SPORTON International Inc.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
Ph: 886-3-327-3456 / FAX: 886-3-327-0973 / www.sporton.com.tw

FCC RADIO TEST REPORT

Applicant's company	**PEGATRON CORPORATION**
Applicant Address	5F., NO. 76, LIGONG ST., BEITOU DISTRICT, TAIPEI CITY 112 Taiwan
FCC ID	**VUIDPC3929C**
Manufacturer's company	**MAINTEK COMPUTER**
Manufacturer Address	233 Jinfeng Rd., Suzhou, Jiangsu, PRC

Product Name	Wireless cable modem
Brand Name	Cisco
Model No.	DPC3940XXXX (X = 0~9 and A~Z or blank)
Test Rule Part(s)	47 CFR FCC Part 15 Subpart E § 15.407
Test Freq. Range	5150 ~ 5250MHz
Received Date	Sep. 17, 2013
Final Test Date	Jan. 14, 2014
Submission Type	Class II Change

Statement

Test result included is for the IEEE 802.11n and IEEE 802.11a/ac (5150 ~ 5250MHz) 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**, **47 CFR FCC Part 15 Subpart E, KDB 789033 D01 v01r03, KDB 662911 D01 v02r01.**

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
FR3O0404-02AB	Rev. 01	Initial issue of report	Jan. 23, 2014

Certificate No.: CB10301192

1. CERTIFICATE OF COMPLIANCE

Product Name	:	Wireless cable modem
Brand Name	:	Cisco
Model No.	:	DPC3940XXXX (X = 0~9 and A~Z or blank)
Applicant	:	PEGATRON CORPORATION
Test Rule Part(s)	:	47 CFR FCC Part 15 Subpart E § 15.407

Sporton International as requested by the applicant to evaluate the EMC performance of the product sample received on Sep. 17, 2013 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.

Sam Chen
SPORTON INTERNATIONAL INC.

2. SUMMARY OF THE TEST RESULT

Applied Standard: 47 CFR FCC Part 15 Subpart E				
Part	**Rule Section**	**Description of Test**	**Result**	**Under Limit**
4.1	15.407(a)	Maximum Conducted Output Power	Complies	0.22 dB
4.2	15.407(b)	Radiated Emissions	Complies	3.31 dB
4.3	15.407(b)	Band Edge Emissions	Complies	3.96 dB
4.4	15.203	Antenna Requirements	Complies	-

3. GENERAL INFORMATION

3.1. Product Details

IEEE 802.11n / ac

Items	Description
Product Type	WLAN (3TX, 3RX)
Radio Type	Intentional Transceiver
Power Type	From Internal Power Supply and Li-ion battery
Modulation	see the below table for IEEE 802.11n/ac
Data Modulation	For 802.11n: OFDM (BPSK / QPSK / 16QAM / 64QAM) For 802.11ac: OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM)
Data Rate (Mbps)	see the below table for IEEE 802.11n/ac
Frequency Range	5150 ~ 5250MHz
Channel Number	4 for 20MHz bandwidth ; 2 for 40MHz bandwidth 1 for 80MHz bandwidth
Channel Band Width (99%)	802.11ac MCS0/Nss1 (20MHz): 17.92 MHz ; 802.11ac MCS0/Nss1 (40MHz): 36.48 MHz ; 802.11ac MCS0/Nss1 (80MHz): 76.32 MHz
Maximum Conducted Output Power	802.11ac MCS0/Nss1 (20MHz): 16.44 dBm ; 802.11ac MCS0/Nss1 (40MHz): 16.75 dBm ; 802.11ac MCS0/Nss1 (80MHz): 16.78 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

IEEE 802.11a

Items	Description
Product Type	WLAN (1TX, 1RX)
Radio Type	Intentional Transceiver
Power Type	From Internal Power Supply and Li-ion battery
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	5150 ~ 5250MHz
Channel Number	4
Channel Band Width (99%)	17.12 MHz
Maximum Conducted Output Power	16.73 dBm
Carrier Frequencies	Please refer to section 3.4
Antenna	Please refer to section 3.3

Antenna and Band width

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

IEEE 11n / ac Spec.

Protocol	Number of Transmit Chains (NTX)	Data Rate / MCS
802.11n (HT20)	3	MCS 0-23
802.11n (HT40)	3	MCS 0-23
802.11ac (VHT20)	3	MCS 0-9/Nss1-3
802.11ac (VHT40)	3	MCS 0-9/Nss1-3
802.11ac (VHT80)	3	MCS 0-9/Nss1-3

Note 1: IEEE Std. 802.11n modulation consists of HT20 and HT40 (HT: High Throughput). Then EUT support HT20 and HT40.

Note 2: IEEE Std. 802.11ac modulation consists of VHT20, VHT40, VHT80 and VHT160 (VHT: Very High Throughput). Then EUT support VHT20, VHT40 and VHT80.

Note 3: Modulation modes consist of below configuration:

11a: IEEE 802.11a, HT20/HT40: IEEE 802.11n, VHT20/VHT40/VHT80: IEEE 802.11ac

3.2. Accessories

Power	Brand	Model	CISCO P/N	Rating
Li-ion Battery	PEGATRON	PB021	35-100101-01	7.5V – 3000mAh, 22Wh
Others				
Power Cable, Non-shielded, 1.45m				
RJ-45 Cable, Non-shielded, 1.2m				

