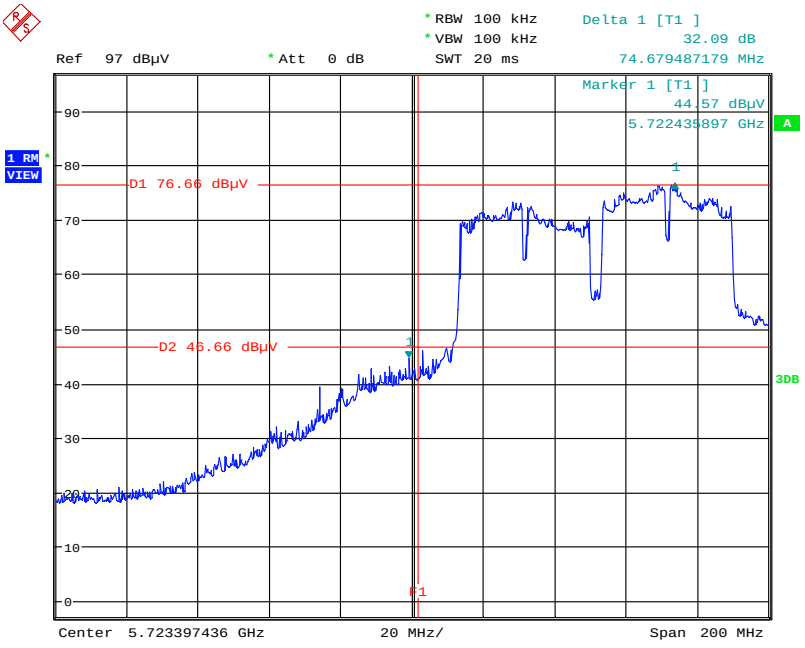
Date: 19.AUG.2011 18:49:07

High Band Edge Plot on Configuration IEEE 802.11n MCS0 20MHz / Ant. 3 / 5825 MHz



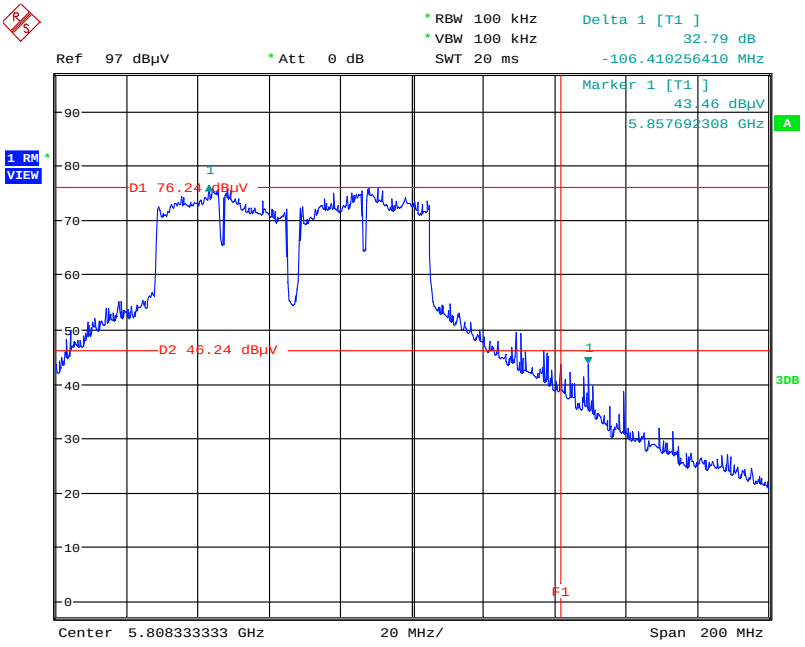
Date: 19.AUG.2011 18:26:49

Low Band Edge Plot on Configuration IEEE 802.11n MCS0 40MHz / Ant. 3 / 5755 MHz



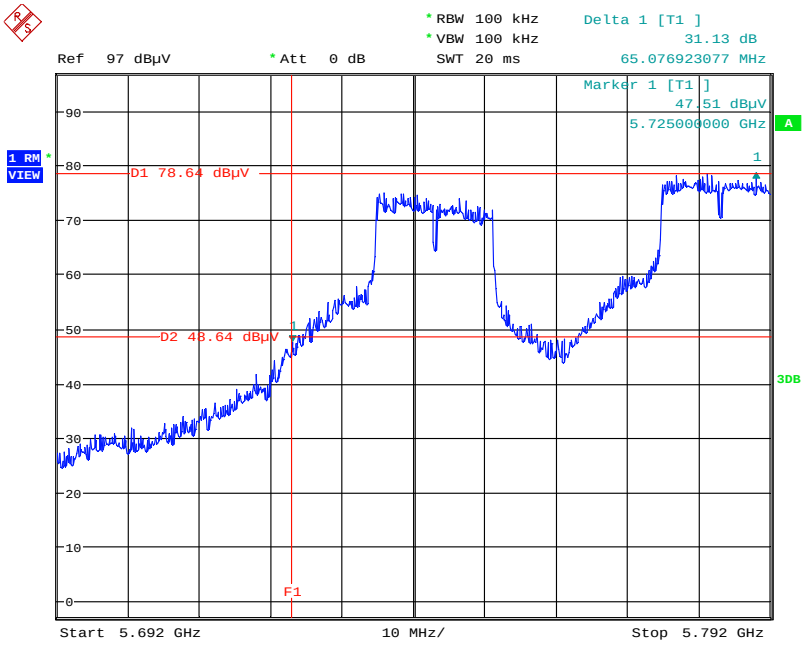
Date: 19.AUG.2011 19:51:45

High Band Edge Plot on Configuration IEEE 802.11n MCS0 40MHz / Ant. 3 / 5795 MHz



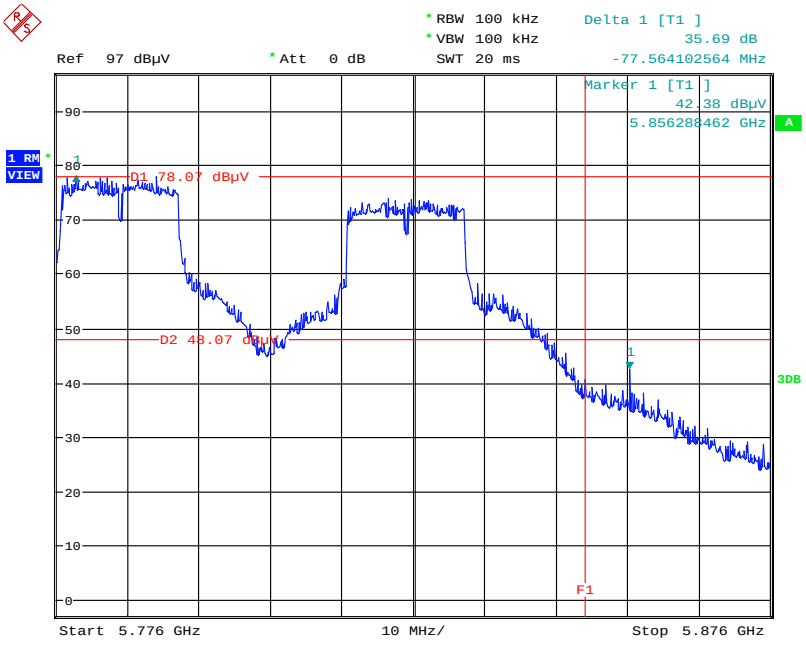
Date: 19.AUG.2011 19:32:26

Low Band Edge Plot on Configuration IEEE 802.11a / Ant. 3 / 5745 MHz



Date: 19.AUG.2011 18:20:04

High Band Edge Plot on Configuration IEEE 802.11a / Ant. 3 / 5825 MHz



Date: 19.AUG.2011 18:22:51

4.6. Antenna Requirements

4.6.1. 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.

4.6.2. 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
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 22, 2010	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Oct. 08, 2010	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Nov. 23, 2010	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26.5GHz ~ 40GHz	Nov. 17, 2010	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP	100304	9kHz ~ 40GHz	Nov. 22, 2010	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-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 17, 2010	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 17, 2010	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 17, 2010	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 17, 2010	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSV30	101026	9KHz~30GHz	Jul. 23, 2011	Conducted (TH01-CB)
Temp. and Humidity Chamber	Ten Billion	TTH-D3SP	TBN-931011	-30~100 degree	May 20, 2011	Conducted (TH01-CB)
Thermo-Hygro Meter	N/A	HC 520	#1	15~70 degree	Nov. 02, 2010	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)
Horn Antenna	COM-POWER	AH-118	071187	1GHz – 18GHz	Mar. 18, 2011	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 17, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 17, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 17, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 17, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 17, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-12	-	1 GHz – 26.5 GHz	Nov. 17, 2010	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-13	-	1 GHz – 26.5 GHz	Nov. 17, 2010	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	0917223	300MHz~40GHz	Sep. 13, 2010	Conducted (TH01-CB)

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Sep. 08, 2010	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 2nd 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

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

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

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