3.3. Table for Filed Antenna

Ant.	Brand Holder	Model Name	P/N	Antenna Type	Connector	Gain (dBi)	
						2.4GHz	5GHz
1	HL TECHNOLOGY GROUP LIMITED	DPC-3940CAD and DPC-3929CAD (Q Housing)	290-30035	PCB Antenna	I-PEX	1.94	-
2	HL TECHNOLOGY GROUP LIMITED	DPC-3940CAD and DPC-3929CAD (Q Housing)	290-30036	PCB Antenna	I-PEX	4.21	2.50
3	HL TECHNOLOGY GROUP LIMITED	DPC-3940CAD and DPC-3929CAD (Q Housing)	290-30037	PCB Antenna	I-PEX	4.21	2.55
4	HL TECHNOLOGY GROUP LIMITED	DPC-3940CAD and DPC-3929CAD (Q Housing)	290-30038	PCB Antenna	I-PEX	-	2.38
5	HL TECHNOLOGY GROUP LIMITED	DPC-3940CAD and DPC-3929CAD (Q Housing)	290-30092	PCB Antenna	I-PEX	1.94	-
6	HL TECHNOLOGY GROUP LIMITED	DPC-3940CAD and DPC-3929CAD (Q Housing)	290-30093	PCB Antenna	I-PEX	4.21	2.50
7	HL TECHNOLOGY GROUP LIMITED	DPC-3940CAD and DPC-3929CAD (Q Housing)	290-30094	PCB Antenna	I-PEX	4.21	2.55

Note:

The EUT has two sets of antennas and each set has four antennas. First set includes Ant.1～4, and second set includes Ant.4～7. The difference between set 1 & set 2 is just model name, so there's only set 1 selected and recorded in the report.

For 2.4GHz function:

For IEEE 802.11n mode (3TX/3RX)

Chain 1, Chain 2 and Chain 3 can be used as transmitting/receiving antenna.

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

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

Only Chain 1 can be used as transmitting/receiving antenna.

For 5GHz function:

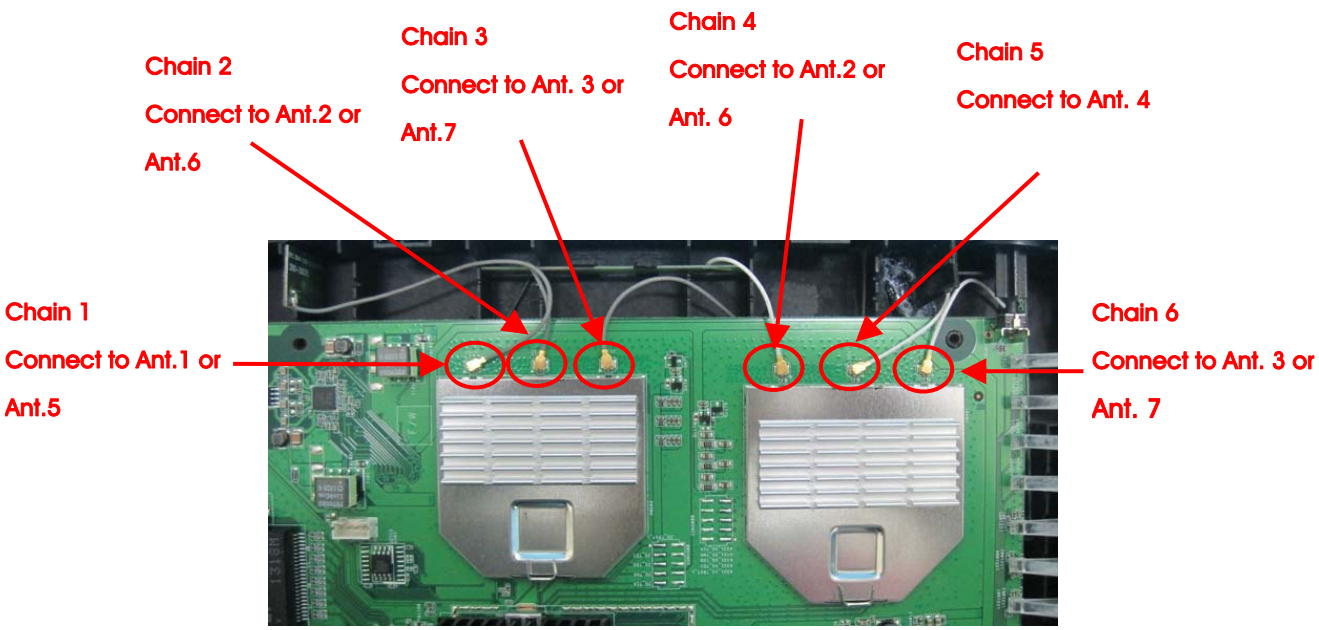
For IEEE 802.11n/ac mode (3TX/3RX)

Chain 4, Chain 5 and Chain 6 can be used as transmitting/receiving antenna.

Chain 4, Chain 5 and Chain 6 could transmit/receive simultaneously.

For IEEE 802.11a mode (1TX/1RX):

Only Chain 4 can be used as transmitting/receiving antenna.


Chain 2
Connect to Ant.2 or
Ant.6
Chain 3
Connect to Ant. 3 or
Ant.7
Chain 4
Connect to Ant.2 or
Ant. 6
Chain 5
Connect to Ant. 4
Chain 1
Connect to Ant.1 or
Ant.5
Chain 6
Connect to Ant. 3 or
Ant. 7

3.4. Table for Carrier Frequencies

There are three bandwidth systems.

For 20MHz bandwidth systems, use Channel 36, 40, 44, 48.

For 40MHz bandwidth systems, use Channel 38, 46.

For 80MHz bandwidth systems, use Channel 42.

Frequency Band	Channel No.	Frequency	Channel No.	Frequency
5150~5250 MHz Band 1	36	5180 MHz	44	5220 MHz
	38	5190 MHz	46	5230 MHz
	40	5200 MHz	48	5240 MHz
	42	5210 MHz	-	-

3.5. Table for Product Information

Items	Description	
Communication Mode	☒ IP Based (Load Based)	☐ Frame Based
Beamforming Function	☐ With beamforming	☒ Without beamforming

3.6. Table for Class II Change

This product is an extension of original report under Sporton project number: FR3O0404AB

1. Adding new model number for new main chip.

   The differences between original model number and new model number are the model number and DOCSIS Config of main chip.

Device model number	The difference of main chip		Performance Checking
	Model no.	DOCSIS Config	
DPC3929XXXX (X = 0~9 and A~Z or blank)	BCM3383Z	8 Downstream channels & 4 Upstream channels	-
DPC3940XXXX (X = 0~9 and A~Z or blank)	BCM33843Z	16 Downstream channels & 4 Upstream channels	**For 5G (Band 1)** 1. Radiated Emissions <Below 1GHz> 2. Radiated Emissions <Above1GHz>: IEEE 802.11ac MCS0/Nss1 40MHz CH 38 IEEE 802.11ac MCS0/Nss1 80MHz CH 42 IEEE 802.11a CH 36 3. Band Edge Emissions Measurement: IEEE 802.11ac MCS0/Nss1 40MHz CH 38 IEEE 802.11ac MCS0/Nss1 80MHz CH 42 IEEE 802.11a CH 36

2. Adding the same type antennas, and the antenna gain of new antennas is lower than originally approved antennas.

There is no change in existing RF relevant portion.

3.7. 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	Chain
Max. Conducted Output Power	11ac 20MHz	Band 1	MCS0/Nss1	36/40/48	4+5+6
	11ac 40MHz	Band 1	MCS0/Nss1	38/46	4+5+6
	11ac 80MHz	Band 1	MCS0/Nss1	42	4+5+6
	11a/BPSK	Band 1	6Mbps	36/40/48	4
Radiated Emission Below 1GHz	CTX		-	-	-
Radiated Emission Above 1GHz	11ac 20MHz	Band 1	MCS0/Nss1	36/40/48	4+5+6
	11ac 40MHz	Band 1	MCS0/Nss1	38/46	4+5+6
	11ac 80MHz	Band 1	MCS0/Nss1	42	4+5+6
	11a/BPSK	Band 1	6Mbps	36/40/48	4
Band Edge Emission	11ac 20MHz	Band 1	MCS0/Nss1	36/40/48	4+5+6
	11ac 40MHz	Band 1	MCS0/Nss1	38/46	4+5+6
	11ac 80MHz	Band 1	MCS0/Nss1	42	4+5+6
	11a/BPSK	Band 1	6Mbps	36/40/48	4

The following test modes were performed for all tests:

For Radiated Emission below 1GHz test:

Mode 1. Stand of EUT (CTX) with 2.4GHz

Mode 2. Stand of EUT (CTX) with 5GHz

Mode 1 is the worst case, so it was selected to record in this test report.

For Radiated Emission above 1GHz test:

Mode 1. Stand of EUT (CTX)

3.8. Table for Testing Locations

Test Site Location					
Address:	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				
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	-	-	-

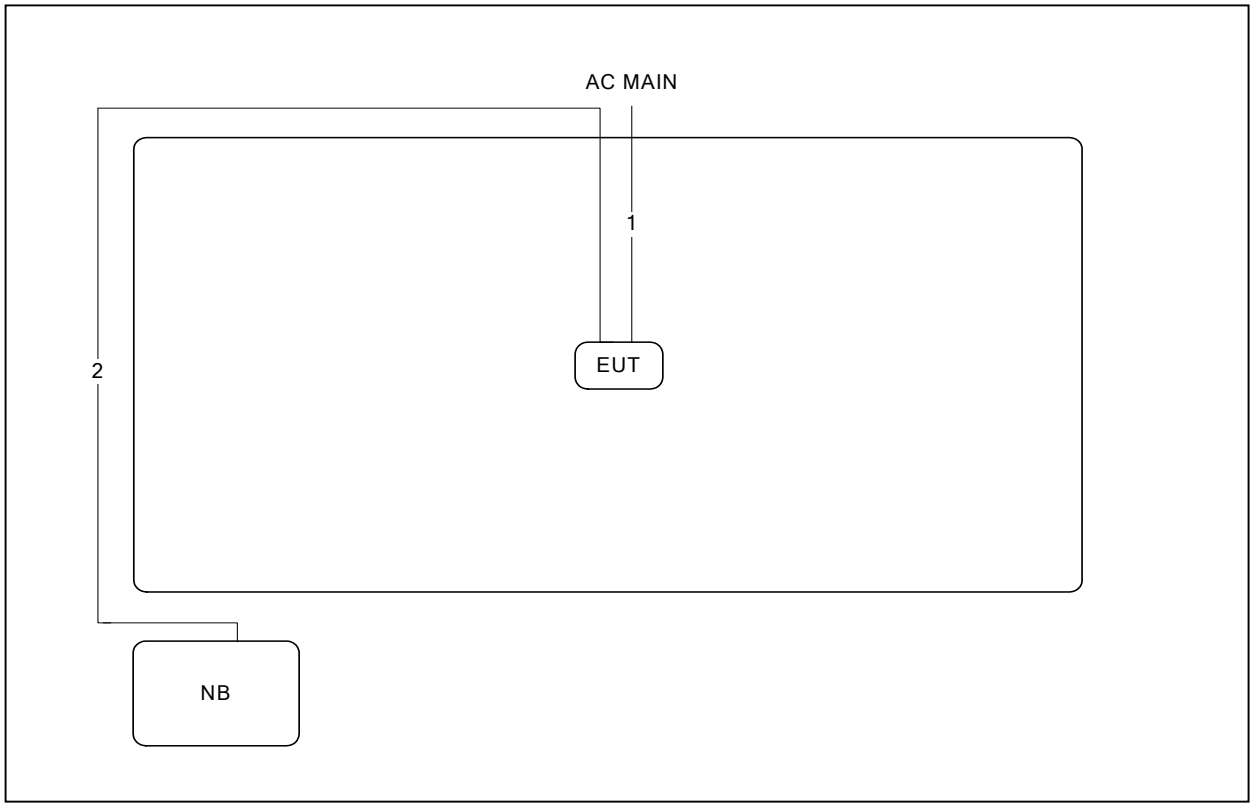
Open Area Test Site (OATS); Semi Anechoic Chamber (SAC).

3.9. Table for Supporting Units

Support Unit	Brand	Model	FCC ID
Notebook	DELL	E6430	DoC

3.10. Test Configurations

3.10.1. Radiation Emissions Test Configuration



Item	Connection	Shield	Length(m)
1	Power cable	No	1.45m
2	RJ-45 cable	No	10m

4. TEST RESULT

4.1. Maximum Conducted Output Power Measurement

4.1.1. Limit

For the band 5.15~5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW (17dBm) or 4 dBm + 10log B, where B is the 26 dB emissions bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

4.1.2. Measuring Instruments and Setting

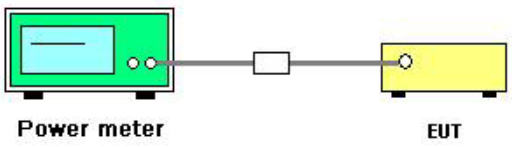
Please refer to section 5 of equipments list in this report. The following table is the setting of the power meter.

Power Meter Parameter	Setting
Detector	AVERAGE

4.1.3. Test Procedures

1. The transmitter output (antenna port) was connected to the power meter.
2. Test was performed in accordance with KDB 789033 D01 v01r03 for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices - Part 15, Subpart E,section (E) Maximum conducted output power =>(3) Method PM (Measurement using an RF average power meter) Multiple antenna systems was performed in accordance with KDB 662911 D01 v02r01 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.

4.1.4. 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	26°C	Humidity	63%
Test Engineer	Magic Lai	Configurations	IEEE 802.11ac
Test Date	Oct. 11, 2013 ~ Oct. 12, 2013		

Configuration IEEE 802.11ac MCS0/Nss1 20MHz / Chain 4 + Chain 5 + Chain 6

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Chain 4	Chain 5	Chain 6	Total		
36	5180 MHz	11.51	11.41	12.07	16.44	17.00	Complies
40	5200 MHz	11.02	10.56	11.45	15.80	17.00	Complies
48	5240 MHz	10.96	10.57	11.23	15.70	17.00	Complies

Configuration IEEE 802.11ac MCS0/Nss1 40MHz / Chain 4 + Chain 5 + Chain 6

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Chain 4	Chain 5	Chain 6	Total		
38	5190 MHz	11.08	12.17	12.56	16.75	17.00	Complies
46	5230 MHz	12.17	12.04	11.46	16.67	17.00	Complies

Configuration IEEE 802.11ac MCS0/Nss1 80MHz / Chain 4 + Chain 5 + Chain 6

Channel	Frequency	Conducted Power (dBm)				Max. Limit (dBm)	Result
		Chain 4	Chain 5	Chain 6	Total		
42	5210 MHz	10.83	12.28	12.71	16.78	17.00	Complies

Temperature	26°C	Humidity	63%
Test Engineer	Magic Lai	Configurations	IEEE 802.11a
Test Date	Oct. 11, 2013 ~ Oct. 12, 2013		

Configuration IEEE 802.11a / Chain 4

Channel	Frequency	Conducted Power (dBm)	Max. Limit (dBm)	Result
36	5180 MHz	16.73	17.00	Complies
40	5200 MHz	12.55	17.00	Complies
48	5240 MHz	12.58	17.00	Complies

4.2. Radiated Emissions Measurement

4.2.1. Limit

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.25 GHz band shall not exceed a -27dBm peak limit or average 54dBuV/m and peak 74dBuV/m limits. In addition, 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

4.2.2. 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	1000 MHz
Stop Frequency	40 GHz
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 10Hz for Average
RBW / VBW (Emission in non-restricted band)	1MHz / 3MHz for peak

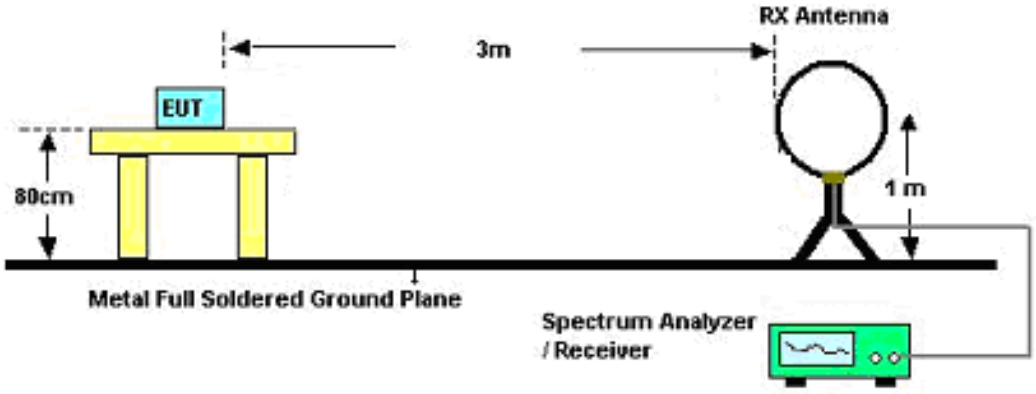
Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RBW 200Hz for QP
Start ~ Stop Frequency	150kHz~30MHz / RBW 9kHz for QP
Start ~ Stop Frequency	30MHz~1000MHz / RBW 120kHz for QP

4.2.3. Test Procedures

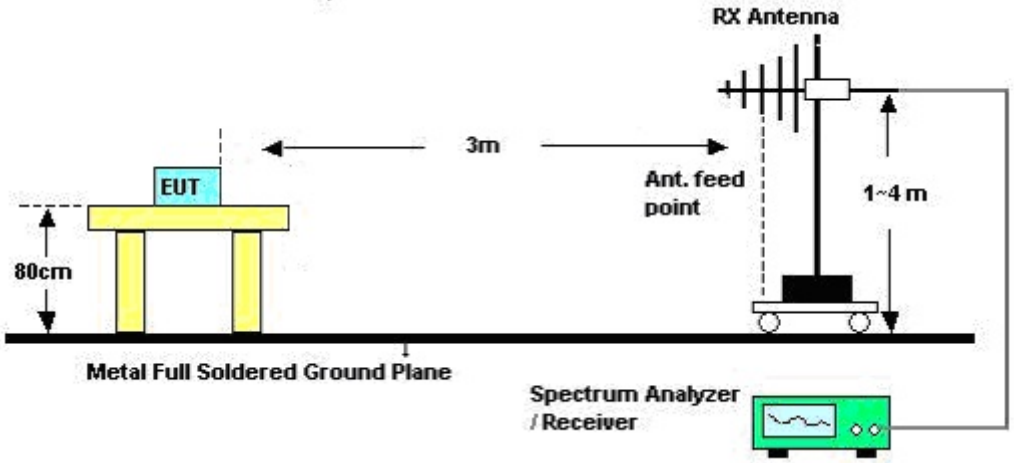
1. Configure the EUT according to ANSI C63.10. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting 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.

4.2.4. Test Setup Layout

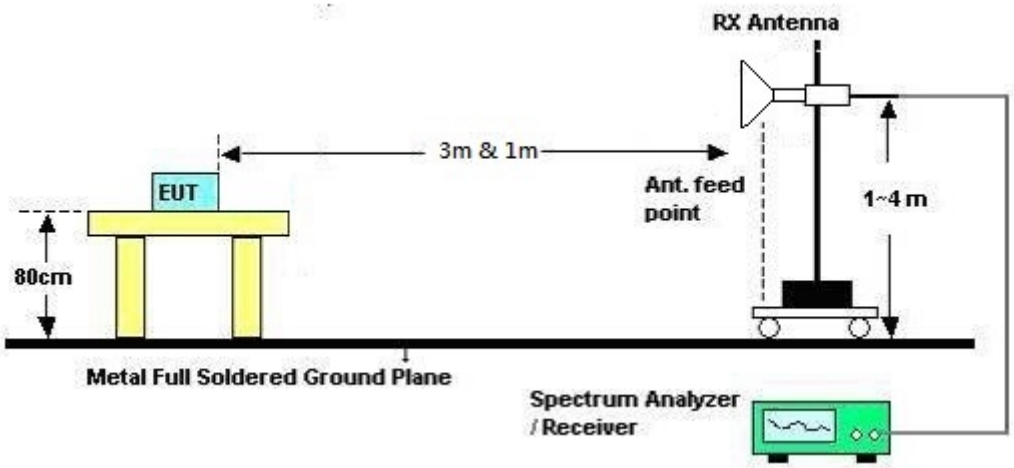
For Radiated Emissions: 9kHz ~30MHz



For Radiated Emissions: 30MHz~1GHz



For Radiated Emissions: Above 1GHz



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

Temperature	25°C	Humidity	40%
Test Engineer	Will Tung	Configurations	CTX
Test Date	Jan. 14, 2014	Test Mode	Mode 1

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.

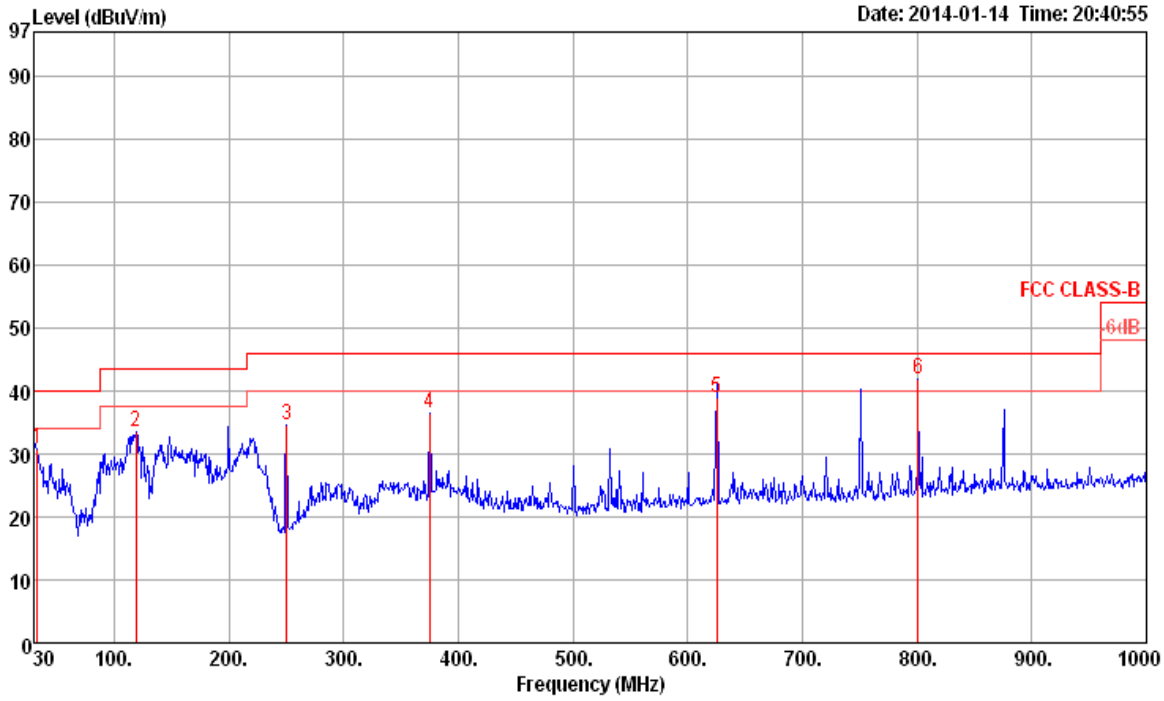
Distance extrapolation factor = 40 log (specific distance / test distance) (Db);

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

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

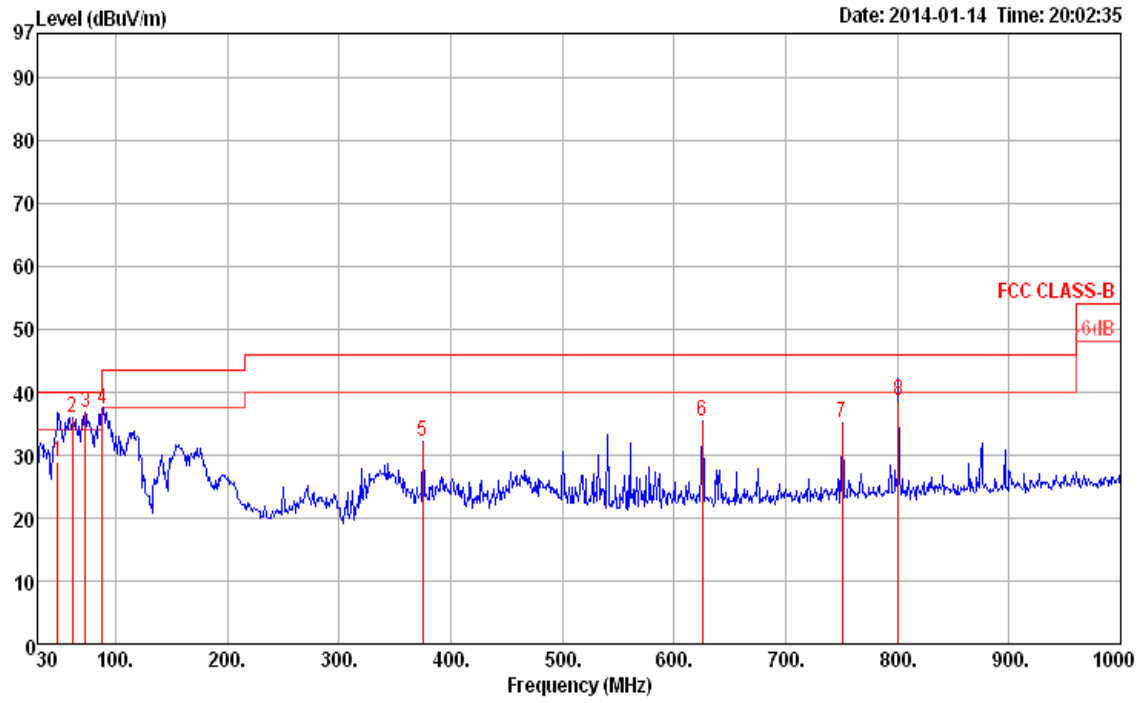
Temperature	25°C	Humidity	40%
Test Engineer	Will Tung	Configurations	CTX
Test Mode	Mode 1		

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	32.91	30.82	40.00	-9.18	40.81	0.66	17.15	27.80	Peak	100	360	HORIZONTAL
2	119.24	33.45	43.50	-10.05	47.20	1.29	12.46	27.50	Peak	100	360	HORIZONTAL
3	250.19	34.67	46.00	-11.33	47.12	1.78	12.77	27.00	Peak	100	360	HORIZONTAL
4	375.32	36.54	46.00	-9.46	46.37	2.20	15.40	27.43	Peak	100	360	HORIZONTAL
5	625.58	38.83	46.00	-7.17	45.15	2.90	18.85	28.07	QP	100	310	HORIZONTAL
6	801.15	41.91	46.00	-4.09	46.51	3.22	19.78	27.60	QP	100	360	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	48.43	28.96	40.00	-11.04	46.81	0.82	9.13	27.80	QP	100	71	VERTICAL
2	61.04	36.06	40.00	-3.94	56.14	0.92	6.76	27.76	Peak	159	0	VERTICAL
3	72.68	36.69	40.00	-3.31	56.67	0.95	6.78	27.71	Peak	159	0	VERTICAL
4	88.20	37.29	43.50	-6.21	55.24	1.08	8.62	27.65	Peak	100	0	VERTICAL
5	375.32	32.03	46.00	-13.97	41.86	2.20	15.40	27.43	Peak	100	0	VERTICAL
6	625.58	35.34	46.00	-10.66	41.66	2.90	18.85	28.07	Peak	100	0	VERTICAL
7	750.71	35.14	46.00	-10.86	40.31	3.20	19.43	27.80	Peak	100	0	VERTICAL
8	801.15	38.52	46.00	-7.48	43.12	3.22	19.78	27.60	QP	100	41	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.

4.2.9. Results for Radiated Emissions (1GHz~40GHz)

Temperature	25°C	Humidity	40%
Test Engineer	Will Tung	Configurations	IEEE 802.11ac MCS0/Nss1 40MHz CH 38 / Chain 4 + Chain 5 + Chain 6
Test Date	Jan. 10, 2014	Test Mode	Mode 1

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	15566.30	42.14	54.00	-11.86	28.85	10.78	38.09	35.58	Average	100	218	HORIZONTAL
2	15566.81	54.94	74.00	-19.06	41.65	10.78	38.09	35.58	Peak	100	218	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	15568.14	42.39	54.00	-11.61	29.10	10.78	38.09	35.58	Average	100	178	VERTICAL
2	15574.84	55.15	74.00	-18.85	41.88	10.78	38.07	35.58	Peak	100	178	VERTICAL

Temperature	25℃	Humidity	40%
Test Engineer	Will Tung	Configurations	IEEE 802.11ac MCS0/Nss1 80MHz CH 42 / Chain 4 + Chain 5 + Chain 6
Test Date	Jan. 10, 2014	Test Mode	Mode 1

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	15629.29	55.35	74.00	-18.65	42.15	10.78	37.99	35.57	Peak	100	191	HORIZONTAL
2	15630.14	42.06	54.00	-11.94	28.86	10.78	37.99	35.57	Average	100	191	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	15636.35	55.47	74.00	-18.53	42.27	10.78	37.99	35.57	Peak	100	97	VERTICAL
2	15636.99	42.46	54.00	-11.54	29.26	10.78	37.99	35.57	Average	100	97	VERTICAL

Temperature	25℃	Humidity	40%
Test Engineer	Will Tung	Configurations	IEEE 802.11a CH 36 / Chain 4
Test Date	Jan. 10, 2014	Test Mode	Mode 1

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	15537.96	43.29	54.00	-10.71	29.99	10.77	38.12	35.59	Average	100	270	HORIZONTAL
2	15537.96	53.36	74.00	-20.64	40.06	10.77	38.12	35.59	Peak	100	270	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	15543.59	54.61	74.00	-19.39	41.30	10.78	38.12	35.59	Peak	100	192	VERTICAL
2	15543.86	42.41	54.00	-11.59	29.10	10.78	38.12	35.59	Average	100	192	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.

4.3. Band Edge Emissions Measurement

4.3.1. Limit

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.25 GHz band shall not exceed a -27dBm peak limit or average 54dBuV/m and peak 74dBuV/m limits. In addition, 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

4.3.2. 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 Parameter	Setting
Attenuation	Auto
Span Frequency	100 MHz
RBW / VBW (Emission in restricted band)	1MHz / 3MHz for Peak, 1MHz / 10Hz for Average
RBW / VBW (Emission in non-restricted band)	1MHz / 3MHz for Peak

4.3.3. Test Procedures

1. The test procedure is the same as section 4.2.3, only the frequency range investigated is limited to 100MHz around bandedges.

4.3.4. Test Setup Layout

This test setup layout is the same as that shown in section 4.2.4.

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 Band Edge and Fundamental Emissions

Temperature	25℃	Humidity	40%
Test Engineer	Will Tung	Configurations	IEEE 802.11ac MCS0/Nss1 40MHz CH 38 / Chain 4 + Chain 5 + Chain 6
Test Date	Jan. 10, 2014	Test Mode	Mode1

Channel 38

	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	5149.20	45.29	54.00	-8.71	5.15	6.13	34.01	0.00	Average	132	107	HORIZONTAL
2	5149.20	57.18	74.00	-16.82	17.04	6.13	34.01	0.00	Peak	132	107	HORIZONTAL
3	5194.01	94.09			53.85	6.16	34.08	0.00	Average	132	107	HORIZONTAL
4	5194.01	104.61			64.37	6.16	34.08	0.00	Peak	132	107	HORIZONTAL
5	5351.60	50.04	54.00	-3.96	9.36	6.26	34.42	0.00	Average	132	107	HORIZONTAL
6	5351.60	60.66	74.00	-13.34	19.98	6.26	34.42	0.00	Peak	132	107	HORIZONTAL

Item 3, 4 are the fundamental frequency at 5190 MHz.

Temperature	25℃	Humidity	40%
Test Engineer	Will Tung	Configurations	IEEE 802.11ac MCS0/Nss1 80MHz CH 42 / Chain 4 + Chain 5 + Chain 6
Test Date	Jan. 10, 2014	Test Mode	Mode1

Channel 42

	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	5000.16	46.38	54.00	-7.62	6.65	6.03	33.70	0.00	Average	109	177	HORIZONTAL
2	5145.19	62.58	74.00	-11.42	22.44	6.13	34.01	0.00	Peak	109	177	HORIZONTAL
3	5198.78	87.94			47.67	6.16	34.11	0.00	Average	109	177	HORIZONTAL
4	5199.58	101.00			60.73	6.16	34.11	0.00	Peak	109	177	HORIZONTAL
5	5363.62	46.26	54.00	-7.74	5.57	6.27	34.42	0.00	Average	109	177	HORIZONTAL
6	5363.62	57.61	74.00	-16.39	16.92	6.27	34.42	0.00	Peak	109	177	HORIZONTAL

Item 3, 4 are the fundamental frequency at 5210 MHz.

Note:

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

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

Temperature	25℃	Humidity	40%
Test Engineer	Will Tung	Configurations	IEEE 802.11a CH 36 / Chain 4
Test Date	Jan. 10, 2014	Test Mode	Mode1

Channel 36

	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	5100.00	61.02	74.00	-12.98	21.01	6.10	33.91	0.00	Peak	176	76	HORIZONTAL
2	5100.64	50.00	54.00	-4.00	9.99	6.10	33.91	0.00	Average	176	76	HORIZONTAL
3	5178.40	111.68			71.45	6.15	34.08	0.00	Peak	176	76	HORIZONTAL
4	5181.28	100.70			60.47	6.15	34.08	0.00	Average	176	76	HORIZONTAL

Item 3, 4 are the fundamental frequency at 5180 MHz.

Note:

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

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

4.4. Antenna Requirements

4.4.1. 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.

4.4.2. 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
BILOG ANTENNA	Schaffner	CBL6112D	22021	20MHz ~ 2GHz	Apr. 16, 2013	Radiation (03CH01-CB)
Loop Antenna	Teseq	HLA 6120	24155	9 kHz - 30 MHz	Nov. 05, 2012*	Radiation (03CH01-CB)
Horn Antenna	EMCO	3115	00075790	750MHz~18GHz	Nov. 01, 2013	Radiation (03CH01-CB)
Horn Antenna	SCHWARZBEAK	BBHA 9170	BBHA9170252	15GHz ~ 40GHz	Dec. 17, 2013	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8447D	2944A10991	0.1MHz ~ 1.3GHz	Nov. 12, 2013	Radiation (03CH01-CB)
Pre-Amplifier	Agilent	8449B	3008A02310	1GHz ~ 26.5GHz	Dec. 16, 2013	Radiation (03CH01-CB)
Pre-Amplifier	WM	TF-130N-R1	923365	26GHz ~ 40GHz	Oct. 23, 2013	Radiation (03CH01-CB)
Spectrum analyzer	R&S	FSP40	100019	9kHz~40GHz	Dec. 02, 2013	Radiation (03CH01-CB)
EMI Test Receiver	Agilent	N9038A	MY52260123	9kHz ~ 8GHz	Dec. 12, 2013	Radiation (03CH01-CB)
Turn Table	INN CO	CO 2000	N/A	0 ~ 360 degree	N.C.R	Radiation (03CH01-CB)
Antenna Mast	INN CO	CO2000	N/A	1 m - 4 m	N.C.R	Radiation (03CH01-CB)
RF Cable-low	Woken	Low Cable-1	N/A	30 MHz - 1 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-1	N/A	1 GHz – 26.5 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-2	N/A	1 GHz – 26.5 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-3	N/A	1 GHz - 40 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
RF Cable-high	Woken	High Cable-4	N/A	1 GHz - 40 GHz	Nov. 17, 2013	Radiation (03CH01-CB)
Signal analyzer	R&S	FSV40	100979	9kHz~40GHz	Oct. 08, 2013	Conducted (TH01-CB)
RF Power Divider	Woken	2 Way	0120A02056002D	2GHz ~ 18GHz	Nov. 18, 2012	Conducted (TH01-CB)
RF Power Divider	Woken	3 Way	MDC2366	2GHz ~ 18GHz	Nov. 18, 2012	Conducted (TH01-CB)
RF Power Divider	Woken	4 Way	0120A04056002D	2GHz ~ 18GHz	Nov. 18, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-7	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-8	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-9	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-10	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
RF Cable-high	Woken	High Cable-11	-	1 GHz – 26.5 GHz	Nov. 19, 2012	Conducted (TH01-CB)
Power Sensor	Anritsu	MA2411B	0917223	300MHz~40GHz	Sep. 18, 2013	Conducted (TH01-CB)
Power Meter	Anritsu	ML2495A	1035008	300MHz~40GHz	Sep. 18, 2013	Conducted (TH01-CB)

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

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

N.C.R. means Non-Calibration required.

6. MEASUREMENT UNCERTAINTY

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	0.026	dB	normal(k=2)	0.013
Cable loss	0.002	dB	normal(k=2)	0.001
AMN/LISN specification	1.200	dB	normal(k=2)	0.600
Mismatch Receiver VSWR 1= AMN/LISN VSWR 2=	-0.080	dB	U-shaped	0.060
Combined standard uncertainty Uc(y)				1.2
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)				2.4

Uncertainty of Radiated Emission Measurement (30MHz ~ 1,000MHz)

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	±0.173	dB	K=1	0.086
Cable loss	±0.174	dB	K=2	0.087
Antenna gain	±0.169	dB	K=2	0.084
Site imperfection	±0.433	dB	Triangular	0.214
Pre-amplifier gain	±0.366	dB	K=2	0.183
Transmitter antenna	±1.200	dB	Rectangular	0.600
Signal generator	±0.461	dB	Rectangular	0.231
Mismatch	±0.080	dB	U-shape	0.040
Spectrum analyzer	±0.500	dB	Rectangular	0.250
Combined standard uncertainty Uc(y)				1.778
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)				3.555

Uncertainty of Radiated Emission Measurement (1GHz ~ 18GHz)

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	±0.191	dB	K=1	0.095
Cable loss	±0.169	dB	K=2	0.084
Antenna gain	±0.191	dB	K=2	0.096
Site imperfection	±0.582	dB	Triangular	0.291
Pre-amplifier gain	±0.304	dB	K=2	0.152
Transmitter antenna	±1.200	dB	Rectangular	0.600
Signal generator	±0.461	dB	Rectangular	0.231
Mismatch	±0.080	dB	U-shape	0.040
Spectrum analyzer	±0.500	dB	Rectangular	0.250
Combined standard uncertainty Uc(y)				1.839
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)				3.678

Uncertainty of Radiated Emission Measurement (18GHz ~ 40GHz)

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Receiver reading	±0.186	dB	K=1	0.093
Cable loss	±0.167	dB	K=2	0.083
Antenna gain	±0.190	dB	K=2	0.095
Site imperfection	±0.488	dB	Triangular	0.244
Pre-amplifier gain	±0.269	dB	K=2	0.134
Transmitter antenna	±1.200	dB	Rectangular	0.600
Signal generator	±0.461	dB	Rectangular	0.231
Mismatch	±0.080	dB	U-shape	0.040
Spectrum analyzer	±0.500	dB	Rectangular	0.250
Combined standard uncertainty Uc(y)				1.771
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)				3.541

Uncertainty of Conducted Emission Measurement

Contribution	Uncertainty of x_i			$u(x_i)$
	Value	Unit	Probability Distribution k	
Cable loss	±0.038	dB	K=2	0.019
Attenuator	±0.047	dB	K=2	0.024
Power Meter specification	±0.300	dB	Triangular	0.150
Power Sensor specification	±0.300	dB	Rectangular	0.150
Signal generator	±0.461	dB	Rectangular	0.231
Mismatch	±0.080	dB	U-shape	0.040
Spectrum analyzer	±0.500	dB	Rectangular	0.250
Combined standard uncertainty Uc(y)				0.863
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)				1.726